

ALIEN TECHNOLOGY®

ALR-F800

HARDWARE

SETUP GUIDE

November 2019



ALR-F800

Legal Notices

Copyright ©2017 Alien Technology, LLC. All rights reserved.

Alien Technology, LLC has intellectual property rights relating to technology embodied in the products described in this document, including without limitation certain patents or patent pending applications in the U.S. or other countries.

This document and the products to which it pertains are distributed under licenses restricting their use, copying, distribution and de-compilation. No part of this product documentation may be reproduced in any form or by any means without the prior written consent of Alien Technology, LLC and its licensors, if any. Third party software is copyrighted and licensed from Licensors. Alien, Alien Technology, the Alien logo, Higgs, Squiggle, the Squiggle logo, and other graphics, logos, and service names used in this document are trademarks of Alien Technology, LLC in the U.S. and other countries. All other trademarks are the property of their respective owners. U.S. Government approval required when exporting the product described in this documentation.

Federal Acquisitions: Commercial Software -- Government Users Subject to Standard License Terms and Conditions. U.S. Government: If this Software is being acquired by or on behalf of the U.S. Government or by a U.S. Government prime contractor or subcontractor (at any tier), then the Government's rights in the Software and accompanying documentation shall be only as set forth in this license; this is in accordance with 48 C.F.R. 227.7201 through 227.7202-4 (for Department of Defense (DoD) acquisitions) and with 48 C.F.R. 2.101 and 12.212 (for non-DoD acquisitions).

DOCUMENTATION IS PROVIDED "AS IS" AND ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT ARE HEREBY DISCLAIMED, EXCEPT TO THE EXTENT THAT SUCH DISCLAIMERS ARE HELD TO BE LEGALLY INVALID.

FCC Compliance

This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with instruction manual, may cause harmful interference with radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his expense.

Any change or modification to this product voids the user's authority to operate per FCC Part 15 Subpart A. Section 15.21 regulations.

Caution

Reader antennas should be positioned so that personnel in the area for prolonged periods may safely remain at least 24 cm (9.5 in) in an uncontrolled environment from the antenna's surface. See FCC OET Bulletin 56 "Hazards of radio frequency and electromagnetic fields" and Bulletin 65 "Human exposure to radio frequency electromagnetic fields."

ISED Compliance

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- 1) This device may not cause interference.
- 2) This device must accept any interference, including interference that may cause undesired operation of the device.

This device has been designed to operate with an antenna having a maximum gain of 6dBi. The required antenna impedance is 50 ohms. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication. Reader antennas should be positioned so that personnel in the area for prolonged periods may safely remain at least 34 cm in an uncontrolled environment from the antenna's surface.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- 1) L'appareil ne doit pas produire de brouillage;
- 2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est

Ce dispositif a été conçu pour fonctionner avec une antenne ayant un gain maximum de 6 dBiL. L'impédance d'antenne requise est de 50 ohms. Pour réduire les interférences radio potentielles pour les autres utilisateurs, le type d'antenne et son gain doivent être choisis afin que la puissance isotrope équivalente (PIRE) ne soit pas supérieure à celle requise pour une bonne communication. Les antennes du lecteur devraient être positionnés de telle sorte que le personnel opérant dans la région d'émission pendant des périodes prolongées peuvent rester en toute sécurité à au moins 34 cm de la surface de l'antenne dans un environnement non contrôlé.

Legal Notices Continued

European Radio Compliance.

This Equipment has been tested and found compliant with the following Mandatory Specifications:

EN 302 208

Radio Frequency Identification Equipment operating in the band 865 MHz to 868 MHz with power levels up to 2 W and in the band 915 MHz to 921 MHz with power levels up to 4 W; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU.

EN 301 489

ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU:

Part 1: Common technical requirements

Part 3: Specific conditions for short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz.

EN 62311:2008 Caution

Reader antennas should be positioned so that personnel in the area for prolonged periods may safely remain at least 25.5 cm, in an uncontrolled environment from the antenna's surface. This is in accordance with EN50364 European safety standards for Human exposure and exposure level radiation limits imposed by The Commission for Non-Ionizing Radiation. ICNIRP

EN60950 / UL 60950 / IEC 60950

Safety of information technology equipment.

This radio must be used with the external mains to DC power adaptor powered by the UL and/or TUV Listed and IEC Certified LPS or Class 2 external power supply rated: POE Output 56V/0.55A, 48V/0.4A or DC 12V/2.5A, supplied with the product.



IFT (Mexico)

Numero: PCPALAL-16 0356

Alien Technology®

Hardware Setup Guide

ALR-F800

June 2017



Table of Contents

CHAPTER 1 INTRODUCTION	1
RFID Reader Overview	1
EPC Class 1 GEN 2 UHF RFID Tags	2
Requirements	2
Specifications	3
RFID Reader	3
Mechanical: Reader Physical Size	4
RFID Reader High Performance Circular Antenna	4
I/O Port Terminal Interface	5
I/O Port Screw Terminal (Female) – Looking at Reader	6
RS-232 Port Pin-outs	6
RS-232 Connector (Female) – Looking at Reader	6
USB Ports	7
Power Supplies	7
System Architecture	8
CHAPTER 2 READER HARDWARE INSTALLATION AND OPERATION	9
Receiving the RFID Reader	9
Reader Antenna Panel	10
Reader I/O Panel	11
Diagnostic LEDs	11
Reset button	11
Reader Antennas	12
System Assembly and Bench Test	12
Bench Test Configuration	12
Bench Test Procedure	16
Installation	17
Requirements	17
Hardware Installation Procedure	17
System Operation: Software Control	19
Reader Interface Guide	20
Demonstration Software Guide	20
Alien RFID Academy	20
Approved High Performance Circular Antennas	22
APPENDIX A: OPERATING FREQUENCY AND POWER	23
APPENDIX B: DECLARATION OF CONFORMITY	24

CHAPTER 1

Introduction

This *Hardware Setup Guide* provides instructions for installing and operating the ALR-F800 RFID Readers.

