ALIEN TECHNOLOGY®

# ALH-901x Series Handheld User's Guide

*Windows Mobile*

Dec 2015

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# Legal Notices


Alien Technology Corporation 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.



**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.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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.

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# User's Guide

## ALH-901x Series

## Table of Contents

# 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 ALH-9010/9011 ("ALH-901x") handheld. This manual provides you with information about the features of the ALH-901x, and how to install, configure, operate, and maintain it. Before you work with the ALH-901x, you should be familiar with your network and general networking terms, such as IP address.

Before you handle and operate your ALH-901x, please read through and become familiar with the contents of this manual.

### How to use the battery correctly

- Do not touch the terminals of the battery with any metal objects.
- If you do not use the battery for a long time after charging, keep it at room temperature.
- Depending on the age of the battery and the operating time while using it, the charge capacity can be reduced.
- You must charge the device with only the provided adaptor.

### Caution when using

- Careless use or repair attempts may damage the unit or stored data. 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.

## Components and Features

The ALH-901x mobile computer is a small, ergonomically designed PDA, built on the Microsoft Windows Mobile 6.5 operating system. The PDA is equipped with an RFID tag reader, MicroSD card reader, 1D or 2D barcode scanner, and optional 3G wireless modem, GPS and camera modules.

## Package components

After opening the product packaging box, check the items listed as below. If there are missing or defective items, please contact the Alien customer support, or your place of purchase.


ALH-901x Body

Adaptor and AC Cable

Main Battery

Cradle

Pistol Grip

Protective Film

USB Sync Cable

Stylus

Hand Strap

## Handheld Components

## Description of Each Component

| Part | Descriptions |
|---|---|
| **UHF Reader** | The 900MHz UHF RFID tag reader module. |
| **1D/2D Barcode Scanner** | The laser beam is emitted through this window. Do not look directly at the laser! |
| **Reset Button** | Enables you to perform a Soft Reset. Press along with the <Power> button to perform a Hard Reset. |
| **Microphone** | Records audio from the surrounding environment. |
| **WLAN LED** | Indicates WLAN power on-off status. |
| **Battery Latch** | Allows you to detach the main battery. |
| **Main Battery** | Provides primary power to the unit. |
| **Volume Buttons** | Adjusts the volume, when you also press the <Fun> button. |
| **Function Buttons (F7, F8)** | Allows you to perform common actions. |
| **Function Button (F9)** | Allows you to perform common actions, like scan for an RFID tag. |
| **Speaker** | Built-in speaker emits various sound effects. |
| **USB Sync Connector** | Allows you to connect and send data to a PC via a USB sync cable. |
| **Earphone Jack** | Allows you to connect earphones. |
| **L/R Arrow Key** | Moves the cursor left and right. When also pressing the <Fun> button, moves the cursor up and down. |
| **Power LED** | Illuminates red when the battery is charging and green when it is fully charged. |
| **Cradle Connector** | Interfaces with the cradle, when docked. |
| **Camera (ALR-9011)** | Allows you to capture and store photographic images. |
| **Cradle Connector** | Enables you to sync with a PC, while charging the batteries. |
| **Keypad** | Allows you to input key presses (numbers, letters, and symbols). |
| **Touchscreen** | Displays running programs, and allows you to control them directly, using the stylus and touchscreen. |
| **Hand Strap Hole** | Enables you to attach the hand strap and/or stylus in a convenient location, while using the device for a long period of time. |

# Chapter 2
# Basic Functions

## Power and Battery

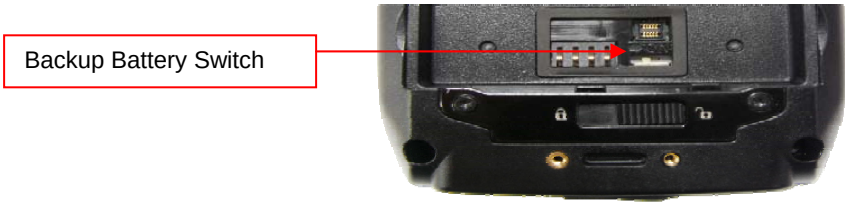
The ALH-901x battery system is composed of main battery, an optional pistol grip battery, and a backup battery. The main battery supplies the power to the system and RAM which retains saved data. A backup battery saves the data in RAM in the situation where the main battery is discharged completely.

| | |
|---|---|
| Main Battery: | 3,000 mAh, 3.7v Lithium–Polymer |
| Pistol-Grip Battery (optional): | 4,400 mAh, 3.7v Lithium-Ion |
| Backup Battery: | 100 mAh, 3.7v Lithium–Polymer |

Switch on the backup battery when first setting up the ALH-901x, and then install the main battery and charge it completely.

### Switch On Backup Battery

The image below shows the battery compartment, after the main battery has already been removed. Slide the lever to the right to switch on the backup battery.

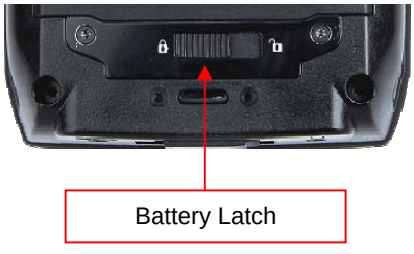


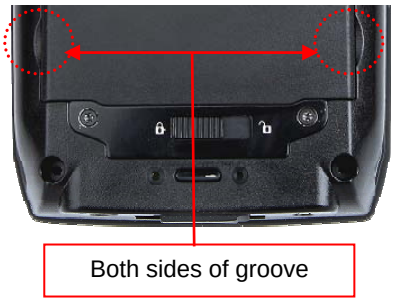

Re-attach the main battery to the back battery compartment of the PDA. Confirm that the battery latch locked firmly (see below).

Connect the adaptor to the PDA adaptor connecting jack, and check to make sure the Power LED is illuminated red, and then allow it to charge completely until it the Power LED turns green.

### Detaching the Main Battery

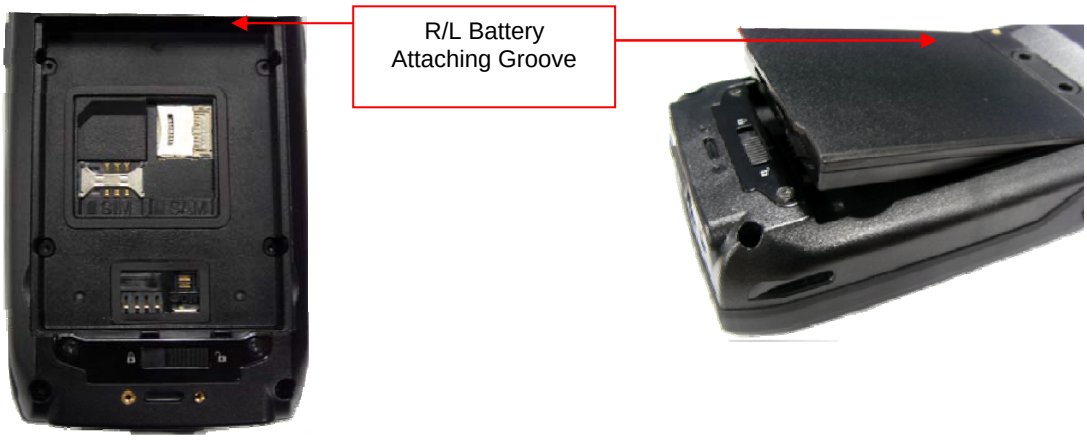
The images below show the back-bottom of the handheld unit. Slide the battery latch to the right (**UNLOCK** side), and then lift the main battery out of the compartment along both sides of groove.



## Attaching the Main Battery

Put the top part of battery into the upward groove, and then press down on the bottom part of the battery into the battery compartment. Slide the battery latch to the left (**LOCK** side) to attach the battery firmly.




## Charging

You must charge the battery only with the provided adapter or cradle. The Power LED illuminates red while charging and green when charging is complete.

**Connecting Adapter**

1. Plug the adapter cable to 110V socket.
2. Connect adapter DC cable to the power connecting jack of the main body.
3. "Power LED" is red while charging.

Caution:
You must charge the battery by using only the dedicated adapter provided by Alien, or your device may be damaged.

## Power On and Off

Pressing the <Power> button once causes the device to enter low-power (sleep) mode. Pressing <Power> button once again activates the system.

### Power On and Off With <Power> Button


**Power Off:**

1. When the system is on, press the <Power> button for a couple of seconds and the backlight will be turned off and it will enter the low-power sleep mode.

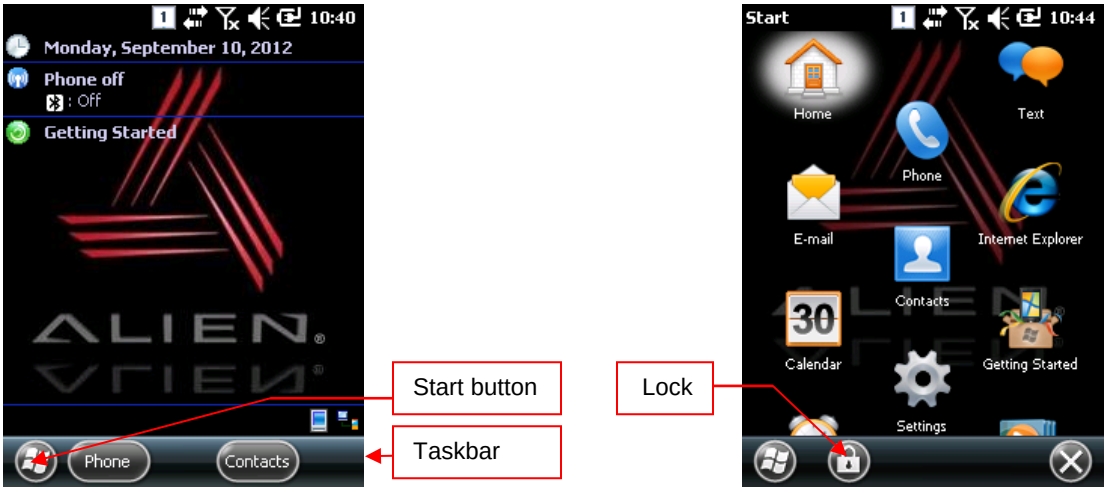
**Power On:**

1. When the system is off, press the <Power> button quickly, and the backlight will turn on and wake up the system.
2. The power will be turned on automatically when you connect to the ActiveSync USB cable.

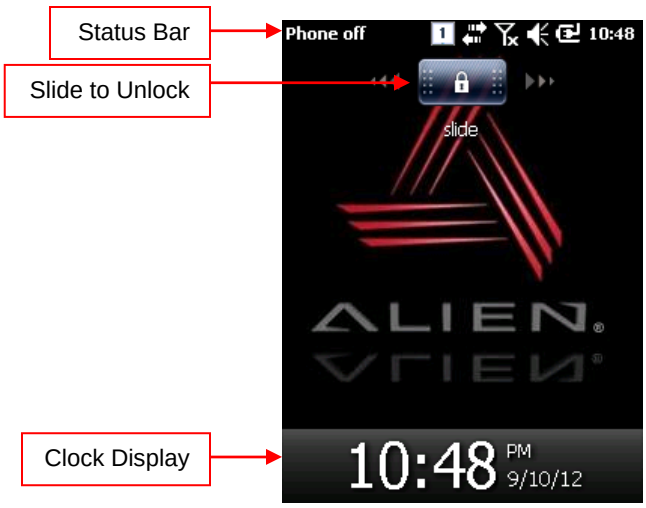
Even though the unit's power is off, the data stored in RAM will be saved, and those programs which have been running before the power was turned off will resume where they left off. If the main battery and backup battery are both discharged, the RAM data will disappear and the system will be start up as if from a cold reboot.

### Locking the Screen

You can lock the screen on the unit, but still be able to see the clock and status bar at the top. Click the Start button, and then the Lock icon next to it to lock the screen.



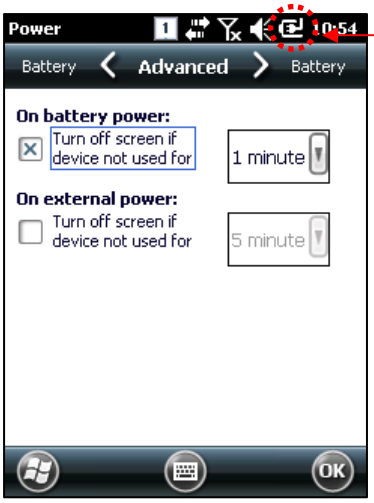
To unlock the locked screen, you swipe across the slider at the top of the screen.




