

# WORKABOUT PRO4 RFID MOBILE COMPUTER

## INTEGRATOR GUIDE



UHF Linear  
WA9901/WA9902



UHF Circular  
WA9903/WA9904



# **WORKABOUT PRO4 RFID MOBILE COMPUTER INTEGRATOR GUIDE**

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## Warranty

For the complete Zebra hardware product warranty statement, go to:  
<http://www.zebra.com/warranty>.

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## Revision History

Changes to the original manual are listed below:

| Change    | Date    | Description    |
|-----------|---------|----------------|
| -02 Rev A | 04/2015 | Zebra rebrand. |
|           |         |                |

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# About This Guide

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## Introduction

This *Workabout Pro4 RFID Integrator Guide* provides the unique set up and operating procedures for the Workabout Pro4 RFID mobile computers.

✓ **NOTE** Screens and windows pictured in this guide are samples and may differ from actual screens.

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## Configurations

All Workabout Pro4 models support the following features:

- Windows Embedded Hand-held 6.5 and CE 6.0
- 512 MB RAM / 4GB Flash
- Alphanumeric keypad (long models) / QWERTY or numeric (short models)
- Color display
- WLAN 802.11 a/b/g/n radio
- Bluetooth
- Optional WWAN Radio
- Optional GPS
- Optional Scanner / Imager / Camera

This guide covers the following options:

| Model Number | Country Support | Power* | Antenna Type |
|--------------|-----------------|--------|--------------|
| WA9901       | Worldwide       | 1 W    | Linear       |
| WA9902       | Europe          | 0.5 W  | Linear       |

| Model Number | Country Support | Power* | Antenna Type |
|--------------|-----------------|--------|--------------|
| WA9903       | Worldwide       | 1 W    | Circular     |
| WA9904       | Europe          | 0.5 W  | Circular     |

\*Note: In presence of others radios running and depending on temperature, it may not be possible to reach maximum output power.

## Chapter Descriptions

Topics covered in this guide are as follows:

- [Chapter 1, Getting Started](#) provides an overview of RFID technology and components and a description of the Workabout Pro4 RFID mobile computer and features.
- [Chapter 2, Updating the RFID Firmware](#) describes how to update the device image and radio firmware.
- [Chapter 3, MobileRFID Functionality](#) includes information on configuring the RFID radio and reading tags.
- [Chapter 4, RFID Sample Application](#) provides information on the RFID sample application and how to use it to assist in custom application development.
- [Chapter 5, Tag Locator](#) provides information on the application used to detect the location of a tag.
- [Chapter 6, Troubleshooting](#) describes Workabout Pro4 RFID mobile computer troubleshooting procedures.
- [Appendix A, Technical Specifications](#) includes the technical specifications for the reader.
- [Appendix B, RFID APIs](#) provides a reference for information on supported RFID APIs.

## Notational Conventions

The following conventions are used in this document:

- “Mobile computer” or “reader” refers to the Workabout Pro4 RFID mobile computer.
- *Italics* are used to highlight the following:
  - Chapters and sections in this and related documents
  - Dialog box, window, links, software names, and screen names
  - Drop-down list, columns and list box names
  - Check box and radio button names
  - Icons on a screen
- **Bold** text is used to highlight the following:
  - Dialog box, window and screen names
  - Drop-down list and list box names
  - Check box and radio button names
  - Icons on a screen
  - Key names on a keypad
  - Button names on a screen

- Bullets (•) indicate:
  - Action items
  - Lists of alternatives
  - Lists of required steps that are not necessarily sequential.
- Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.

---

## Related Documents and Software

The following documents provide more information about the reader.

- *Workabout Pro4 Hand-Held Computer Quick Start Guide*, p/n 8000297
- *Workabout Pro4 Hand-Held Computer Regulatory Guide*, p/n 8000296
- *Microsoft Applications for Windows Mobile 6 User Guide*, p/n 72E-108299-xx
- *Application Guide for Mobility Devices*, p/n 72E-68902-xx
- *Wireless Fusion Enterprise Mobility Suite User Guide for Version 3.00*, p/n 72E-122495-xx
- *Mobility Services Platform 3.2 User Guide*, p/n 72E-100158-xx

For the latest version of guides, go to: <http://www.zebra.com/support>.

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## Service Information

If you have a problem with your equipment, contact Zebra support for your region. Contact information is available at: <http://www.zebra.com/support>.

When contacting support, please have the following information available:

- Serial number of the unit
- Model number or product name
- Software type and version number

Zebra responds to calls by e-mail, telephone or fax within the time limits set forth in service agreements.

If your problem cannot be solved by Zebra support, you may need to return your equipment for servicing and will be given specific directions. Zebra is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty.

If you purchased your business product from a Zebra business partner, please contact that business partner for support.



# Chapter 1 Getting Started

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## Introduction

This chapter provides an overview of RFID technology and components, and describes the Workabout Pro4 RFID mobile computer and its features.

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## RFID Technology Overview

RFID (Radio Frequency Identification) is an advanced automatic identification (Auto ID) technology that uses radio frequency signals to identify *tagged* items. An RFID tag contains a circuit that can store data. This data may be pre-encoded or can be encoded in the field. The tags come in a variety of shapes and sizes.

To read a tag the mobile computer sends out radio frequency waves using its integrated antenna. This RF field powers and charges the tags, which are tuned to receive radio waves. The tags use this power to modulate the carrier signal. The reader interprets the modulated signal and converts the data to a format for computer storage. The computer application translates the data into an understandable format.



**Figure 1-1** RFID System Elements

### RFID Components

Zebra RFID solutions offer low cost, long read range, and a high read rate. These features provide real time end-to-end visibility of products and assets in the factory, distribution center, retail outlet, or other facility. The Workabout Pro4 RFID system consists of the following components:

- Silicon-based RFID tags that attach to retail products, vehicles, trailers, containers, pallets, boxes, etc.
- An integrated antenna that supports applications such as item level tracking and asset tracking.
- An embedded radio module that powers and communicates with tags for data capture and provides host connectivity for data migration.

#### Tags

Tags contain embedded chips that store unique information. Available in various shapes and sizes, tags, often called **transponders**, receive and respond to data requests. Tags require power to send data.

There are several categories of tags based on the protocol they support, read/write memory, and power options:

- Active RFID tags are powered by internal light-weight batteries, and also use these batteries to broadcast radio waves to the reader.
- Semi-passive RFID tags are also powered by internal light-weight batteries, but draw broadcasting power from the reader.
- Passive RFID tags are powered by a reader-generated RF field. These tags are much lighter and less expensive than active tags, and are typically applied to less expensive goods.

#### Antenna

Antennas transmit and receive radio frequency signals.

#### Radio Module

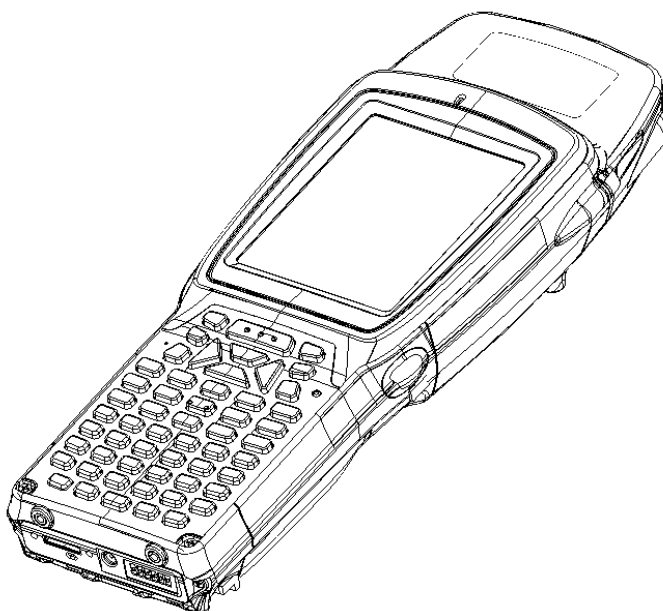
The radio module communicates with the tags and transfers the data to a host computer. It also provides features such as filtering, CRC check, and tag writing. The Workabout Pro4 RFID mobile computer supports standard RFID tags as described by EPCGlobal<sup>TM</sup> Class 1 Gen2 protocol.

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## Workabout Pro4 RFID Mobile Computer

The Zebra Workabout Pro4 RFID mobile computer includes an intelligent C1G2 UHF RFID reader with RFID read performance that provides real-time, seamless EPC-compliant tags processing. Workabout Pro4 RFID mobile computers are designed for indoor inventory management and asset tracking applications, and can host third-party, customer-driven embedded applications. Features include:

- ISO 18000-6C standard (EPC Class 1 Gen 2)
- Read, write, kill, lock, block write/block erase, and permalock functionality
- Alphanumeric keypad (long models) / QWERTY or numeric (short models)
- Color display
- Orientation-insensitive integrated external antenna
- Windows® Embedded Hand-held 6.5 and CE 6.0
- WLAN 802.11 a/b/g/n wireless connectivity
- Application-specific setup for ease of installation
- Low Level Reader Protocol (LLRP)
- Sample application and support for custom or third-party applications
- RFID API support
- Event and tag management support



**Figure 1-2** *Workabout Pro4 RFID Mobile Computer*

The Workabout Pro4 RFID mobile computer provides a wide range of features that enable implementation of complete, high-performance, intelligent RFID solutions.

