

ALIEN TECHNOLOGY®

ALR-H450 User Guide

January 2016



ALR-H450

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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 own 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 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." Care should be taken to prevent operating multiple heterogeneous transmitters at the same time to limit battery drain and SAR exposure.

Industry Canada Compliance

Operation is subject to the following two conditions: (1) this device may not cause interference and (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. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. 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.

European Radio Compliance

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

EN 302 208

Electromagnetic Compatibility and Radio spectrum Matters (ERM) Radio Frequency Identification Equipment operating in the band 865 MHz to 868 MHz with Power levels of 2w ERP.

Part 1: Technical requirements and methods of measurements.

Part 2: Harmonized EN under article 3.2 of R&TTE Directive.

EN60950

Safety of information technology equipment. This radio must be used with the external mains to DC power adaptor, supplied with the product.

EN 301 489

Electromagnetic compatibility and Radio spectrum Matters (ERM) Electromagnetic Compatibility (EMC) standards for Radio equipment and services:

Part 1: Common technical requirements

Part 3: Specific conditions for short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz.

CE 11770



Alien Technology®
User Guide
ALR-H450 Handheld



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Chapter 1

Introduction

About this Manual

This manual provides you with safety information, technical support information, and sources for additional product information.

Who should read this manual?

This manual is written for the person who is responsible for installing, configuring, and maintaining the Alien ALR-H450 handheld. This manual provides you with information about the features of the ALR-H450, and how to install, configure, operate, and maintain it.

Before you operate your ALR-H450, please read through and become familiar with the contents of this manual.

Introduction

The Alien ALR-H450 is a highly reliable and expandable Android-powered handheld terminal, with data capture, data processing, and wireless communication. Easy deployment, reduced complexity and decreased maintenance are just some of the benefits of using the Alien ALR-H450 handheld.

The ALR-H450 meets industrial level IP64 (IEC sealing), and is perfect for routine applications, such as: railway inspection, road/parking toll, vehicle inspection, logistics express, power inspection, warehousing management, chain retail, etc. Whether the mobile operators are working indoors or outdoors, with the Alien ALR-H450, your business is always highly efficient and on-line.

The Alien ALR-H450 comes with world-wide band WCDMA technology. Multi-channel data and voice communication guarantees real-time communication and data efficiency.

Precautions When Using the Battery

- Don't leave batteries unused for extended periods of time, either in the product or in storage. When the battery has been unused for 6 months, check the charge status and charge or dispose of the battery as appropriate.
- The typical estimated life of a Lithium-Ion battery is about two or three years, or 300 to 500 charge cycles, whichever occurs first. One charge cycle is a period of use from fully charged, to fully discharged, and fully recharged again. Expect a two to three year life expectancy for batteries that do not run through complete charge cycles.
- Rechargeable Lithium-Ion batteries have a limited life and will gradually lose their capacity to hold a charge. This loss of capacity (aging) is irreversible. As the battery loses capacity, the length of time it will power the product (run time) decreases.
- Lithium-Ion batteries continue to slowly discharge (self-discharge) when not in use or while in storage. Routinely check the battery's charge status.
- Observe and note the run time that a new fully-charged battery provides for powering your product. Use the new battery run time as a basis to compare run times for older batteries. The run time of your battery will vary depending on the product's configuration and the applications that you run.
- Routinely check the battery's charge status.

- Carefully monitor batteries that are approaching the end of their estimated life.
- Consider replacing the battery with a new one if you note either of the following conditions:
 - The battery run time drops below about 80% of the original run time.
 - The battery charge time increases significantly.
- If a battery is stored or otherwise unused for an extended period, be sure to follow the storage instructions in this document. If you do not follow the instructions, and the battery has no charge remaining when you check it, consider it to be damaged. Do not attempt to recharge it or to use it. Replace it with a new battery.
- Always follow the charging instructions provided with your product. Refer to your product's user manual and/or online help for detailed information about charging its battery.
- Charge or discharge the battery to approximately 50% of capacity before storage.
- Charge the battery to approximately 50% of capacity at least once every six months.
- Remove the battery and store it separately from the product.
- Store the battery at temperatures between 5 °C and 20 °C (41 °F and 68 °F).

Precautions When Using the Handheld

- Careless use or repair attempts may damage the unit or stored data and will void any warranties. Alien is not responsible for this damage, so important data should be kept separately.
- If you have a problem, do not try to repair or disassemble the product yourself; please contact Alien customer service.
- Do not use where devices sensitive to electromagnetic radiation are operating, such as a hospital, airplane, etc., or risk of interference may occur.
- The unit may malfunction at very high or low temperatures, or in a very humid environment.
- Please do not use sharp objects to touch the screen, or damage may result. Use only soft objects, like your finger or the included stylus, on the touchscreen.

NOTE

The main battery comes preinstalled into the handheld. Make sure to remove protective film from the battery terminals before operating the unit.



Components and Features

Handheld Components



Handheld Buttons

Button	Function
Power Button	Press and hold to turn the device on or off
Scan Button Left Side Button Right Side Button	Auxiliary buttons to provide additional application-specific functionality for custom programs.