**Power Off Automatically**

If the device has not been used for a period of time, the system will enter low-power (sleep) mode automatically. Carefully setting the sleep mode time in the Power Management control panel can save power and prolong the life of the battery.

**[Start] > [Settings] > [Power] > [Advanced]**




Power Icon

- You can also click the status bar at the top, and then the <Power> icon to enter this screen.
- To reactivate the device after it has gone to sleep automatically, press the <Power> button.

**Battery Discharging**

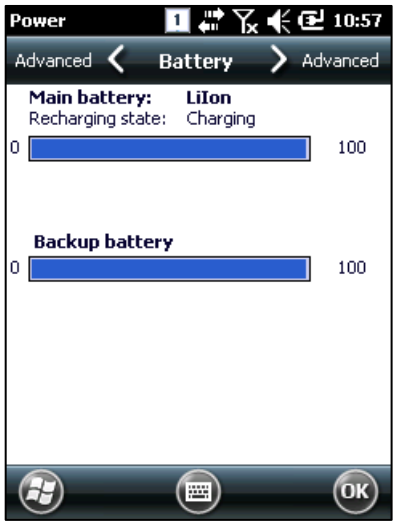
If the main battery discharges completely while the system is turned on, the device will go into low-power (sleep) mode automatically, and even pressing the <Power> button will not cause the system to turn on. In this case, you should fully charge the main battery and then press the <Power> button to turn on the handheld.

## Checking the Battery Gauge

Battery life is largely affected by the user's usage habits. The battery may need up to twelve hours to charge completely.

**Checking Battery Gauge**

**[Start] > [Settings] > [Power] > [Battery]**




**Low Power Warning**

If the remaining battery charge cannot support the running system any more, a low power warning message window will appear on the screen. You will need to press the <Power> button to turn off the power, and charge the battery as soon as possible.

## Backup Battery

The backup battery can safely maintain the RAM data, even when the main battery is discharged completely.

> Caution:
> **If the main battery and the backup battery are both discharged, the RAM data will be lost. Any unsaved data in the running programs will be lost. After charging and rebooting, the system will not be restored to its previous state.**

## Disposal of Battery

If the battery becomes damaged or reaches its end-of-life, you need to purchase a new one. Please dispose the used batteries in an approved location.

# System Reset

If there is no response from the handheld, or an application is locked up and stops responding, then a reset of the handheld may be necessary. Resetting the system is also required when you want to upgrade firmware,

## Soft (Warm) Reset

If there is no response from the system, you should first perform a soft reset. A soft reset will halt running programs and the user memory will be deleted. Installed programs and saved data are not affected. Use the stylus pen to press <**Reset**> button briefly. The screen will go black momentarily before the system reboots again.

**Soft Reset**

- Press Reset button.
- System will reboot.
- Desktop appears in about ten seconds.
- Your registry information, copied files, and installed programs are all retained.


## Hard (Cold) Reset

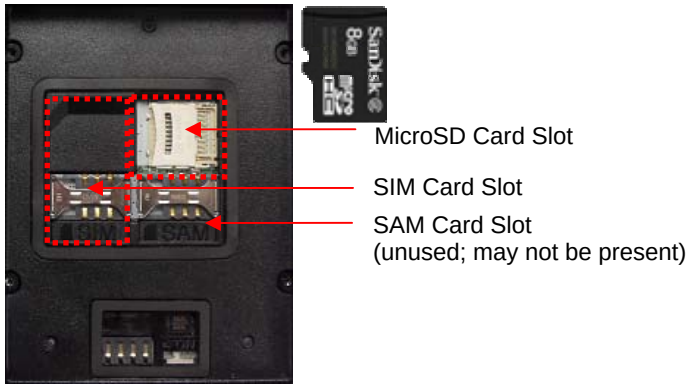
A Hard Reset (which is sometimes called a Cold Reset) initializes the hardware completely. The user's installed programs, files, and registry values will be retained, but the real-time data and date/time will be reset. You need to reset the time and date after performed Hard Reset. You should only perform a Hard Reset when the Soft Reset fails to restore the system. Hold the <Power> button while using the stylus pen to press the <Reset> button, then release both of them simultaneously. The screen will go black momentarily before the system restarts again.

**Hard Reset**

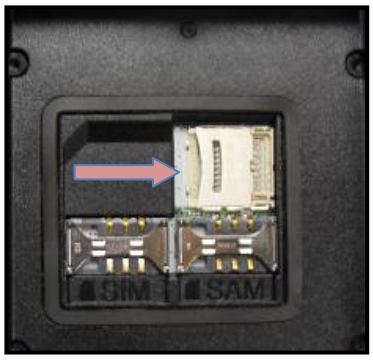
- Press Power and Reset buttons together.
- System will reboot.
- Desktop reappears in about ten seconds.
- Time & date window will pop up and need to be reconfigured.


# Using a MicroSD Card

The image below is with the battery compartment off. There is one MicroSD card slot, and one SIM card slot. Instructions for inserting and configuring a SIM card, for 3G network communications, are given in the chapter, "Using a SIM Card".



## Installing a MicroSD Card



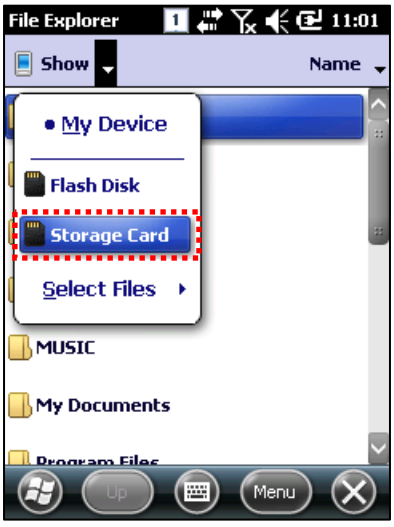

Carefully slide the metal cover to the right, along the direction of the arrow, to open it.


Lift the cover up along arrow direction.


Set the MicroSD card into the slot and lower the cover again.

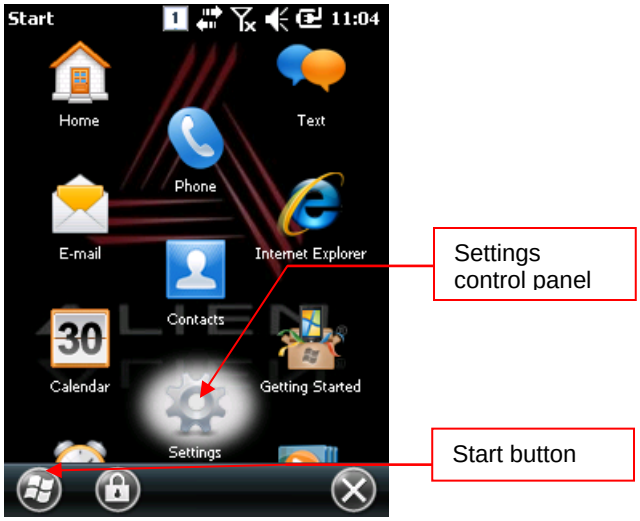

Slide the cover to the left to lock it, and reattach the main battery.

You can find the MicroSD memory card icon in the File Explorer, after inserting the MicroSD card.



# System Settings

Most of the system settings can be changed through the Settings control panel, which is accessed via the Start button.

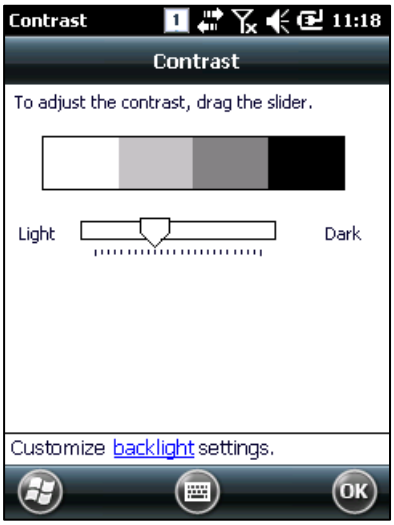


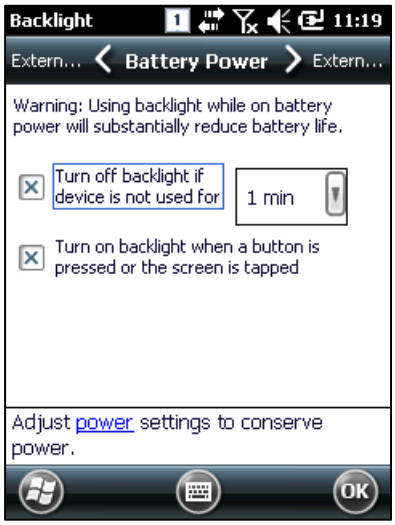

## Setting Screen Contrast

The screen brightness/contrast is one of the biggest parts of your power consumption, so you may need to adjust it to suit your actual needs.

**[Start] > [Settings] > [System] > [Contrast]**

A lighter contrast makes a brighter screen, and will consume battery power faster than a darker contrast. You can also control how long before the screen automatically dims, in the Backlight control panel.

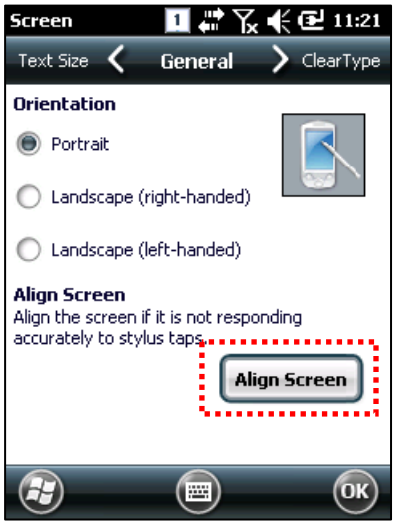


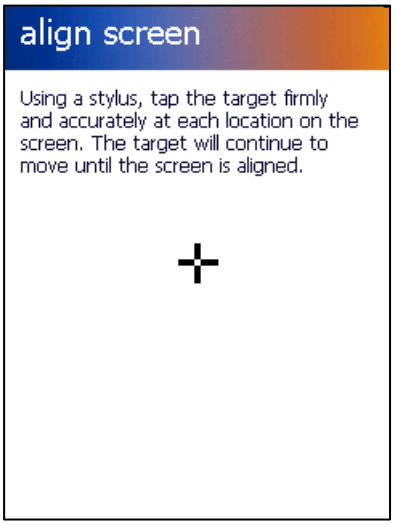



## Screen Calibration

The first time the device is used, or if you haven't used the device for a long time, you may find that you cannot accurately select the place where you touch with the stylus. In this case, you need to perform the screen calibration.

**[Start] > [Settings] > [System] > [Screen] > [Align Screen]**



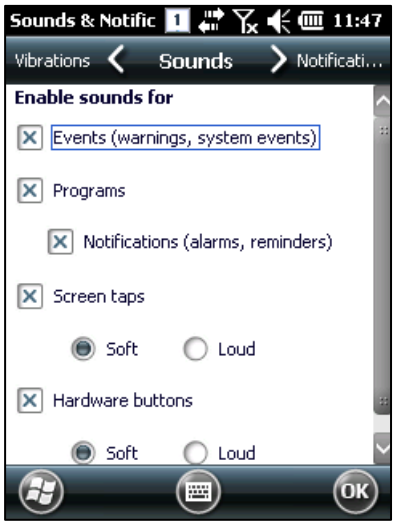



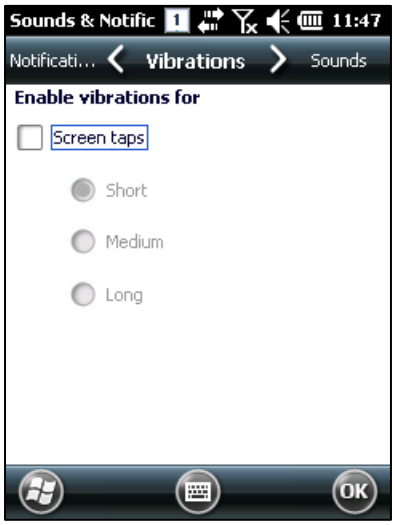

Press and hold the stylus pen briefly on the center of the cross symbol, and repeat five times as it moves around the screen.

## Setting System Sounds

You can set which system sounds are enabled (including vibrations) in the Sounds & Notifications control panel.