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## Reading Tags

To read RFID tags:

1. Remove the Workabout Pro4 from AC power and ensure the LLRP icon is green.
2. Use an RFID reader application to enable tag reading. For a sample application, browse to the Workabout Pro4 Application directory and select **RFID3Sample6.exe**. See [Chapter 4, RFID Sample Application](#).
3. Aim the mobile computer at the tag, oriented horizontally or vertically depending on the tag orientation. The distance between the tag and the antenna is the approximate read range.
4. Press the trigger within the application to interrogate all RFID tags within the radio frequency (RF) field of view and capture data from each new tag found. Release the trigger to stop interrogating tags.

# Chapter 2 Updating the RFID Firmware

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## Introduction

This chapter lists contact information to assist you with RFID Firmware updates.

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## Updating the RFID Firmware

The RFID\_FLASH utility, used to update the RFID firmware, is no longer provided. For related issues, contact Zebra support: [https://portal.zebra.com/Support/US-EN?WT.mc\\_id=support](https://portal.zebra.com/Support/US-EN?WT.mc_id=support)



# Chapter 3 MobileRFID Functionality

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## Introduction

MobileRFID is an RFID server application that runs in the background on the mobile computer. The MobileRFID icon appears in the system tray. This chapter includes information on using and configuring MobileRFID.



**Figure 3-1** *MobileRFID Icon*

## MobileRFID Icons

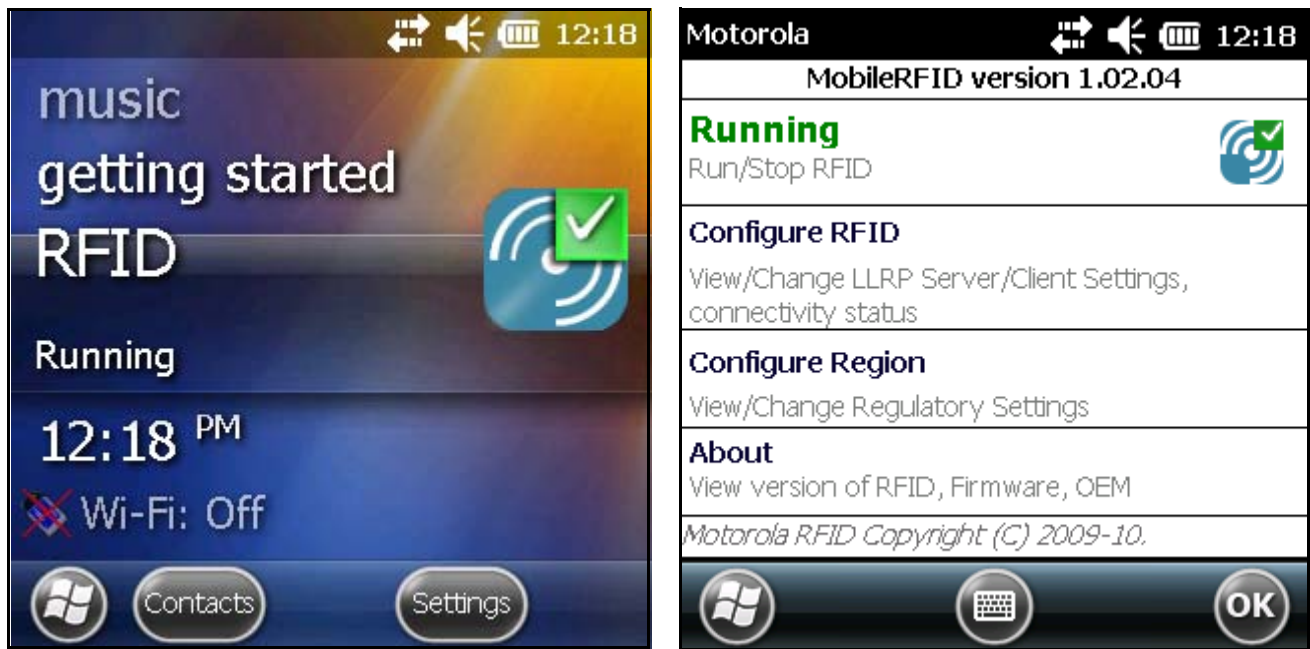
The MobileRFID icon indicates RFID radio status as described in [Table 3-1](#).

**Table 3-1**    *MobileRFID Icon Indicators*

| Icon                                                                              | Indication                                                                   |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------|
|  | RFID running, radio on.                                                      |
|  | RFID running, (radio off/not enough power).                                  |
|  | RFID stopped (radio not found/battery critical/stopped from user interface). |

## MobileRFID Menu

If using RFID as the Windows default home screen, tap the RFID panel, then tap the **Settings** button.



**Figure 3-2** MobileRFID Home Window and Settings Window

If not using RFID as the Windows default home screen, tap the MobileRFID icon in the system tray. A menu appears.



**Figure 3-3** MobileRFID Icon Menu

## Configure Region

### Upon Startup

After upgrading the mobile computer, the following window appears on startup.

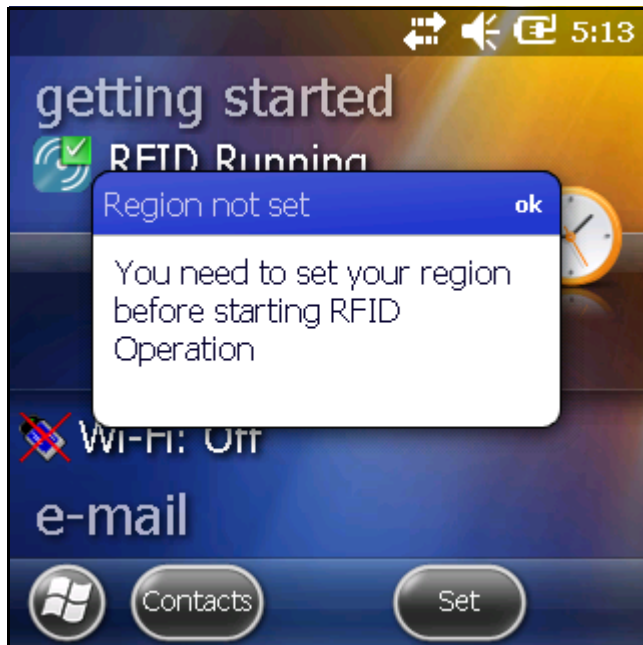


Figure 3-4 Country Not Set Window

1. Tap **OK**. When no country is selected, the **Region Configuration** window appears.



Figure 3-5 Region Configuration Window

2. Select the region of operation and communication standard as allowed by the regulatory standards of that country/region from the drop-down menus. The following warning message appears.



**Figure 3-6** Region Selection Warning Message

3. Tap **Yes** to confirm. A window appears indicating success.



**Figure 3-7** Region Selection Success Window

### After Startup

If not done at startup, set the regulatory region as follows:

1. Invoke the MobileRFID menu, then tap **Configure Region**.
2. In the **Region Configuration** window, select a region from the **Region of Operation** drop-down menu.



Figure 3-8 Region Configuration Window

3. Tap **Yes** on the warning window that appears. A confirmation window appears upon successful completion.

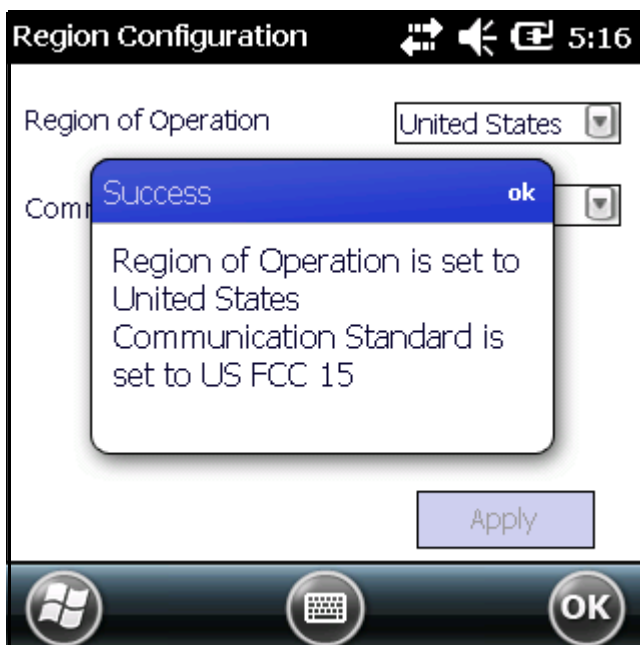


Figure 3-9 Region Selection Success Window

4. Tap **OK**.

## Configure RFID

RFID is in Server Mode by default. To configure RFID to operate in Client Mode:

1. Invoke the MobileRFID menu, then tap **Configure RFID**.

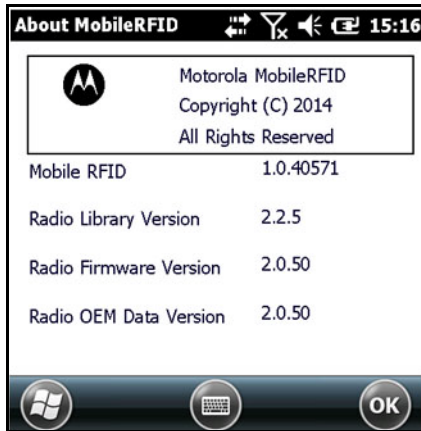


**Figure 3-10** RFID Configuration Window

2. Select the **Client Mode** check box.
3. In the **LLRP Port** field, enter the port number on which the server waits for the RFID client to communicate. The default is 5084.
4. In the **Server IP** field, enter the server IP for the remote host to which RFID communicates as a client.
5. Tap **Apply**.
6. Tap **OK** to close the window.

