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FREQUENTLY ASKED QUESTIONS (FAQ)
AWID LR-2000
LONG-RANGE RFID READER

The purpose of this document is to provide the prospect a thorough non-technical understanding of the AWID long-range reader designed for Automated Vehicle Identification (AVI) applications. This document is divided into two main sub-headings: (1) a discussion focused on the reader system itself, and (2) a discussion of application-related issues, both in an FAQ format. For further clarification, the user is referred to AWID technical support at support@awid.com or AWID's Regional Sales Managers.

LR-2000 Specific Equipment FAQ's:

1. **Q: What exactly is AWID's LR-2000 RFID reader?**

    A: The LR-2000 RFID reader is the successor to the original AWID LR-911 AVI reader. Identical in form, fit and function but with more state-of-the-art application-specific RFID tags, the LR-2000 has better reliability, longer tag-read distance, and better ROI. The LR-2000 operates in the same license-free Ultra-High Frequency (UHF) 902-928 MHz band as does the LR-911.

2. **Q: Does the LR-2000 looks exactly like the older version LR-911 reader?**

    A: In order to answer this question, one must understand that, like the LR-911 reader, the "system" consists of three main modules: (a) the actual reader transmitter-receiver, (b) the required accessories, and (c) the RFID credentials (tags) that go with the reader. One cannot tell the difference by looking at the reader's transmitter-receiver housing. The LR-2000 uses the same enclosure as the LR-911; therefore the LR-2000 mounts the same way as the LR-911 did, utilizing the same mounting bracket. The only change made to the LR-2000's transmitter-receiver was new firmware to read the new RFID tags.

3. **Q: Are there other changes in the new LR-2000 "system" compared to the older LR-911?**

    A: AWID has introduced a new power supply that we sell optionally for LR-2000 operation. This is a smaller "brick" power supply than before. It provides sufficient power to operate perfectly one LR-2000 reader. Ideal power supply specs are clearly listed in Section 2.4 of the LR-2000 Installation & Operation Manual that you can download. Because the power supply is a "switcher", it radiates RF noise. Hence the "brick" should be located at least 6 linear feet away from the reader's transmitter-receiver unit. However, the main enhancement has been made in the actual RFID credentials themselves.

4. **Q: The LR-911 came also in a "Hi-Lo" version. Is the same true for the LR-2000?**

    A: Yes. The LR-2000 also can be ordered in a Hi-Lo configuration where the signal pattern needs to be enhanced either vertically (for different vehicle heights ... big trucks vs. cars) or horizontally (for vehicle approaches with tight corners). The configuration of the LR-2000HiLoMA is a remote antenna connected to the master reader's transmitter-receiver via a 6 foot coax cable. The two units have identical 8-inch-square enclosures. They are usually mounted 4 feet apart, on a pole or on an overhead structure.

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5. **Q: So the LR-911 reader system has been discontinued?**

   A: Only for all new applications. If there is an existing project where the LR-911 has been already deployed, then AWID will allow additional LR-911 readers to be deployed for that project only.

   Take notice – LR-911 credentials are not compatible with LR-2000 credentials, and vice versa. AWID technical support continues to be available for the LR-911 at support@awid.com.

6. **Q: Can the old style power supply that was used with the LR-911 also be used with the LR-2000?**

   A: Only for a brief interim time period. AWID strongly recommends that the new power supply that we sell optionally be installed ASAP. While the reader may draw peak loads of about 900 milliamps, one needs to have a DC power supply with about 50% more current rating (around 1.5 amps) to assure that the DC power remains quiet and smooth. If one uses an Altronix supply, it needs to be their LPS3 model rated at 2.5 amps.

7. **Q: What is so special about the LR-2000's main enhancement … the credentials?**

   A: The new LR-2000 tags utilize a new chip and antenna design standard. This standard has been exclusively used by the technical community in supply chain and asset tracking RFID applications for several years. A large amount of R&D dollars has been spent in this arena resulting in better-performing RFID tags, while lowering costs at the same time due to high-volume production. AWID took this state-of-the-art standard and wrapped the chip and antenna designs (called inlays) inside new plastic form factors specifically aimed at vehicle-based AVI applications.

8. **Q: Are the data that AWID programs into the LR-2000 tag identical to the supply chain format?**

   A: No. AWID still provides site code and serial number data just as before. But now we utilize the new tag designs created by the supply chain standard.