Device Specifications

Physical Characteristics	
Dimensions	185 x 85 x 105 mm (7.28 x 3.35 x 4.13 in)
Weight	448 g (15.8 oz.) (with main battery)
Screen	4 in. WVGA (480x800) TFT-LCD
Keyboard	3 function keys, 3 side buttons
Battery	Rechargeable Li-ion polymer, 3.7V, 3200 mAh (main) and 3.7V 5200 mAh (handle)
Expansion Slot	Micro SD, up to 32GB
SIM Slot	1 SIM, 1 PSAM
Audio	0.5W

Performance Characteristics	
CPU	Cortex-A7 1.3GHz quad core
OS	Android 4.4.2
Memory	1GB RAM, 4GB Flash
Interface	USB Micro-B
Storage	Micro-SD card
Max Storage Expansion	32GB

User Environmental Characteristics	
Operating Temp.	-10°C to 50°C
Storage Temp.	-40°C to 70°C
Humidity	5%RH-95%RH (non-condensing)
Drop Survival	1 m drop, 6 sides (concrete floor under operating temp.)
Sealing	IP64, IEC compliance

Wireless Communication	
WAN	WCDMA/HSDPA/HSPA+ (850/1900/2100MHz) GSM/GPRS/EDGE (850/900/1800/1900 MHz)
WLAN	IEEE802.11b/g/n, internal antenna
WPAN	Bluetooth v2.1+EDR, v3.0+HS, v4.0 Low Energy

RFID / Barcode	
RFID (UHF)	UHF 865-868 / 902-928MHz, EPC Class1 Gen2 / ISO18000-6C
Barcode Scanner	2D CMOS laser scanner (Symbol SE4500)

Development Environment	
SDK	Alien SDK
Programming Language	Java
Development Tool	Android Studio

Chapter 2

Basic Functions

Power and Battery

The ALR-H450 battery system consists of the main battery and a pistol grip battery which more than doubles the available power.

Main Battery: 3,200 mAh, 3.7v Lithium-Polymer
Pistol-Grip Battery: 5,200 mAh, 3.7v Lithium-Ion

Battery Installation

1. Place the main battery into the battery compartment.
2. Push down on the battery while sliding the battery lock into position.

Battery Charging

Place the handheld into the Charging Cradle.
Connect the adapter with the power cable to charge the device.



CAUTION

You must charge the battery with the power supply adapter provided by Alien Technology, or your device may be damaged

Power On and Off

Press the 'Power' button on the side to turn the device on and off.

SIM Card Installation

Remove the main battery and examine the connectors underneath it.



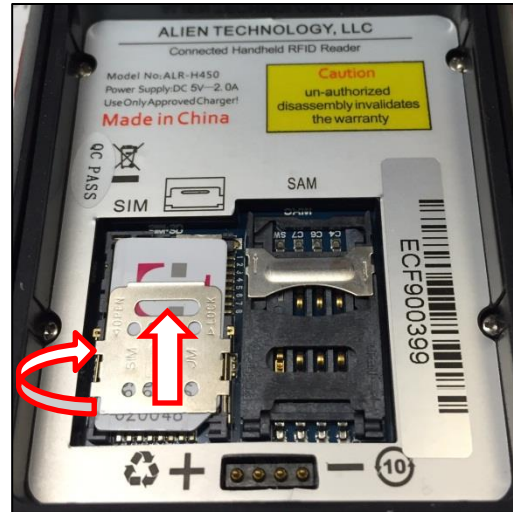
Locate the SIM card holder and **SLIDE** it downward to release it.



FLIP the SIM card holder up toward you.



INSERT your SIM card into the SIM card holder.



FLIP the SIM card back down and **SLIDE** the holder upward to lock it in position.

MicroSD Card Installation



Locate the SIM card holder and **SLIDE** it downward to release it.



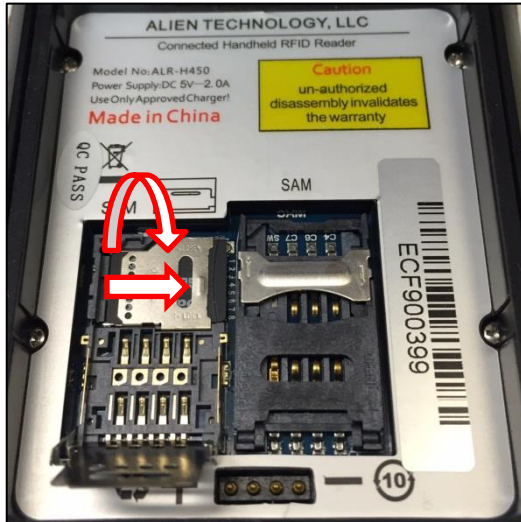
FLIP the SIM card holder up toward you out of the way. **SLIDE** the SD card holder toward the left to release it.



FLIP the SD card holder up toward the left.



INSERT your MicroSD card into the SD card holder.



FLIP SD card holder down and slide it toward the right to lock it in position.



FLIP the SIM card holder back down and **SLIDE** it upward to lock it in position.