## Version Information

To view software version information for the RFID application, invoke the MobileRFID menu, then tap **About**.



**Figure 3-11** *About MobileRFID Window*

This window displays the MobileRFID application version, radio library version, radio firmware version, and radio OEM data version.

✓ **NOTE** The version information in [Figure 3-11](#) may differ from the information on the actual mobile computer screen.

## Run/Stop RFID

To stop RFID service tap **Stop** in MobileRFID menu. This frees the RFID radio.



**Figure 3-12** *RFID Stopped*

To restart RFID, tap **Run** in MobileRFID menu.

## Battery Configuration

The option to configure battery life/performance is available from version 1.0.40535 of the Workabout Pro4 software.

The configure performance option is used to manage battery life of the Workabout Pro4. There are five different preconfigured settings to balance between read-performance and battery life. Battery life will be maximum when the slider bar is kept to the left-most. The device will perform at maximum performance efficiency when the slider bar is kept to the right-most. By default, the slider bar is set at the center.

All settings made using this option can be overwritten using RFID3 API configuration settings.

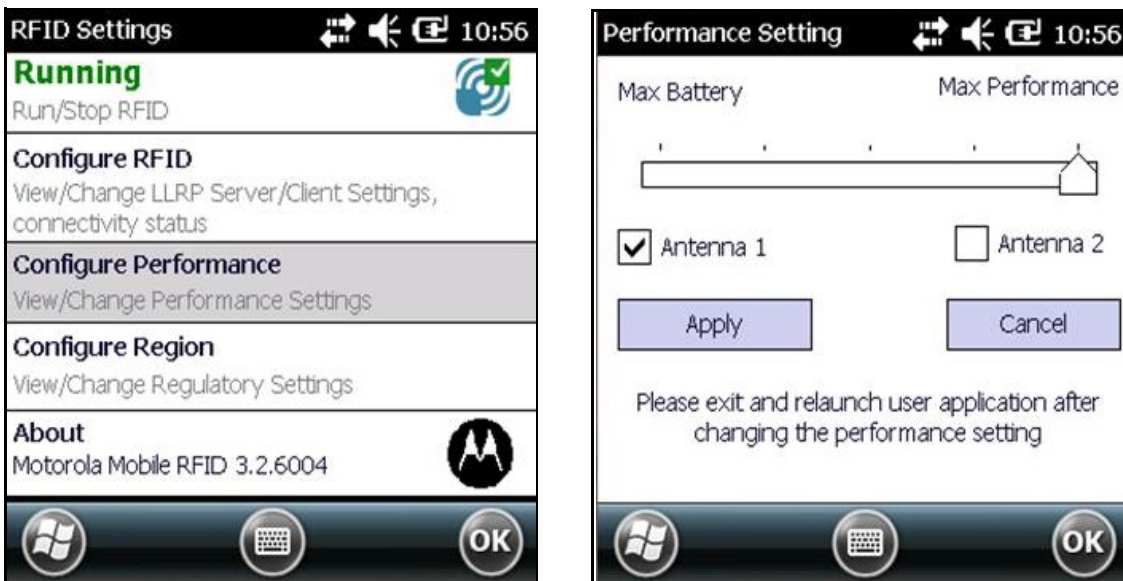


Figure 3-13 Battery Performance Configuration

## Smart Power Management Implementation

A smart power management algorithm (SPM) was also developed on top of the battery configuration. The main purpose of this algorithm is to optimize the trade-off between battery life and performances to offer the best RFID performances handled by WAP4 platform in real time.

This SPM algorithm will define the maximum RFID output power usable by WAP4 depending on following parameters:

- Battery depletion level
- Battery temperature
- WWAN

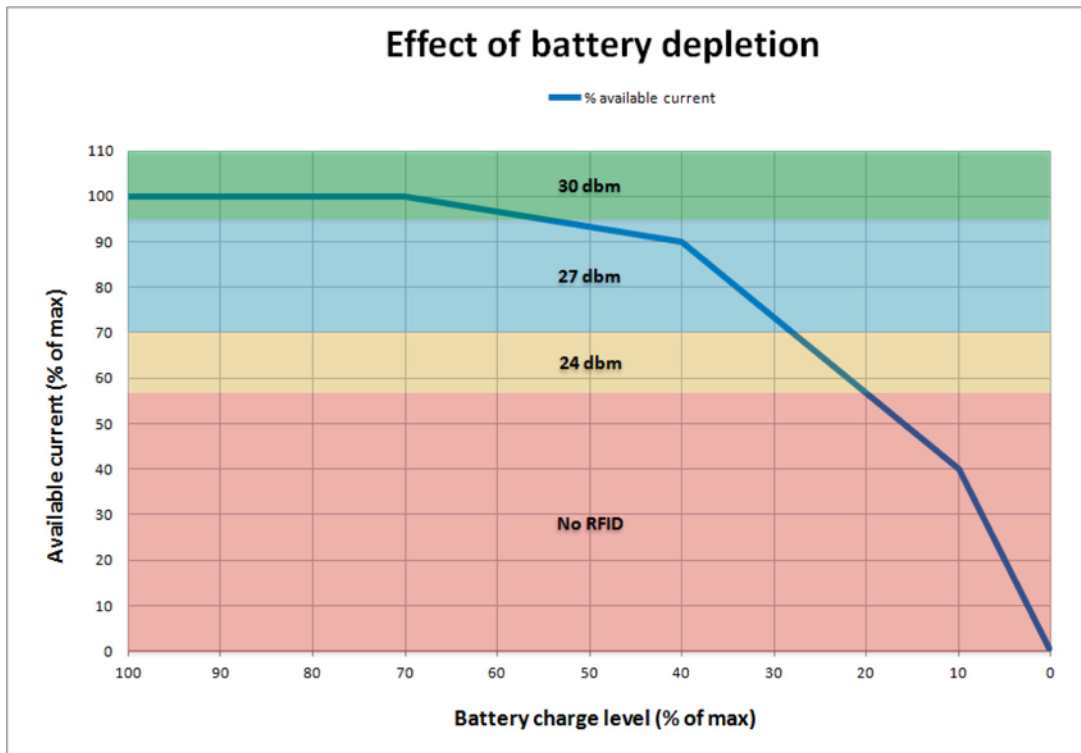


### **IMPORTANT**

Scanner power impact is not detailed in this section as it is not recommended to trig both the scanner and RFID simultaneously. This operation is prevented at the OS level and users should not bypass this restriction.

### Battery Depletion Impact

The following graph illustrates the impact of battery depletion. It defines the maximum RFID output power that the Workabout Pro4 platform can handle in normal temperature operating mode (+0°C to +40°C). Due to Li-Ion chemistry, as the battery charge level goes down, the percentage of available current decreases.



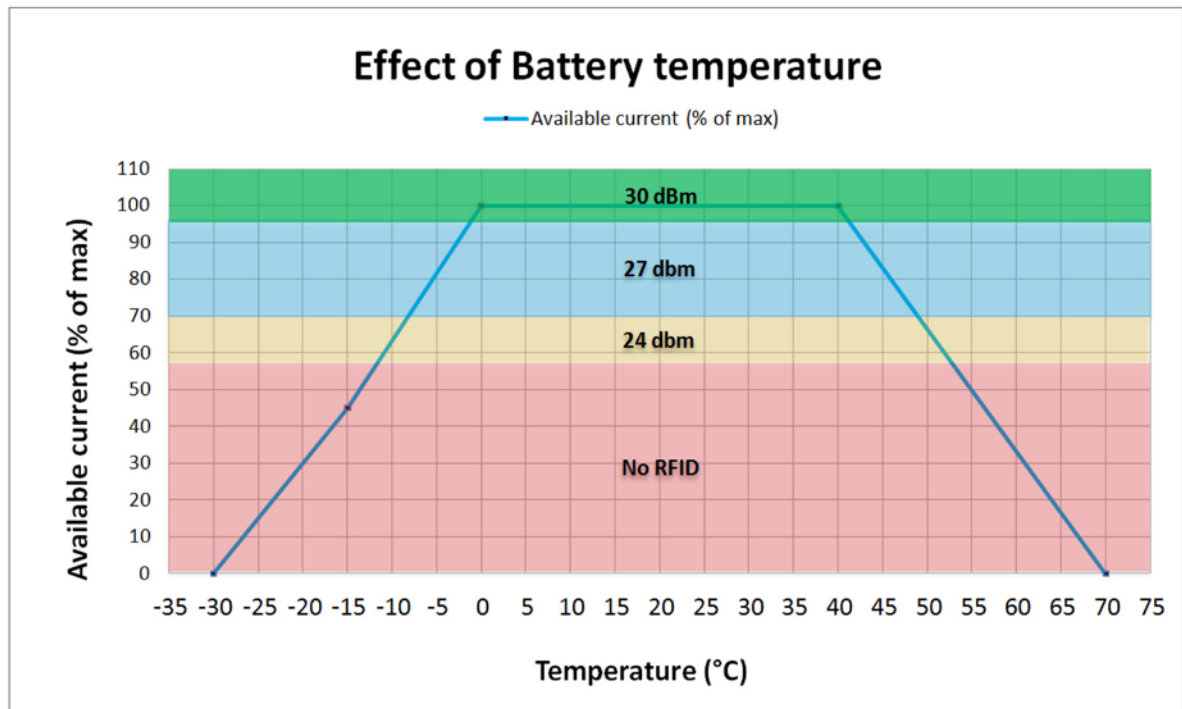
**Figure 3-14** Battery Depletion Graph



**NOTE** As indicated in the graph above, RFID cannot operate below 20% battery capacity. Users must charge the battery or replace it to continue RFID operation.