**[Start] > [Settings] > [Sounds & Notifications]**

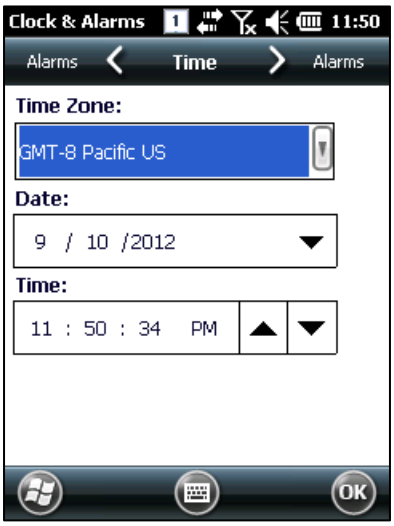



You can adjust the volume quickly by folding the Fun button while pressing the Up and Down button along the left side of the unit.

### Setting the Date and Time

**[Start] > [Settings] > [Clocks & Alarms]**

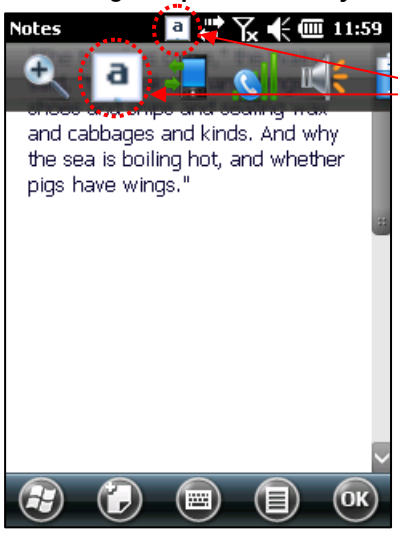



## Using the Keypad

The physical keypad enables you to input numbers, letters and special symbols. You can also execute other preset functions with the <Fun> button.

If you'd like to change the current input mode, press the <**1 ALP>** button on the keypad as it steps through the following sequence:
**"1" (Numeric) -> "a" (lowercase letters) -> "A"(uppercase letters) -> "1"**

**You can also change input modes by using the Status Bar icon:**




Clicking the Status Bar, and then the Input Mode icon also allows you to change the input mode.

### Entering Data

**Numeric Keypad Mode, "1":** Press the <**1 ALP**> button or keypad icon on the taskbar to change to the numeric mode. Pressing a keypad button will directly enter the number printed on that key.

**Alphabet Keypad Mode, "A,a":** Press the <**1 ALP**> button or keypad icon on the taskbar to change to the lowercase (a) or uppercase (A) mode. Each keypad button has 2-4 letters or symbols. Pressing the button once causes the first letter or symbol to be entered; quickly pressing twice causes the second letter or symbol to be entered, and the third letter or symbol requires the button to be pressed three times quickly.

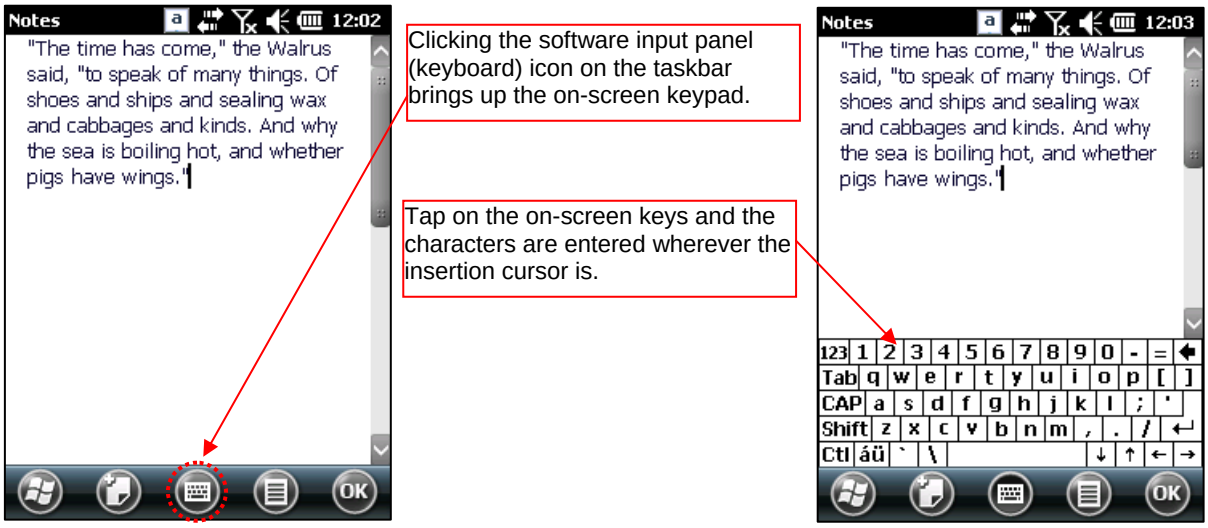
### Using the <Fun> Button

Pressing <Fun> button and other buttons simultaneously can activate various functions, as below:

| Fun + Button | Descriptions |
|---|---|
| **<Esc>** | Cancels the selected command or the program's current task. |
| **Volume button <Up>, <Down>** | Increases or decreases the sound volume. |
| **<3>,<9>** | Performs page-Up or page-Down operations. |
| **<2>,<4>,<5>,<6>,<8>** | Moves the cursor Left, Right, Up, Down, and Home. |
| **<Del>** | Deletes a letter located to the right of the cursor. |
| **<7>** | Works like a Tab key. |
| **<*>,<0>,<#>** | Enables you to input +, 000, and – symbols. |
| **<F3>,<F4>** | Enables you to use as two additional function buttons. |

## Using the Soft Input Panel

Sometimes, when entering data on-screen, it is easier to use the stylus and the soft input panel to enter text. You can configure the layout of the soft input panel in the Input Panel control panel.



# Using the Stylus

You can tie the stylus to the hole in the hand strap connector, to allow you to use the stylus like a mouse on a PC. The hand strap has a small integrated holster for storing the stylus safely.

Use the stylus to:

- Select a letter on the onscreen soft keypad.
- Select a program on the desktop or taskbar.
- Select a button, tab bar, or other control in an application window.

> Caution:
> Please do not use sharp objects on the touch screen. Use only the supplied stylus; otherwise you could seriously damage the touch screen.

# Using ActiveSync

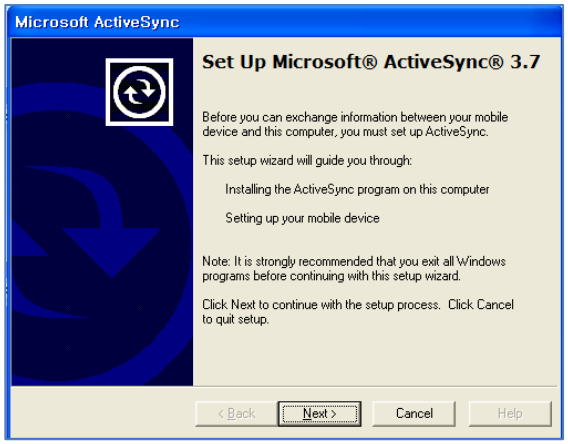
The ActiveSync interface synchronizes data between the PC and handheld device, so that you can install programs, copy, transition, and delete data, etc.

## Installing Microsoft ActiveSync Program

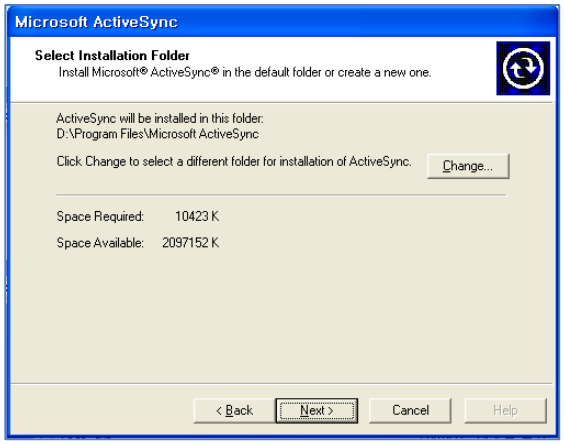
Download the latest version of the ActiveSync program from the Microsoft website, and install it to your PC.

http://www.microsoft.com/downloads/

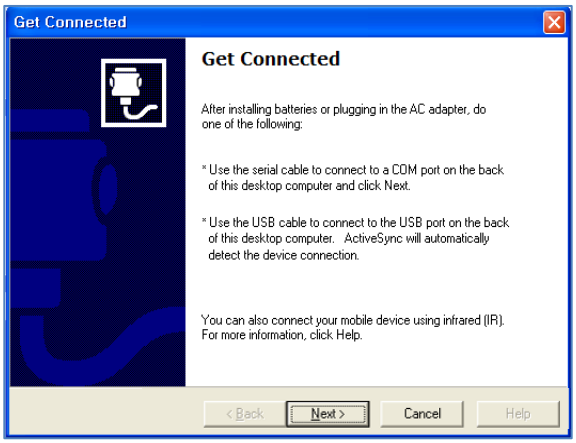
**Caution:**
**You must use ActiveSync v3.7 version or later.**




Click the [Next] button.




Designate the installation folder, and then click the <Next> button.



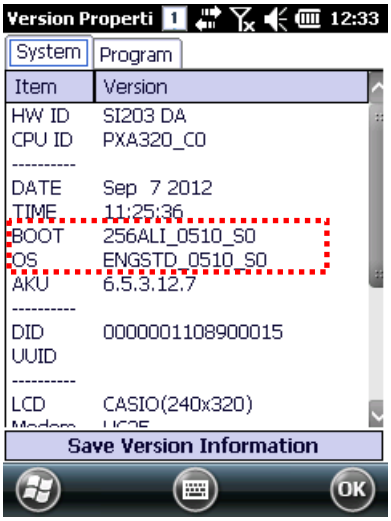

The installation was finished. Now when you use the USB cable to connect to the USB port on your computer, ActiveSync will automatically detect the device and make a connection.

## Handheld Firmware

**[Start] > [Settings] > [System] > [Versions]**

You can check the handheld's firmware version in the Version control panel. In order to load a new firmware image, you must use the unit's Boot Menu (described later).


Go to the Version control panel to examine the current firmware version.




The BOOT and OS lines show the current firmware version (in this case, v510).

New firmware for the handheld is distributed as two separate image files – one for the bootloader, and one for the main OS image. Upgrading the unit's firmware will reset it to a factory-default state. Any data or programs you may have loaded may be removed and you will have to reconfigure the unit afterwards.

Currently, the only way to install new firmware is to copy those files to the top level of a MicroSD card and install the card into the back of the unit. Alien recommends 2GB cards from SanDisk, for

the purposes of upgrading firmware. ***Do not put any other files on the MicroSD card!*** Once the two firmware files are on a memory card, and inside the handheld, you use the Boot Menu to install them

## Boot Menu

To perform a Hard Reset and go to the Boot Menu, press the <Reset> button, and then immediately hold the <Fun> button. After a few seconds, the [Boot Menu] window will appear.

Enter the [Boot Menu] in any of the following situations:

- To upgrade the unit's firmware.
- After an upgrade, to clean the Windows system registry.

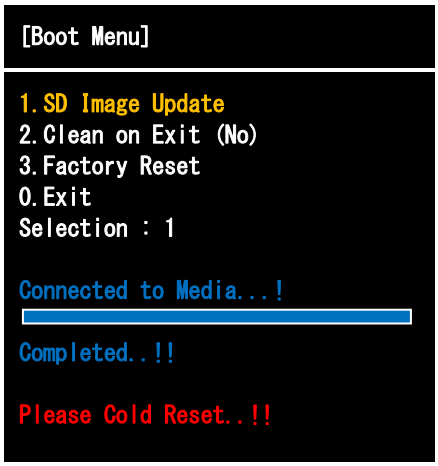

```
[Boot Menu]

1.SD Image Update
2.Clean on Exit (No)
3.Factory Reset
0.Exit
Selection :
```

The [Boot Menu] start-up screen, with Firmware Upgrade, Format, and Factory Reset options.

```
[Boot Menu]

1.SD Image Update
2.Clean on Exit (No)
3.Factory Reset
0.Exit
Selection :1

Connected to Media...!

Searching....

BOOT_WM65204356ALI_0509_SO
BOOT_WM65204356ALI_0510_SO
Update Start / Cancel?
(Start:Enter, Cancel:BKS Key)
```

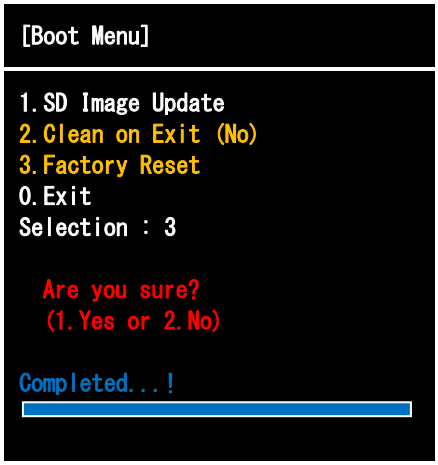
Press the 1 key to start a Firmware Upgrade. The image files must be installed on an MicroSD memory card. The unit should be powered with a plug-in power supply during a firmware load, to prevent an interruption due to a low battery.

