SkyeTek Development Kit User Guide
SkyeWare 4
Version 090206

Copyright Information

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SkyeTek Development Kit User Guide

Chapter 1

Overview

The SkyeTek® Developer Kit provides all the hardware and software components you need to test the integration of RFID as a feature in your product. This includes modules, sample tags, antenna, demo software, device drivers, design guides, application notes, and more.

Please visit www.skyetek.com for a list of SkyeModule Readers Available with the Development Kit.

About This Guide

This guide contains all of the information you need to get started with evaluation and testing of a SkyeModule™ M2, M4, M7,M9, or M10 reader:

Chapter 1: Overview – Introduces the contents of this guide, describes SkyeTek's Advanced Universal Reader Architecture, and lists the benefits of working with SkyeModule readers.

Chapter 2: Setup and Installation – Lists the contents of the Developer Kit and guides you through initial setup and configuration of your system. Provides instructions for installing the SkyeWare 4™ GUI applications used for evaluation of the SkyeModules, and discusses the features of each of these tools.

Chapter 3: Using SkyeWare 4 Capabilities – Demonstrates SkyeWare functions such as read range, anti-collision performance, and how to construct SkyeTek Protocol v3.0 (STPv3) commands to help you develop and test software to support your application.

Chapter 4: Using SkyeWare 4 Applications – Explains how to use SkyeWare 4 applications to make implement Product Authentication, Access Control, or Asset Tracking systems.

Chapter 5: Configuring Your System – Explains how to use the SkyeWare 4 application to make configuration changes to the reader, firmware, or specific tags.

Appendix A: Troubleshooting – Answers commonly asked questions about setting up, configuring, and using the SkyeModules and evaluation software provided in the SkyeTek Developer Kits.

Appendix B: Host Interface Board Reference – Provides electrical and mechanical specifications for the host interface board.

The SkyeTek Advantage

SkyeTek's focus on the OEM reader market means you will become a partner to a company committed to:

- **Tagnostic™** readers that work with the widest variety of tag types
- Enabling countless **embedded applications** by building the smallest, most cost effective market
- Focusing on an **open and modular architecture** with a common form factors
- Building a common code base with a **high ReaderIQ**

Advanced Universal Reader Architecture

SkyeTek's advanced universal reader architecture (AURA™) separates the RFID reader into two layers:

- *SkyeOS™*, a software layer, independent of the underlying tags, protocols, and hardware optimized for advanced reader intelligence and seamless application integration. SkyeOS decouples reader software from hardware. This provides a platform-independent, Tagnostic™ interface common across SkyeTek reader modules. This lets you re-use code as the underlying protocols, cryptography, and components evolve.
- *ReaderDNA*, hardware reference designs that provide a common architecture across HF and UHF optimized for efficiencies in cost, density, and power consumption. ReaderDNA shares common tag interoperability, protocol support, processor, form factor, and power supply across RFID reader modules enabling faster development cycles and greater scale economies.

Adopting AURA gives you a single architecture for reader hardware and software. This makes the task of designing, building, and maintaining a RFID application simple, manageable, and cost efficient over the lifetime of the application.

SkyeTek's SkyeOS Embedded

SkyeOS, SkyeTek's firmware, comes standard on all SkyeTek radio modules. SkyeOS encompasses all direct communication to the transponder via the transceiver chip or discrete analog front end design. SkyeOS includes:

- Innovative security and crypto libraries that make even the cheapest tags secure
- Sophisticated anti-collision algorithms
- Easily configurable system parameters providing ultimate flexibility
- The highest ReaderIQ of any module available today

Security

SkyeSecurity, the SkyeOS security component, supports standardized cryptography, which can be supplied as needed from the crypto-libraries. These could include: DES, 3DES (TDEA), AES, SHA (1-512), MD5, and PRNG. SkyeSecurity can secure previously insecure tags by providing crypto-libraries at the reader level instead of the more typical host level. This lets you use cheaper otherwise insecure tags in ways that you could not before.

SkyeOS also supports the Mifare™ and Crypto RF® proprietary cryptographic schemes. (Note that additional license fees may apply for proprietary schemes.)

Anti-Collision

SkyeOS has modular anti-collision algorithms that are protocol or tag-specific. SkyeTek has devised these sophisticated anti-collision algorithms to address both ISO and non-ISO approaches to anti-collision. Using these specialized techniques, SkyeTek can simultaneously singulate tags within mixed tag populations to correctly display entire UIDs quickly, even when tags are in very close proximity.

System Configuration

SkyeOS provides support for memory storage for use on two platforms. Because of the modular nature of SkyeOS, this could be added to any design, but may require additional components. SkyeOS also uses efficient power management methods, configurable parameters, and internationally standardized command sets.

Reader IQ

SkyeTek's engineering team has a long history and notable experience in RFID, and that has its benefits. Our SkyeOS has a higher Reader IQ than other reader software available on the market. For example, SkyeOS is Tagnostic, supporting a wide variety of tag types (including some proprietary transponders) in all of our reader module product offerings. SkyeTek's engineering team has worked with an extensive array of tags, including proprietary vendor tags, and offers support based on empirical characterization. As such, tag idiosyncrasies are automatically managed by our software.

SkyeTek's ReaderDNA

In addition to licensing SkyeOS, SkyeTek can also provide licenses for its hardware reference architecture if you wish to leverage SkyeTek designs using existing components of your own design. For example, if you have a processor built into an existing product that has extra cycles, you can use it to run the SkyeOS code instead of having to add another processor. This can significantly reduce your costs and eliminate redundant components. You can also use modules or other integrated boards manufactured by your own contract manufacturers.

ReaderDNA is built on the same premise as SkyeOS: to give you the ultimate flexibility in design. Our reader modules and ReaderDNA offer configurability across multiple applications and in various existing hosts.

Software

SkyeTek provides C and .NET APIs that lets you create software that works with your SkyeModule M2, M4, M7, M9 or M10 using SkyeTek Protocol version 3.

Interfaces

Depending on the SkyeModule, SkyeTek supports up to four host interfaces. These interfaces include:

- UART TTL
- USB
- SPI
- I^2C

Additionally, you can use seven GPIO pins with peripheral device, use a connector for an external 7816 slot, or connect directly to the board via available through-hole pins.

Power Management

Power-limited devices make use of the advanced power management features that minimize duty cycles while maximizing throughput. SkyeTek's reader modules typically consume far less power than traditional readers on the market today.

Antennas

Numerous antenna designs exist for SkyeOS-based modules. They vary in size and quality factor. However, these SkeyTek's designs maintain consistent impedance values to maintain compatibility with commercial-off-the-shelf antennas. Again, this gives you as much design flexibility as possible.