### Battery Temperature Impact

The following graph illustrates the impact of battery temperature on available current and maximum usable RFID output power. A Li-Ion battery operating either below or above the temperature range – below 0°C or above 40°C – cannot supply the same current as it can within the allowable temperature range. When outside the temperature range, RFID cannot operate at 30 dBm; RFID output power is scaled down in case of extreme temperatures according to the graph below:



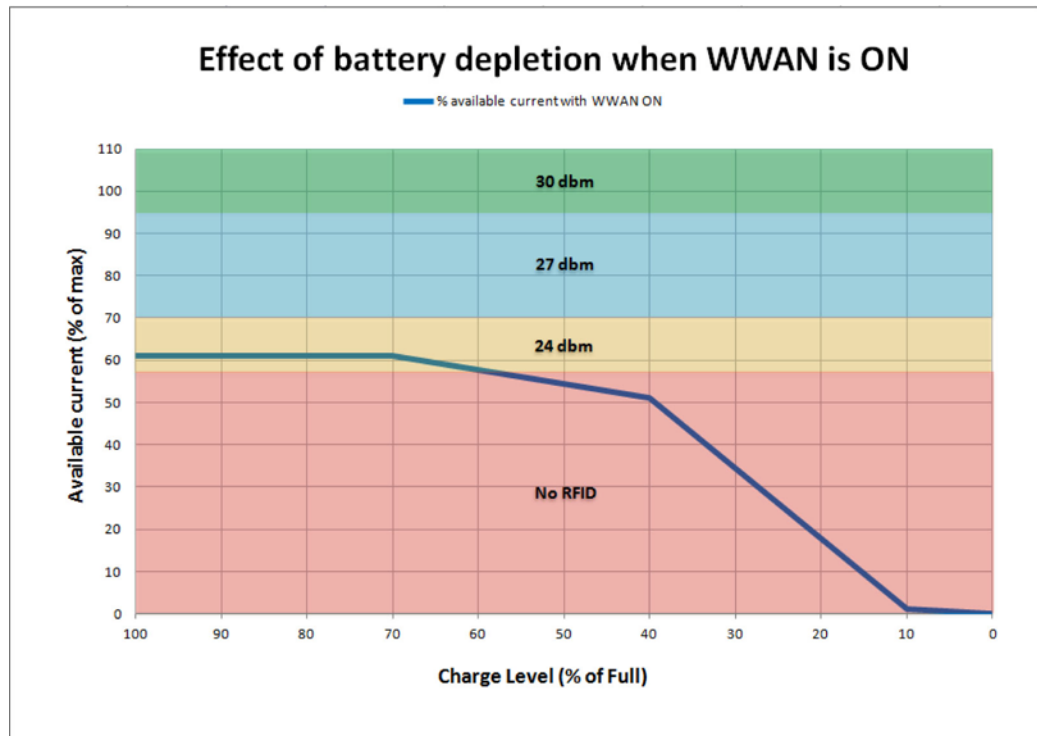
**Figure 3-15** Battery Temperature Graph



**NOTE** As indicated in the graph above, RFID is not usable below -17°C and above 57°C (Workabout Pro4 maximum operating temperature is +50°C which overrides RFID maximum operating temperature).

### WWAN Impact

Turning **ON** WWAN reduces the remaining current available for the RFID option; in fact, RFID maximum output power is impacted. With WWAN **ON**, RFID is not usable below 50% battery, but it is still usable at 24 dBm maximum the remainder of the time.



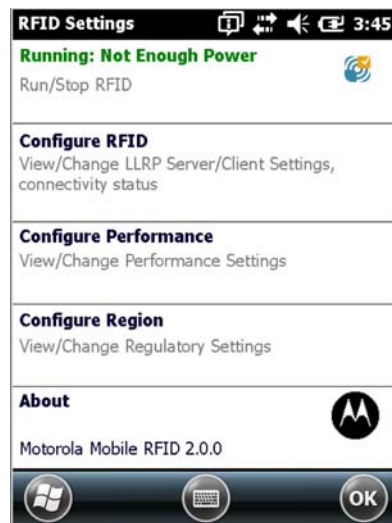
**Figure 3-16** Battery Depletion Graph when WWAN is ON



#### **IMPORTANT**

All the parameters listed above are cumulative. If WWAN is ON at low temperatures, RFID is not likely to operate.

If the RFID is prevented from operating due to insufficient power, a message like the one below is displayed in the RFID Settings screen.



**Figure 3-17** *Not Enough Power*



# Chapter 4 RFID Sample Application

---

## Introduction

The RFID Application CS\_RFID3Sample6.exe provides an overview of how the application works and assists application developers in developing custom applications.

The mobile computer can read, write, lock, kill, and program Gen2 tags. Each tag contains the EPC number (64 or 96 bits), CRC, and kill code. The mobile computer can also collect data by decoding in-range EPC Gen2 RFID tags.

Initiating the trigger button within the sample application causes the mobile computer to interrogate all RFID tags within the radio frequency (RF) field of view. The reader captures data from each new tag and adds it to the list box in the **EPC ID** window. Release the trigger to stop interrogating tags.

## Launching the RFID Sample Application

Select **RFID Demo** in the **Start** menu to start the RFID sample application.



Figure 4-1 RFID Demo Icon

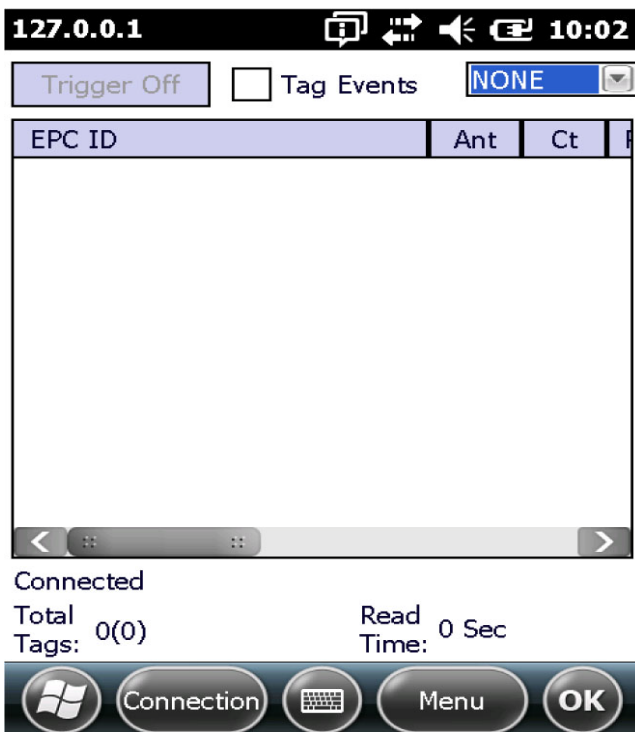


Figure 4-2 RFID Sample Application Window

In the sample application window:

- Press the trigger within the application to initiate the tag read. Release the trigger to terminate tag reading.
- Use the **Mem Bank** drop-down to select a tag memory bank to read. The default memory bank is EPC (**None**). Other options are **TID**, **Reserved**, and **User**.

---

## Connection

Tap **Connection** to display the reader IP and port number.



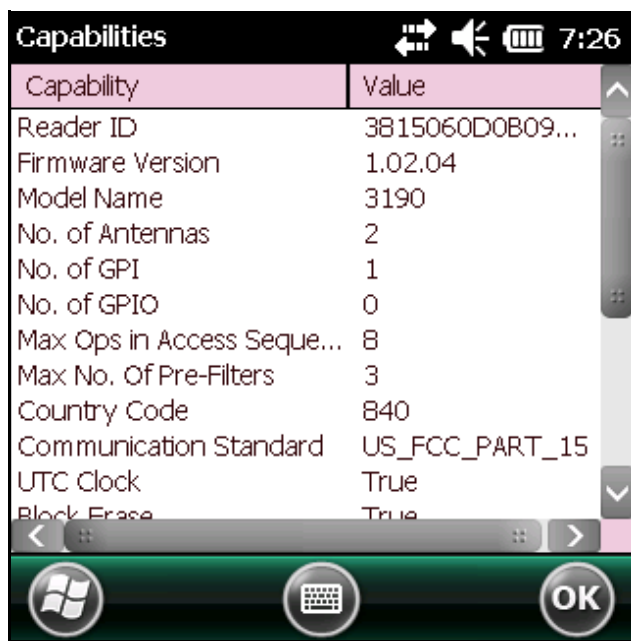
**Figure 4-3** Connection Window

Select **Disconnect** to disconnect the reader.