Chapter 3

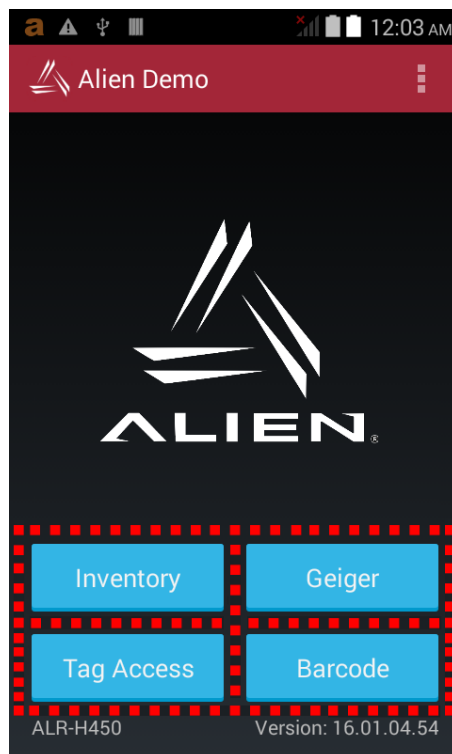
RFID Tag Reader

Starting the ALR-H450 Demo Software

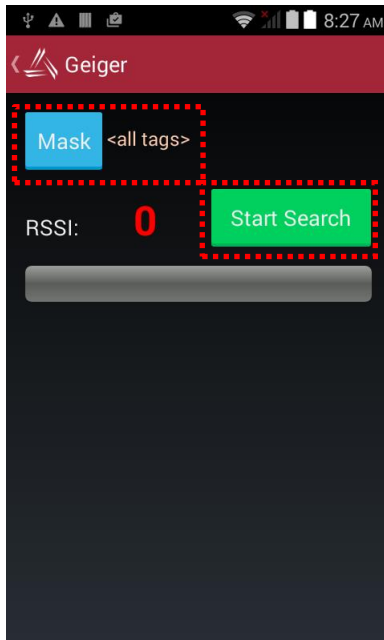
Start Alien Demo Software by tapping on the



icon in the OS Applications group.

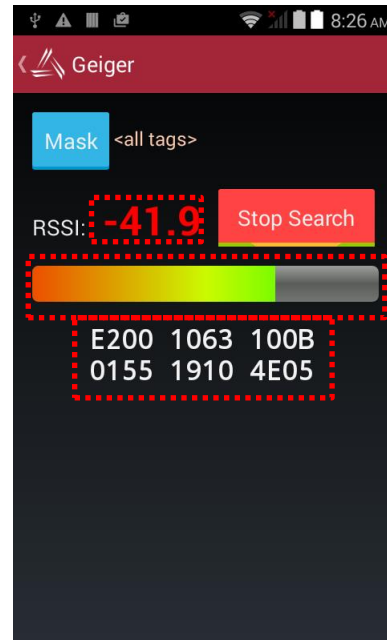


The Alien demo app's main screen has buttons for each of its utilities, and a menu item for reader settings



The Geiger will show the tag's signal strength. Use the Start Search button (or pistol-grip trigger) to start the search.

Use the **Mask** button to refine your search to specific tags.



When a tag is read, its EPC is displayed on the screen, along with graphical and numeric readouts of the tag's return signal strength.

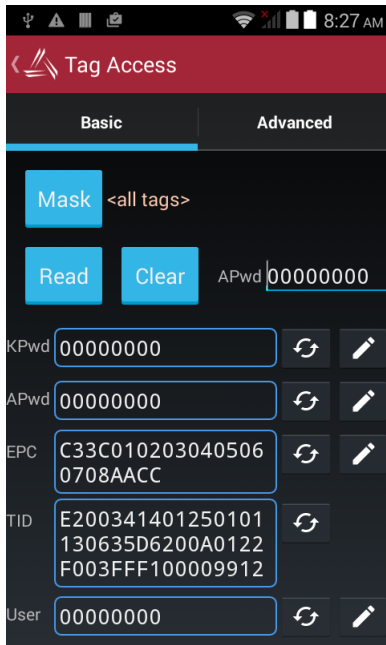
Tag Access Utility

The Tag Access utility allows you to read from and write to specific portions of a tag's memory. The utility is divided up into two separate tabs: the Basic tab and the Advanced tab. The Basic tab gives a quick overview of the tag's memory layout, and gives you basic ability to write new data to the tag. The Advanced tab gives full access (bank, start pointer, and length) over the low-level writing and reading operations, as well as controls for locking and unlocking specific portions of tag memory.

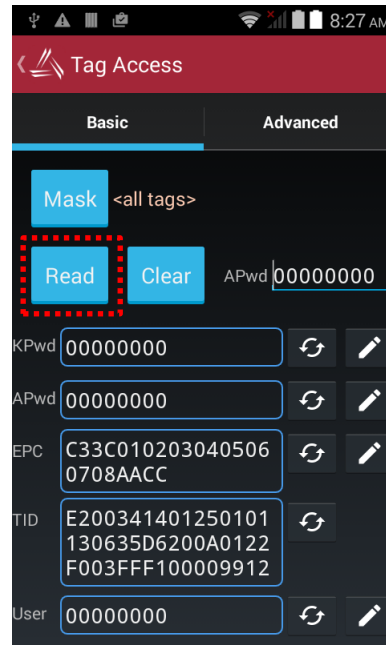
EPC Gen2 tag memory is divided up into four distinct banks: Reserved, EPC, TID, and User. The Reserved bank contains the tag's Access password and Kill password (each two words long), though all tags may not support both passwords. The EPC bank contains the tag's "id" – its Electronic Product Code (or "EPC") – along with some other information related to the EPC. The TID bank is read-only, and contains information about the tag's manufacturer, model, and basic capabilities. Alien Higgs tags contain bits in the TID bank that are guaranteed to be unique from one tag to the next. The User bank may not be present in all tag types, and when present, each tag provides different amounts of available user memory.

Basic Access Tab

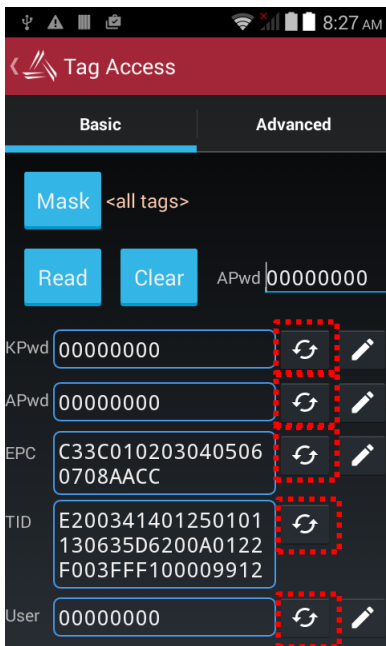
The Basic Access tab has text fields for each of the separate fields of tag memory. Clicking the **Read** button (or pulling the pistol-grip trigger) causes the reader to try and read all of the data for each of the fields, from whatever tag is in the field. The separate fields fill in, one-by-one, as the data is read. Since there is no definitive way of knowing how much User memory a tag has, the reader simply reads the User data two words (32 bits) at a time, until a failure occurs.