You will be prompted to confirm each image file before it is loaded. The 1st filename (in blue) is the currently-installed version, and the 2nd filename (in red) is the new one that will be loaded if you confirm by pressing the Enter button on the keypad.




Once complete, you will be prompted to cold reset the handheld. Press the Power and Reset keys at the same time, to perform a cold reset.

Before allowing the unit to boot after a firmware upgrade, it is a good idea to perform a Factory Reset on the unit. Do this by holding down the Fun button immediately after the cold reset, to re-enter the Boot Menu.




Press the 2 key to enable the Clean on Exit option (1 to enable, 2 to cancel). The reset is actually performed when you press 0 to exit the boot menu. Formatting the unit with this method returns it to the factory-default configuration, but leaves the Flash disk alone.

Press the 3 key to completely clean the system, including reformatting the Flash disk. Press 1 to proceed, or 2 to cancel.

You should always do one of these resets after installing new firmware.

Pressing the 0 key at the Boot Menu prompt will leave the bootloader and launch Windows Mobile. The first boot-up after a firmware upgrade can sometimes take a few seconds longer than usual, as Windows rebuilds the registry and desktop interface.

# Chapter 3
# RFID Tag Reader

The ALH-901x handheld readers contains a full-featured 900 MHz UHF RFID tag reader. It is able to inventory, selectively read from, and write to, RFID tags which support the EPC Gen2 protocol. The Frequency range is 850MHz - 960MHz, and can be adjusted for different regions.


## Starting the ALH-901x RFID Demo Software

The Alien RFID demo software is accessible from the Alien Demos folder in the Start menu. It provides an example of what you can accomplish with a custom application on the reader.

**[Start] > [Alien Demos] > [RFID]**

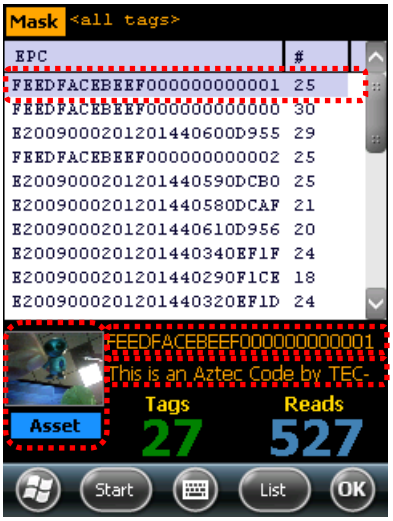

The Alien demos are located toward the bottom of the Start menu.


The RFID demo app's main screen has buttons for each of its utilities, and a menu item for reader settings. Click the Exit menu item to close the demo app.

# Inventory Utility

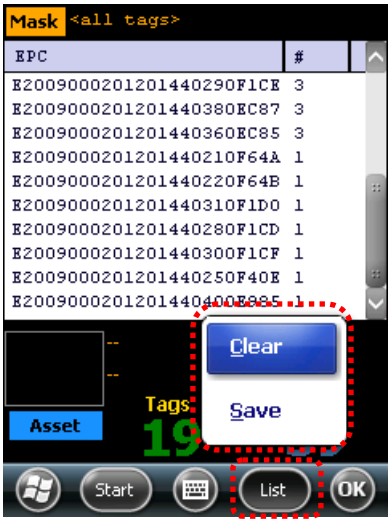
The Inventory utility allows you to scan all of the tags within range of the reader, and see each tag's EPC and read count in a scrollable list. You start and stop the inventory utility by either holding the pistol-grip trigger button, or by clicking once on the green Start button. The reader continues to read tags until you release the trigger or click the Stop button. Click the OK button at the bottom-right corner to return to the main screen.


Each tag that is read is added to the scrolling list, along with the count for each tag. The number of unique tags and total number of reads is displayed.




Clicking on a tag in the list shows its full EPC below the list, and if that tag has already been associated to an Asset, its image and barcode are displayed. Assets can be defined with the Asset button, and used to select tags in the Tag Mask screen.


Clicking the yellow Mask button at the top of the Inventory screen takes you to a page where you can specify a subset of tags to read (see the Tag Mask section). This powerful feature causes the reader to only read the tags you want it to read – those selected by the mask.

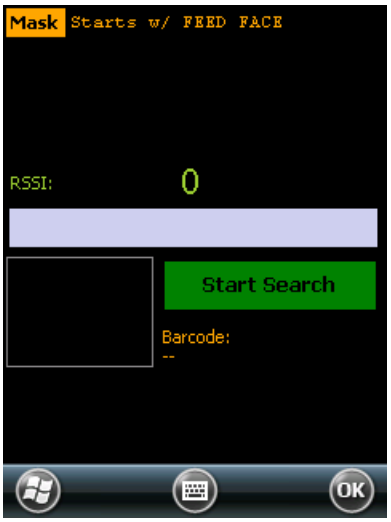



The List menu at the bottom gives you options to clear the list, and save the list data to a file on the device.

## Geiger Tag Utility

The Geiger Tag utility is designed to assist you in finding the location of a particular tag, or one of a group of tags. It does this by measuring the returning signal strength (RSSI) from the tag, and displaying this information on the screen, along with an audible and vibratory queue. As you pass the reader near a tag, the RSSI increases, and you will see, hear, and feel the change.

To start the Geiger Tag search, either hold the pistol-grip trigger button, or click once on the green Start Search button. The reader continues to read tags until you release the trigger or click the Stop button. Click the red Close box at the top-right corner to return to the main screen.




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


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.


Having the Geiger react to every tag it sees can quickly become overwhelming. Use the yellow Mask button at the top-left corner to indicate which tag or tags you are interested in finding (see the Tag Mask section). Narrowing the search down with a tag mask can make the Geiger utility much more effective.


If a tag corresponds to an Asset that has already been defined, its image and associated barcode are also displayed.

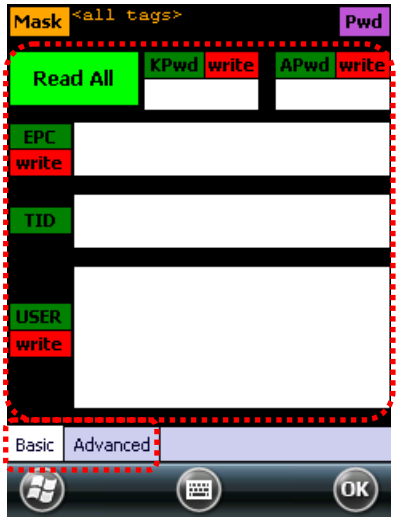
# Tag Access Utility

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 EPC code – along with some other information related to the EPC. The TID bank is generally 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 it is supported each tag provides different amounts of memory there.

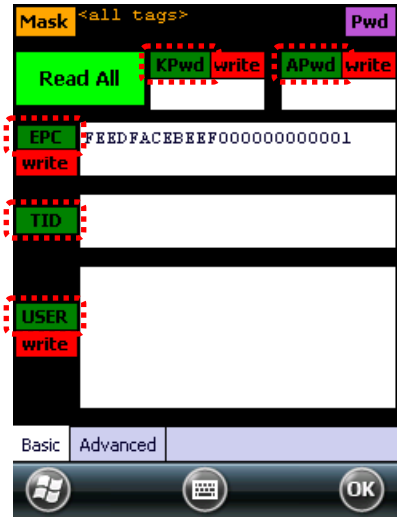
## Basic Access Tab

The Basic Access tab has text fields for each of the separate fields of tag memory. Clicking the Read All 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.

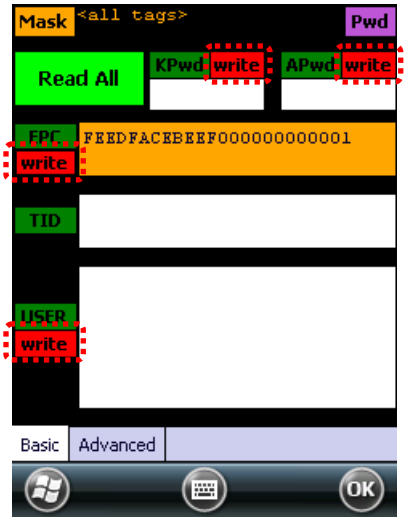



The Basic Access tab gives a visual overview of all of the fields in tag memory.


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

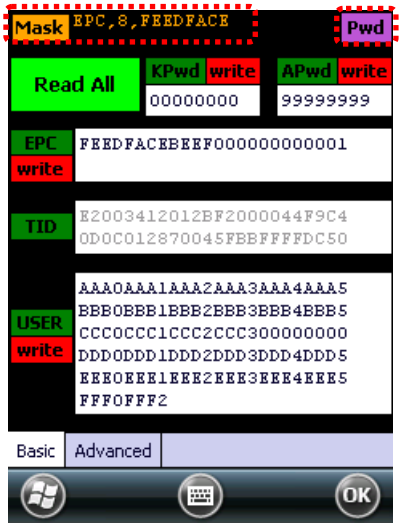



Pressing one of the small green buttons labeling each memory field will cause the reader to only read data from that field.

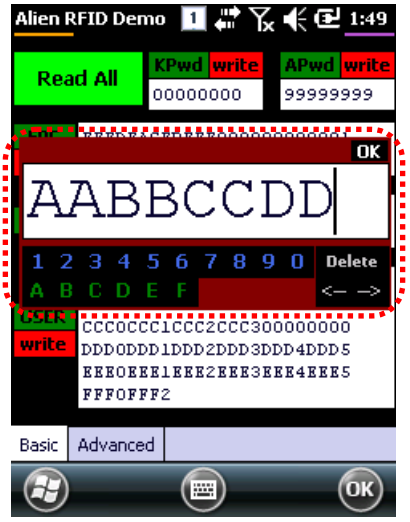



Pressing one of the red "write" buttons causes the reader to write the shown data to the tag. You can edit the data in the field before writing it to the tag. The field turns orange while writing, and then turns white or red, depending on the success of the write operation.

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 yellow 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 Pwd button at the top-right corner to do this.




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

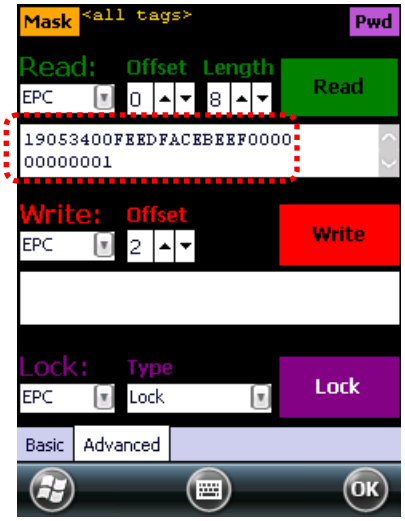



The violet Pwd button opens up a dialog window where you can enter in an Access Password, for accessing tag memory that may have been locked.

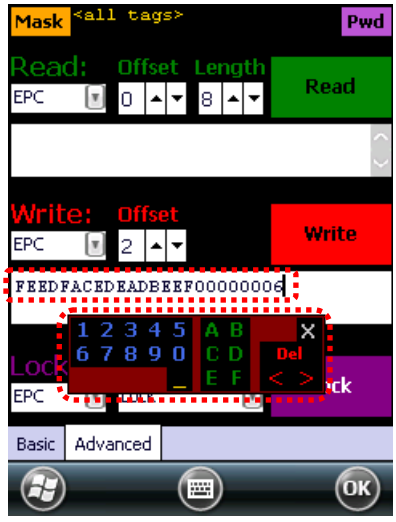
## Advanced Access Tab

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).

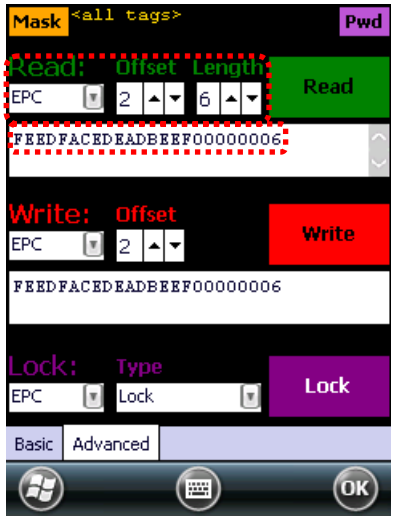

Three main areas in Advanced Access: Read, Write, and Lock. Each requires you to specify a memory bank.