---

## Capabilities

Select **Menu > Capabilities** to view the capabilities of the connected reader.



| Capability                 | Value           |
|----------------------------|-----------------|
| Reader ID                  | 3815060D0B09... |
| Firmware Version           | 1.02.04         |
| Model Name                 | 3190            |
| No. of Antennas            | 2               |
| No. of GPI                 | 1               |
| No. of GPIO                | 0               |
| Max Ops in Access Seque... | 8               |
| Max No. Of Pre-Filters     | 3               |
| Country Code               | 840             |
| Communication Standard     | US_FCC_PART_15  |
| UTC Clock                  | True            |
| Block Erase                | True            |

**Figure 4-4** Capabilities Window

---

## Configuration Menu Options

The Configuration menu includes the following options:

- Tag Storage Settings
- Antenna
- RF Mode
- Singulation
- Power On/Off Radio
- Reset to Factory Defaults

## Tag Storage Settings

Select **Menu > Config > Tag Storage Settings** to view/configure tag storage settings.



Tag Storage Settings

Maximum Tag Count 64

Max Tag ID Length (Bytes) 12

Max Size of Memory Bank (Bytes) 64

Apply

OK

**Figure 4-5** *Tag Storage Settings Window*

This window includes the following fields:

- **Maximum Tag Count** - The maximum number of tags to store in the DLL.
- **Max Tag ID Length** - The maximum tag length.
- **Max Size of Memory Bank** - Storage to allocate for the memory bank's data.
- **Apply** - Select to apply the configuration changes.

## Antenna

Select **Menu > Config > Antenna** to view/configure the antenna.

The image shows a screenshot of the 'Antenna Config' window on a mobile device. The window has a black header with the title 'Antenna Config' and icons for back, forward, and a list. The time '7:27' is displayed in the top right. Below the header, there are four configuration fields, each with a dropdown arrow on the right: 'Antenna ID' with the value '1', 'Receive Sensitivity (dB)' with the value '0', 'Transmit Power (dBm)' with the value '2700', and 'Hop Table Index' with the value '1'. Below these fields is a list of frequencies: '915750, 915250, 903250, 926750, 926250, 904250, 927250, 920250'. The list has up and down arrow buttons on its right side. At the bottom right of the configuration area is an 'Apply' button. The bottom of the screen features a green bar with three circular icons: a Windows logo, a keyboard icon, and an 'OK' button.

**Figure 4-6** Antenna Configuration Window

This window includes the following fields:

- **Antenna ID** - Selecting an antenna ID updates the configuration values in the other fields.
- **Receive Sensitivity (dB)** - Lists the reader-supported values for the selected antenna.
- **Transmit Power (dBm)** - Lists the reader-supported values for the selected antenna.
- **Hop Table Index** - Updates the Hop Frequency list with its corresponding frequencies.
- **Apply** - Select to apply the configuration changes.

## RF Mode

Select **Menu > Config > RF Mode** to view/configure the RF mode for each antenna.

| Parameter       | Value   |
|-----------------|---------|
| Mode Identifier | 18      |
| DR              | DR_64_3 |
| Bdr             | 62500   |
| M               | MV_4    |

**Figure 4-7** RF Mode Window

This window includes the following fields:

- **Antenna ID** - Selecting an antenna ID updates the configuration values in the other fields.
- **Tari Value** - TARI specified in nsec.
- **RF Mode Table** - RF mode table configured for the current antenna.
- **Apply** - Select to apply the configuration changes.

## Singulation

Select **Menu > Config > Singulation** to view/configure the singulation control settings for each antenna.

**Figure 4-8** *Singulation Control Settings Window*

This window includes the following fields:

- **Antenna ID** - Selecting an antenna ID updates the configuration values in the other fields.
- **Session** - The session number for the inventory operation.
- **Tag Population** - The approximate tag population in the RF field of the antenna.
- **Tag Transit Time** - The time in milliseconds that the tag typically remains in the RF field of the antenna.
- **State Aware** - Indicates if the antenna performs state aware or state unaware singulation.
- **Inventory State** - Select a tag of state A or B. Valid only for State Aware singulation
- **SL Flag** - Valid only for State Aware singulation
- **Apply** - Select to apply the configuration changes.

## Power On/Off Radio

Select **Menu > Config > Power On/Off Radio** to change the power settings of the RFID radio.



**Figure 4-9** Radio Power Settings Menu

## Reset to Factory Default

Select **Menu > Config > Reset to Factory Default** to restore the default reader configuration.

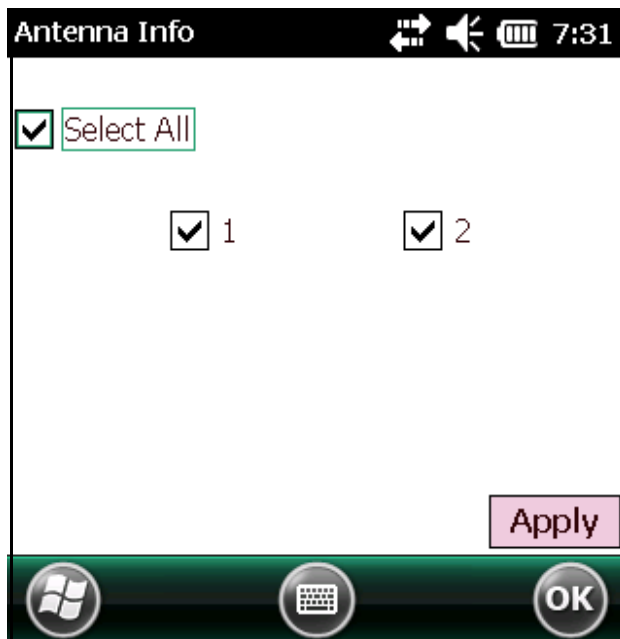
### Operations Menu Options

The **Operations** menu includes the following options:

- Antenna Info
- Filter
- Access
- Triggers

### Antenna Info

Select **Menu > Operations > Antenna Info** to view/configure the list of antennas that can be used for inventory/access operations.



**Figure 4-10** *Antenna Info Window*

## Filter

Select **Menu > Operations > Filter** to view/configure the following filters:

- Pre-Filter
- Post-Filter
- Access-Filter

### Pre-Filter

Select **Menu > Operations > Filter > Pre-Filter** to view/configure pre-filters.

The screenshot shows the 'PreFilter' window with the following fields and controls:

- Antenna ID:** A dropdown menu showing '1' and a checked box for 'Use Filter 1'.
- Memory Bank:** A dropdown menu showing 'EPC' and an 'Offset' field showing '32'.
- Tag Pattern:** A text field containing 'aabbccdd'.
- Filter Action:** A dropdown menu showing 'STATE AWARE'.
- Action:** A dropdown menu showing 'INV A NOT INV B' and a 'Target' dropdown menu showing 'S0'.
- Filter Tabs:** Two tabs labeled 'Filter 1' and 'Filter 2' are visible, with 'Filter 1' being the active tab.
- Apply Button:** A button labeled 'Apply' is located at the bottom right of the configuration area.
- Bottom Bar:** A green bar at the bottom contains three circular icons: a Windows logo, a keyboard icon, and an 'OK' button.

**Figure 4-11** PreFilter Window

This window includes the following fields:

- **Antenna ID** - Selecting an antenna ID updates the configuration values in the other fields.
- **Memory Bank** - Memory bank on which the filter is applied.
- **Offset** - The first (msb) bit location of the specified memory bank against which to compare the tag mask.
- **Tag Pattern** - The pattern against which to compare the specified memory bank.
- **Filter Action** - Select the required filter action. For more information, refer to the Gen2 specification available at <http://www.epcglobalinc.org/standards/>.

## Post-Filter

Select **Menu > Operations > Filter > Post-Filter** to view/configure post-filters.

**Figure 4-12** *PostFilter Window*

This window includes the following fields:

- **Memory Bank** - Memory bank on which the filter is applied.
- **Offset** - The first (msb) bit location of the specified memory bank against which to compare the tag mask.
- **Tag Pattern** - The pattern against which to compare the specified memory bank.
- **Tag Mask** - The bit mask to facilitate bit wise filtering.
- **Match Pattern** - Select the tag pattern to match (A, B, both, or neither).

## Access-Filter

Select **Menu > Operations > Filter > Access-Filter** to view/configure the access-filters.

The screenshot shows the 'AccessFilter' window with the following fields and controls:

- Memory Bank:** A dropdown menu currently showing 'EPC'.
- Offset:** A text input field containing the value '32'.
- Tag Pattern:** A text input field containing the value '11223344'.
- Tag Mask:** A text input field containing the value 'ffffff'.
- Tag Pattern A:** A tab labeled 'Tag Pattern A'.
- Tag Pattern B:** A tab labeled 'Tag Pattern B'.
- Match Pattern:** A dropdown menu currently showing 'A'.
- Use Filter:** A checked checkbox.
- Apply:** A button to apply the settings.