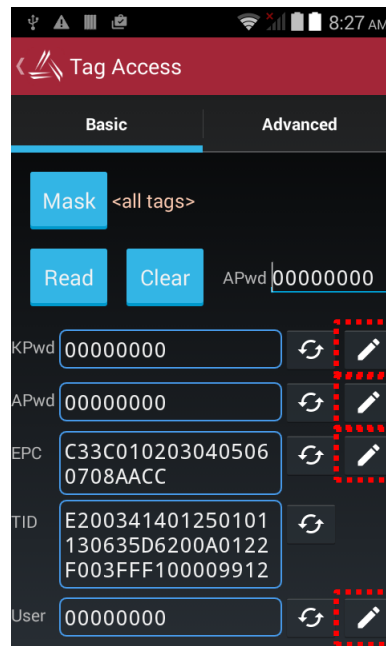
The **Basic Access** tab gives a visual overview of all of the fields in tag memory.



Pressing the **Read** button (or pulling the pistol-grip trigger) fills in each memory field with data from the tag.

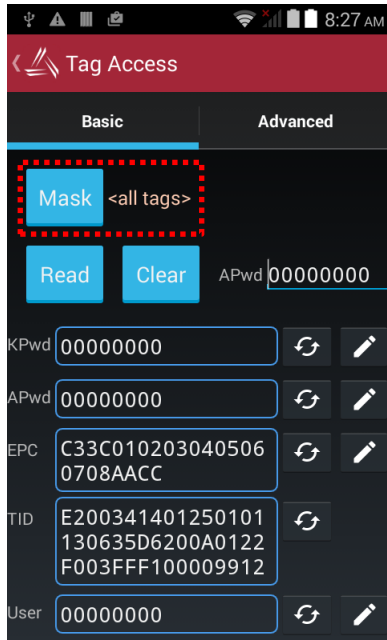


Pressing one of the small “refresh” buttons labeling each memory field will cause the reader to only read data from that field.

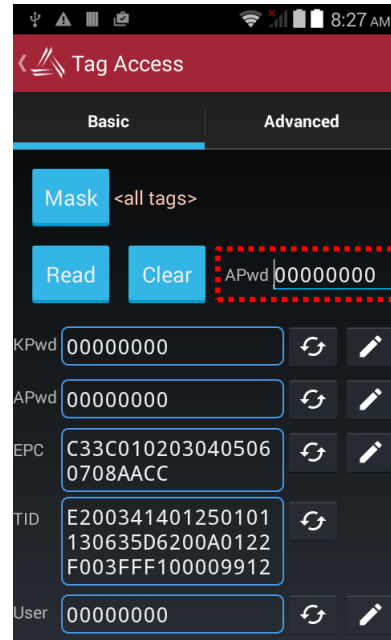


Pressing one of the pencil “write” buttons causes the reader to write the shown data to the tag. You can edit the data in the field before writing it to the tag. The field turns white or red, depending on the success of the write operation.

When there are many tags in the field, the **Basic Access** tab can have difficulty reading all of the data from the same tag when you click the Read All button. To make sure that you are accessing the same tag throughout the operation, you should set a tag mask, using the blue **Mask** button at the top-left corner of the screen. Also, when the tag has some of its memory fields locked with an access password, you must provide that same password as part of the access operation in order for it to succeed. You use the violet **APwd** field at the top-right corner to do this.



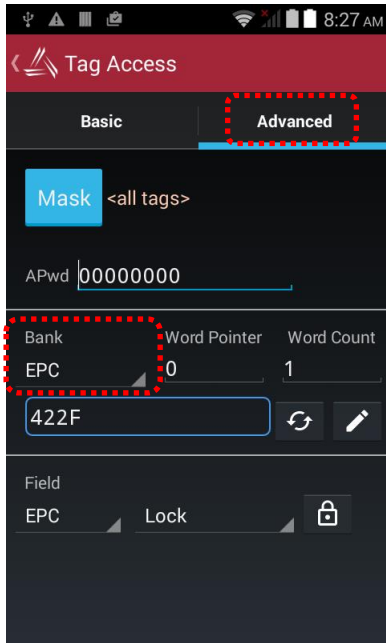
The **Mask** button lets you restrict the reader to only access one tag at a time.



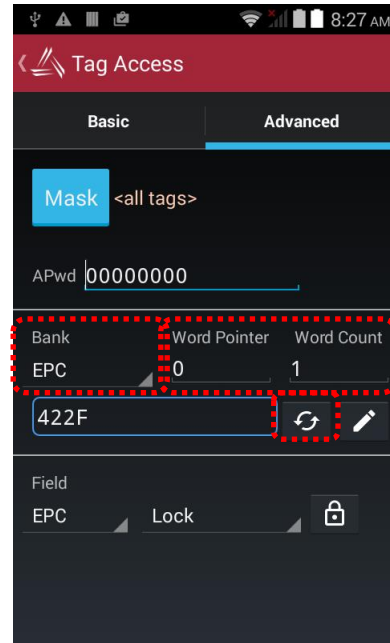
The **APwd** field is where you can enter in an Access Password, for accessing tag memory that may have been locked.

