Technical Reference

Installations -- Recommended Practices

AWID recommends the following practices when installing its products, to assure that they meet the published specifications and perform with complete satisfaction.

The Plan -- Start with These Questions

- Is the purpose to identify people or vehicles or something else?

- What is the proposed application? – For access control at doors or gates, or identification, or record keeping?

- What is the country in which the installation will occur?

- What read range between the credentials and the reader is required?

- What are the environment and the weather conditions around the planned reader location?

- What will be the pattern of the flow of vehicles (or people) in the reading zone?

- What types or sizes of vehicles will be tagged?

The Products

- Know the client's or end user's goals and desires for the system.

- Select the reader technology by matching (a) the new requirements or (b) the existing readers and credentials.

- Select the reader model by meeting the read range and the conditions. Watch for need for weather-protected reader models, or protective housings for the readers.

- Select the credentials: (a) hand-held or hands-free; (b) movable (portable) or permanent (fixed position).

The Site

- At the site: Inspect the site before committing to purchase the products. Know that it is suitable for the application and installation. Use AWID's reader as a portable test device, or a test/demo kit, for mobile testing at the site. Avoid other sources of RF radiation. Watch for reduced read range as an indication of interference.

- At your shop: Before you carry the products to the site for installation, you may gain confidence in the procedure by doing a quick, temporary hook-up at your shop. This saves more expensive time at the site later.

Documentation

- Read up: Read the short Instruction Sheet or Quick Installation Guide *before* you go to the site. Know the requirements, and ask AWID's Technical Support for guidance.

- For reference: Take the instructions with you to the site. They show how to install the products well, or to contact AWID's Technical Support.

Mounting the Reader

- Locations: Know where the reader can be mounted (a) for good reading of the credential and (b) to avoid other credentials while one is reading.

- Good reading: Consider the need to read the credentials --
  (a) without having the RF fields of neighboring readers overlap, and
  (b) without having the reader for this lane see tags on cars in other lanes, and
  (c) having one tag in the reading zone at any time.

- One "live" reader: If the RF fields of two neighboring same-type readers overlap, a tag at one reader may be read by the second reader. Avoid this by a variety of techniques. (Ask AWID's Technical Support for suggestions.)
  Examples: (a) Two LF proximity readers back-to-back for people walking in & out at a door – the system loses direction information.
  (b) Two UHF readers at neighboring lanes for in & out vehicles – both gates may open for a vehicle.

- Avoid metal: (a) AWID's small low-frequency (proximity) readers are metal-compensated. Their read range ratings are for mounting on a metal surface. They have somewhat better range when mounted away from metal.
  (b) AWID's MR-1824 has optional metal-compensation. The "MC" version works *better* when it is mounted on a metal surface with a footprint larger than the reader.
  (c) AWID's metal-backed UHF readers can be mounted on metal. But there must be no metal or other material close at the sides, not in front of these readers.

Cables for Power and Data

- Uniformity: Cables for Wiegand data interface and for RS-232 interface can have the same specifications.

- Length: (a) The Wiegand interface protocol limits cable length to 500 feet. Beyond that length the "square" Wiegand data pulses may have reduced amplitude or degraded shape, resulting in lost pulses at the panel.
  (b) The RS-232 specification for cable length is up to 75 feet.

- Wire gauge: (All specifications are in AWG – American Wire Gauge)
  (a) For data lines, 22 gauge is always sufficient. The current flow in a digital data wire is very small. 22 gauge is strong enough for pulling up to 500 feet in typical installations.
  (b) For DC power to low-frequency (proximity) readers, 22 gauge is sufficient with the smaller readers; but the MR-1824 group of readers should use 18 gauge for power.
  (c) For DC power to UHF readers, 18 gauge is sufficient up to 500 feet. There is no advantage in larger wires.
  (d) Cable with heavier gauge wires tolerate rougher pulling jobs. Smaller wires use less space inside conduit.

- Shielded cable: *Always* use overall-shielded (100% rating, wrapped or braided) cables for *both* DC power and code data – "access control" rating, high quality.

- Wrong cable: *Never* use "Cat5" or "Cat6" cable. It does not meet the basic standards for RF readers. That includes all AWID readers.

- Separate or combined: Reader cables carry both DC power and code data. They may be in separate cables, or combined in a single cable. The decision may rest on how close the power supply is to the panel. For simple cable specifications, see AWID's reader product sheet, or the Material List, or the installation instructions.

- Twisted-pairs: Cable carrying data must *not* have twisted-pairs of wires. Twisting may cause cross-talk between wires in long runs. Use only cable with bunched wires. (The standard 1 turn per foot of length is OK.)

- Spares in the pairs: If existing cable at the site is twisted pairs (otherwise meeting the specifications), and if there are spare conductors, connect the reader's wires so that Data-0 is in one wire of a twisted-pair, Data-1 is in one wire of a different pair, and Data-Common is in one wire if a third pair. This allows long runs without cross-talk.