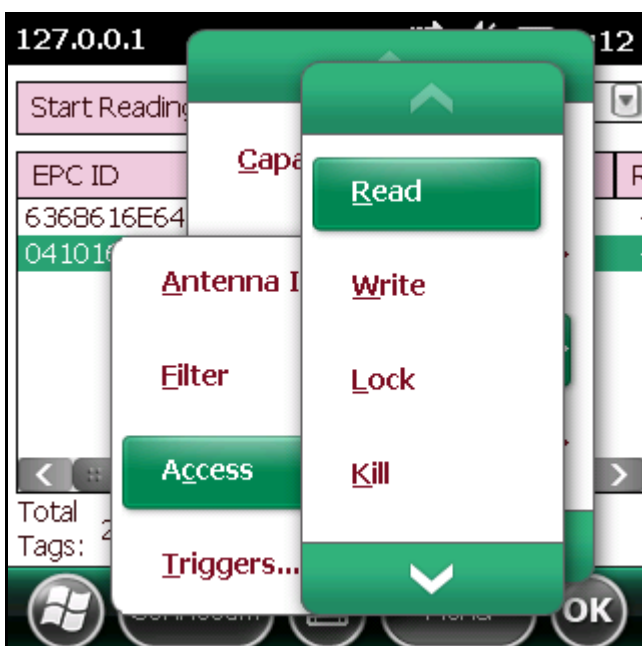
The bottom of the window features a navigation bar with icons for a Windows logo, a keyboard, and an 'OK' button.

**Figure 4-13** AccessFilter Window

See [Post-Filter on page 4-12](#) for field descriptions.

## Access

Select **Menu > Operations > Access** to perform the following access operations.

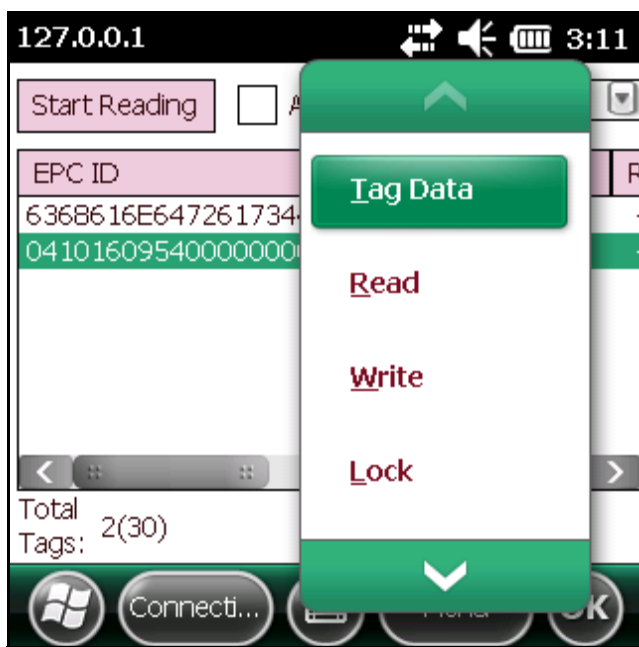


**Figure 4-14** Access Menu

The **Access** menu includes the following options:

- Read
- Write
- Lock
- Kill
- Block Write
- Block Erase

To perform an access option on a single tag, right-click the tag in the list of read tags on the main window to invoke the tag's context menu.



**Figure 4-15** Tag Context Menu

### Access Operation Windows

The access operation windows include the following fields. Set options as required in the various parameter windows. Not all windows include all options.

- **Tag ID** - The name of the selected tag.
- **Password** - Set a password before performing any access operation (except Kill).
- **Memory Bank** - Select the memory bank (Reserved, EPC, TID, User)
- **Offset** - Offset of the first word to read from the selected memory bank.
- **Length** - Tag/data length.
- **Write Data** - The data to write to the selected tag (Write window only).

- **Lock Privilege** - Access options for the selected tag (Write window only):
  - **None** - The can not change the lock privilege of the particular memory bank.
  - **Read\_Write** - The user can read and write to the tag.
  - **Perma\_Lock** - Permanent lock.
  - **Perma\_Unlock** - Permanent unlock.
  - **Unlock** - The user can unlock the tag for writing.

**Read**

Tag ID (Hex) AD8522004852838514000061

Password (Hex) 0

Memory Bank EPC

Offset (Bytes) 0 Length (Bytes) 0

Data Read (Hex) EF6E3000AD8522004852838514000061

Access Filter Read

Windows Keyboard OK

**Figure 4-16** Read Access Operation Window

**Write Tags**

Tag ID (Hex) AD8522004852838514000061

Password (Hex) 0

Memory Bank USER

Offset (Bytes) 0 Length (Bytes) 4

Data (Hex) Aabbccdd

Access Filter Write

Windows Keyboard OK

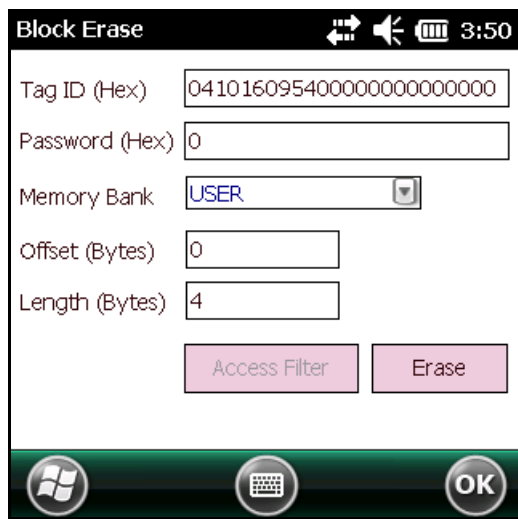
**Figure 4-17** Write / Block-Write Access Operation Window



Figure 4-18 Lock Access Operation Window



Figure 4-19 Kill Access Operation Window



The screenshot shows a mobile application window titled "Block Erase". At the top, there are icons for signal strength, volume, and battery, along with the time 3:50. The main area contains several input fields: "Tag ID (Hex)" with the value "041016095400000000000000", "Password (Hex)" with "0", "Memory Bank" with a dropdown menu showing "USER", "Offset (Bytes)" with "0", and "Length (Bytes)" with "4". Below these fields are two buttons: "Access Filter" and "Erase". At the bottom of the screen is a navigation bar with three circular icons: a Windows logo, a keyboard icon, and an "OK" button.

**Figure 4-20** Block Erase Access Operation Window

## Triggers

Select **Menu > Operations > Trigger** to view/configure the following triggers:

- Start Trigger
- Stop Trigger
- Report Trigger

### Start Trigger



The screenshot shows a mobile application window titled "Trigger". At the top, there are icons for signal strength, volume, and battery, along with the time 7:43. The main area contains several input fields: "Trigger Type" with a dropdown menu showing "Periodic", "Start Date" with a date and time picker showing "Mar /31/11 07:20:24 PM", and "Period (ms)" with "1". Below these fields are three buttons: "Start Trigger", "Stop Trigger", and "Report Trigger". At the bottom of the main area is a "Tag Report Trigger" field with "0" and an "Apply" button. At the bottom of the screen is a navigation bar with three circular icons: a Windows logo, a keyboard icon, and an "OK" button.

**Figure 4-21** Start Trigger - Periodic Window

**Trigger** 1:14

Trigger Type: GPI

Event: 1

☐ High To Low

☒ Low To High

Start Trigger Stop Trigger Report Trigger

Tag Report Trigger: 0 Apply

Windows Mobile navigation bar with Start, Keyboard, and OK buttons.

**Figure 4-22** Start Trigger - GPI Window

**Trigger** 12:50

Trigger Type: Handheld Trigger

Event: ☐ Trigger Released

☒ Trigger Pressed

Start Trigger Stop Trigger Report Trigger

Tag Report Trigger: 0 Apply

Windows Mobile navigation bar with Start, Keyboard, and OK buttons.

**Figure 4-23** Start Trigger - Handheld Trigger Window

## Stop Trigger

The screenshot shows a mobile application window titled "Trigger". At the top, there are icons for connectivity, volume, and battery, along with the time "12:48". The main area contains a "Trigger Type" dropdown menu set to "Duration" and a "Duration(ms)" text input field containing "2000". Below these are three buttons: "Start Trigger", "Stop Trigger", and "Report Trigger". At the bottom, there is a "Tag Report Trigger" text input field containing "0" and an "Apply" button. The bottom of the screen features a navigation bar with a Windows logo, a keyboard icon, and an "OK" button.

**Figure 4-24** Stop Trigger - Periodic Window

The screenshot shows the same "Trigger" window, but with different settings. The "Trigger Type" dropdown menu is now set to "GPI with Timeout". Below it, there is a "Port" dropdown menu set to "1", a "Time Out" text input field containing "2000", and an "Event" section with two radio buttons: "High To Low" (which is selected) and "Low To High". The "Start Trigger", "Stop Trigger", and "Report Trigger" buttons are still present. At the bottom, the "Tag Report Trigger" text input field contains "0" and the "Apply" button is visible. The navigation bar at the bottom remains the same with the Windows logo, keyboard icon, and "OK" button.

**Figure 4-25** Stop Trigger - GPI with Timeout Window

The screenshot shows a mobile application window titled "Trigger". At the top, there is a status bar with icons for signal strength, speaker, battery, and the time 12:48. The main content area has three input fields: "Trigger Type" with a dropdown menu showing "Tag Observer", "Tag Observation" with a text box containing "5", and "Time" with a text box containing "1000". Below these fields is a row of four buttons: "Start Trigger", "Stop Trigger", "Report Trigger", and an empty button. At the bottom of the main area is a "Tag Report Trigger" section with a text box containing "0" and an "Apply" button. The bottom of the screen features a green bar with three circular icons: a Windows logo, a keyboard icon, and an "OK" button.