Advanced Access Tab

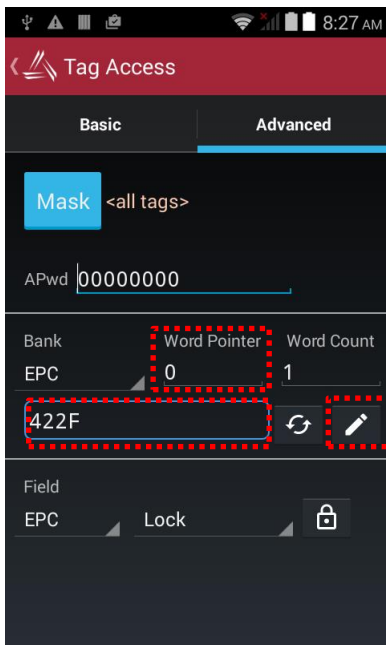
The Advanced Access tab has three general control areas: Read, Write, and Lock. All three operations require you to specify the bank of tag memory to access (Reserved, EPC, TID, and User). When reading and writing, you must specify the offset into that bank of memory where you would like to access. The reading operation also requires you to specify the length of the data to read. Both the offset and length parameters are measured in words (1 word = 2 bytes = 16 bits).



Three operations in Advanced Access: **Read**, **Write**, and **Lock**. Each requires you to specify a memory bank.



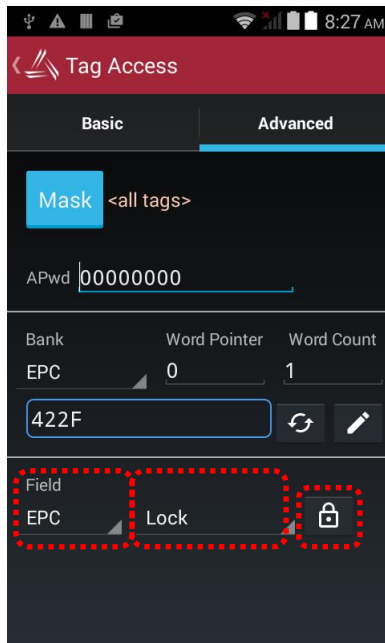
To read from a memory bank, select the **Bank**, start **Word Pointer**, and **Word Count**, then click the read/refresh button. Note that the tag's EPC starts at word #2 of the EPC bank.



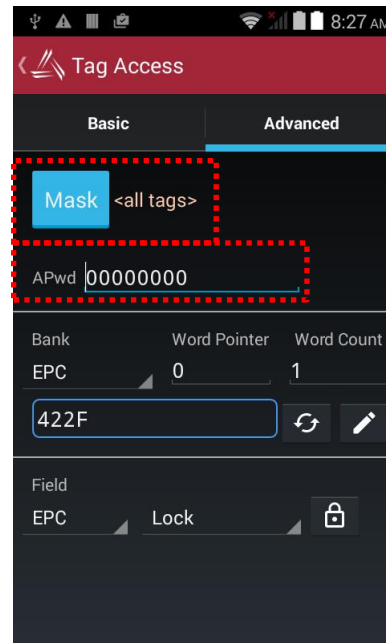
To write data to a memory bank, select the start **Word Pointer** to write to, and enter the hex-formatted data, then click the pencil/write button.

When locking, you have the option of locking the Access Password and Kill Password (both in the Reserved bank) separately, so the Lock command has a list of tag memory *fields* instead of *banks*. The other parameter is the type of lock: Lock, Unlock, PermaLock, and PermaUnlock. All locking operations require you to confirm by clicking OK to an alert message. The “Perma” options are, well, permanent, so use caution.

Locking a field doesn’t immediately protect it until you also write a non-zero Access Password to the tag (and you should probably lock that field as well!). Please refer to the EPC Gen2 Protocol Specification for complete details on how the various locking operations affect the tag’s behavior.



When locking, specify the field to lock, the lock type, then click the **Lock** button. You will be given a chance to change your mind before performing a lock operation.



Just like on the Basic Access screen, you have full access to the tag Mask and current Access Password in this screen.

Tag Mask

When the application first launches, it is configured to look for and report every tag it sees. You don’t always want to read every tag – perhaps you are searching for only one class of product, or are trying to access one particular tag in order to write data to it. The Gen 2 protocol provides for something called a select mask - a filter definition that is broadcast to all of the tags in the field before each operation, that specifies which tags are allowed to participate in that operation.

The ALR-H450 allows you to specify a tag mask, which is used transparently in each of the utility screens. The current mask is displayed at the top of each screen near the Mask button. Each utility has its own mask, so use caution when switching from the Inventory to the Geiger to the Tag Access screens.

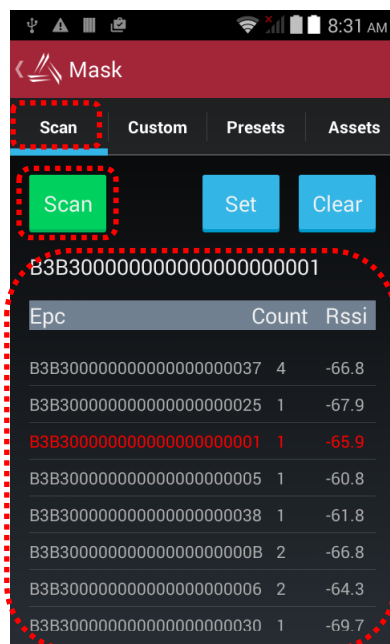
At its heart, a tag mask defines a piece of data that must match exactly a specific portion of the tag’s memory. This includes the memory bank (not just the EPC bank), a pointer offset into that bank, and the actual hex data to match against.