Note in this read that the tag's actual EPC code (FEEDFACEBEEF…0001) is actually offset two words from the start of the EPC bank.




You must enter the hex data to write in the field. The helpful popup keypad makes entering hex data easy.

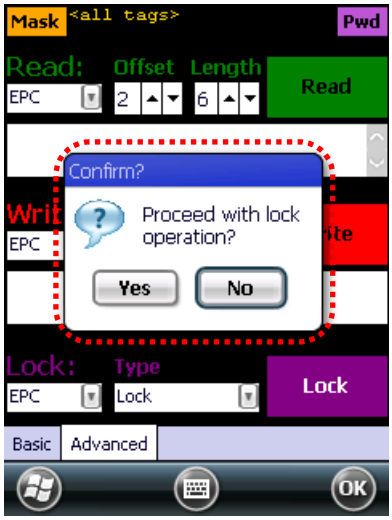



Verify the success of the write operation with another read (of just the EPC code this time). Now it is FEEDFACE**DEAD**BEEF00000006.

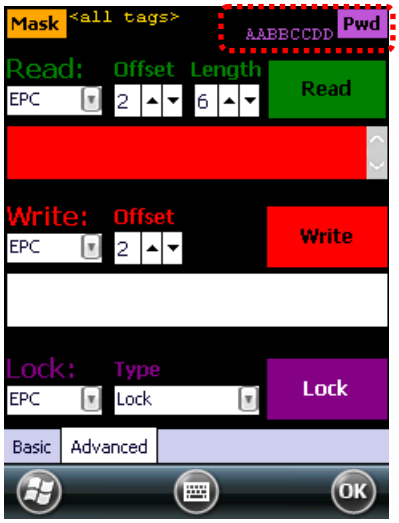
When locking, you have the option of locking the Access Password and Kill Password (both in the Reserved bank) separately, so the Lock command has a list of tag memory *fields* instead of *banks*. The other parameter is the type of lock: Lock, Unlock, PermaLock, and PermaUnlock. All locking operations 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, and the lock type.




Confirm the lock operation. PermaLock and PermaUnlock cannot be undone!




As on the Basic Access tab, you have full access to the tag Mask and current Access Password in this tab.

On this screen, the read operation failed because we were trying to access it with an incorrect Access Password.

## 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 ALH-901x demo software 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 in yellow text, alongside the Mask button that brings up the Tag Mask whenever it is clicked.

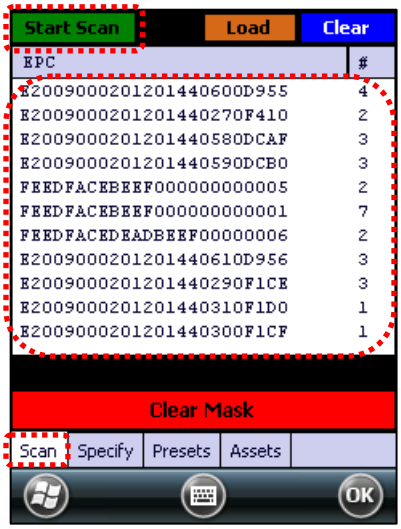

At its heart, a tag mask defines a piece of data that must match exactly a specific portion of the tag's memory. This includes the memory bank (not just the EPC bank), a pointer offset into that bank, and the actual hex data to match against.

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:

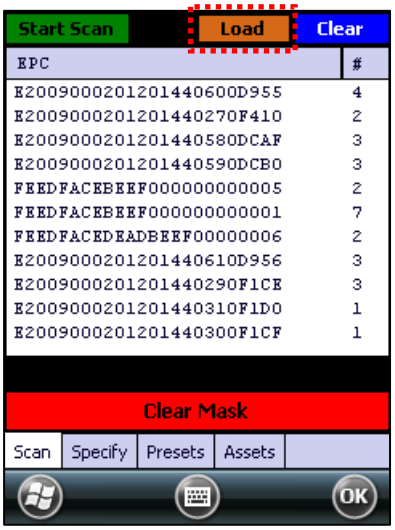
1. Scanning the field for tags (or loading a text file of EPCs) and picking a tag from a list.
2. Exactly defining the bank, offset, and hex data.
3. Picking a named mask from a preset list
4. Selecting a pre-defined asset (RFID+barcode+photo)

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.

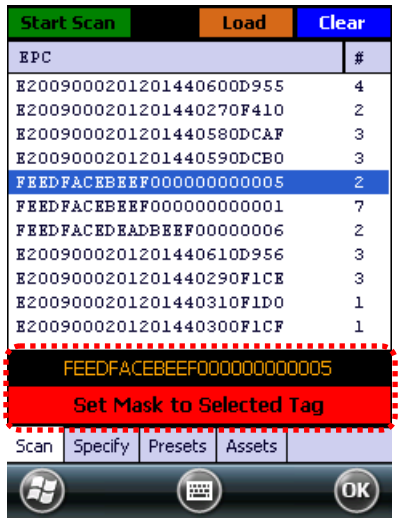
## Tag Mask – Scan




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




You can also click on the Load button to import a list of tags, either one you created yourself (one EPC per line) or a saved list from the Inventory screen.




Select a tag from the list and click the Set Mask to Selected Tag button. To clear the mask, click an empty part of the list and then click the Clear Mask button.


Masks defined with the Scan method are displayed on the utility screens as simply the full EPC of the tag.

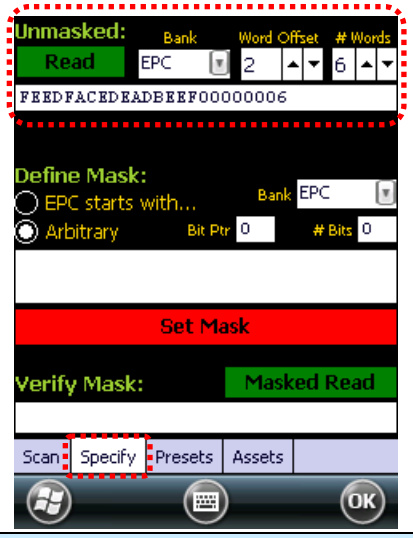
## Tag Mask – Specify

The Tag Mask "Specify" tab allows you to do three things: take a quick peek at tag memory (to help you determine your mask definition), define an arbitrary or "EPC Prefix" mask, and verify your mask.

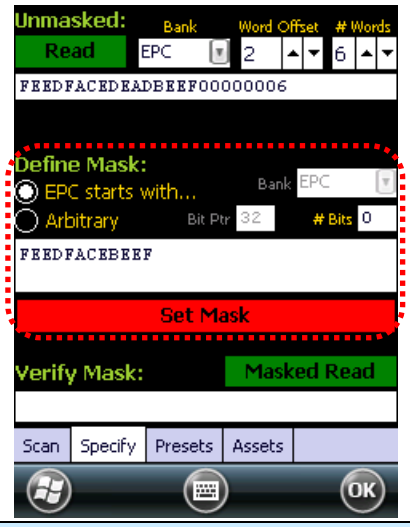
The upper section, called Unmasked, lets you choose a bank, pointer offset, and number of words to read. Clicking the green Read button will query any tag in the field (without any masking) and report the data from that tag.

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 mask. If you select EPC Prefix, 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 Arbitrary, you choose the bank and pointer offset, along with the mask data. Click the red Set Mask button to define your mask.

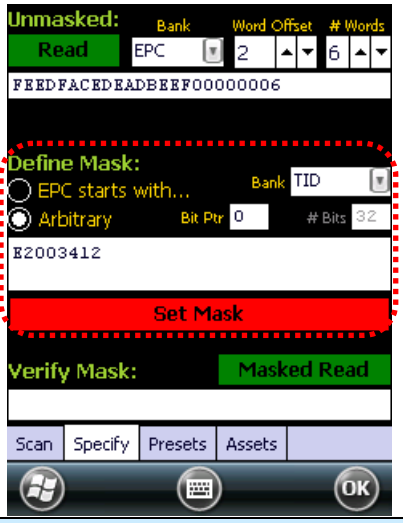
After you've defined a mask, you can do a quick verification by clicking the green Masked Read button in the Verify Mask section at the bottom. Any responding tag's EPC will be shown in the text field there.



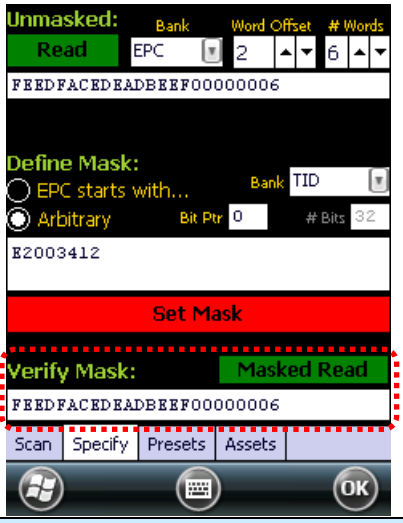

The Quick Peek section lets you get a glimpse of an actual tag's memory, to help you define your mask.




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




Defining an arbitrary mask requires you to specify the bank and offset, along with the data. This TID mask example selects all Alien Higgs3 tags.



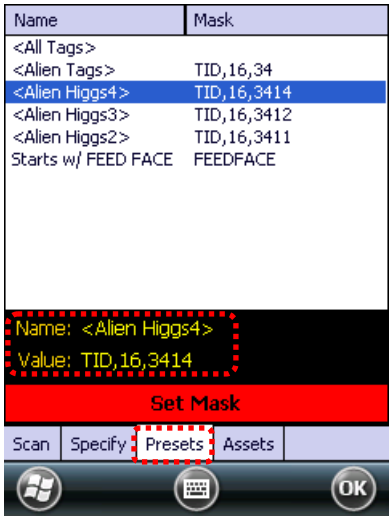

Using the Verify Mask feature, you can make sure you've entered the mask correctly. Be sure to test tags that match as well as tags that don't match.


Masks defined with the EPC Prefix method are displayed on the utility screens as that initial part of the EPC.


Masks defined with the Arbitrary method are displayed on the utility screens with the bank, offset, and data.

## Tag Mask – Presets

The third way to set a tag mask is with the Presets tab. This screen shows a list of pre-defined tag masks, such as “all tags”, “all Higgs3 tags”, etc. These presets are hard-coded in the application, but you can replace the default list with one of your own.

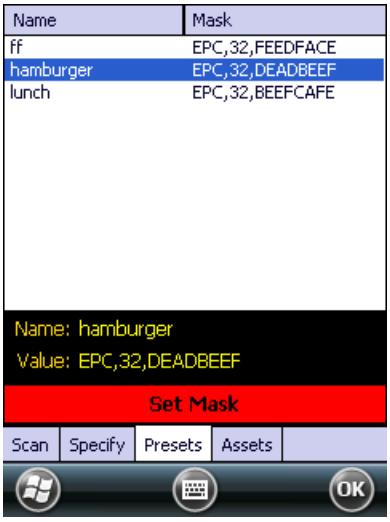



Pick one of the selections from the Presets list, and you can see the displayed name and mask definition. Click the Set Mask button to use it.


Masks chosen from the Presets tab are shown on the utility screens with the display name in the mask preset definition. Your own mask presets might display “Blue Jeans” or “Pallet Tags” instead.

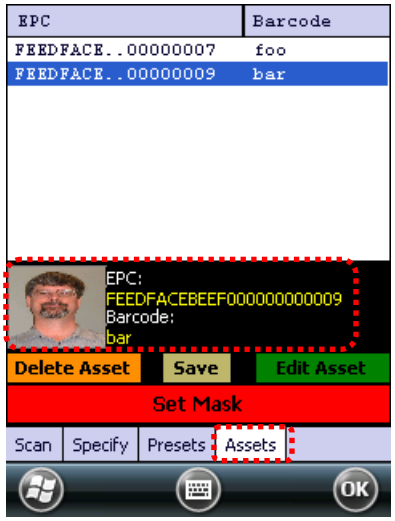
To use your own list of mask presets, just create a folder called \Flash Disk\RFIDAssets and place a file called presets.txt there. Each line of the presets.txt file should contain the preset name, followed by a tab, followed by the mask string (bank_name,bit-offset,hex_data). For instance, a presets.txt file might look like this:

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



## Tag Mask – Assets

The Assets feature of the RFID demo application shows how you might associate an EPC code, barcode, or photo snapshot (ALH-9011 only) 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 photo is shown on the screen for verification, and you can also see the associated barcode as well.




Assets can be created from the Tag Mask-Assets tab, or directly from the Inventory page, using the "Asset" button there. Select an asset from the list to see its details, and then click the Set Mask button to configure the reader to only read that asset's RFID tag.