SkyeTek Development Kit User Guide

Chapter 2

Setup and Installation

Prerequisites

- Host computer running Microsoft® Windows® XP and Microsoft® Windows® Vista operating system.
- Available serial or USB data port

Contents of the Developer Kit

The following contents should be included in your shipment:

Table 2-1   Contents of Developer Kits

Component:	SkyeModule Developer Kit:					
	M2	**M4**	**M7**	**M9**	**M10**	**Item Level**
SkyeModule, compact flash (CF) form factor				X		M2 (MH) *and* M9 (either CF or MH)
—*or*— mounting hole (MH) form factor	X	X	X	X	X	
Host interface board	X	X	X	X	X	X
MMCX to SMA cable	X	X	X	X	X	X
HF external antenna	X	X				X
UHF external antenna			X	X	X	X
6V, 3.3A power supply	X	X	X	X	X	X
Power adapter kit	X	X	X	X	X	X
RS-232 cable	X	X	X	X	X	X
USB 2.0 cable	X		X	X	X	X
SkyeTek sample tag kit	X	X	X	X	X	X
CD with SkyeWare 4 software and documentation	X	X	X	X	X	X
Multiplexer (MUX) support	X		X	X	X	X

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The installation CD places the following on your system:

- SkyeWare 4™ developer tool suite
- Software libraries
- Documentation
- (M4 only) Firmware personality files

Setting Up Your SkyeModule

To set up your SkyeModule you must first install SkyeWare 4. (An installation wizard should start automatically when you put the CD into your computer. If the wizard doesn't run automatically, run the **setup.exe** program on the CD.) To set up your SkyeModule:

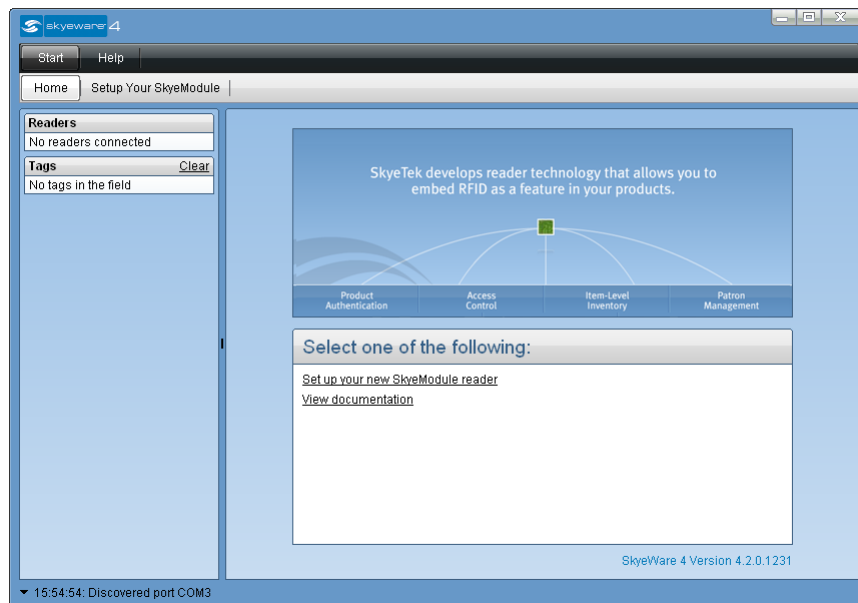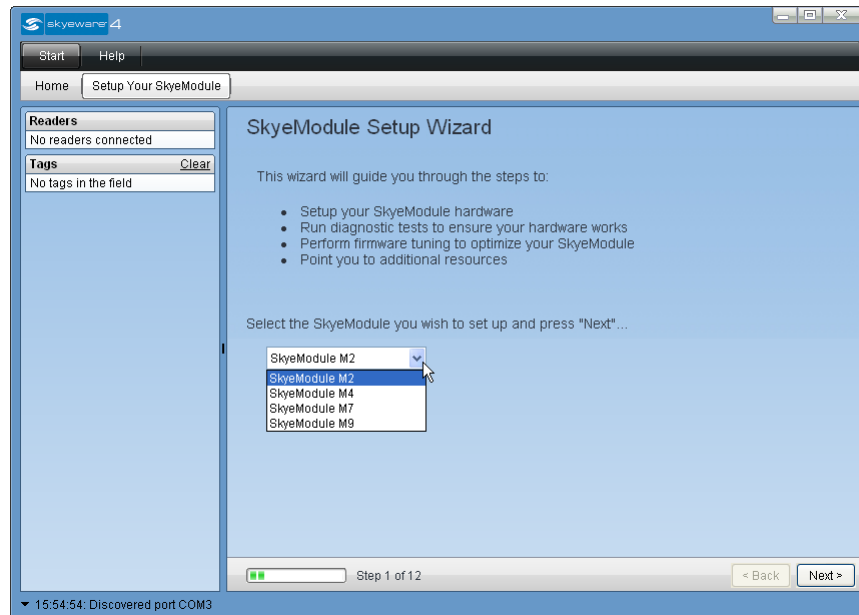1. Start SkyeWare 4 after the installation wizard finishes. This displays the home screen (Figure 2-1).

Figure 2-1   SkyeWare 4 Home Screen

2. Click on the tab, **Setup Your SkyeModule**. This displays the first screen of the Setup Wizard (Figure 2-2).

Figure 2-2   SkyeWare 4 Setup Wizard

3. Click on the tab, **Setup Your SkyeModule**. This displays the first screen of the Setup Wizard (Figure 2-2).

4. Select the SkyeModule you wish to set up from the pull-down menu in the middle of the screen.

5. Follow the instructions on each screen to set up your hardware.

6. Use the following checklist to verify that the connections are correct (see Figure 2-3):

   ● The external antenna cable attaches directly to the MMCX connector on the SkyeModule reader. (SkyeModule readers supports any 50 ohm antenna tuned to the correct frequency range.)

   ● The SkyeModule reader itself plugs into either the 24-pin MH-style connector on the bottom side of the host interface board or (if applicable) the 50-pin CF-style connector on the top of the interface board.

   ● Make sure the communications cables (either USB or RS-232) are connected to both the host interface board and the host computer. (The green and red LEDs on the SkyeModule light up when the reader is communicating with the host. (For more information on the LEDs, see Appendix A, "Troubleshooting".)

   ● Make sure the AC power adapter is plugged into a power supply and to the host interface board. (An LED on the host interface board lights up when the board has power.)