- AC: *Never* run alternating current – not even low-voltage AC – in the same cable that carries DC power into the reader and/or data from the reader. Always use a separate cable for AC, distant from the reader's cables.

- Unused wires: The reader's unused wires should be separately insulated, using beads or tape. Do not bunch-cut the wires.

- "Noisy" wires: Wires that carry switched loads (like door lock power) should be in shielded cables, suitably grounded. These cables should be distant from the reader's cables.

DC Power for Readers

- One-On-One Rules: (a) For all readers, have a single DC power source connected to the reader.
  (b) For all UHF readers, have a separate, independent, dedicated DC power supply for each reader.
  (c) Do not use multiple-channel DC power supplies for UHF readers – not even supplies with filtered outputs.

- Clean DC: Specifications for DC power into all RF-type access control readers should include (a) linear-rated supply and (b) regulated DC output. These indicate high quality that contributes to good reader performance.

- Voltage: The power supply's DC output may always be nominal 12 volts for all AWID reader models.
  (a) LF proximity readers work between about + 5 volts and +12 volts. MR-1824 needs a 1 ampere DC supply.
  (b) UA-612 needs a 12 volt, 1 amp supply. Other uAxcess readers use 5-12 volts, 1 amp or more.
  (c) UHF long-range readers work at 7-15 volts IF there is sufficient current capacity in the supply. The popular source is a battery-charging power supply, with voltage as high as 14.0 volts, rated for 2.5 amps or more. If the power cable is between 300 and 500 feet long, current rating should be 3.5 amps.

- Voltage *drop*: For UHF long-range readers, the IMPORTANT factor is not the applied voltage – it is the *voltage drop* from the power supply to the reader's DC wires. For sufficient current flow, voltage drop should not exceed several tenths of a volt. If voltage drop exceeds 0.4 volts, look for a power supply or power cable problem.

- Current rating: Use a DC power supply that has excess DC current capacity – around two times the peak current drawn by the reader. AWID's product sheets, Material Lists, and instructions show the recommended power supply rating, including the recommended excess capacity. This practice keeps the load on the power supply at 50% or less, for smooth, "quiet" power. (The reader always draws only as much current as it needs.)

- "High power" readers: For the MR-1824 and UHF readers, do not draw the DC power from the panel reader port's DC terminals. The panel's terminals do not supply sufficient current reliably, and it tends to be noisy DC. Use a separate power supply independent from the panel.

Wiring Procedures – DC Power

- Wiring up: When you wire up a reader, connect the black wire (negative) first, and the red wire (positive) last.

- Disconnecting: When you disconnect a reader, remove the red wire first and the black wire last.

- Safety: Remove DC power from the reader before making any change in wiring associated with the reader.

- Common negative: In the MR-1824 readers, connect 3 points for a common DC negative – (a) the separate DC power supply, and (b) the reader's black wire, and (c) the panel reader port's "Ground" terminal.
  NOTE: The UHF readers must NOT have this 3-way connection. Read the wiring instructions carefully.

- Reset power: Use the red wire to cycle the DC off and on –
  (a) for any reader in "go to sleep" condition that has stopped reading credentials, and
  (b) for a long-range reader after making any change in the internal settings of the reader using AWID's downloaded LongRangeReaderSettings program.

- Cure: If "go to sleep" condition occurs, trouble-shoot and cure the cause of that problem.
  (See "Trouble-Shooting".)

Wiring Procedures – Wiegand Data

- One-On-One Rules: (a) Only one Wiegand reader may be connected to the data wires in the cable; and
  (b) Only one data cable can be wired into the reader input port on the controller panel; and
  (c) The data cable must be wired into only one reader port on the panel.

Wiring Procedures – Function Control Lines

- Reader functions: LF proximity readers have remote control lines for the reader's LED, beeper/alarm, and data-hold.

- LED terminals: If the panel's reader port has more than one "LED" terminal (for example, red and green LED, or LED-A, -B, -C), the reader's brown wire must connect to the "Green LED" terminal, or equivalent.

Grounding

- For low-frequency (proximity) readers:
  (a) The shields or drain wires of all cables (reader, DC power, and data) must be tied together. Then the shield near the ends of power and data cables farthest from the reader must be connected to true earth-ground.
  (b) Good earth-ground points are (1) a grounding rod, (2) permanent cold water pipe, (3) steel structure in the building, and (4) the green (ground) wire in a 120 VAC electrical receptacle.
  (c) Do not connect the proximity readers' shield or drain wire inside the head-end panel or to the metal cabinet, even if they have terminals labeled "Ground". These are not reliable tie-points for the readers' shield. They tend to be noisy.