9. **Q: Can you explain in detail the various LR-2000 RFID credentials introduced by AWID?**

   A: AWID has initially released 7 variations of RFID tags compatible with the LR-2000 reader. The tags come with various code formats. They can be programmed in formats from 26 through 50 bits. Encryption algorithms are also programmed into the reader and credentials, transparent to the user, so that the wireless long-range transmitted data between reader and tag cannot be decoded if captured. The 7 tags are as follows:

   (1) <u>Clamshell badge</u>   The credit-card-size portable clamshell (CS) design is identical in form to the standard low-frequency proximity reader CS design that we are all familiar with in building access control. Using this card type, the badge is "presented" to the reader by the user through the car's window.

   (2) <u>Graphics badge</u>   The graphics (GR) badge is ISO-compatible with the many badge printers on the market today. This allows graphics and text data to be printed right onto the badge. Like the CS badge, these thinner credit-card-size credentials are also presented to the reader by the user. Unlike the low-frequency (LF) graphics credentials that AWID offers, no magnetic stripe option is offered in this LR-2000 UHF card.

   (3) <u>Visor tag</u>   The white mobile visor tag (VT) comes with a white clip for easy mounting onto a car's sun visor. The visor tag is the same size as the familiar "hello - my name is …" party name tag. The driver flips the visor down and the tag is read through the windshield. Visor tag mounting can be on either the driver's visor or the passenger's visor, depending on what side the reader is located relative to the car's approach.

   (4) <u>Hang tag</u>   The white hang tag (HT) is a variation of the visor tag but is designed with an integral hook to be hung from the vehicle's rear-view mirror mounting post, just like a disabled handicap placard only shorter in length.

   (5) <u>Rear-View Mirror tag</u> The permanently adhered rear-view mirror (RV) tag is black in color so it doesn't stand out when it is mounted to the back of the vehicle's rear-view mirror. Depending on reader location relative to the car's approach, this large-band-aid-size tag can be mounted on either side of the mirror's mounting post. This tag "self-destructs" into unusable pieces if someone tries to remove it after the adhesive solidifies.

(6) <u>Windshield tag</u>   *Like the RV tag, the windshield (WS) tag also self-destructs when it is pulled from the windshield. This tag, longer than a regular band aid, is white in color. It was designed to be mounted on vehicle windshield glass for proper operation.*

(7) <u>Metal-Mount tag</u>   *The metal-mount tag (MT) performs best if it is mounted on metal. It is designed for outside industrial applications. The ¼-inch-thick black tag looks like a tongue depressor with Mickey Mouse ears on the ends for secure mounting using conventional hardware. The tag comes also with a self-adhesive strip along its backside. The tag's mounting hole dimensions allow for attachment on the front license plate. But it can be adhered on a bumper or screwed to a door or fender. The MT credential is the most sensitive to parallel mounting of all the LR-2000 tags. That is, the MT's centerline axis needs to be more in parallel to the reader's front face than the other tags. This is especially crucial when license plate reading is required. Please refer to the application-specific Q&A in the next section regarding the metal-mount tag and attachment to a license plate.*

These credentials can generally be classified as badges (cards) that are portable, or tags that are fixed. The Clamshell and Graphics badges are hand-held; the others are attached permanently to vehicles.

It is important to note that typical applications may require more than one credential type to insure end-user satisfaction.

AWID is continually looking at new tag designs for continuous improvement and applications.

LR-2000 Application-Specific FAQ's:

1. Q: What are the main applications for the LR-2000 long-range UHF reader by AWID?

A: The LR-2000 has been used primarily in high-end gated communities for unattended vehicle access control. Secondary applications have been access control for both cars and trucks in industrial complexes, and access control of emergency carts in a hospital environment. Some Parking OEM's are evaluating the reader for incorporation into their respective product lines for vehicle lane access and traffic reporting.

2. Q: A new LR-2000 Installation Kit has been introduced. Can you describe the kit's contents?

A: AWID revamped the old LR-911 installation kit to be more user-friendly. The kit comes in a foam-lined travel case and has everything the dealer/integrator would need to perform a site survey or demonstration. The kit now includes a modified LR-2000 demo test reader, a small beeper module, AWID's standard power supply (a gel-cell portable battery or a car's 12 volt battery could be used if no AC power is available), a small lipstick-size RF signal detector, and one each of all the RFID tags described above.

3. Q: How would one use the kit?

A: The self-contained kit is designed for stand-alone operation wherein no connection to any control electronics is required. The primary purposes of the kit are for the dealer/integrator to set the correct expectation level with the end-user decision maker/influencer by demonstrating the reader's read range, and for subsequent selection of the various credentials, either in shop conditions or at the actual site location. The LR-2000EVAL reader's interface is disabled, so it cannot be offered as a salable unit. The RF signal detector is a battery-powered device that beeps when the reader is operating, and tells if there is any RF signal interference that may cause reduced read-range at the site. The signal detector should be used ASAP after the reader location is initially proposed. A secondary use of the kit is for trouble-shooting during the installation process and service calls. AWID technical support will always ask if a kit is available. Effective technical support may not be possible unless a kit is available at the site.