**Figure 4-26** Stop Trigger - Tag Observation with Timeout Window

The screenshot shows a mobile application window titled "Trigger". At the top, there is a status bar with icons for signal strength, speaker, battery, and the time 12:49. The main content area has three input fields: "Trigger Type" with a dropdown menu showing "N Attempts", "No. of Attempts" with a text box containing "10", and "Time Out" with a text box containing "1000". Below these fields is a row of four buttons: "Start Trigger", "Stop Trigger", "Report Trigger", and an empty button. At the bottom of the main area is a "Tag Report Trigger" section with a text box containing "0" and an "Apply" button. The bottom of the screen features a green bar with three circular icons: a Windows logo, a keyboard icon, and an "OK" button.

**Figure 4-27** Stop Trigger - N Attempts with Timeout Window

**Trigger** 12:50

Trigger Type: Handheld Trigger

Time Out: 0

Event: ☒ Trigger Released ☐ Trigger Pressed

Start Trigger Stop Trigger Report Trigger

Tag Report Trigger: 0 Apply

Windows Keyboard OK

**Figure 4-28** Stop Trigger - Handheld Trigger with Timeout Window

## Report Trigger

**Trigger** 12:56

New Tag: Moderated 500

Tag Invisible: Moderated 500

Tag back to visibility: Moderated 500

Start Trigger Stop Trigger Report Trigger

Tag Report Trigger: 0 Apply

Windows Keyboard OK

**Figure 4-29** Report Trigger Window

---

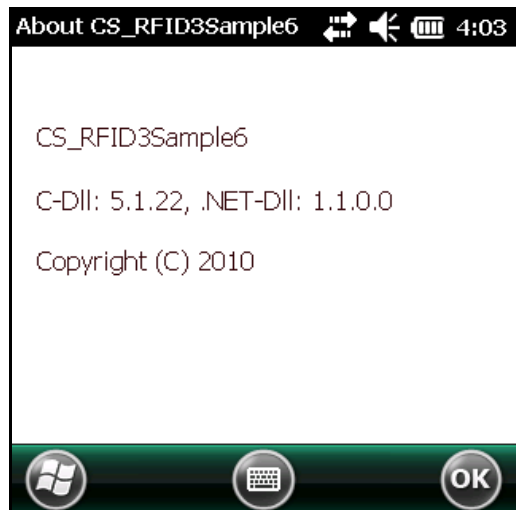
### Management Menu Options

Management options are not applicable for handheld readers.

---

### Help Menu

Select **Menu > Help** to display the version information. The version numbers displayed in this window are examples. Actual version numbers are based on the versions of the files on the device.



**Figure 4-30** *Help Window*

---

### Exit

Select **Menu > Exit** to exit the RFID sample application.

# Chapter 5 Tag Locator

---

## Introduction

Use Tag Locator to detect the location of a tag. By providing the TagID of an item, this application can find the relative position of the tag with respect to the mobile computer. Move the mobile computer back and forth to obtain the location of the tag as indicated by the beep frequency and a vertical progress bar showing the relative position of the tag.

The Tag Locator application requires the following components/DLLs on the device:

- `RFIDAPI32.dll` (Version 5.1.15 or higher)
- `Symbol.RFID3.Device.dll` (Assembly version 1.1.0.1, File version 1.1.0.7 or higher)
- `Symbol.Audio.dll`
- `Symbol.dll`
- `Symbol.Notification.dll`
- `Symbol.StandardForms.dll`

---

## Using Tag Locator

To use the Tag Locator application:

1. Tap **TagLocator** in the **Application** folder on the mobile computer to open the Tag Locator application.

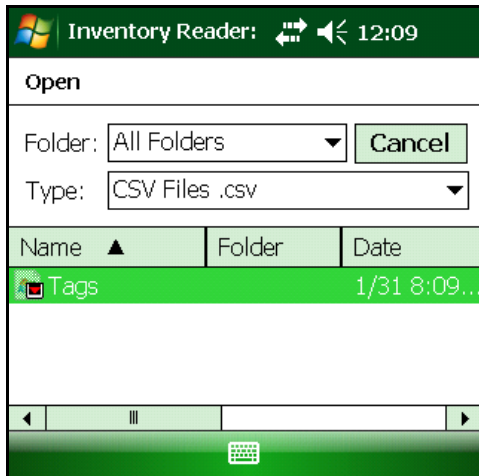


**Figure 5-1** *Tag Locator*

2. Enter the tag ID in one of three ways:
  - Type the tag ID in the **TagID** text box, then select **Locate** or press and hold the trigger.
  - Perform a search operation by selecting the **Search Tags** button or by pressing and holding the trigger.
  - Select the **Import Tags** button to import a list of saved tags from a .csv file. See [Locating Tags Using a .csv File on page 5-3](#).

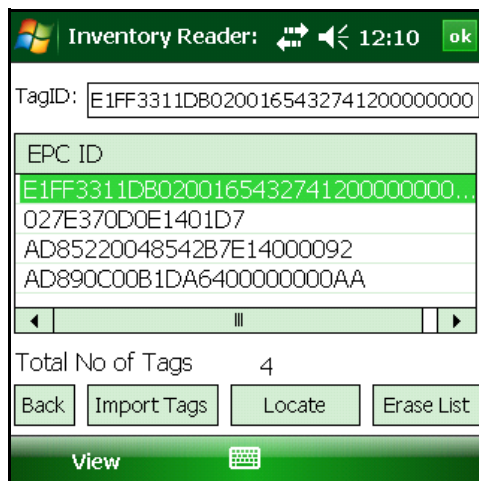
## Locating Tags Using a .csv File

1. Select the **Import Tags** button to import a list of saved tags from a .csv file. The following window appears.



**Figure 5-2** Opening a .csv File

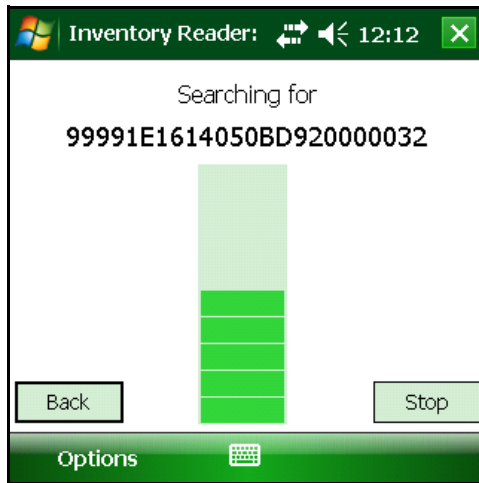
2. Select the desired .csv file to import the tags to the list.



**Figure 5-3** Tag List

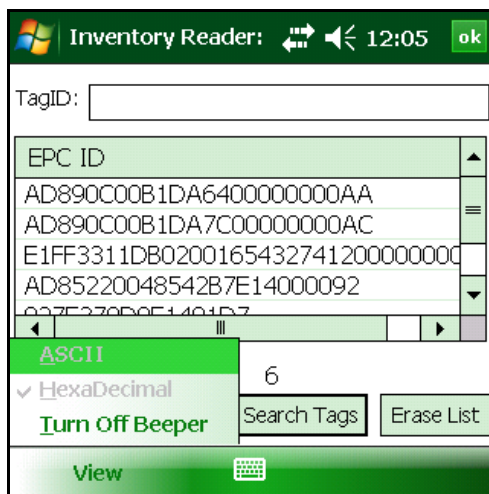
3. Select a tag from the list to search.

4. Select the **Locate** button or press and hold the trigger. Move the mobile computer in all directions to get the relative position of the tag, indicated by a beep, the vertical progress bar, or both.



**Figure 5-4** Tag Search

Use the **Options** menu to turn the beeper on and off and to display data in ASCII or hexadecimal format.



**Figure 5-5** Options Menu

# Chapter 6 Troubleshooting

## Introduction

Table 6-1 on page 6-1 provides troubleshooting information.

## Troubleshooting

Table 6-1 Troubleshooting

| Problem                                                                          | Possible Causes                                                 | Possible Solutions                                                                                 |
|----------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Mobile computer does not turn on.                                                | Lithium-ion battery not charged.                                | Charge or replace the lithium-ion battery.                                                         |
|                                                                                  | Lithium-ion battery not installed properly.                     | Ensure the battery is installed properly.                                                          |
|                                                                                  | System crash.                                                   | Perform a warm boot. If the RFID reader still does not turn on, perform a cold boot.               |
| Rechargeable Lithium-ion battery did not charge.                                 | Battery failed.                                                 | Replace battery. If the mobile computer still does not operate, try a warm boot, then a cold boot. |
|                                                                                  | Mobile computer removed from cradle while battery was charging. | Insert mobile computer in cradle and begin charging.                                               |
| No sound.                                                                        | Volume setting is low or turned off.                            | Increase the volume setting.                                                                       |
| Tapping the window buttons or icons does not activate the corresponding feature. | LCD screen not aligned correctly.                               | Re-calibrate the screen.                                                                           |
|                                                                                  | Battery is not inserted properly.                               | Insert the battery properly.                                                                       |

**Table 6-1** *Troubleshooting (Continued)*

| Problem                                                            | Possible Causes                                                                                                    | Possible Solutions                                                                                                                                                                                                                           |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A message appears stating that the mobile computer memory is full. | Too many files stored on the mobile computer.                                                                      | Delete unused memos and records. Save these records on the host computer.                                                                                                                                                                    |
|                                                                    | Too many applications installed on the mobile computer.                                                            | If additional applications have been installed on the RFID reader, remove them to recover memory. Tap <b>Start &gt; Settings &gt; System</b> tab > <b>Remove Programs</b> icon.                                                              |
| Reader is not reading tags.                                        | The tag is out of its read range.<br>Tags are damaged.<br>Tags are not EPCgen2.<br>Read application is not loaded. | Move the tag into the read range. See <a href="#">Reading Tags on page 1-4</a> .<br>Use tags of good quality.<br>Use EPCgen2 tags.<br>Verify that the unit is loaded with a read application.                                                |
| Reader is not reading tags and the LLRP icon is orange.            | There is not enough power available from the battery.                                                              | Charge or replace the lithium-ion battery. Turn off devices that consume higher levels of power (GSM, GPS, Scanner). Do not use the hand-held in cold conditions. See to <a href="#">Smart Power Management Implementation on page 3-9</a> . |



**NOTE** If problems still occur, contact the distributor or call the local contact. See [page ix](#) for contact information.