> **Note –** For the SkyeModule M7, M9, or M10 make sure that you attach the power cable, even if you use the USB interface. This ensures that the SkyeModule can maintain its transmit power accuracy.
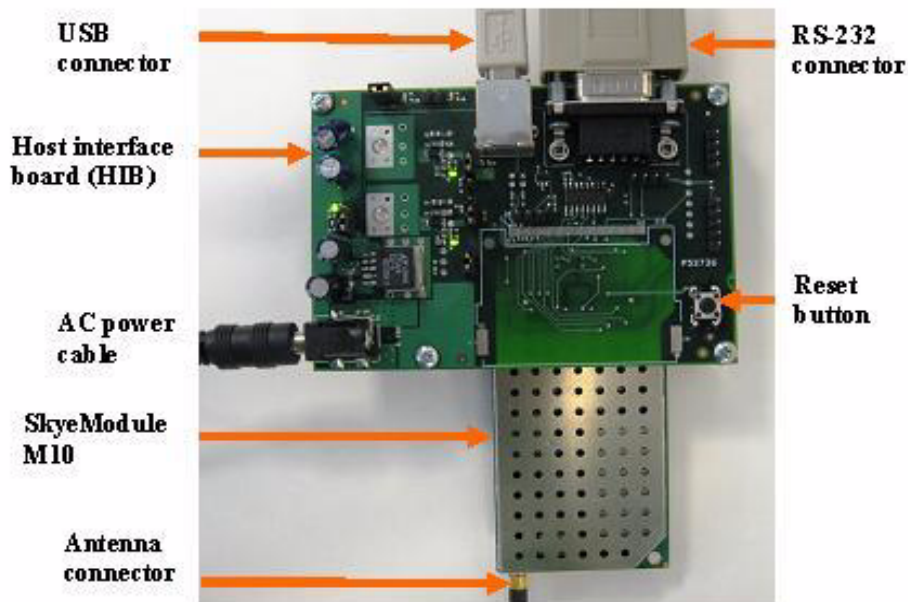
Figure 2-3   Hardware Connections for a SkyeModule M10
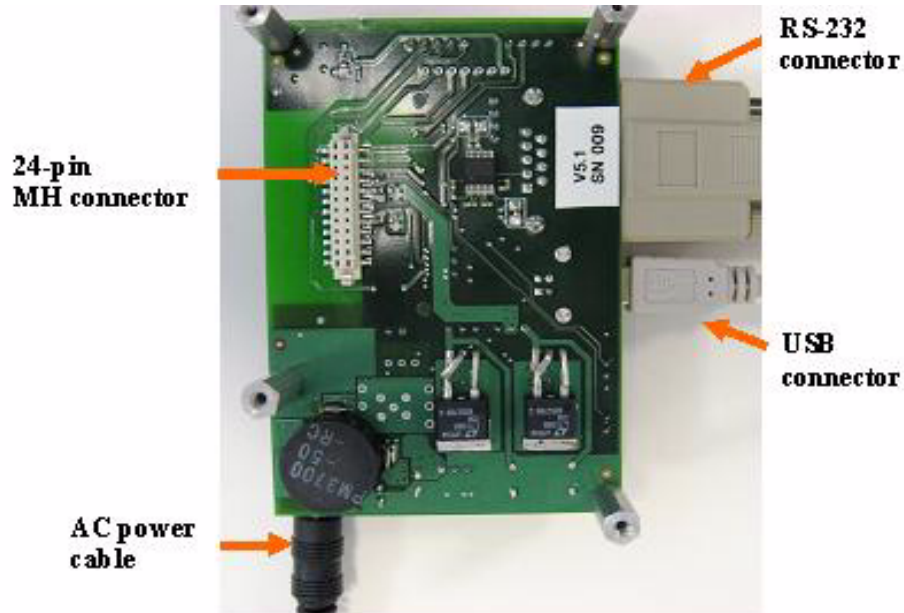
Figure 2-4   MH Connector on Underside of Host Interface Board

● Ensure that SkyeWare 4 displays the reader information on the left side of the screen (Figure 2-5). Any tags in the read field are also displayed.

Figure 2-5   Reader and Tag Display

7. (Optional) Use the wizard to check the following:

● Selecting and installing a firmware personality (product authentication, access control, or asset tracking)

● Tag detection

● Tag read range

● Anti-collision performance

8. Use the SkyeWare tabs to explore SkyeWare functionality. (See the next section for more information.)

Exploring SkyeWare 4

After you install and configure your SkyeModule M2, M4, M7, M9, or M10, you can use the various tab functions of SkyeWare 4 to explore the reader's capabilities.

The home screen displays function tabs that let you set up, demonstrate, configure, and test your SkyeModule M2, M4, M7, M9, or M10. Use these tabs to access different functions with your reader. (See the following chapters for detailed information on each function chapters.)

Figure 2-6   SkyeWare Screen After Reader Setup

Capabilities Tab

This tab contains subtabs that let you perform high-level demonstrations of the basic functionality of your SkyeModule. This includes:

- Read Range—lets you test the distance at which the reader first detects a tag.
- Anti-collision—shows how the reader can distinguish multiple tags at once.
- Memory—performs basic tag memory functions (read, write, load, save).
- Secure Memory—lets you read or write encrypted and signed tag memory.
- Access Control—demonstrates how to set up tag access control applications.
- Asset Tracking—shows how to track a tagged asset through multiple locations.
- Protocol—lets you develop and test SkyeTek Protocol v3 commands. You can construct commands in either ASCII or Binary format, based on the tag type and selected flags. This lets you quickly and easily send commands and view responses from your reader.

See Chapter 3, "Using SkyeWare 4 Capabilities" for more information.

Applications Tab

(M2 and M4 only) This tab lets you use applications for high-level functionality of your SkyeModule. This includes:

● Product Authentication—you can configure tags to control product usage.

● Access Control—encodes tags to limit access to entryways.

● Asset Tracking—tracks product or asset information through different locations.

See Chapter 4, "Using SkyeWare 4 Applications" for more information.

Configuration Tab

Subtabs for this tab let you quickly set up reader, radio, firmware, and tag settings, including:

● Reader—sets basic reader functions, such as reader name, reader ID, serial port, or USB port values. You can also manage default reader settings.

● Radio—lets you specify radio settings for the SkyeModule M7, M9 or M10 including regulatory mode, modulation settings, antenna gain, frequency settings, and frequency hopping parameters.

● Firmware—allows you to reload or upgrade SkyeModule M2, M4, M7, M9, or M10 firmware. You can also change the firmware personalities to support different applications (M4 only).

● Tag—lets you configure tag formation.

See Chapter 5, "Configuring Your System" for more information.

Setting Up Your Test Environment

To get the results you expect for tag performance, read range, and so on, you must pay attention to the environment in which you will test and operate your SkyeModule reader and antennas. Performance and read range are highly dependent on antenna selection, tag selection, operating environment, and specific system settings, including:

- Tag considerations, including:
    - Tag selection criteria: selecting a specific tag type from the Tag Type pull-down list in SkyeWare can improve detection performance versus using the more general Auto-Detect setting.
    - Orientation: angle of tag to reader field.
    - Tag type, manufacturer, and individual tag: all can induce performance variations.
    - Tag mounting surface: some materials—particularly metals and liquids—can interfere with tag detection.
    - Tag movement: whether tag is rotating or moving past the detector and at what speed.
- Environment: to maximize accuracy for testing, SkyeTek recommends that you use an outdoor free-space test when possible.
- RF output power (M7, M9 and M10): set the RF power to the maximum recommended output for your desired regional regulatory requirements. (Maximum RF power is 24 dBm for the SkyeModule M7, 27 dBm for the SkyeModule M9 and 30 dBm for the SkyeModule M10.
- Frequency hopping settings (M7, M9 and M10): these vary with the reader's regional settings and can depend on antenna performance.
- Antenna considerations, including:
    - Antenna gain: a higher-gain antenna provides a longer read range. However, a longer range requires a smaller beam width, which reduces the size of the read field and affects read reliability.
    - Antenna cable length: antenna-cable gain/loss is approximately -0.49 dB/meter (-0.15 dB/foot) for a standard RG58 coaxial cable.
    - Antenna polarization: linear antennas can add range, but they also require that the tag has a specific orientation to the antenna before the reader can detect the tag. Circular polarized antennas in general have less range, but they also let you orient the tag to the antenna in multiple ways.