In reality, you don't always want to have to think about memory banks and pointer offsets – you just want to find that pair of jeans that is on the wrong rack, or you only care about “pallet tags”, however that is defined for you. The Tag Mask screen therefore gives you four ways to pick a tag mask:

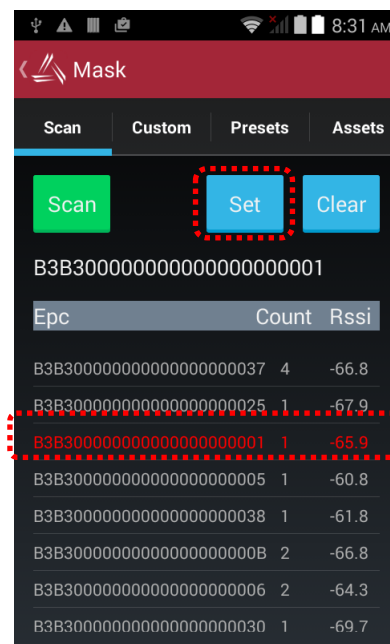
1. Scanning the field for tags (or loading a text file of EPCs) and picking a tag from a list.
2. Exactly defining the bank, offset, and hex data.
3. Picking a named mask from a preset list
4. Selecting a pre-defined asset (RFID+barcode+picture)

Once you have defined and set your mask, just close the Tag Mask window and your new mask will be displayed at the top of the screen you were originally on, and it will be used in subsequent operations.

Tag Mask – Scan



The **Scan** tab acts just like the Inventory screen – start/stop the reader with the trigger or Scan button, and all tags in range are displayed.

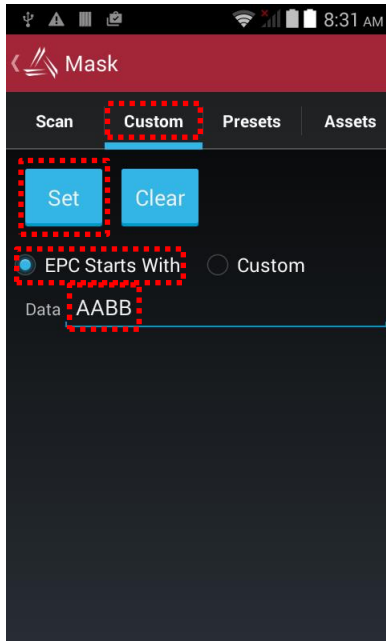


After scanning, select a tag from the list and click the **Set** button.
To clear the mask, click the Clear button.

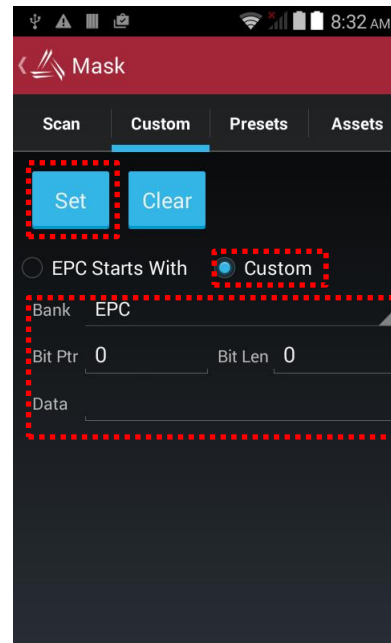
Tag Mask – Custom

The Tag Mask “Custom” tab allows you to define an arbitrary mask on any portion of a tag’s memory, or a simpler “EPC Prefix” mask.

The middle section is where you actually define your mask. There are two options here: create a mask based on an EPC prefix (i.e. “all tags starting with...”), or create an arbitrary custom mask. If you select EPC Starts With, the only thing you have to provide is the hex data representing the initial part of the EPC code for your tags (the other controls are disabled). If you select Custom, you choose the bank and pointer offset, along with the mask data. Click the Set button to define your mask.



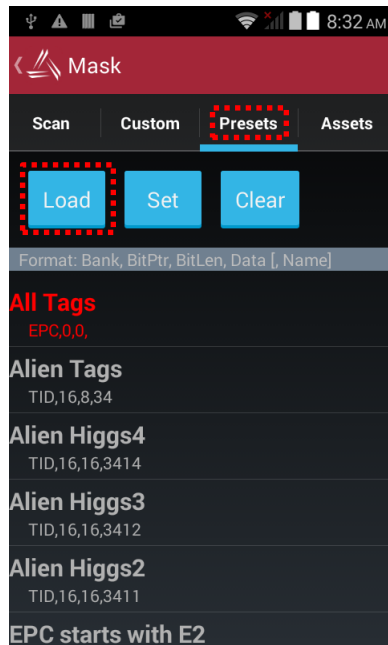
Defining a mask based on an EPC prefix is easy – just click the “EPC Starts With” radio button, enter the EPC data and click the Set button.



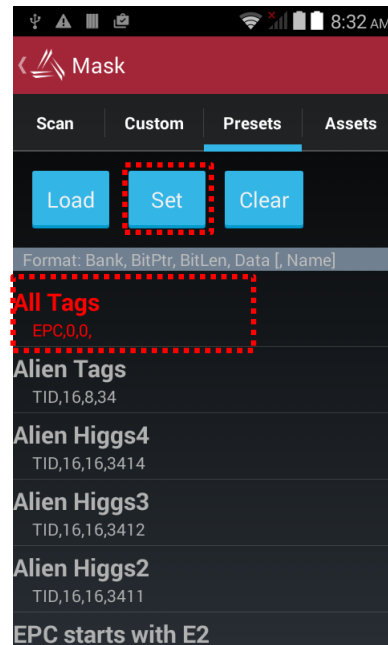
Defining a custom mask requires you to specify the bank, bit offset, and bit length of the mask, along with the data.