# Appendix A Technical Specifications

## Technical Specifications

The following tables summarize the RFID reader intended operating environment and technical hardware specifications.

**Table A-1** *Technical Specifications*

| Item                                              | Workabout Pro4 RFID                                                                                                                                                                         |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Physical and Environmental Characteristics</b> |                                                                                                                                                                                             |
| Dimensions                                        | LONG: 8.78 in. x 2.95 in./3.94 in. x 1.22 in./1.65 in.<br>(223 mm x 75/100 mm x 31/42 mm)<br><br>SHORT: 7.87 in. x 2.95 in./3.94 in. x 1.22 in./1.65 in.<br>(200 mm x 75/100 mm x 31/42 mm) |
| Weight                                            | Short: 16.2 oz./461 g; Long: 18.6 oz./526 g                                                                                                                                                 |
| Keyboard                                          | Alpha Numeric (long models)<br>QWERTY or Numeric (short models)<br>High reliability keypad<br>Ultra-white backlight                                                                         |
| Display                                           | 3.7 in. VGA/QVGA (640x480)<br>Transflective color<br>Touch display<br>Sunlight visibility with 240 cd/m <sup>2</sup> brightness                                                             |
| Battery                                           | 4400 mAh Lithium Ion battery<br>Super capacitor power back-up                                                                                                                               |
| Expansion Ports                                   | Micro SD slot<br>100 Pin Expansion Interface<br>Dedicated USB port<br>Audio port<br>Scanner Interface                                                                                       |

**Table A-1** *Technical Specifications (Continued)*

| Item                               | Workabout Pro4 RFID                                                                                                                                                                                                                                                                                |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Camera (optional)</b>           | Optional color<br>8 MP<br>Autofocus<br>4X digital zoom<br>Bright LED flash<br>Video capable                                                                                                                                                                                                        |
| <b>Performance Characteristics</b> |                                                                                                                                                                                                                                                                                                    |
| CPU                                | Sitara™ AM37x AR M Cortex™-A8 1GHz processor                                                                                                                                                                                                                                                       |
| Operating System                   | Microsoft® Windows® Embedded CE 6.0<br>Microsoft® Windows® Embedded Hand-held 6.5                                                                                                                                                                                                                  |
| Memory (RAM/ROM)                   | 512 MB RAM/ 4 GB Flash                                                                                                                                                                                                                                                                             |
| Application Development            | SMDKs available through the Support Web Site                                                                                                                                                                                                                                                       |
| Data Capture Options               | Laser engine reads 1D symbologies with intuitive laser aiming.<br>RFID reader reads Gen2 tags.                                                                                                                                                                                                     |
| Bundled Applications               | Internet Explorer® 6<br>Wordpad®<br>ActiveSync®<br>Microsoft Office (WE HH 6.5 only)                                                                                                                                                                                                               |
| Additional Software                | Kiosk<br>MobiControl<br>Total Recall/TweakIt/Dr. Debug<br>A.R.C.<br>Windows® Mobile Device Center                                                                                                                                                                                                  |
| Terminal Emulation                 | TekTerm<br>Stay-Linked Terminal Emulation<br>Naurtech CETerm and Industrial Web Browser<br>Wavelink TE                                                                                                                                                                                             |
| Barcode Scanner Options            | 1D standard range laser1<br>1D extended range laser2<br>1D standard range linear imager<br>2D imager.<br>NOTE: All scan engines are available factory configured or user installable as either an end-cap or slim pod. <b>The scanner and the RFID are not designed to be used simultaneously.</b> |

**Table A-1** Technical Specifications (Continued)

| Item                                | Workabout Pro4 RFID                                                                                                                                                                                                                                                                                         |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>User Environment</b>             |                                                                                                                                                                                                                                                                                                             |
| Operating Temperature               | -20°C to +50°C (-4°F to +122°F)                                                                                                                                                                                                                                                                             |
| Storage Temperature                 | -40°C to +60°C (-40°F to +140°F)                                                                                                                                                                                                                                                                            |
| Humidity                            | 5% to 95% non condensing                                                                                                                                                                                                                                                                                    |
| Drop Specification                  | 1.5 m (5 ft.) 26 drops to polished concrete (powered with options and accessories)<br>Multiple 1.8 m (6 ft.) drops to polished concrete<br><b>Note:</b> This drop rating is not supported by circular antenna configurations – Models WA9903 & WA9904.                                                      |
| Environmental Sealing               | IP 65, IEC 60529                                                                                                                                                                                                                                                                                            |
| ESD                                 | +/-15 kV air discharge<br>+/-8 kV contact                                                                                                                                                                                                                                                                   |
| <b>RFID Module Options</b>          |                                                                                                                                                                                                                                                                                                             |
| UHF Module                          | Frequency: 885.7-867.5 MHz or 902-928 MHz<br>Protocols supported: EPC Class 1 Gen 2; ISO 18000-6C                                                                                                                                                                                                           |
| Antenna                             | UHF Linear polarized antenna (End-cap)<br>or<br>UHF Circular polarized antenna (Pod)                                                                                                                                                                                                                        |
| <b>Wireless Data Communications</b> |                                                                                                                                                                                                                                                                                                             |
| WWAN Radio                          | Optional UMTS/HSPA + WAN radio (data only in the Americas) with GPS receiver (supports AGPS, GLONASS and SBAS)<br><b>Note:</b> In the Americas, no co-transmission is possible with RFID. RFID and WWAN work in toggle mode. In Europe, the voice feature is only offered with the linear antenna RFID kit. |
| WLAN Radio                          | 802.11a/b/g/n; optional diversity antenna module available                                                                                                                                                                                                                                                  |
| WLAN Data Rates                     | 802.11a - up to 54 Mbps<br>802.11b/g - up to 54 Mbps<br>802.11n @ 2.4 GHz - up to 72.2 Mbps<br>802.11n @ 5 GHz - up to 72 Mbps                                                                                                                                                                              |
| WLAN Security                       | WEP (40 or 104 bit)<br>WPA /WPA 2 Personal<br>WPA / WPA 2 Enterprise - EAP -TTL S (PAP, MSCHAP, MSCHAPv2), EAP-TLS, PEAPv0-MSCHAPv2, PEAPv1-EAP-GTC, EAP-FAST, TKIP, AES                                                                                                                                    |
| <b>Bluetooth®</b>                   | Integrated <b>Bluetooth®</b> V2.0+EDR<br><b>Bluetooth®</b> coexistence                                                                                                                                                                                                                                      |
| GPS                                 | Optional GPS/Wi-Fi diversity antenna module (supports AGPS and SBAS)                                                                                                                                                                                                                                        |
| <b>Voice and Audio</b>              |                                                                                                                                                                                                                                                                                                             |

**Table A-1** *Technical Specifications (Continued)*

| Item                               | Workabout Pro4 RFID                                                                                                                                                                                                                                                                                                              |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Push-to-talk                       | VoIP over Wi-Fi                                                                                                                                                                                                                                                                                                                  |
| Beeper                             | High volume 86dBA beeper (95dBA beeper with extended range laser)<br>Optional speech module                                                                                                                                                                                                                                      |
| Certified                          | Vocollect and Wavelink Speakeasy clients                                                                                                                                                                                                                                                                                         |
| <b>Peripherals and Accessories</b> |                                                                                                                                                                                                                                                                                                                                  |
| Cradles                            | Single-slot or 4-slot available                                                                                                                                                                                                                                                                                                  |
| Charger                            | 4-Slot spare battery charger                                                                                                                                                                                                                                                                                                     |
| Other Accessories                  | Vehicle power outlet adapter, vehicle cradle accessory, pistol grip, hand strap, wrist strap, holsters, protective carrying cases and rubber boots                                                                                                                                                                               |
| <b>Regulatory</b>                  | Worldwide Safety, EMC, RF, Laser approvals; CE Mark, E Mark (vehicle cradles), RoHS compliant, WEEE compliant, REACH compliant                                                                                                                                                                                                   |
| <b>Warranty</b>                    | Subject to the terms of the Zebra hardware warranty statement, the Workabout Pro 4 is warranted against defects in workmanship and materials for a period of 1 (one) year from the date of shipment.<br>For complete warranty statement, please visit: <a href="http://www.zebra.com/warranty">http://www.zebra.com/warranty</a> |

# Appendix B RFID APIs

---

## RFID API Reference Site

RFID APIs are available in C and .NET. For information on supported RFID APIs, refer to the *Enterprise Mobility Developer Kit* (EMDK), available at <http://www.zebra.com/support>.

For C, refer to the EMDK for C v2.1 or later. For .Net, refer to the EMDK for .NET v2.2 or later.



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