Note – With the M7, M9, or M10: the MMCX antenna connector for the M7, M9 and M10 allows quick connections but can let a loose antenna cable rotate, yaw, or pitch in the connector socket if you do not secure the cable. Cable motion increases the VSWR to the receiver and degrades performance. Make sure that you provide strain relief for the antenna cable to prevent any cable motion or mechanical stress at the MMCX connector.
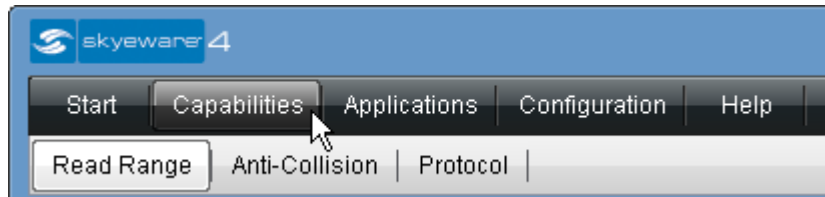
Chapter 3

Using SkyeWare 4 Capabilities

Overview

The SkyeWare 4 Capabilities tab gives you high-level evaluation tools that demonstrate basic features of your SkyeModule reader. SkyeWare 4 recognizes the reader and firmware and adjusts the demonstration functions accordingly. This chapter discusses each demonstration function.

Figure 3-1   SkyeWare 4 Capabilities Tab

**Table 3-1**   Summary of Capability Demonstrations

SkyeModule Reader	Capability	Description
M2, M4, M7, M9, M10	Read Range	Test antenna range
M2, M4, M7, M9, M10	Anti-Collision	Select multiple tags within read field
M2, M4, M7, M9, M10	Memory	Read/write tag memory
M2, M4	Secure Memory	Read/write encrypted and signed tag memory (requires specific firmware—contact SkyeTek for more information)
M2, M4, M7, M9, M10	Protocol	Construct and execute reader commands and receive responses using the SkyeTek Protocol, STPv3.

Note – Not all demonstrations work with all tags.

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Read Range

The *Read Range* demonstration lets you check the range at which the antenna can detect individual tags of different types.To access this screen, click on the **Capabilities tab**, then the **Read Range** subtab.
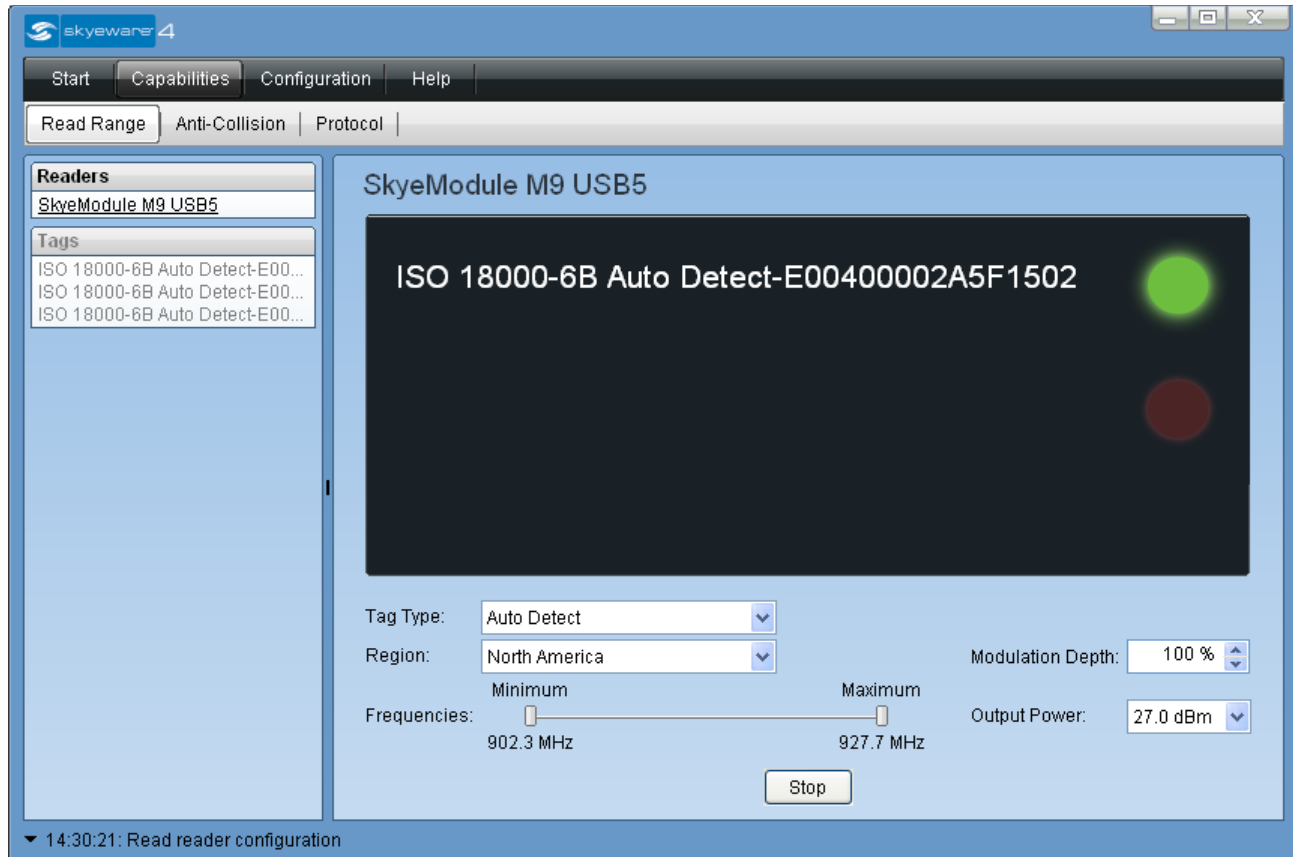
Figure 3-2   Read Range Demonstration Function

Note – Changing the reader ID from the factory default of FFFFFFFF to any other value disables the read range demonstration function. See "Configuring the Reader" on page 50 for more information.

How to Use:

1.   (Optional) Select a specific tag type from the pull-down menu. (The default value is Auto Detect, which detects all tags.)

2.   (Optional for M7, M9 or M10) Adjust the radio settings to improve the read range:

    a.   Select a compliance region from the Region pull-down menu.

    b.   Click and drag the Minimum or Maximum sliders in the Frequency field to adjust the detection range.

      c.   Use the up or down arrows in the Modulation Depth field to adjust the percentage for the modulation depth in increments of 10—*or*—type a number between 0 and 100 directly into the field.

      d.   Select an power level region from the Output Power pull-down menu. (Possible values range from 10-30 dBm in 0.1 dBm increments.)