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4. **Q: AWID seems to be implying that the installation kit needs to be a one-time <u>mandatory</u> requirement. Is this assumption correct?**

   A. Yes! Based on tech support's negative experience resulting from the non-enforcement of earlier LR-911 installation kit procurement, AWID <u>will not allow</u> the shipment of any LR-2000 reader without an installation kit if it is a first-time buy. AWID <u>will allow</u> LR-2000-only shipments if an installation kit is confirmed to be in the installer's possession from a previous buy. The one-time cost can be amortized easily over the initial project's total expenditure and will pay for itself via honest expectation levels coupled with error-free installations.

5. **Q: Can the LR-911 installation kit be upgraded to the LR-2000 installation kit?**

   A. No. Although the beeper+LED test unit is common to both kits, the addition of the demo/test LR-2000, new power supply, RF signal detector, carrying case and new credentials do not make an upgrade feasible.

6. **Q: Are there any major installation tips to assure a successful installation?**

   A: <u>First</u>, the installation kit should always be used at the site by sales or project personnel, not only to set the correct expectation level, but also to make sure that the production reader will operate in the same environment. <u>Second</u>, after the Installation Manual is reviewed, the production unit should be tested in a low-stress lab bench setting to make sure that the reader is correctly reading the tags chosen for the project. Then the reader should ideally be connected directly to the appropriate port on the access control panel before the reader is installed at the remote location.
   <u>Third</u>, after reader wiring is connected to the remote cable, the voltage measured at the reader's installation location should be only a few tenths of a volt DC below the no-load voltage read at the power supply. The power supply is usually located near either the reader or the access control panel.

   The reader's input DC power is never supplied by the access control panel because (a) there is usually not enough current available in the panel's DC power supply, and such a connection could possibly damage the panel's DC supply; (b) each reader must be connected to a dedicated power supply to which nothing else is connected; and (c) the reader's DC supply should be a linear, regulated supply except in California where state law requires a switching supply. At a nominal input voltage of 12 volts DC, current draw should be in the 450 milliamp range at standby and around 900 milliamps during tag data processing and transmission. Power wiring should be 18 AWG stranded cable, while data can be on 22 AWG stranded cable. All cables should be shielded.

7. **Q: LR-2000 specs indicate the device is "splash proof", not "water resistant". What can be done to increase reader tolerance to the outside elements?**

   A: The LR-2000, like the LR-911, was designed to go outdoors but only in a covered environment (that is, recessed inside a parking garage). The unit was not designed to be exposed directly to the outside elements. AWID does not offer an enclosure that protects the reader from the environment. However, third-party suppliers (www.thehousingcompany.com) do offer a Lexan-built housing that can accommodate LR-2000 mounting within the enclosure. The model PCH196 enclosure has a hinged front panel with key-lock that protects the reader from vandalism, rain, snow, ice, high-temp sunlight, etc. with no read-range degradation.

8. **Q: How important is site location layout and vehicle approach for a successful install?**

   A: As previously mentioned, the actual install site should be free of spurious RF signal interference, and good tag reads should have been observed previously using the LR-2000 installation kit. Depending on vehicle type, and using WS, RV, HT, VT or possibly MT tags, the reader may be mounted 7 feet high on a pole so that the reader's RF signal "rains down" onto the appropriate car tag location. If the CS or GR style card is selected, one might want to install the reader perpendicular to the vehicle's approach path so that the driver presents the credential to the low-mounted reader for access control. In either scenario the credential and the reader are parallel to each other for best reading. Ideally one car length should be allowed between the reader pole location and the access gate. Vehicle approach speed should not exceed 5 MPH. Vehicle approach should be in a straight path when coming into the reader's RF field. Sometimes the vehicle lane requires a tight turn just before reader engagement. In that case, the LR-2000HiLoMA configuration should be used.