Tag Mask – Presets

The third way to set a tag mask is with the Presets tab. This screen can show a list of pre-defined tag masks, such as “all tags”, “all Higgs3 tags”, etc. You’ll need to create a list of your own, and then load it into the app.



Click the **Load** button to read your mask definition file (see below). The list of defined masks appears in the main part of the screen.



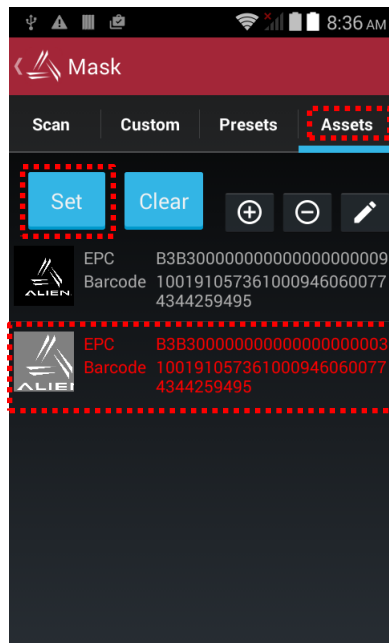
Click one of the defined masks to select it, and then click the **Set** button.

To use your own list of mask presets, just create a text file that you can access with the Load button. Each line of the mask presets file should contain the bank number, bit pointer, but length, mask data, and an optional preset name – all separated by commas. For instance, a presets.txt file might look like this:

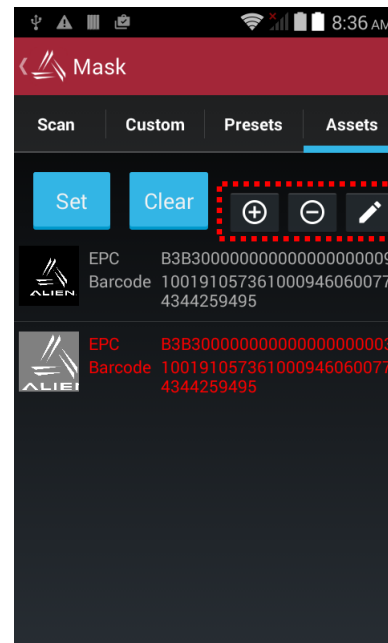
```
1, 32, 32, FEEDFACE, ff
1, 32, 32, DEADBEEF, hamburger
1, 32, 32, BEEFCAFE, lunch
```

Tag Mask – Assets

The Assets feature of the Alien demo application shows how you might associate an EPC code, barcode, or a picture to an actual physical asset. By linking those pieces of information, you can cross-reference a barcode scan with the EPC code on that product's RFID tag, and see a picture of the asset each time the tag is read. If you need to search for a particular asset, you can select it from the list of assets, set the Tag Mask to that asset's EPC code, and then use the Geiger utility to go look for that tag. When the tag is detected, the item's picture is shown on the screen for verification, and you can also see the associated barcode as well.



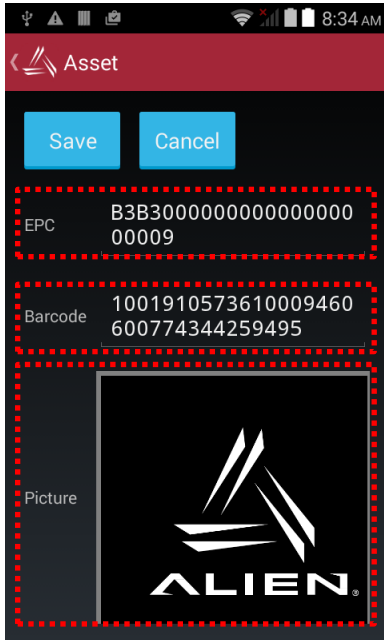
At the Assets mask screen, simply select one of the created assets from the list and then click the **Set** button to mask on that asset.



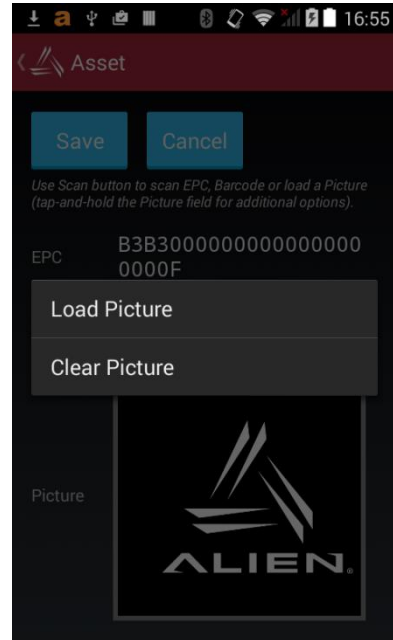
To create a new asset, click the **+** button. To remove or edit an existing asset, select it from the list and then click the **-** or pencil/edit buttons.

There are four steps to creating or editing an asset, and pulling the gun trigger performs each one and advances you to the next step. You can skip steps, or redo steps by manually tapping on one of the step buttons.