3.   Place a single tag in the read field.

4.   Click on the **Start** button.

5.   Move the tag around in the field. As the reader detects the tags, it displays the tag information and flashes the green light. A tag error flashes the red light.

6.   Click on the **Stop** button to stop the test.

Anti-Collision

The *Anti-Collision* demonstration lets you test the reader's ability to detect multiple tags, also known as inventory mode. This capability indicates how quickly the reader can read multiple tags held in the read field at the same time while performing the appropriate anti-collision functions. You can also set the reader to continuously detect tags as you move them in and out of the detection field.

To access this screen, click on the **Capabilities tab**, then the **Anti-Collision** subtab.
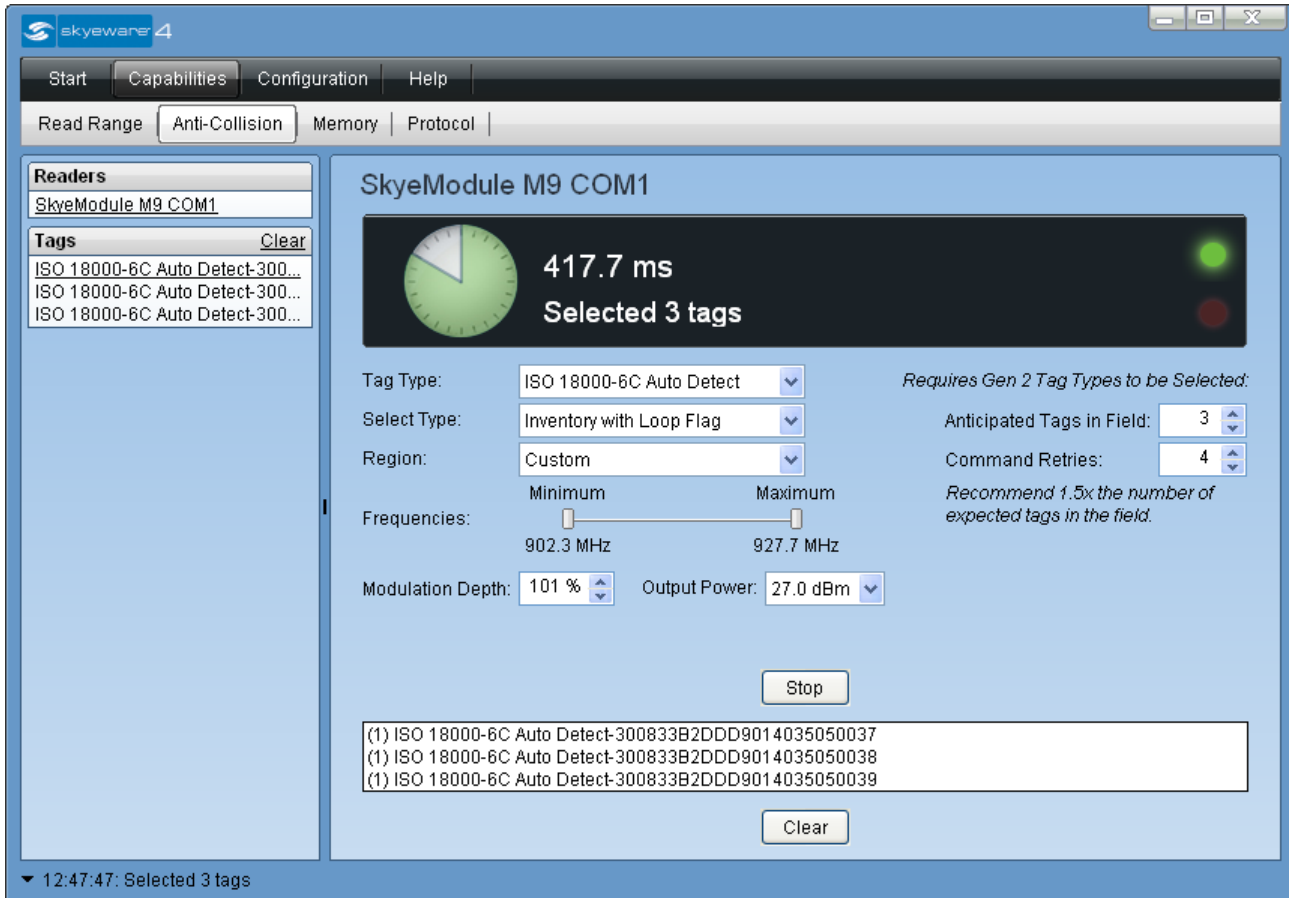
Figure 3-3   Anti-Collision Demonstration Function

How to Use:

1.   (Optional) To limit this function to specific tags, select a tag type from the pull-down menu. (The default value is Auto Detect, which detects all tags.)

2.   In the Select Type field, use the pull-down menu to select either **Inventory** or **Inventory with Loop Flag**.

- **Inventory** instructs the reader to scan once for all tags in the field.

- **Inventory with Loop Flag** places the reader in loop mode, which scans continuously for any new tags entering the detection field. The reader continues reading tags in this fashion until you exit the demonstration or click **Stop**.

Note – Changing the reader ID from the factory default of FFFFFFFF to any other value disables loop mode. (See "Configuring the Reader" on page 50 for more information.)

3.   (Optional for M7, M9 or M10) Adjust the radio settings to improve the read range:

a.   Select a compliance region from the Region pull-down menu.

b.   Click and drag the Minimum or Maximum sliders in the Frequency field to adjust the detection range.

c.   Use the up or down arrows in the Modulation Depth field to adjust the percentage for the modulation depth in increments of 10—*or*—type a number between 0 and 100 directly into the field.

d.   Select an power level region from the Output Power pull-down menu. (Possible values range from 10-30 dBm in 0.1 dBm increments.)

4.   (Optional for C1Gen2 tags) Adjust the inventory settings to improve the read range:

a.   Use the up or down arrows in the Anticipated Tags in Field field to match the number of tags you want to detect. This automatically adjusts the Command Retries field to a corresponding number.)

b.   Use the up or down arrows in the Command Retries field to match the number set the number of times the reader will repeat the command before timing out. (This automatically adjusts the Anticipated Tags in Field field to a corresponding number.)

5.   Hold multiple tags in the read field.

6.   Click the **Start** button once. SkyeWare 4 displays the detected tags in the data display area. When complete, SkyeWare 4 also displays a green light and the length of time required for the inventory and anti-collision process. A tag error flashes the red light.

7.   (Optional) If you selected **Inventory with Loop Flag**:

a.   Move additional tags into the detection field and observe the reader's ability to detect them. (The reader rereads any tags that you leave in the detection area.)

b.   Click on the **Stop** button to end the loop.