This document is designed for use by RFID system integrators and software developers - those who wish to develop software products and extended systems that take full advantage of the RFID Reader's capabilities.

Included with each developer's kit is a Download instruction that contains additional information about RFID and the ALR-F800 including the following:

- *RFID Primer* – an overview of RFID technology and a glossary of terms.
- *Reader Interface Guide* – an overview of the communication interfaces for the ALR-F800.
- *Quick Installation Guide* – a quick start guide for installing and running the ALR-F800 reader
- *Quick Reference* – a quick reference guide summarizing the Alien Reader Protocol command set.
- *Demo Software Guide* – details installing and operating the Alien RFID Gateway demonstration software.
- *Quick Upgrade Guide* – briefly explains how to use the demonstration software to upgrade the ALR-F800. The ALR-F800 can only be upgraded through the LAN/PoE port.
- *Developer's Guides*, Application Programming Interfaces and Example Code.

RFID Reader Overview

The Alien ALR-F800 RFID reader is designed to read and program any EPC Class 1 Generation 2 tag and issue event reports to a host computer system. The host computer can be locally connected to the reader via RS-232, serial over USB or at a remote network location. It is designed to accept power through an IEEE 802.3af compliant network or a conventional 12 Volt DC power source.

The RFID Reader is delivered with the following components:

- One (1) RFID Reader

The RFID Reader Kit is delivered with the following components and accessories:

- One (1) RFID Reader
- One (1) PoE power supply
- One (1) AC power cord
- One (1) standard network cable to connect the PoE power supply to the reader.

Additionally, the RFID Reader Developer's Kit includes the following items:

- One (1) ALR-8696-C antenna
- One (1) RS-232 serial cable (to connect to host computer)
- One (1) Network cross-over cable
- Download instructions for demonstration software, user guides, documentation and the Alien RFID Gateway Application
- Software APIs and example code
- An assortment of Class 1 Gen 2 UHF tags

EPC Class 1 GEN 2 UHF RFID Tags

The Alien ALR-F800 RFID reader is designed to read and program any EPC Class 1 Generation 2 tag and issue event reports to a host computer system. Class 1 tags are “passive” devices meaning they do not have a battery or other onboard power source. They are powered solely by the RF energy transmitted by an RFID reader.

Tags communicate with the reader through backscatter modulation. The tags do not transmit RF energy. Instead, they change their reflective characteristics in a controlled way and reflect RF energy back to the reader. An analogy to this is the way you can use a mirror to signal someone by reflecting light from the Sun.

Alien Technology manufactures user-programmable EPC Class 1 Generation 2 tags compliant with all key commercial and DoD mandates. Alien Technology offers a variety of designs capable of delivering optimal performance worldwide, including Europe and Asia.

For more information about RFID tags from Alien Technology, please visit our website at:

<http://www.alientechnology.com>.

Requirements

To interface with the RFID Reader you will need the following:

- A PC running Windows 98 or higher, with CD-ROM drive, an available RS-232 serial port and/or Ethernet connectivity and/or USB.
- An 802.3af compatible network connection, or
- Standard 120/220 VAC 50/60 Hz outlet and the POE power supply (provided with the reader kit) or DC power cable.
Note: Only these supplies may be used to power the ALR-F800.
- Host software (Alien Gateway demo software, telnet terminal or your own custom software)

Specifications

Specifications for key components of the RFID Reader system are provided in the tables below. Only these listed components may be used in the RFID reader system.

The reader table refers to US or ETSI specifications only. Reader models released for the other countries may have different power levels, frequency of operation and channel spacing in compliance with local regulations where the product is sold.

RFID Reader

Name	Alien Multi-Port General Purpose RFID Reader
Model Number	ALR-F800; ALR-F800-EMA
Architecture	Point-to-multipoint reader network, mono-static
Operating Frequency	902.75 MHz – 927.25 MHz or 865.7MHz – 867.5MHz
Hopping Channels	50 USA or 4 ETSI
Channel Spacing	500 KHz USA or 600 KHz ETSI
Channel Dwell Time	< 0.4 seconds USA or < 4s ETSI
RF Transmitter	< 30 dBm at the end of 6 m LMR-195 cable
Modulation Method	Phase Reversal – Amplitude Shift Keying (PR-ASK)
20 dB Modulation Bandwidth	< 100 KHz
RF Receiver	2 Channels
Power Consumption	<13 Watts (dependent on use model)
Communications Interface	RS-232 (DB-9), TCP/IP (RJ-45) , USB virtual Com
Inputs/Outputs	4 coax antenna, 4 inputs / 8 outputs (optically isolated), RS-232 com port, USB virtual Com, LAN / PoE, power, USB, SD Card
Dimensions	(cm) 19.1 x 20.2 x 2.8 • (in)7.5 x7.0x 1.0
Weight	Approximately 0.84 kg (1.85 lbs)
LED Indicators	DC Power, RF ON, Read, Fault(red), Link, Active, Antennas 0-3
Operating Temperature	-20°C to +55°C (-5 °F to +130°F)
Operating Environment	Indoor operation only
Software Support	APIs, sample code, executable demo app (Alien Gateway)
Protocol Support	Comply with EPC Class 1 Gen 2 and 18000 – 6C
Compliance Certifications	FCC Part 15; FCCID: P65ALRF800B; IOC: 4370A-ALRF800B; CE: CE2280 UL EN IEC 60950, CB Report

Mechanical: Reader Physical Size



Figure 1 - Outline Drawing of the ALR-F800 (mm)

RFID Reader High Performance Circular Antenna

Model	ALR-8696-C
3 dB Beamwidth	E-plane: 65 degrees • H-plane: 65 degrees
Frequency	865-960 MHz
Gain (dBi)	6.0 dBiL (maximum)
Polarization	Circular
RF Connector	6 m LMR-195 with Reverse-Polarity TNC
VSWR	1.5:1
Dimensions	(cm) 26 x 26 x 3.4 • (in) 10.2 x 10.2 x 1.32
Weight	1.1 kg • 2.5 lb

I/O Port Terminal Interface

The ALR-F800 I/O port provides four digital inputs and eight digital outputs, optically isolated from the reader circuitry for use in noisy industrial environments. Opto-isolators have two basic elements: a light source (usually a light emitting diode) and a photo-sensitive detector. These two elements are positioned facing one another and inserted in an electrical circuit to form an opto-coupler. The key property of an opto-coupler is that there is an insulating gap between the light source and the detector. No current passes through this gap, only the desired light waves representing data. Thus, the two sides of the circuit are electrically isolated from one another.