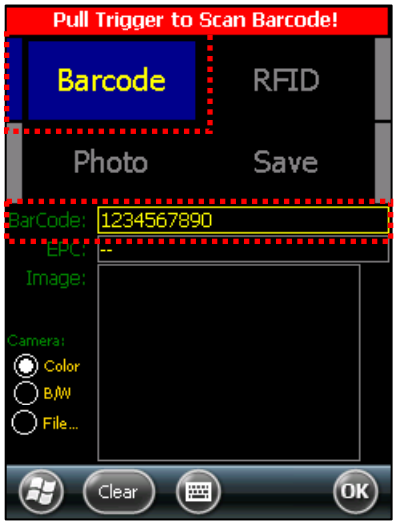
The Save button saves the asset list to \Flash Disk\RFIDAssets\assets,txt. You can edit that file to generate your own asset list.

When you select an asset from the list, the "Delete All" button changes to "Delete Asset" and the "Add Asset" button changes to "Edit Asset".

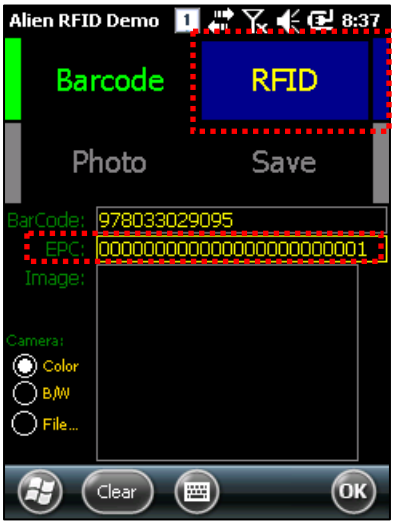
Whether you click the Asset button from the inventory screen, or the Add Asset button from the Tag Mask-Asset screen, you will see the Asset screen. There are four steps to creating an asset, and pulling the gun trigger performs each one and advances you to the next step. You can skip steps, or redo steps by manually tapping on one of the step buttons.

1. Barcode – scan a barcode
2. RFID – read an RFID tag
3. Photo – take a picture or load an image file
    a. You can use the color camera or the 2D barcode's B&W camera.
    b. Only the ALH-9011 has the camera capability.
4. Save – remember the asset definition

Each button indicates the status of that activity – grey text and indicator mean no data has been collected. A blue button indicates which activity is selected. The button text changes color to indicate if the unit is ready (yellow), working/scanning (red), or done (green) with that activity. To perform the action, pull the gun trigger, tap the button again, or use one of the various keypad buttons on the handheld.




The Barcode scan is first. Just pull the trigger to scan a barcode and advance to the next step. When the barcode is successfully scanned, it is displayed in the middle of the screen.




Next step is reading the RFID tag. Just pull the trigger, press the Scan button above the keypad, or tap on the RFID button again to read the EPC.

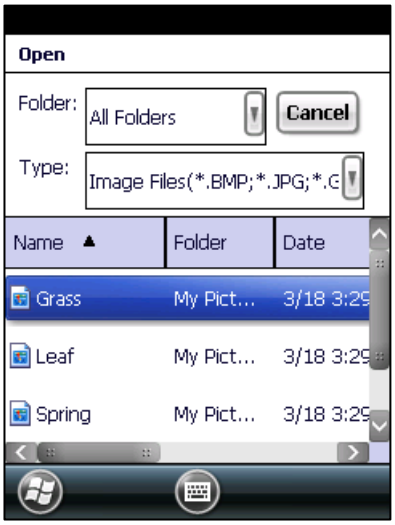
When you take a photo of your asset, you have two different camera options to use. You can use the full color camera, or the 2D barcode scanner's own lower-resolution black & white camera). The B&W camera is significantly faster to use, in practice, since the barcode scanner device is already powered up by this point, and ready to capture images. You can select which camera to use with the small radio buttons to the left of the image preview:



The color camera interface uses the Windows Mobile camera capture dialog. Press the Enter key on the keypad (not the gun trigger) to take the snapshot. Press the OK button when done.


After taking the color snapshot, you see your image preview back on the Asset screen, and it is all ready to save now.


The B&W camera from the 2D barcode scanner takes lower-quality images, but is much faster, and the preview image while pointing the camera appears right in the Asset screen itself, rather than in a separate window.




A third option exists: you can load an image file already stored on the device. Just select the "File…" radio button instead of one of the camera options, and you will see the standard Open File dialog, where you can find and select your image file. Unfortunately, the dialog supplied by Microsoft is rather difficult to use…


After you've collected the asset information, click the Save button (or pull the trigger while it is selected) to record the asset.

The Clear button resets the asset information, and the OK button cancels the operation.

# Reader Settings

The Reader 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 Reader Settings screen from the menu button at the bottom of the main screen. There is a second Network tab with some additional parameters related to the reader's network interface and some common Alien features, such as a Heartbeat and TagStream functionality.

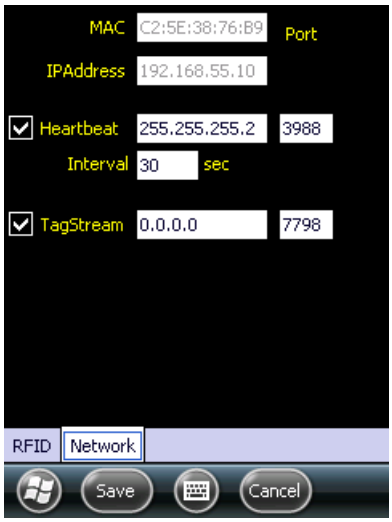
To commit any changes made on the Reader Settings pages, you must click the Save menu button at the lower-left corner. Clicking the Cancel button in the lower-right corner returns you to the main screen without applying any of the changes that you made.


The RFID tab has controls for RF Power and some Gen2 parameters, such as Session, Q, and Inventory Target.

You can configure the Inventory demo to send Select ("wake up") commands to tags for an amount of time at the start of each tag search, and there's an option to disable tag write operations on the Access demo.

Units configured for some regions may also provide checkboxes for selecting specific frequency channels.

The RFID module firmware version and configured region are displayed in the bottom corner.




The Network tab shows the reader's MAC and IP addresses, as well as fields and checkbox controls for the Heartbeat server (for UDP-based discovery), and a TCP-based TagStream feature.

# Chapter 4
# Barcode Scanner (1D & 2D)

The ALH-9010 comes equipped with a 1D barcode scanner, and the ALH-9011 is equipped with a 2D barcode scanner. Both models are designed to recognize all known 1D and 2D barcodes.


## Barcode Demo

The Barcode demo application is accessible from the Start menu.

**[Start] > [Alien Demos] > [Barcode]**


Starting the Barcode demo app, toward the bottom of the Start menu.


Press the Scan button to read a barcode. You can also pull the trigger on the pistol-grip, or use various key on the outside of the handheld.

# Setting Barcode Symbology

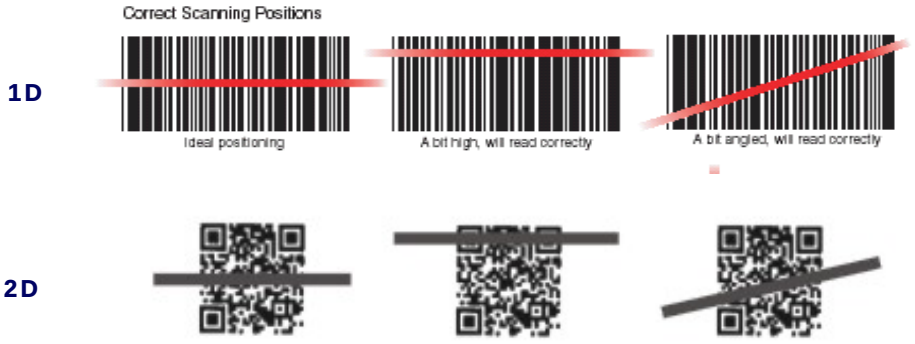
There are many different barcode encoding standards, depending on the region and industry. You must make sure that the barcode scanner is set to decode the types of barcodes that you expect to encounter. Selecting too many symbologies can increase the time it takes to decode a barcode, or result in the barcode being misinterpreted.

The Barcode demo application currently does not allow you to enable/disable each barcode symbology, though this capability exists in the device APIs supplied with the Alien Handheld SDK. There are other features of the barcode scanner, not exposed in the demonstration application, such has bi-directional redundancy checks, and up to 4 levels of security verification on each scan.

# Barcode Scanning Beam Position

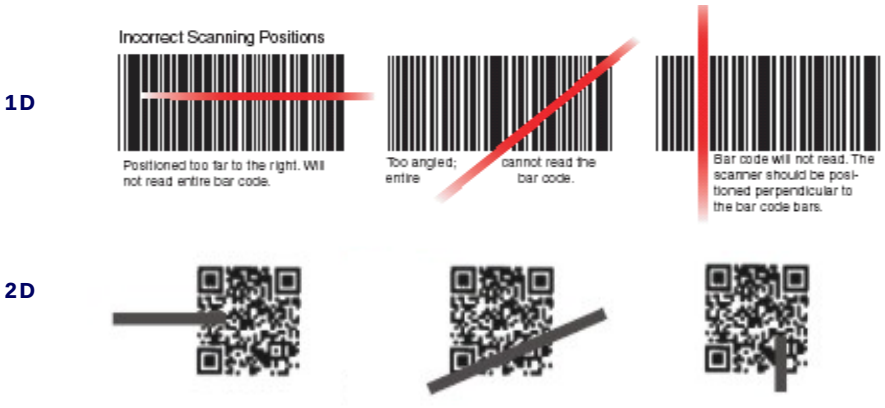
## Correct Scanning Beam Position

1. The smaller the size of the barcode, the closer the handheld needs to be. The effective scanning range is 1.5-12 inches (40-300mm). If the unit fails to scan the barcode, adjust the scan angle and distance.
2. The laser beam is a red thick line, when scanning a barcode.




## Incorrect Scanning Beam Position

1. The laser beam must pass across the entire barcode.
2. It will not scan the barcode if the laser beam crosses only part of the barcode.



# Chapter 5
# Wireless LAN

The ALH-901x handheld readers are equipped with an internal 802.11 radio module to transfer data, and interface the unit with your network using wireless communication. It supports TCP/IP network protocols, and can communicate with a host computer directly.

## Powering Up the WLAN Radio

**[Start] > [Settings] > [System] > [WiFi Power]**

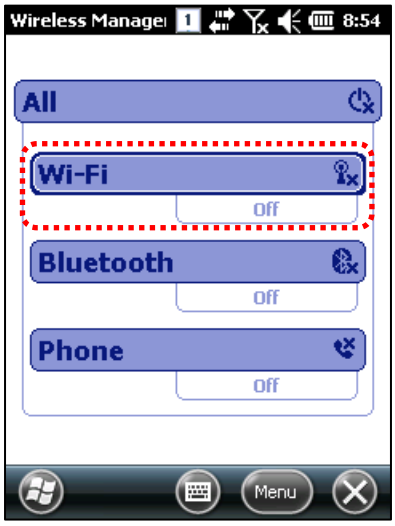

Running the WiFi Power control panel.


Turn the WiFi module on/off here. Choose between the Summit Configuration Utility or the Windows WZC to manage your WiFi connections.

## Configuring the WLAN Connection

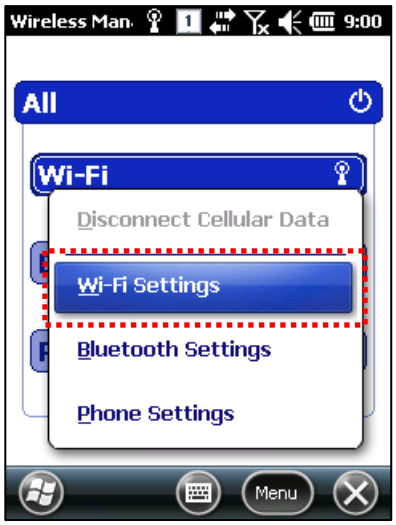
Use the Windows Wireless Manager to manage your WLAN connections.
**[Start] > [Settings] > [Connections] > [Wireless Manager]**


Running the Wireless Manager

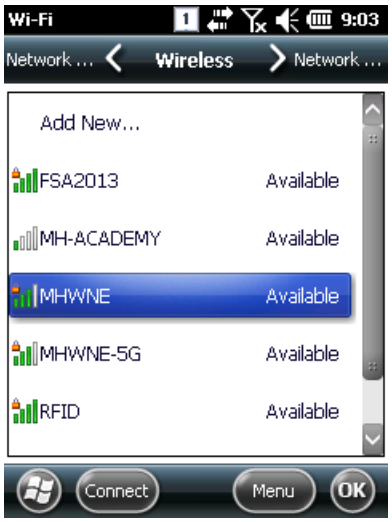



If Wi-Fi is “Off”, click it to connect to a wireless network.