8.   When you finish testing, clear the data area by clicking the **Clear** button at the bottom of the screen.

Memory

The *Memory* demonstration lets you check your reader's ability to read and write to tag memory. To access this screen, click on the **Capabilities tab**, then the **Memory** subtab.
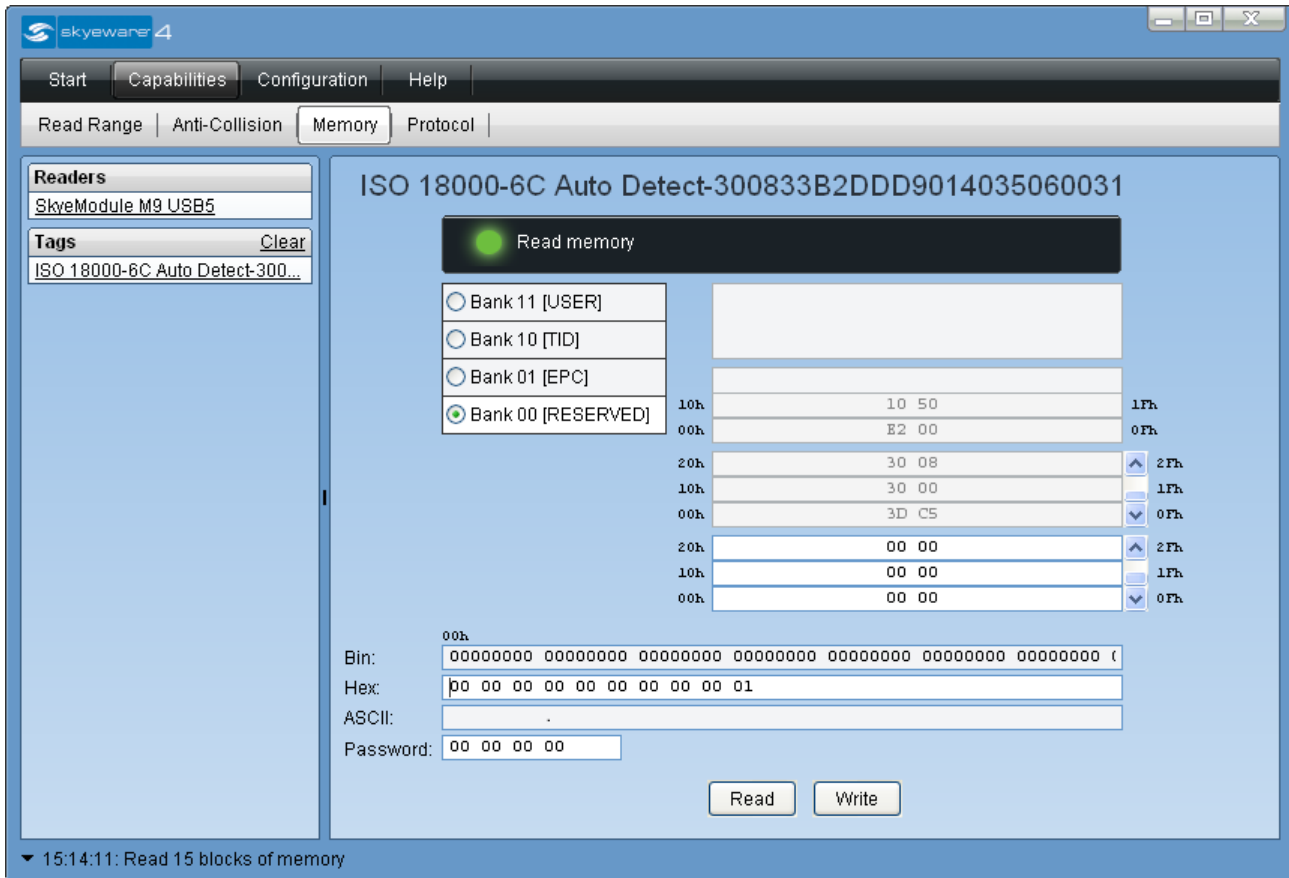
Figure 3-4   Memory Demonstration Function

How to Use:

1.   Place a tag or tags in the read field. The SkyeModule M2, M4, M7, M9 or M10 automatically reads the tag memory. The green Select tag light indicates the tag is successfully detected, and the green Read memory light and progress indicator that the memory is being read.

Note – The specific fields displayed for the tag memory display depend on the memory layout of the tag you use for this demonstration.

2.   (Optional) If you are using multiple tags in the field, click on the tag you wish to work with in the tag list on the left side of the screen.

3.   (Optional) To read or reread all of the tag memory, click on the **Read** button.

4. (Optional) To write to memory:

    a. Click on one of the editable fields in the memory display (User Bank, Bin, Hex or ASCII).

    b. Type a new data value into the selected field. As the edit field changes, the memory display updates with the memory for the selected mode.

    c. Click on the **Write** button write the new data values to the tag.

4. (Optional) To load the current tag memory with the contents of a previously saved binary (.bin) file:

    a. Click on the **Load** button. This opens a file selection window for the SkyeWare 4 firmware directory.

    b. Select a binary file (.bin) that contains the memory data from a compatible tag.

    c. Click **Open**. This loads the stored memory onto the current tag. If the file is incompatible with the tag (for example, if the file has more memory than the tag can hold), the read operation fails.

5. (Optional) To save the current tag memory contents to a binary (.bin) file:

    a. Click on the **Save** button. This opens a file selection window for the SkyeWare 4 firmware directory.

    b. Enter a filename with a .bin extension in the file name field.

    c. Click the **Save** button. You can now load the file onto other tags using the **Load** button on the memory screen.

Note – You can configure access permissions and editable parameters for some types of tags by clicking on the **Configuration** tab and **Tag** subtab. See "Configuring Tags" on page 61 for more information.
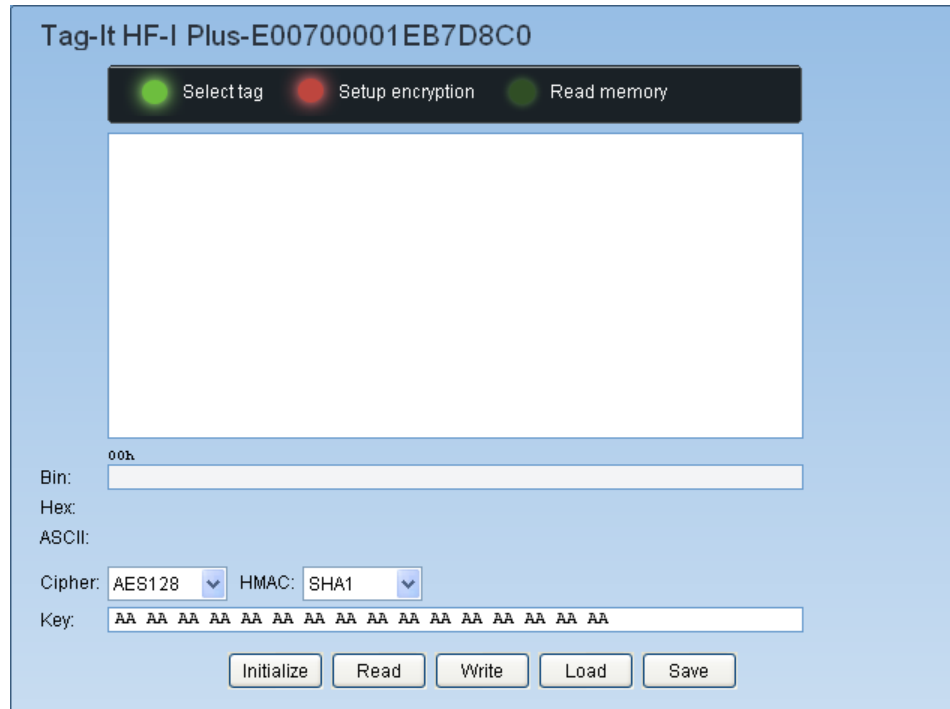
Secure Memory

(Applies to SkyeModule M2 and M4 readers and compatible tags only. This feature requires specific firmware—contact SkyeTek for more information.)