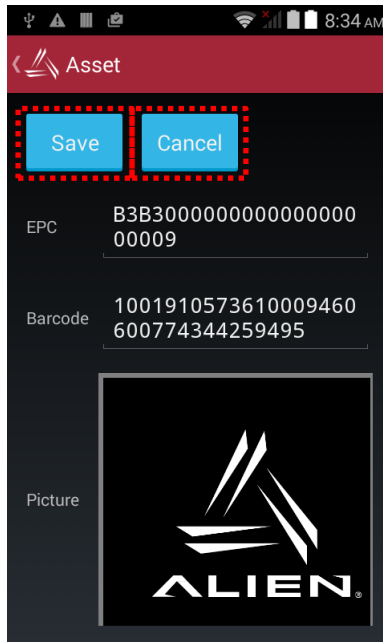
1. RFID – read an RFID tag
2. Barcode – scan a barcode
3. Picture – load an image from a file
4. Save – remember the asset definition



Pull the trigger (or use the Scan button) to scan EPC, barcode, load asset image in sequence, or click on a particular field to edit it.



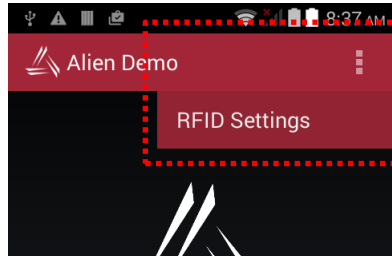
Tap-and-hold on the Picture field for a popup menu with additional options (Load or Clear the image).



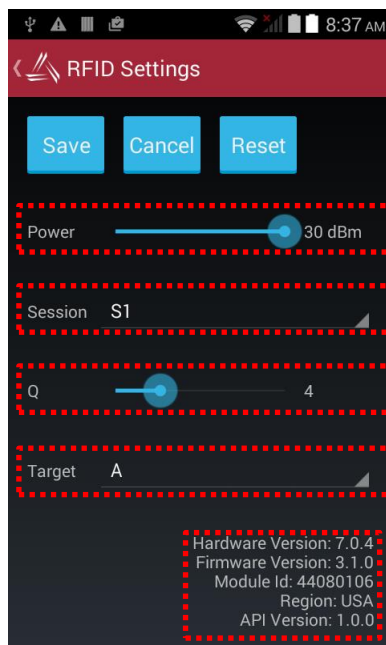
Click the **Save** button to save the changes, or the **Cancel** button to return without saving.

RFID Settings

The RFID Settings screen allows you to see and change certain parameters of the RFID reader, such as transmit power, and some Gen2-specific parameters on the RFID tab. You get to the RFID Settings screen from the menu button at the top of the main screen. The RFID Settings screen also has useful device, hardware module, and software version information.

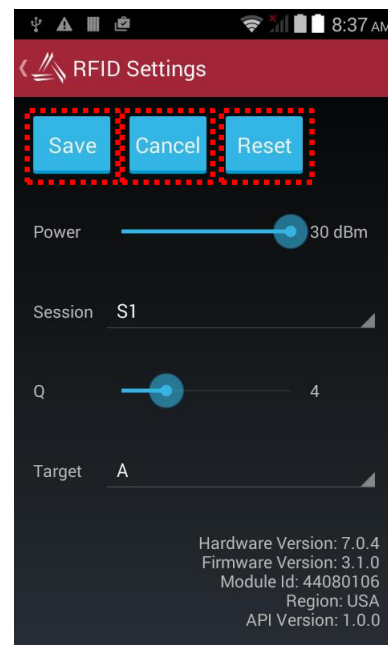


Access the RFID Settings screen from the top Alien Demo screen.



Configure the RFID reader's transmit power, inventory session (1-4), starting Q value (according to how many tags are expected), and inventory Target (usually "A").

Hardware, Firmware, and API versions are shown at the bottom.



Save stores the current settings.

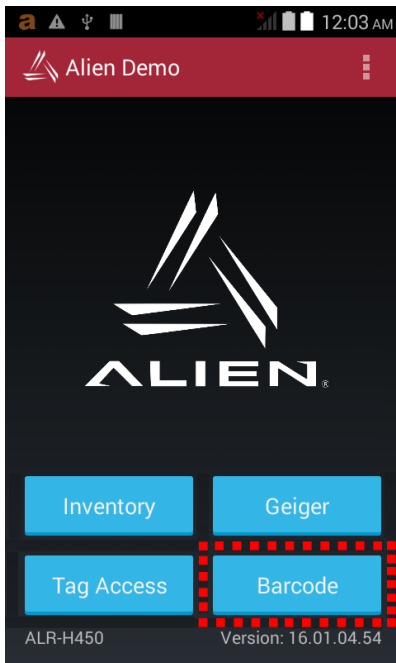
Cancel ignores and changes you may have made.

Reset restores the settings to their default values.

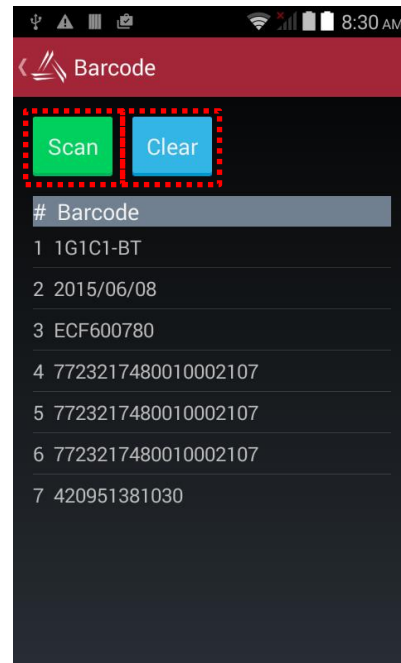
Chapter 4

Barcode Scanner

The ALR-H450 comes equipped with a 2D barcode scanner. The Barcode demo application is accessible from the Alien Demo main screen.



Starting the Barcode demo app, toward the bottom of the main demo screen...



Press the Scan button or pull the trigger to read a barcode. The Clear button removes scanned items from the list.