This protects the circuitry inside the reader from damaging ground loops (when the external device is at a different ground potential than the reader), and voltage spikes.

The external device must supply the V+ and V- voltage references.

Alternatively, if isolation is NOT required an internal 12V power source is supplied and can be routed to the V+ and V- pins with a jumper wire. This is only available if the unit is powered by the DC source jack.

I/O Port Screw Terminal Connector (Phoenix 14-pin header)		
Pin 1	V+	(5-24 VDC External)
Pin 2	V-	(Return External)
Pin 3	Output 0	(1.5A max; 7.3A total)
Pin 4	Output 1	"
Pin 5	Output 2	"
Pin 6	Output 3	"
Pin 7	Output 4	"
Pin 8	Output 5	"
Pin 9	Output 6	"
Pin 10	Output 7	"
Pin 11	Input 0	(5-24 VDC)
Pin 12	Input 1	"
Pin 13	Input 2	"
Pin 14	Input 3	"
Pin 15	Internal Fused 12.0 VDC	
Pin 16	Chassis GND	

I/O PORT SCREW TERMINAL (FEMALE) – LOOKING AT READER

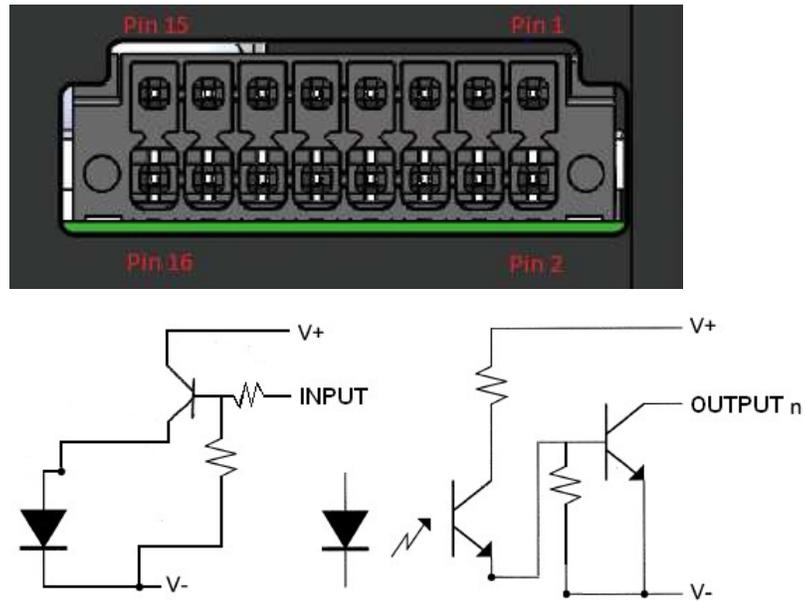


Figure 2 - Input and Output Circuits

RS-232 Port Pin-outs

RS-232 Connector (Female DB-9F)	
Pin 1	DCD Connected to Pin 6
Pin 2	TR1 Transmit Data (Output)
Pin 3	RC1 Receive Data (Input)
Pin 4	DTR Connected to Pin 6
Pin 5	Ground
Pin 6	DSR Connected to Pin 4
Pin 7	RTS Connected to Pin 8
Pin 8	CTS Connected to Pin 7
Pin 9	Not Connected

RS-232 CONNECTOR (FEMALE) – LOOKING AT READER

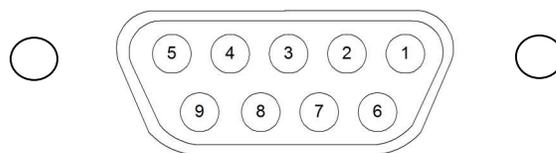


Figure 3 - RS-232 Connector

USB Ports

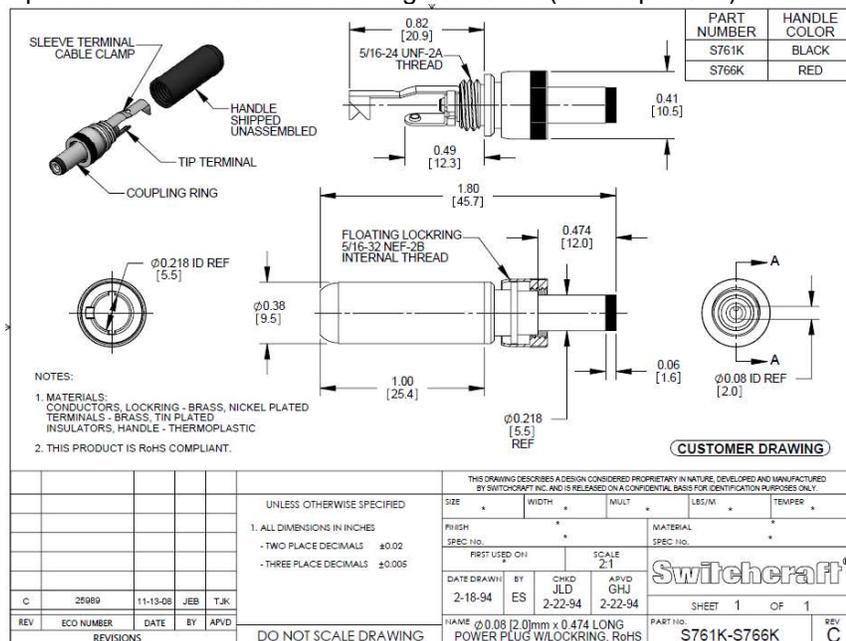
There two USB ports on the back of the ALR-F800 reader USB-A and USB-B. They are both female connectors and their functionality is as follows:

- USB-A is used to connect various USB devices including USB flash drives, Wi-Fi and Bluetooth adapters.
- USB-B is used as a serial console for either Alien Reader Protocol interface or Linux OS login.