This demonstration lets you check your reader's ability to read and write with encryption and hashing.

● To access this screen, click on the **Capabilities tab**, then the **Secure Memory** tab.

● Refer to your SkyeModule reader's reference guide for more information on Cipher and HMAC functions and for a full discussion of Secure Memory commands.

Figure 3-5 Secure Memory Demonstration Function

How to Use:

1. Select a Cipher from the pull-down menu. (The HMAC uses the SHA-1 algorithm only and is not selectable with this release.)

2. Enter a hexadecimal key value in the key field.

3. Click on the **Initialize** button. This initializes the tag to use the secure algorithms and keys selected.

4. Click on the **Read** button to read all the memory.

5. Click on one of the editable fields below the memory display (Bin, Hex or String).

6. Type a new data value into the selected field. As the edit field changes, the memory display updates with the memory for the selected mode.

7. Click on the **Write** button to write the encrypted data values to the tag.

Protocol

The Protocol tab lets you send specific SkyeTek Protocol v3.0 (STPv3) commands to the reader so that you can develop and test software to support your specific application.

● For detailed information on understanding and using STPv3 commands, flags, fields, and responses, refer to the *SkyeTek Protocol v3 Reference Guide*.

● Refer to the reference guide for your SkyeModule reader for reader-specific examples of using STPv3 commands.
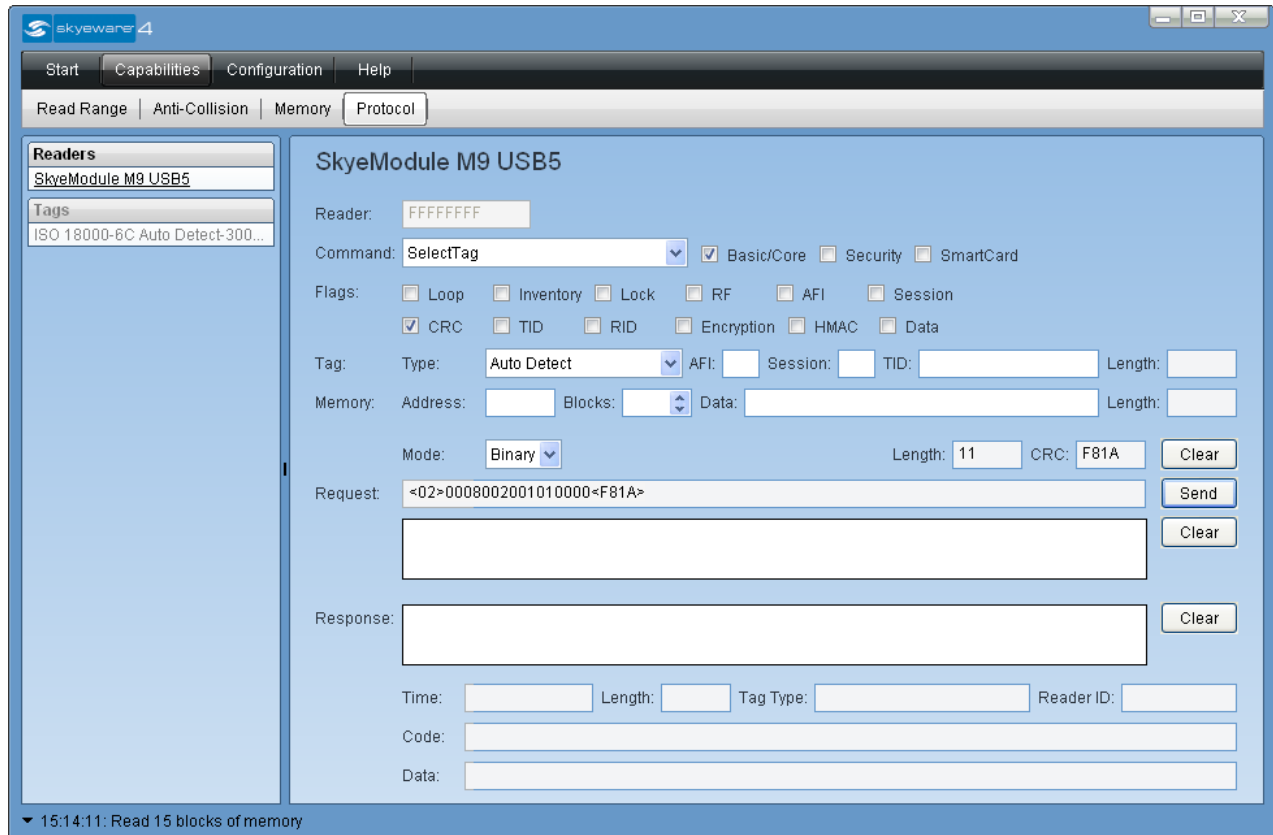
Figure 3-6   Protocol Panel

<u>How to Use</u>:

To execute a command:

1. Click on the arrow next to the Command field. This displays a pull-down list of all reader and tag commands.
2. Click on a command on the list.
3. Enter additional values for the command parameters:
   ● Reader—Lets you specify a reader ID if you click the RID flag checkbox.

- Flags: SkyeWare automatically highlights the available flags for each command that you select from the command list.

  - Loop—enables loop mode for tag selection. (See "Using Loop Mode" on page 35 for more information.)

  - Inventory—enables Inventory mode for tag selection

  - Lock—the command will lock tags or blocks of tag memory

  - RF—keep the RF detection field activated after the command executes

  - AFI—the command will use the Application Field Identifier (AFI) field to select tags

  - Session—use the Session Field to select tags

  - CRC—CRC required for the request or response

  - TID—Tag ID (TID) present in the request

  - RID—Reader ID (RID) present in the Request (see Reader field above)

  - Encryption—write or read data will be encrypted

  - HMAC—verify the HMAC for read and write commands

  - Data—data is present in the command

  (Required flags for each command and flag combinations are described in the *SkyeTek Protocol v3 Reference Guide.*)

- Tag parameters:

  - Type—Specifies the type of tag with which the reader module communicates (select from pull-down list)

  - AFI value—specifies the Application Field Identifier (AFI) used to detect a tag in the RF field

  - Session—specifies the session number to be used with a series of commands

  - TID—specifies the tag ID to which the command is directed

  - TID Length—the length of the Tag ID

- Memory parameters:

  - Address—specifies the address

  - Blocks—specifies the amount of data to be written by or read from the reader module. (The location of the data is specified by the Address field.)