9. **Q: I understand that RFID-based credentials, including the LR-2000's tags, sometimes do not work on certain types of car windshields. Can you please elaborate?**

A: Sometimes high-end luxury cars (typically top-of-the-line Mercedes, BMW, Bentley …) are ordered from the dealer with metallic-film coating on their windshields. In some cases the coating reflects sunlight, to keep the passenger compartment cooler and to reduce glare. In other cases the coating senses water outside the windshield to make automatic windshield wipers start to operate. Unfortunately this metallic coating blocks RF signal transmission regardless of what type of RFID devices (active or passive) are mounted on the windshields. To eliminate this problem some car manufacturers provide a cutout around the inside rear-view mirror, and sometimes also low on the windshield, just to the left of center (BMW). The cutout sometimes can be seen with the naked eye if closely observed. The metallic coating for cooling and windshield wipers may be a manufacturer's option; glare-reduction film is probably an aftermarket purchase. When these vehicles are encountered, the non-fixed clamshell (CS) or graphics (GR) card held by the fingertips outside the car's window may be the only alternative.

Another vehicle option that could interfere with tags inside vehicles is the RF transmitter for anti-collision warning and braking. Again the only alternative may be the MT tag on the front grill or bumper, or the CS or GR card held by the fingertips.

10. **Q. Previous mention was made of the metal-mount tag (MT) used in a license plate reading application. Can you please elaborate?**

A. As previously indicated the MT credential is optimized for metal mounting applications. If held by the fingertips, performance is degraded. Another characteristic is that the MT tag tends to be more sensitive to aiming compared to the other LR-2000 compatible credentials. Therefore in a license plate installation, the LR-2000 reader should be facing head-on to the license plate tag as much as possible relative to the vehicle's approach path from a height that allows all vehicles to pass underneath. Mounting a single reader on a high pole on either the driver's side or the passenger's side, looking down to read windshield tags as well as the occasional license plate tag, will give inconsistent reads from the license plate tag. Any non-MT credential scenario mixed in with a license-plate-mounted MT tag will require testing and an LR-2000HiLoMA configuration in most cases.

11. **Q: In light of Answer #9, can AWID's LR-2000 guarantee 100% reliability of reading windshield tags regardless of vehicle model?**

A: No. AWID cannot in good conscious make such a claim. Around 95% would be more realistic. The answer is to test the variety of tags in the LR-2000 installation kit, and find those that work better than WS tags in the problem vehicles The MT tag generally works well outside the vehicle when the inside tags don't read. In the worst case, the CS and GR cards, held up to the reader by the fingertips, do work.

12. **Q: What is the main purpose in the introduction of the UA-612 UHF reader?**

A: There are two main applications that we see for the UA-612 reader.

(1) In dealing with the gating and parking community, it became apparent that the ability to manage one set of credentials, one database for gate access <u>and</u> building access, could be a desirable benefit. The UA-612 satisfies this requirement by providing a short-range building access Ultra-High Frequency (UHF) reader that responds to the same credentials used for long-range vehicle access control.

(2) Additionally, the UA-612 reader, utilizing its standard Wiegand or RS-232 serial interface, can also double as a credential "enrollment reader" for the long-range tags and cards during system activation.

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13. **Q: What is an enrollment reader?**

A: In a high-volume credential application, linking the site code and serial number programmed into each credential with individual user data can become a formidable task. Depending on the specific software attributes of the access panel used on the project, the reader may be connected directly to an "enrollment port" on the access panel or may be connected to the actual server PC maintaining the software. In either case, by manually presenting the credential to the UA-612 reader, the site code and sequential number data can be entered quickly into a user profile template, for example, bypassing tedious and inaccurate typing. This associates the entered credential data with the user. The enrollment process is typically done in real-time as the credentials are deployed, since user profile data have already been entered.

14. **Q: What is AWID's warranty on the LR-2000 "system"?**

A: The LR-2000 carries a two-year warranty on material and workmanship, just like the older LR-911 reader. All LR-2000 credentials carry a lifetime warranty, just like all LR-911 credentials. Specific details are noted in AWID's Warranty Policy, abbreviated version, dated January 2008. Copies are available upon request.

15. **Q: Does AWID offer an Advance Replacement Policy for installed LR-2000's deemed to be defective?**

A: AWID at its discretion may offer Advance Replacement if identical product (new or used) is available and approved for shipment. Details and procedures are noted in our official Product Return Policy, available upon request.

AWID is sensitive to non-billable manpower costs associated with the travel, uninstall and logistics of replacing defective readers. This is all the more critical when dealing with a system component like the LR-2000 unit, which typically becomes an immediate application choke point.

LR-2000 Advance Replacements can be virtually eliminated (1) if <u>mandatory purchase</u> of the LR-2000 installation kit is enforced, (2) if usage of the kit as outlined in FAQ #3 (on page 3) is performed <u>before</u> any production equipment is ordered, and (3) if one generally follows the steps outlined in FAQ #6 (on page 4) in conjunction with the LR-2000 Installation Manual to avoid costly out-of-carton problems or embarrassing installation blunders <u>before</u> the reader is pole-mounted.

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