Power Supplies

The ALR-F800 has been certified to operate in accordance with FCC or other national requirements when powered by an 802.3af compliant network capable of supplying 12.95 watts minimum, or by using one of the power supplies listed below. Only the power supplies listed below may be used with the ALR-F800 reader.

- ALR-F800, CORD PACK Power over Ethernet (PoE) Power Supply.
- ALR-F800 12.0 V DC Power Supply.
- Optional Switchcraft S761K locking connector (center positive).



CAUTION: The ALR-F800 should never be “hot plugged”, that is there shouldn’t be DC voltage already present on the connector before inserting into the reader connector. For example, if using the recommended AC-DC adapter available thru Alien Technology, LLC, the DC power supply should be plugged into the reader and locking ring secured first before plugging in the AC power cord. This is to ensure that the 12 volts input voltage does not exceed the maximum recommended 14 volts nor exceeds the ramp of 10 V / mS.

System Architecture

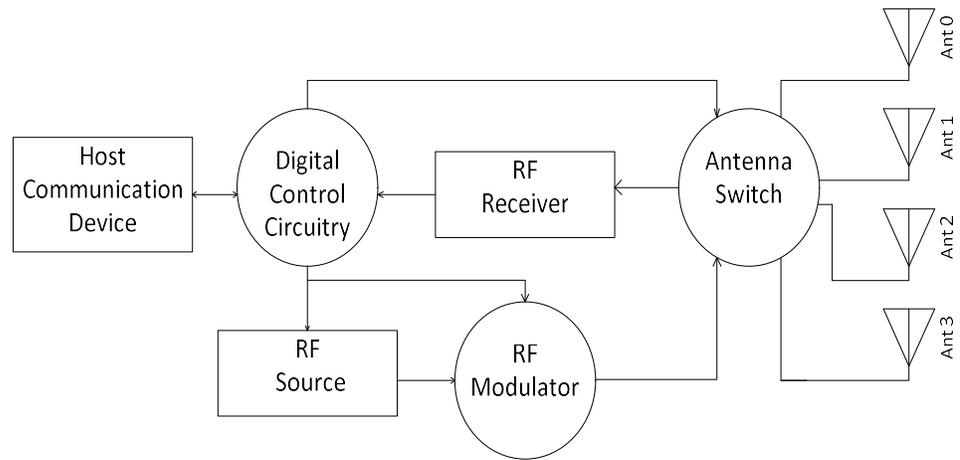


Figure 4 - System Architecture for the ALR-F800 Reader

CHAPTER 2

Reader Hardware Installation and Operation

This chapter describes the RFID Reader and provides installation and operation information.

Receiving the RFID Reader

Your RFID Reader is shipped with the items listed below. Please verify the contents of your received shipment before assembling.

- RFID reader

The RFID Reader Kit is shipped with the items listed below.

- RFID reader
- ALR-F800 Cord Pack which includes the PoE power supply, AC power cable and standard Ethernet cable.

Additionally, the RFID Reader Developer's Kit includes the following items:

- An ALR-8696-C antenna
- RS-232 reader-to-PC cable
- One Ethernet cross-over cable for direct connection to a local host/PC
- Download instructions for demonstration software, user guides, documentation, Software APIs and example code
- An assortment of Class 1 Gen 2 UHF tags



Figure 5 - ALR-F800 Reader (Antennas and tag kit not shown)

Reader Antenna Panel

- 4 Antenna Ports (RP-TNC)

Reader I/O Panel

The I/O panel (shown below) includes the following (Left to Right):

- LAN TCP/IP and PoE port
- Auxiliary DC Power connector
- Reset button
- USB A
- USB B
- SD Card
- 9-pin D female RS-232 serial port
- 16-pin I/O terminal block (GPIO)



Figure 6 - ALR-F800 Reader Connections

Diagnostic LEDs

The ALR-F800 includes diagnostic LEDs on the face of the reader to provide easy and convenient external indication for various operating conditions:
On the Front Panel you will find:

- **POWER (green)** – indicates power is applied to the reader.
- **CPU (green)** – indicates CPU is active. **(red)** – indicates a fault condition with the reader
- **READ (green)** – indicates that the reader is receiving data from a tag.
- **Sniff (green)** – indicates a tag signal has been detected, though it may not be strong enough yet to complete a transaction.
- **Antenna Lights 0-3 (green)** – indicates Active transmitting antenna.

Reset button

On the ALR-F800 I/O panel you will find the reset button. The functionality is as follows:

- **Hold during power up** (file system recovery mode) – With a USB Flash Drive installed with the proper system files, the reader will re-flash all system code. (Contact Alien support for detailed procedure)
- **Short hold after power up** (2 – 3 Seconds) – Cause the reader a soft reboot after release.
- **Long hold after power up** (> 10 Seconds) – Causes the reader to return to factory settings after release.

Caution: Do not use a metal object or excessive force, to push the reset button.



Figure 7 – ALR-F800 Front Panel Reader Diagnostic LEDs

Reader Antennas

The ALR-F800 includes 4 antenna ports. These antenna ports are a reverse-polarity TNC connector. Only antennas documented in this manual (FCC approved) may be used with the ALR-F800.

System Assembly and Bench Test

Assembling the RFID Reader system is easy. We recommend you set up the system and verify its operation in a bench test configuration before installing it in a production setting.

Bench Test Configuration

1. **Place the Reader on a tabletop.** Ensure that a standard 120 or 220 VAC outlet or 802.3af compliant network port is nearby, and there is sufficient space is available on the tabletop for the reader and antenna.



Figure 8 – Power, RS-232, USB, SD Card and LAN Connections

2. Connect the RS-232 cable or USB B to the reader.

- Align the male cable connector so that its shape and pins match the shape and holes of the female DB-9 RS-232 port.