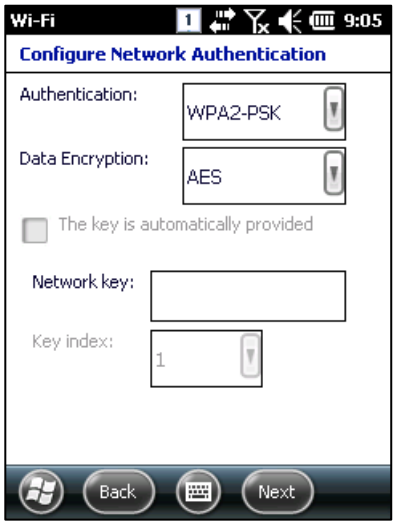

If no known networks are found, you may see a notification like this when it finds a new network. Click the OK menu button to initiate the connection process.




Use the Menu button, and the Wi-Fi Settings option to see the list of wireless servers that are known or available.




The Wi-Fi Settings screen lists all visible networks. It will automatically connect to a known network. Select a different network and click the Connect button, or tap-hold on it to see a contextual menu.




When connecting to a network for the first time, you may have to specify the proper authentication & encryption modes, a security key, and possibly other configuration information.

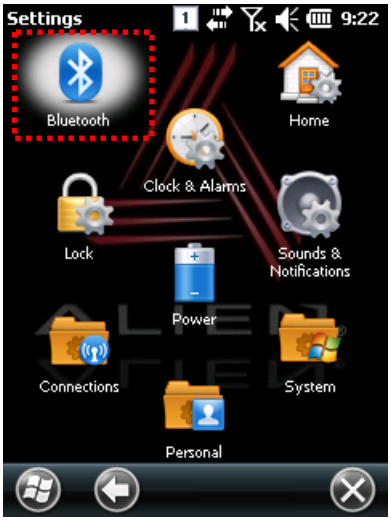
# Chapter 6
# Bluetooth

The ALH-901x handheld readers feature Bluetooth technology for wireless communication with other devices, such as wireless printers, supporting the Serial Printer Profile (SPP). By default, the Bluetooth service is turned off.

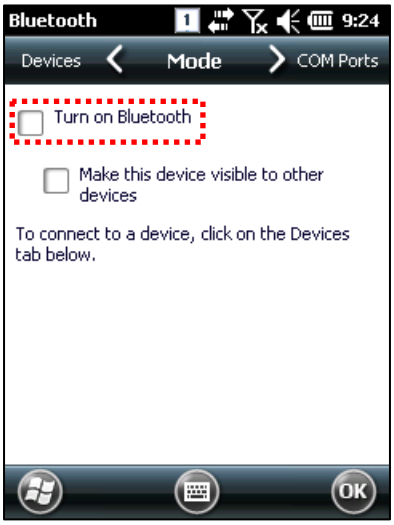
## Turning on Bluetooth

The Bluetooth radio is turned off by default. To use Bluetooth, turn it on first with the Bluetooth control panel.

**[Start] > [Settings] > [Bluetooth]**




Use the Bluetooth control panel to turn the Bluetooth radio on and off, connect to devices, etc.

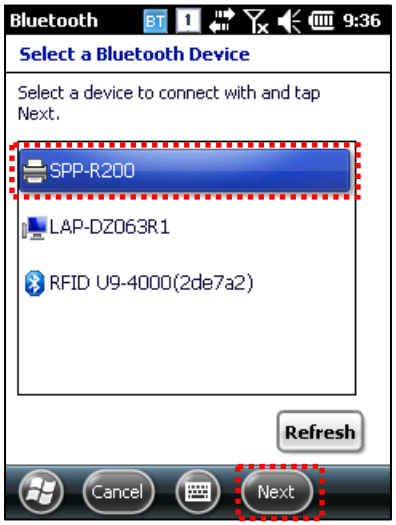



Using the “Mode” page, select the “Turn Bluetooth On” checkbox. If you want other devices to find and connect to the handheld, select the “Make this device visible” checkbox too.

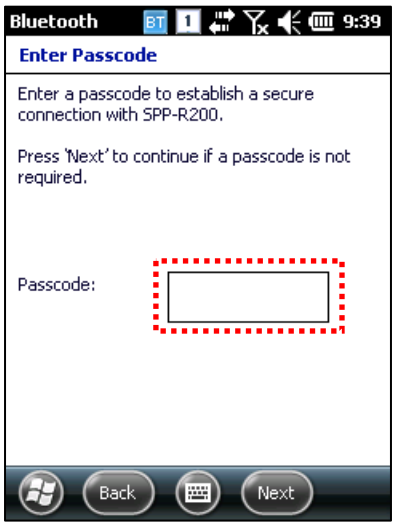
## Connecting Bluetooth Printers (SPP)

The Bluetooth control panel connects to a printer through a virtual serial port. The SPP Bluetooth device will appear as a virtual Com port. Start at the Devices page of the Bluetooth control panel.

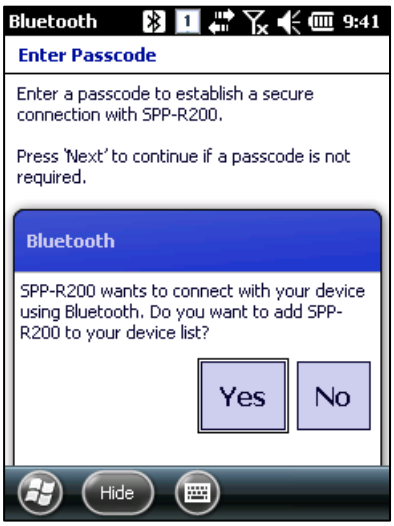

In the Bluetooth Devices screen, click the Add New Device… button.




The handheld will look for available Bluetooth devices. Select the one to connect to and press the Next menu button.

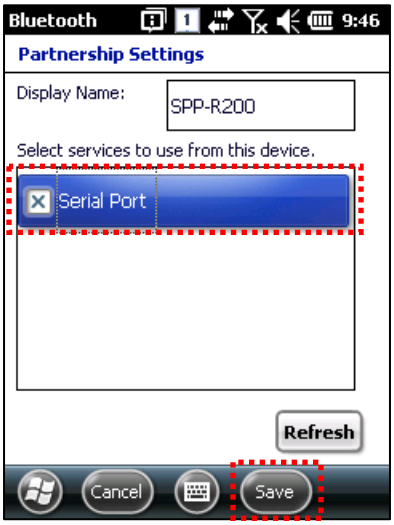



Some devices require you to enter a PIN before you can connect to them.




You will have to confirm the connection before the device is added to your device list.

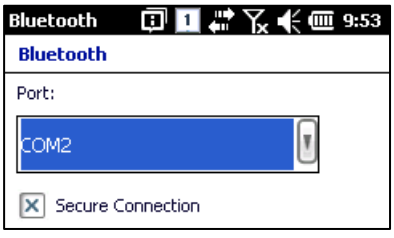

Once the device is in the device list, you need to select which services you wish to use from the Bluetooth device. Click the device item to open the Partnership Settings page.




Select one of the services the device offers, and click the Save menu button.


Click the Connect button to finish the connection.


Switch to the COM Ports page, and click the New Outgoing Port button to map the Bluetooth device to a virtual COM port.




Select your Bluetooth device, then pick one of the COM ports. Some of the listed COM ports may already be in use by other devices.

# Chapter 7
# Using GPS

The ALH-9011 handheld reader contains an internal GPS module for finding the geographic location of the handheld reader. The GPS service requires line-of-sight visibility with at least four of the constellation of orbiting GPS satellites, so the speed of the initial fix and the accuracy of all data depend greatly on the quality of the signal from the orbiting satellites. Being inside of or in between buildings, under tree cover, or near heavy electrical machinery can degrade the quality of the GPS data.

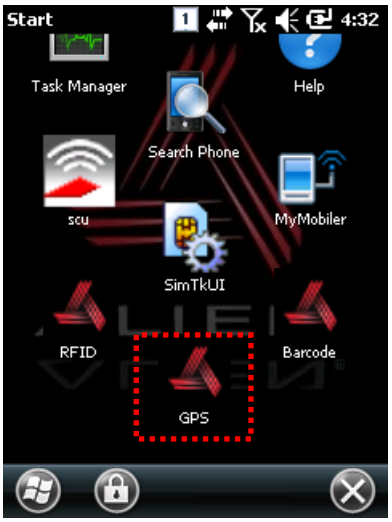
In Windows Mobile, the GPS receiver is managed by the OS itself, and is accessible either directly through its COM port (COM6, @9600 baud), or by using Microsoft's GPS Intermediate Driver. You can configure many of the low-level connection settings for the GPS receiver using the GPS control panel (Start -> Settings -> System -> GPS)

## Running the GPS Demo Program

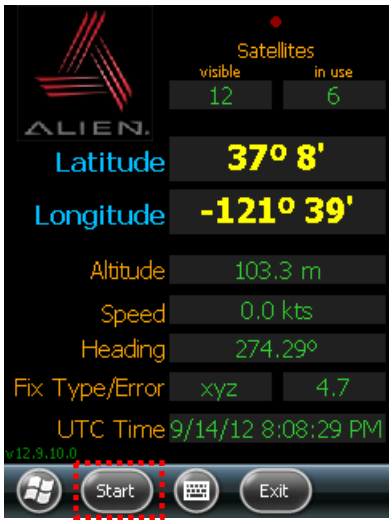
Find an open place outdoors to check your GPS signals. Depending on your actual environment, the time to receive a fix and location data is different - about 3-10 minutes is typical. After receiving a GPS fix the first time, it takes less time to receive GPS data on subsequent attempts.

The Alien GPS demo software is accessible in the Alien Demos folder in the Start menu.

**[Start] > [Alien Demos] > [GPS]**




Starting the GPS demo program, at the bottom of the Start menu.




Start/stop receiving GPS data with the button. Wait outside for a satellite fix, and then observe decoded data in the various fields around the screen.

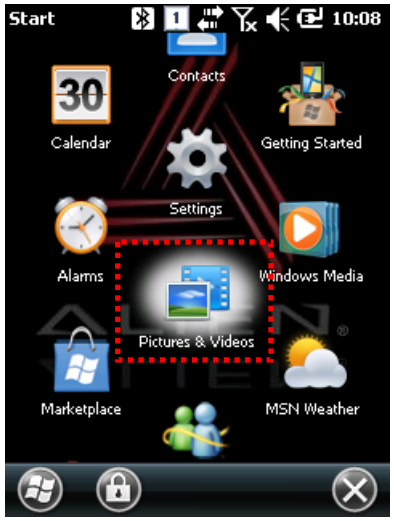
# Chapter 8
# Using the Camera

The ALH-9011 is equipped with a 3 megapixel camera which allows for adjustments of brightness, video resolution, picture quality, etc.

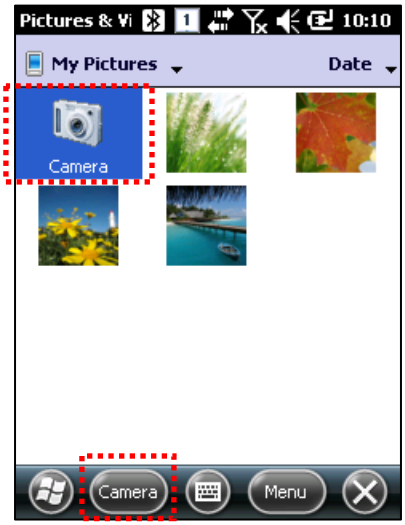

## Using the Camera

The camera is accessible as a standard Windows camera device, so custom applications would generally use the Windows APIs to access it. A convenient way to use the camera, though, is with the built-in “Pictures & Videos” control panel.

**[Start] > [Pictures & Videos]**

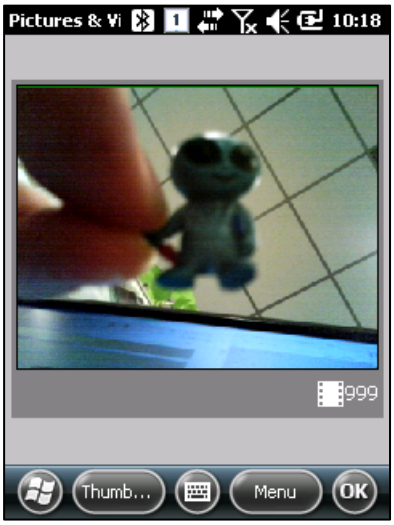



Running the Pictures & Videos control panel.