- For UHF readers: The shields or drain wires of all cables (reader, DC power, and data) must be tied together. Then the shields must NOT be grounded anywhere – they are connected together but they must float at both ends.

- Reader's shield: The drain wire in the readers' cable may be a bare silver-colored wire, or it may have gray plastic insulation that can be pulled easily to expose the wire.

- Same grounds: Door frames, metal cabinets, posts, poles, pedestals, fences gate operators, and metal conduit must be grounded in the same way that an associated reader must be grounded. If necessary, drive a grounding rod into wet earth, and run a solid buss between the rod and the metal on which the reader is mounted.
  (a) This point may be a safety issue and may be regulated by safety code.
  (b) If unsure of grounding, measure both DC and AC voltage between a proven ground and the mounting metal device. It should not be more than a tenth or two of a volt.

Operating Procedures

- Reset for reader settings: After making a change in a long-range reader's operating parameters (using AWID's LongRangeReaderSettings program), reset the reader by cycling the DC power off and on.

- Single credential: Read one credential at a time. Have other credentials outside the reader's effective RF field. The reasons for this are --
  (a) To prevent possible data collision if two credentials were activated simultaneously by the reader; and
  (b) To assure that the system knows which tag (which person or which vehicle) was read in the recorded event.

Protection from Environment

- Surges: If the electrical service is subject to voltage surges and spikes, perhaps caused by electrical storms or electrical devices or machinery, install a surge protector on the reader's wires.

- Noise: Noise filters are available from Security distributors. They connect on the cables of an access control system. They should be connected as close as possible to the potential source of noise, for example, next to a door lock.

Trouble-Shooting Procedures

- Restore reading: If the reader enters a "go to sleep" condition (shut down – no LED power indication, and no card reading), restore the reader to normal operation by cycling the DC power off and of. Then look for the *cause* of "go to sleep" – usually noisy power or unshielded cables or improper shield grounding.

- Substitute battery: If the reader's DC power supply or the power cable is suspected of causing problems, substitute a battery in place of the power cable at the reader's red and black wires. A 12 volt, 7.5 ampere-hour back-up battery is always good. For a small low-voltage (proximity) reader, a common 9 volt battery works well.

Encoded Credentials (Cards, Tags, Wafers)

- Matching the products: Use only AWID's 125 kHz proximity cards and keytags and wafers with AWID's proximity readers. Use only AWID's WS and MT tags with the LR-911 long-distance reader. (Suitable credentials from HID may read on AWID's proximity readers. Ask AWID's Technical Support.)

- Save the codes: Record the code data for the installation (a) at your shop or office, and (b) inside the controller's locked cabinet. Give a written copy of the code data to your customer's system supervisor; insist that the supervisor save the code data in a safe place accessible to authorized personnel and the purchasing agent.

- Vital: Consider the codes as vital data for continuing support of the installation and of your customer.

- Ordering credentials: Necessary code data for re-order of credentials and for system troubleshooting include:
  (a) the bit format (usually 26-bit Wiegand standard), and
  (b) the facility code or site code (frequently the same on all credentials at the site), and
  (c) the range of ID numbers or PINs (the sequential numbers that identify the individual credentials).
  These data may be printed on the cards and keytags and wafers. They appear on AWID's Sales Order and Invoice, and on the printed list that accompanies shipments of credentials.

Special Application -- Elevators

- "Tough place": Elevator cabs are a very harsh environment for readers. These items are especially important.

- Cable: The traveler cable must be excellent quality, strong, and well shielded. Low-voltage traveler cable provided by elevator companies is usually suitable for voice, but not for data. Insist on proper cable.

- Wiring: Data-0 and Data-1 wires from the reader must not be connected to the same twisted-pair in the traveler cable. If there are several shielded communications cables in the traveler, connect the reader's data lines into different cables.

- Grounding: The reader's drain wire must be connected to the traveler cable's shield. The cable shield must be carefully grounded at the panel end.

- Voltage: Use a 12 volt DC power supply. This will allow voltage drop without affecting reader performance.

- Power supply: To avoid running reader power through the traveler cable, mount the reader's power supply on the elevator cab.

- Environment: Keep the reader cable away from electrical machinery and relays in the elevator control room.

The Host System

- Code entry: Program the host, through the PC-based program or the controller's keypad, for all factors affected by the credentials. Enter the bit format (commonly 26-bit Wiegand standard), the facility code, the credentials' ID number (PIN) for all users (use block-programming or auto-enrolling if available).

  Your level: To start, set the host for all door groups, all day & time zones, top priority, all user privileges. After you see codes entering correctly, you can set these other factors as requested by the system administrator.

References

- For additional information, please visit AWID's Web site www.awid.com.

- For technical support questions, visit www.awid.com/support or call **1-800-369-5533** (in the U.S.) or +**1-408-825-1100, option 1** from 6:00 a.m. to 4:00 p.m. Pacific time.