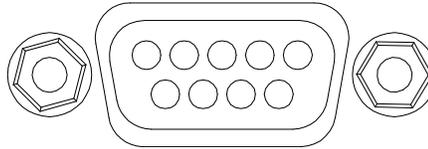


Figure 9 - RS-232 Connector

- Push the aligned connector into the port.
 - Finger-tighten the screws to secure the cable/connector to the reader.
- ## 3. Connect the RS-232 cable to the serial port on the PC.
- Settings for RS-232 are 115,200 baud, 8 data bits, no parity, 1 stop bit, and no flow control.
 - Start up terminal software on the PC, such as HyperTerminal with these settings, and be prepared to observe the reader's messages as it boots up.
- ## 4. Connect the POE power supply to the reader.
- If you are using an 802.3af compliant network, skip this step.
 - **WARNING:** You must use the PoE power supply certified for use with the ALR-F800 by Alien Technology. Failure to do so voids the product warranty and violates the terms of the FCC license.
 - If you are using the PoE power supply, use the standard Ethernet cable to connect the reader RJ-45 jack to the "LAN+DC" RJ-45 jack of the power supply.
 - If you are using the optional DC power cord, connect the DC power jack into the DC power plug of the reader. Tighten the screw fitting finger tight.
 - DO NOT plug the AC power or the DC cord into the supply at this time.
- ## 5. Connect the Ethernet cable to the reader and LAN or PC.
- If you are using an 802.3af compliant network to power the reader skip this step.
 - Connecting to the LAN
 - If you are using the PoE power supply provided with the Reader Kit, connect a standard Ethernet cable from the PoE power supply LAN port to a nearby LAN drop or network switch.
 - If you are using the DC power cord, connect a standard Ethernet cable to the ALR-F800 LAN/PoE port and to the LAN drop or network switch.
 - Connecting directly to a PC
 - If you are using the PoE power supply provided with the Reader Kit, connect a cross-over Ethernet cable from the PoE power supply LAN port to the PC LAN port.

- If you are using the AC/DC power brick, connect a cross-over Ethernet cable to the ALR-F800 LAN/PoE port and to the PC LAN port.

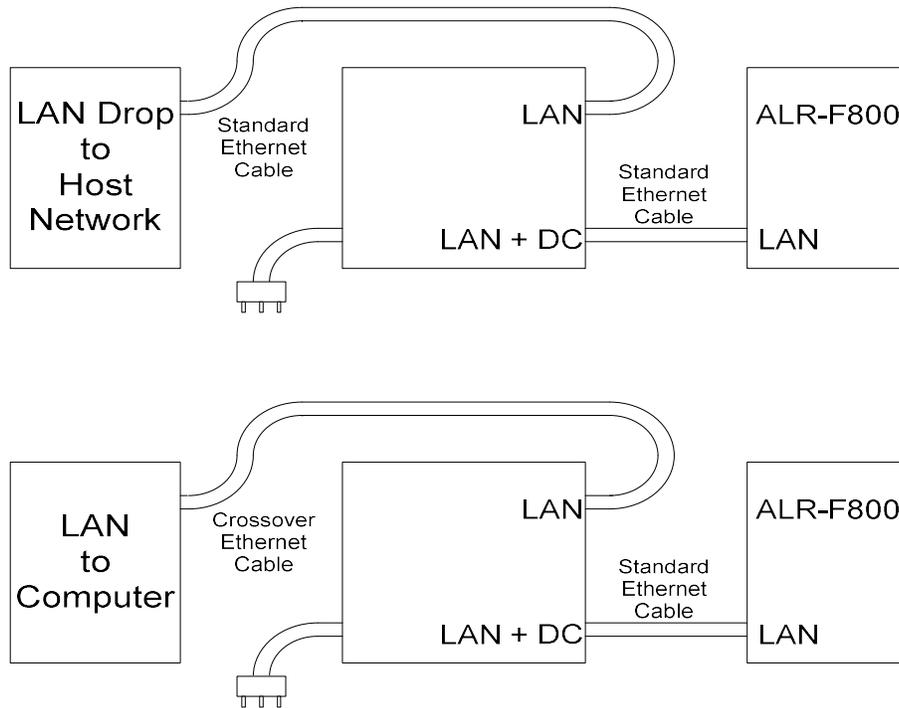


Figure 10 – PoE Power Supply and Network Connection Diagram

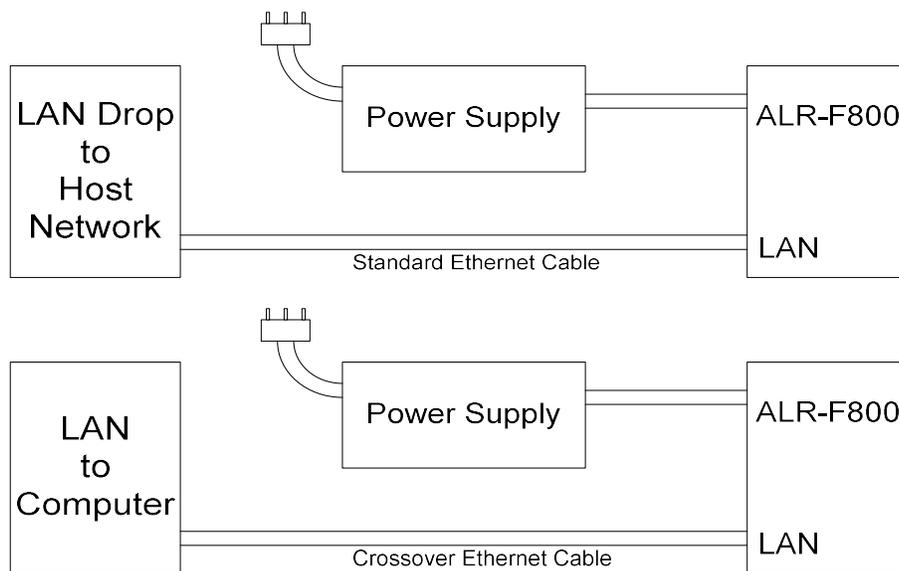


Figure 11 – 12V DC cord and Network Connection Diagram

- The reader comes preconfigured to look for a DHCP server to set its network parameters. In the absence of a DHCP server, the reader will use the following settings:

- IP Address: 192.168.1.100
- Subnet Mask: 255.255.255.0
- Gateway: 192.168.1.1

6. Connect the antenna to the antenna port.

- The ALR-F800 is a mono-static system (a single antenna acts as both transmitter and receiver). Four antenna ports (ANT 0-3) are provided. Each antenna provides a single read point.
- Only the antennas listed in this manual and their associated cables (if specified) may be used with this reader.
- The antenna ports are found on the reader I/O panel on the left-hand side if viewing the reader from the top with the connectors at the bottom. It uses a reverse polarity TNC connector. If using the Alien Gateway software, please note that ANT 0 is selected by default when first initialized.
- Align the antenna's coax cable's center pin and push it into the port.
- Screw the fitting from the cable end onto the reader connector *clockwise* until finger-tight to secure the cable to the reader.

7. Power up the reader

- If you are using an 802.3af compliant network to power the ALR-F800 connect a standard LAN cable between the ALR-F800 LAN/PoE port and the 802.3af enabled LAN drop or network switch. The green POWER LED will illuminate when power is on.

Note: If using an 802.3af compliant network it must be capable of supplying up to 12.95 watts.

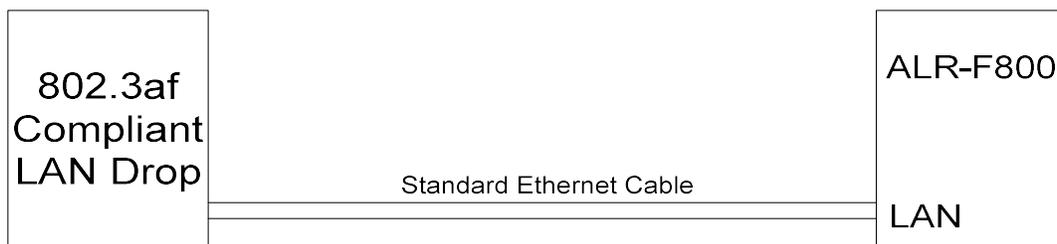


Figure 12 – 802.3af Network Connection Diagram

- If you are using the PoE Power supply or the DC cord, plug the AC power cord into the supply and into the wall outlet. The green POWER LED will illuminate when power is on.

8. Observe the reader's boot-up trace on the serial port, and determine the network settings.

The RS-232 port displays useful information while the reader boots, including network settings. Toward the end of the trace, the reader displays a block of text similar to the following:

```
-----  
Network Settings:  
MAC Address : 00:1b:5f:00:e8:bb  
Hostname    : alr-00e8bb  
IP Address  : 10.10.81.101  
Netmask     : 255.255.255.0  
Gateway     : 10.10.81.1  
DHCP        : on  
DHCP Timeout: 60  
IPv6 Address: fd::aaaa  
IPv6 Netmask: 112  
IPv6 Gateway: fd::1  
IPv6 DHCP   : on  
DNS          : 10.1.4.22 10.1.4.23  
TimeServer   : 128.138.140.44  
TimeZone     : 0  
CommandPort : 23  
-----
```

Once the reader boots and you see the "Boot>Ready!" prompt, pressing return will bring up the "Alien>" prompt.

9. Ensure the PC has compatible network settings.

- In order for you to be able to connect to the reader over TCP/IP, the host PC must be on the same subnet as the reader. If you are unfamiliar with how to do this, consult your local IT service for assistance.
- Once the initial connection is made, you may configure your reader's network settings as you choose. Refer to the *Reader Interface Guide* for instructions on how to do this.

You are now ready to bench test or demonstrate the RFID Reader system.

Bench Test Procedure

1. Position the reader so you can see the diagnostic LEDs

- You may also want to position the PC so you can view the monitor

2. Access an operational mode suitable for bench testing.

- Open the Alien Gateway RFID Demonstration Application.
- Select Tag Grid on Gateway.
- The RF ON light should illuminate.
- Refer to the applicable software application user guide for specific instructions.

3. Move a tag slowly away from the antenna's range.

- Begin with the tag well inside the expected read range (~2m or 6 ft) and move it toward the antenna while observing the LEDs.

4. Verify the READ LED illuminates when the tag is inside the read zone.

- The READ LED should illuminate green.

5. Verify the host receives the tag data.

- The tag should be displayed on the monitor.

6. If bench test conditions are verified, proceed to installation.

Installation

This section provides guidance for configuring components in your RFID system. You should consider the overall design of your specific system before permanently mounting the equipment.

Installation involves many of the same connection steps required for bench test. However, instead of placing equipment on a tabletop, the reader, antenna, and their accessories are mounted in your application environment.

Requirements

Before installing your RFID Reader system, you will need the following:

- An 802.3af compliant network connection or standard 120 or 220 VAC power outlet

WARNING: If you do not use an 802.3af compliant network to supply DC power you must use the power supplies provided by Alien Technology. Failure to do so voids the product warranty and violates the terms of the FCC license.

- RS-232 cables, Ethernet cables or antenna coax cables needed to accommodate routing requirements.
- Mounting hardware suitable for the surface to which equipment is to be attached. Use M4 pan head screws 4.5mm maximum thread length.

Hardware Installation Procedure

1. Select mounting position for antenna(s).

CAUTION: Reader antenna should be positioned so that personnel in the area for prolonged periods may safely remain at least 23 cm (9 in) in an uncontrolled environment from the antenna's surface. See FCC OET Bulletin 56 "Hazards of radio frequency and electromagnetic fields" and Bulletin 65 "Human exposure to radio frequency electromagnetic fields."

- Mount the reader and antenna(s) at the periphery of the desired read window so that the position of the most distant tag passing through the window is no farther from the antenna than the maximum range specified for your system design.
- Position the reader and antenna(s) at a height approximately midway between the highest and lowest expected tag position. (For example, a pallet tag may be the lowest tag position to be read, while the top-most case on a fully stacked pallet may represent your highest tag position.)
- **NOTE:** To maintain compliance with FCC regulations, use only antennas, cables, and power supplies supplied with the unit or approved by Alien Technology for use with the ALR-F800.