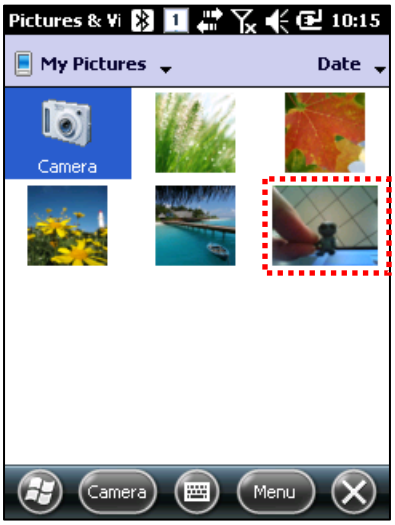



Click the Camera icon or the Camera menu button at the bottom.

The Windows Camera Dialog




Aim the camera, and press the Enter button on the keypad to take the snapshot. Then press the OK button to close the Camera Dialog.



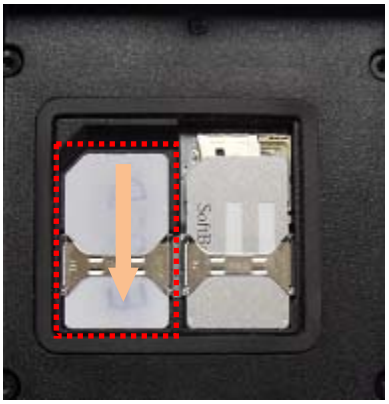

The control panel saves the image in My Pictures, by default. Your application can put the image wherever it wants to.

# Chapter 9
# Using a SIM Card

The ALH-9011 is equipped with a SIM card slot and wireless HSDPA radio supporting enhanced 3G connectivity. After inserting the SIM card, you'll have to do some initial configuration, depending on the wireless carrier you choose. After that, the ALH-9011 can use the 3G network for wireless data communications.

## Installing SIM Card

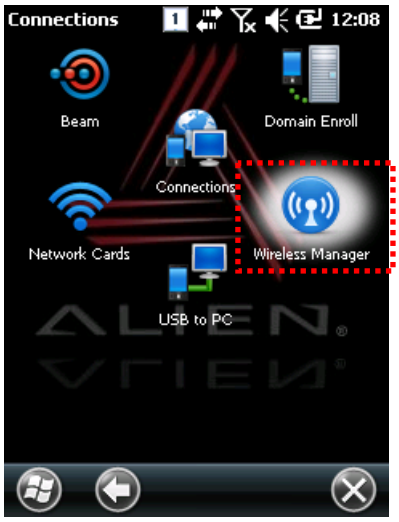
A SIM card can be easily inserted and pulled out along the arrow direction. Note the location of the dog-eared corner of the SIM card (top-left).



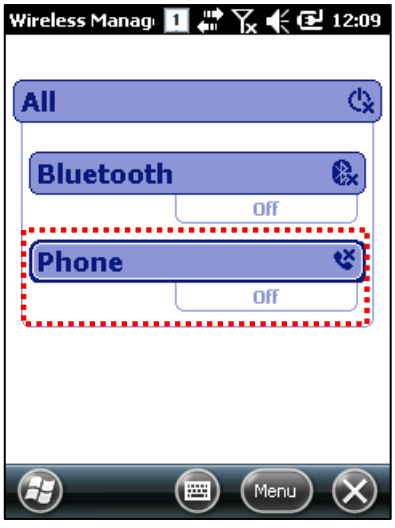
## Turning on the 3G Phone

Before you can configure your 3G connection, you have to first turn the phone module on. It is off by default, in order to conserve battery power. Use the Wireless Manager to control power to the phone module.

**[Start] > [Settings] > [Connections] > [Wireless Manager]**




Starting the Wireless Manager control panel.



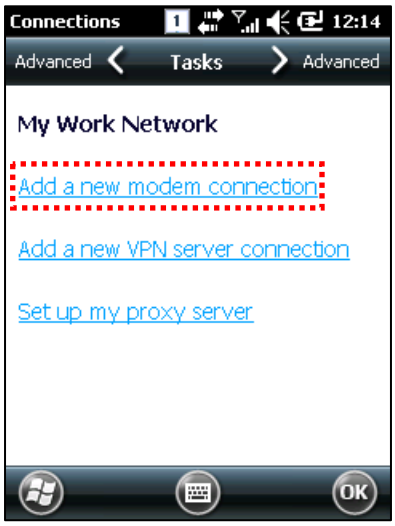

Click the Phone button on the Wireless Manager page to turn it on & off. The blue indicator light above the handheld's display illuminates when the phone is powered up.

## Creating the 3G Network Connection

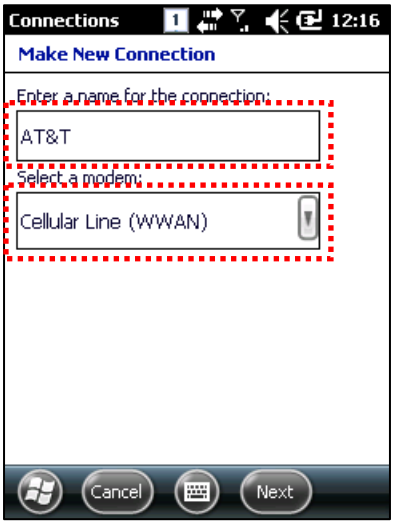
Before you use the 3G phone for the first time, you need to define the network connection. After that is done, all you need to do is turn the 3G phone on and off, and it will automatically connect to the cellular network as needed. Use the Connections control panel to do this.

**[Start] > [Connections] > [Connections]**

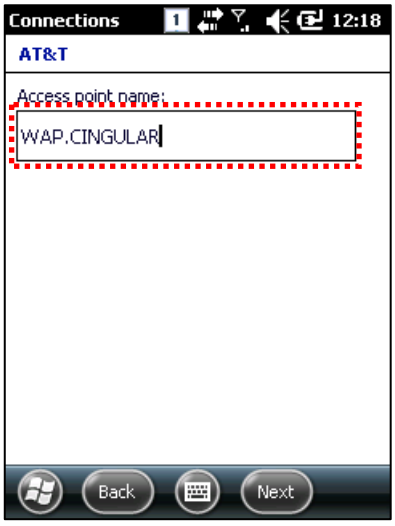

Starting the Connections control panel.



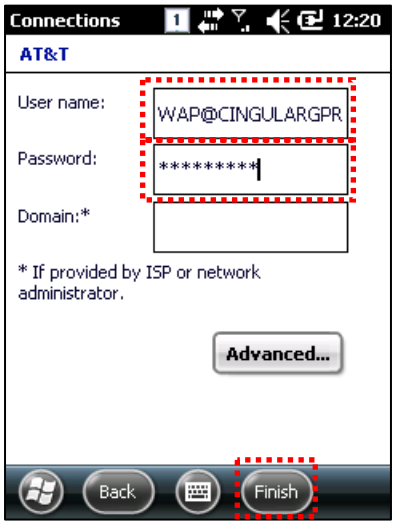

Click the “Add a new modem connection” link.



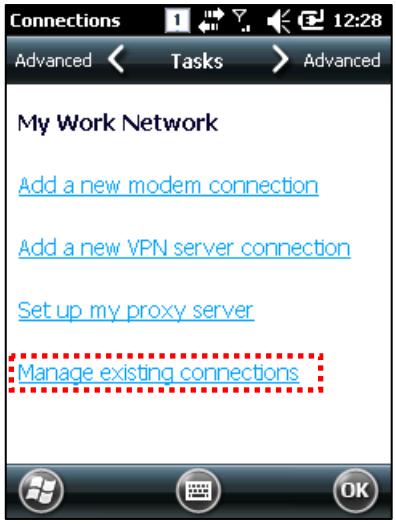

Enter a name for this network connection, and choose the “Cellular Line (WWAN)” modem option. We use AT&T in this example.




You may need to enter in an Access Point Name (APN). This will be specified by your wireless carrier.



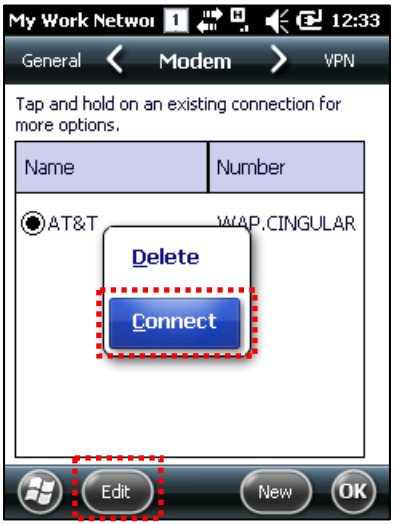

Most providers will require you to enter in one of their not-so-secret username / password combinations.
This username is WAP@CINGULARGPRS.COM, and the password is CINGULAR1.
Click the Finish button when you're done.



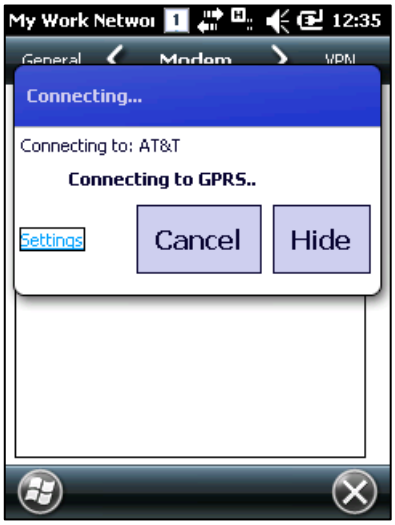

In the Connections control panel's Tasks page, click the "Manage existing connections" link to see all of your network connections that have been created.

## Making the 3G Network Connection

Once the 3G connection has been defined once, all you need to do is make sure the 3G phone is turned on, and the handheld will initiate the cellular connection on demand. You can force it to connect manually at the Connections control panel.




The Modem page lists your existing connections. Tap-hold on a connection to delete it, or initiate the connection manually with the Connect option. You can also use the Edit menu button to change a connection's settings.




While the 3G modem is connecting to the cellular network, you'll see a status dialog window that looks like this.

# Appendix

## Configuration

| Physical and Environmental Characteristics | |
|---|---|
| **Dimensions** | 6-1/4" x 3-1/4" x 4-5/8" (5-1/8" with pistol grip)<br>15.8 cm x 8.0 cm x 11.5 cm (13.5 cm with pistol grip) |
| **Weight** | 320g |
| **Operation Temperature** | -10ºC to 50ºC |
| **Storage Temperature** | -30ºC to 60ºC |
| **Humidity** | Non-condensing |
| **Drop** | 1.5m drop to concrete |
| **Performance Characteristics** | |
| **Processor** | Marvell™ PXA320 806MHz |
| **Operating System** | Windows Mobile 6.5 |
| **Memory** | ROM 256MB; RAM 256MB |
| **Display** | 3.5" QVGA with Backlight; TFT LCD; 240x320 Pixels; Stylus Touch-Screen Interface |
| **Audio** | Phone Receiver; Earphone Jack |
| **Communication Port** | RS-232 serial port; USB 1.1 |
| **Expansion Slot** | 1 MicroSD Slot (SDHC); 1 SIM Slot; |
| **Keypad** | 29-key |
| **Notifications** | Vibrator, Speaker, LEDs |
| **Power Supply** | |
| **Main Battery** | Lithium ion 3.7V 3,000mAh; Optional 4,400mAh in pistol grip |
| **Backup Battery** | Lithium Polymer 3.7V, 100mAh |
| **Adaptor** | Input 100VAC ~ 240VAC; Output 5VDC 3A |
| **Network Characteristics** | |
| **Wireless LAN** | WLAN (802.11 b/g) |
| **Bluetooth** | Class 2, v2.0 (SPP Only) |
| **GPS** | A-GPS with Internal Antenna |
| **Antenna** | Internal LAN & WLAN |
| **HSDPA** | Wireless HSDPA for Enhanced 3G Connectivity |
| **Data Capture Devices** | |
| **Barcode Engine** | 1D Laser Scanner (2D on ALH-9011) |
| **Camera** | 3.0 Mega-pixels with Autofocus (ALH-9011) |
| **UHF 900MHz RFID Reader** | |
| **Frequency** | 850MHz - 930MHz |
| **Reading Range** | 0m - 7m |
| **Writing Range** | 0m - 3m |
| **Antenna Gain** | 2 dBi |
| **Speed** | 62.5 kbps |
| **RF Output** | 1W EIRP |
| **Protocol** | EPC Gen2 ISO 18000 6C<br>ISO 18000 6B |
| **Multi-Reading** | Anti collision |