2. Select mounting position for reader.

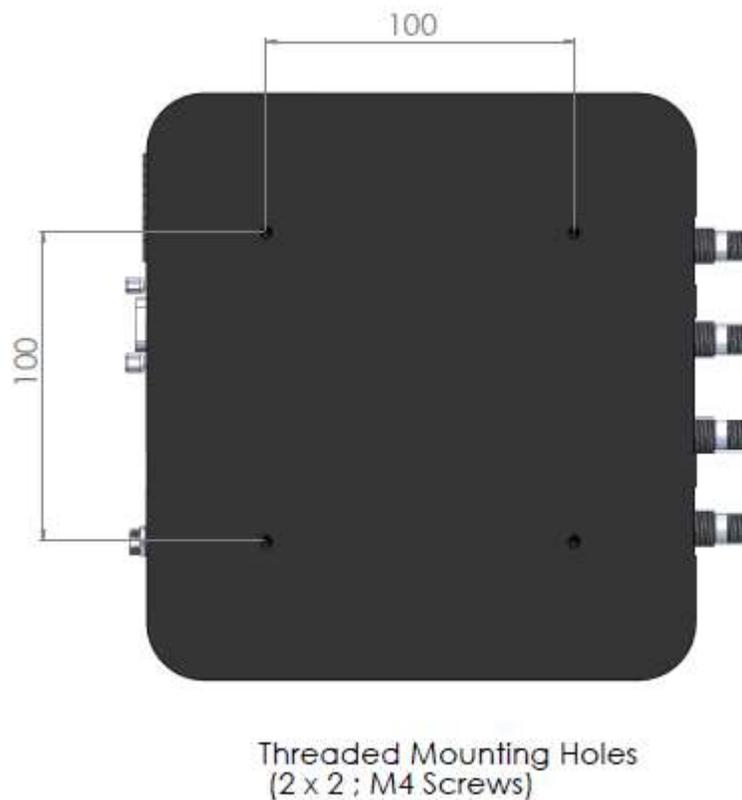
The ALR-F800 has been designed to provide reliable operation over its operating temperature range. This is enhanced by proper mounting of the reader during bench test and installation. Place the reader on a solid, thermally conductive surface. Optimum thermal performance is achieved by mounting the unit to a metal mounting plate with direct contact between the

reader base and the mounting plate. When mounting vertically the reader IO panel should be oriented at the bottom.

- Antennas should be placed close enough to the reader to accommodate the cable length without putting strain on the connectors.
- Mount units individually. Do not stack them.

3. Install the reader.

- Secure the reader through the four mounting holes to its mounting location (wall, post, mounting bracket) using appropriate M4 pan head screws less than 4.5 mm long.



4. Install the antenna(s).

- Secure the antenna through the mounting holes on either flange to its mounting location using appropriate hardware.

5. Connect the antenna(s) to reader.

- Route coax cable from the antenna to the reader according to your system design specifications and secure it properly. Do not kink the antenna cable and maintain bend radii of at least 1 inch.
- Align the connector of the cable with the reader antenna port, push into the port, and finger-tighten the screw fitting.

6. Connect reader power supply.

- If you are using an 802.3af compliant network for reader power skip this step

- If you are using the PoE power supply, use a short standard Ethernet cable to connect the reader's RJ-45 jack to the LAN+DC RJ-45 jack of the power supply. Align the RJ-45 connector with the corresponding TCP/IP port on the reader or the power supply and push the connector in.
- If you are using the optional DC power cord, connect the DC power jack into the DC power plug of the reader. Tighten the screw fitting finger tight.
- DO NOT plug the AC power cord into the supply at this time.

7. Connect reader to the LAN or host PC.

- If you are using an 802.3af compliant network for reader power skip this step.
- If you are using the PoE power supply, connect the Ethernet cable into the LAN jack of the power supply. Align the RJ-45 connector with the corresponding TCP/IP port on the power supply and push the connector in. Connect the other end to a LAN drop or network switch. You may optionally connect the reader directly to a PC's network port, but you should use an Ethernet cross-over cable in this situation.
- If you are using the DC power cord, connect the Ethernet cable into the LAN jack of the reader. Align the RJ-45 connector with the corresponding TCP/IP port on the reader and push the connector in. Connect the other end to a LAN drop or network switch. You may optionally connect the reader directly to a PC's network port, but you should use an Ethernet cross-over cable in this situation.
- If you wish to observe the reader's boot up trace, or control the reader via RS-232, align and connect a DB-9 serial cable to the reader's RS-232 port, and to the serial port on the PC. Configure your terminal software as described previously in the Bench Test Configuration section.

8. Connect reader power.

- If you are using an 802.3af compliant network to power the ALR-F800, connect a standard LAN cable between the ALR-F800 LAN/PoE port and the 802.3af enable LAN drop or network switch. The green POWER LED will illuminate when power is on

Note: If using an 802.3af compliant network it must be capable of supplying up to 12.95 watts.

- If you are using the PoE power supply or the DC cord, plug the AC power cord into the supply and into the wall outlet. The green POWER LED will illuminate when power is on.

9. You are now ready to use the reader.

System Operation: Software Control

The ALR-F800 RFID Reader is controlled from software running on a host system that communicates with the reader using the ASCII-based Alien Reader Protocol. All applications use this protocol to communicate with the reader.

You may operate the reader from your own application code, using the example code provided on the Developer's Kit download, or using the Alien RFID

Gateway application which is a demonstration program also included in your download instructions.

For more details, refer to either the *Reader Interface Guide* or the *Demonstration Software Guide* described briefly below.

Reader Interface Guide

The Alien Reader Protocol, mentioned previously, is described in detail in the *Reader Interface Guide*. Using this interface, the reader can be configured to read tags when queried or after one of a variety of event triggers (e.g., a rising edge on one of the I/O pins or a timer).

Tag data acquired in response to these triggers can be transmitted to the host in a number of formats (e.g., text, XML or custom) and under a number of conditions (e.g., on a new tag being observed, or a tag disappearing from view).

If you are a software developer, the *Reader Interface Guide* provides the information you will need to connect to the reader from a host computer, communicate with it, and customize its performance.

Demonstration Software Guide

The *Demonstration Software Guide* describes the installation and operation of the Alien RFID Gateway application.

The Alien RFID Gateway application is a useful demonstration program that allows users to explore the reader's functionality and build customizable demos with a user-friendly interface.

Using the Gateway, the various operating modes of the reader can be controlled and custom interactive demos can be constructed using sounds, images, and text.

Alien RFID Academy

Need to absorb RFID systems fast? Enroll in the Alien RFID Academy! In two or three days we'll share our practical expertise in RFID tags, antennas, readers, frequencies, systems, and protocols.

The Alien RFID Academy is a hands-on immersion into the workings, uses, and challenges of RFID technology. Rather than a product pitch, we put products to the test in the classroom, provide students with hands-on exposure in our RFID Solutions Center, and short-cut the learning curve by sharing practical solutions to real-world challenges. You'll learn best industry practice tag placement techniques for packaging and pallets alike.

Upon completion of the training, you will learn how to avoid common costly mistakes, know how to make the correct decisions for your business, how to select the right RFID options for your requirements, and where to find RFID answers.

Alien RFID Intermediate / Advanced Academy Topics:

- RFID Physics, Protocols & Practical Applications
- Tag Placement & Packaging Considerations
- RFID Reader/System Configuration & Optimization
- Hands-on Implementation

- RFID System Architecture and Integration
- Conducting Site-surveys & Contending with Interference

Please visit <http://www.alientechnology.com> for more information.

Approved High Performance Circular Antennas

* Reverse Polarity-TNC

<i>Model</i>	Frequency	Gain (dBi)	Polarization	RF Connector	VSWR	Dimensions	Weight	Approved w/Multiplexer
<i>ALR-8696-C</i>	865-960 MHz	6.0 dBiL (max)	Circular	6 m LMR-195 with RP- TNC*	1.5:1	(cm) 26.0 x 26.0 x 3.4 (in) 10.20 x 10.20 x 1.32	1.10 kg 2.5 lb	
<i>ALR-8698</i>	865-928 MHz	8.5 dBiL (max)	Circular	RP- TNC	1.3:1	(cm) 25.8 x 25.8 x 3.6 (in) 10.16 x 10.16 x 1.42	0.91 kg 2.0 lb	X
<i>ALR-8697</i>	865-928 MHz	5.5 dBiL (max)	Circular	RP- TNC	1.3:1	(cm) 25.8 x 25.8 x 3.6 (in) 10.16 x 10.16 x 1.42	0.91 kg 2.0 lb	X
<i>A6590C</i>	865-928 MHz	6.0 dBiL (max)	Circular	SMA	1.4:1	(cm) 91.5 x 30.5 x 0.8 (in) 36.00 x 12.00 x 0.30	2.00 kg 4.4 lb	
<i>BRA-02-6</i>	902-928 MHz	3.0 dBiL (max)	Circular	SMA	1.3:1	(cm) 12.8 x 12.8 x 0.2 (in) 5.00 x 5.00 x 0.78	0.30 kg 0.7 lb	
<i>A5010</i>	865-867 MHz 902-928 MHz	8.0 dBiL (max)	Circular	SMA	1.3:1	(cm) 25.0 x 25.0 x 1.4 (in) 9.85 x 9.85 x 0.55	0.75 kg 1.6 lb	
<i>NSS Wave 7</i>	902-928 MHz	5.5 dBiL (max)	Linear	RP- TNC	1.7:1	(cm) 220.0 x 22.9 x 3.8 (in) 87 x 9.00 x 1.5	1.80 kg 4.0 lb	
<i>DB-900-12-L</i>	902-928 MHz	12.0 dBiL (max)	Linear	N-Female	1.3:1	(cm) 45.0 x 45.0 x 4.0 (in) 17.7 x 17.7 x 1.6	2.00 kg 2.2 lb	
<i>ALR-A1001</i>	902-928 MHz	5.5 dBiL (max)	Circular	SMA	1.3:1	(cm) 25.0 x 25.0 x 1.4 (in) 9.8 x 9.8 x 0.55	0.75 kg 1.6 lb	X
<i>ALR-0501</i>	902-928 MHz	3.0 dBiL (max)	Circular	SMA	1.3:1	(cm) 12.9 x 12.9 x 2.0 (in) 5.1 x 5.1 x 0.8	0.3 kg 0.66 lb	X

Appendix A

ALR-F800-EMA Operating Frequency and Power

Minimum Frequency	Maximum Frequency	EIRP
865.7 MHz	867.5 MHz	35.1 dBm

Appendix B: Declaration of Conformity

This declaration of conformity is issued under the sole responsibility of Alien Technology, LLC.

Radio Equipment: Model: ALR-F800-EMA
 Brand: ALR-F800
 ALR-F800-X

Manufacturer
Alien Technology, LLC
845 Embedded Way
San Jose, CA 95138
1.408.782.3900
www.alientechnology.com

EU Authorized Representative
Alien Technology LLC
Stephen Crocker
Director, Sales/Channels EMEA and India
scrocker@alientechnology.com
www.alientechnology.com

Alien Technology declares that the ALR-F800-EMA is in conformity with the essential requirements of European Harmonisation Legislation Directive 2014/53/EU

Conformity is demonstrated by testing to the applicable requirements of the following harmonized standards

- EN 301 489-1 v2.1.1
- EN 301 489-3 v2.1.1
- EN 302 208 v3.1.1
- EN 60950-1:2006+ A11:2009+ A1:2010+ A12:2011+ A2:2013
- EN 62311:2008

Signed for and on behalf of

Alien Technology, LLC
845 Embedded Way
San Jose, CA 95138

on 1 June 2017

John Hattick
Senior Director, Hardware Engineering