  - Data—the data being sent with the command

  - Data Length— the exact number of bytes required by the data field

- Mode (binary or ASCII)

- Length—the length of the command in bytes (automatically calculated)

- CRC (automatically calculated; mandatory in binary mode, and optional in ASCII mode)

4.   Click the **Send** button to send the command to the reader to be executed. The response is displayed in the Response area.

You can also:

● Click the **Clear** button to clear the screen and reset the screen to its default values.

● Read and write to all system parameters supported by the reader. (See the reference guide for your SkyeModule reader for more information on which parameter address and values are supported.)

● Perform all tag commands supported by the reader, including communications with specific tag types. (See the protocol document for supported commands and the reference guide for specific tag examples.)

● Use the memory field for writing to system parameters or when reading and writing to tag memory. (See the reference guide for your SkyeModule reader for the address, number of blocks and valid data values for different system parameters.)

● Select whether data is transmitted in ASCII or binary format – when using binary mode, the CRC flag is required.

The Response section displays all responses to commands in the text field with a time stamp of when the response was received. You can also:

● Click the **Clear** button to clear the screen and reset the defaults.

● View the response received from the reader in the Code field.

● View contents of the Tag Type field which is valid when sending tag commands only and provides the tag type being used.

● View the contents of the Data field, which contains the data stored in the specified address or the tag id when issuing a Select Tag command.

Performing Tag Operations

The following examples show how to perform basic tag commands with the SkyeModule M2, M4, M7, M9 or M10. See the reference guide for your SkyeModule reader for further examples specific to your reader.

Selecting a Tag

Selecting a Single Tag

To send a basic Select Tag command for a single tag:

1. Click on the **Capabilities** tab, **Protocol** subtab. This displays the Protocol panel with the following defaults set:

    - Select Tag command displayed in the Command field

    - CRC flag set (this automatically calculates the CRC)

    - Tag Type set to Auto Detect

    - Binary mode

2. Hold a tag in the detection field.

3. Click **Send**. This sends the command to the reader and displays the reader response as soon as it is received (Figure 3-7).
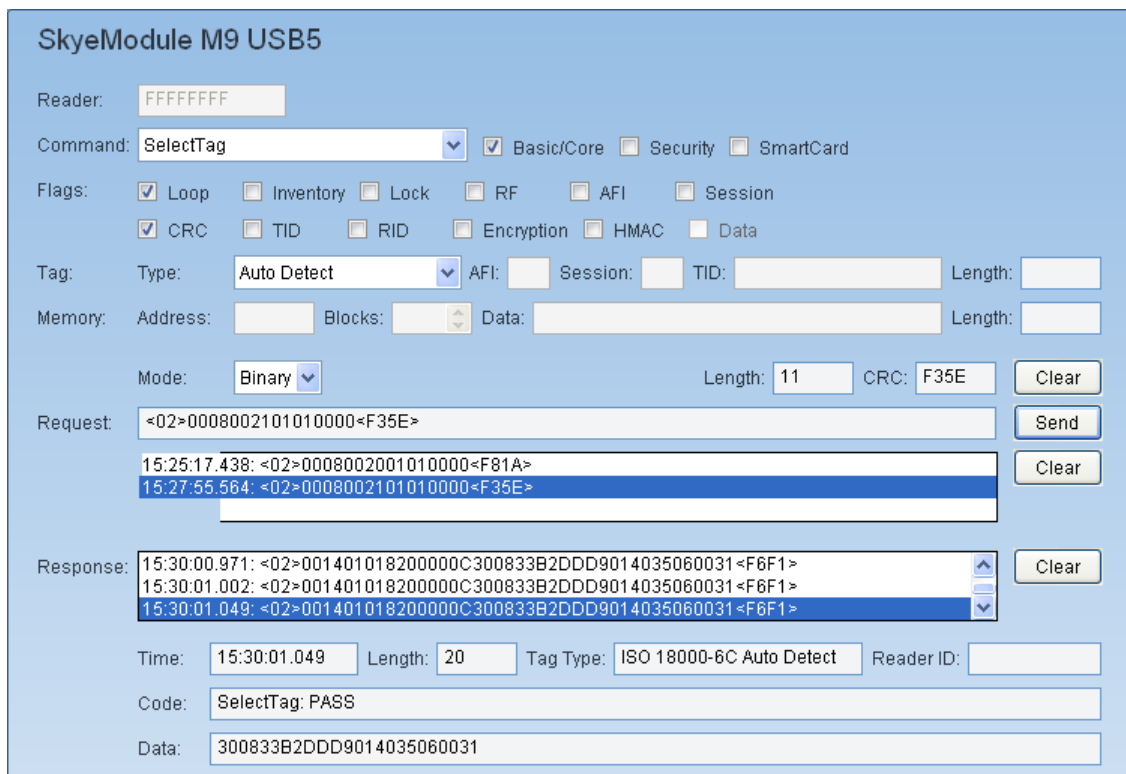
Figure 3-7 Select Tag Command for Single Tag

Using Loop Mode

Loop mode lets you set up continuous monitoring of whatever supported tag is detected.

Note – Loop mode is designed for demonstrations and read range testing. Therefore, loop mode only works when the reader ID is set to the factory default of FFFFFFFF. In typical working applications, readers with unique reader ID's are grouped together on one port or host; they do not need to remain in loop mode, because the host system usually switches between different readers quickly and frequently. See "Configuring the Reader" on page 50 for more information about reader IDs.

To send a Select Tag command using loop mode:

1. Click on the pull down menu arrow in the Command field and choose **Select Tag** from the list.

2. Click on the **Loop** check box in the Flags area.

3. Hold a tag or multiple tags in the detection field.

4. Click **Send**. The reader sends the command and displays a response for each tag detected, then repeats.

5. Remove the tag(s) from the field or click on the **Send** button again to end loop mode. (Sending any new command ends loop mode.) Figure 3-8 shows the command and the reader responses for a single tag with loop mode ended by resending the same command.

Figure 3-8   Select Tag Command Using Loop Mode

Using Anti-Collision (Inventory) Mode

Anti-collision or inventory mode lets you set up continuous monitoring of whatever supported tag is detected. To send a Select Tag command using loop mode:

1. Click on the pull down menu arrow in the Command field and choose **SelectTag** from the list.

2. Click on the **Inventory** check box in the Flags area.

3. Hold a multiple tags in the detection field.

4. Click **Send**. The reader sends the command and displays a single response for each tag detected, followed by a short response to indicate that the inventory is complete. (There can be any number of tag responses depending on the number of tags in the field.)Figure 3-8 shows the command and the reader responses for four tags with an inventory-complete response.
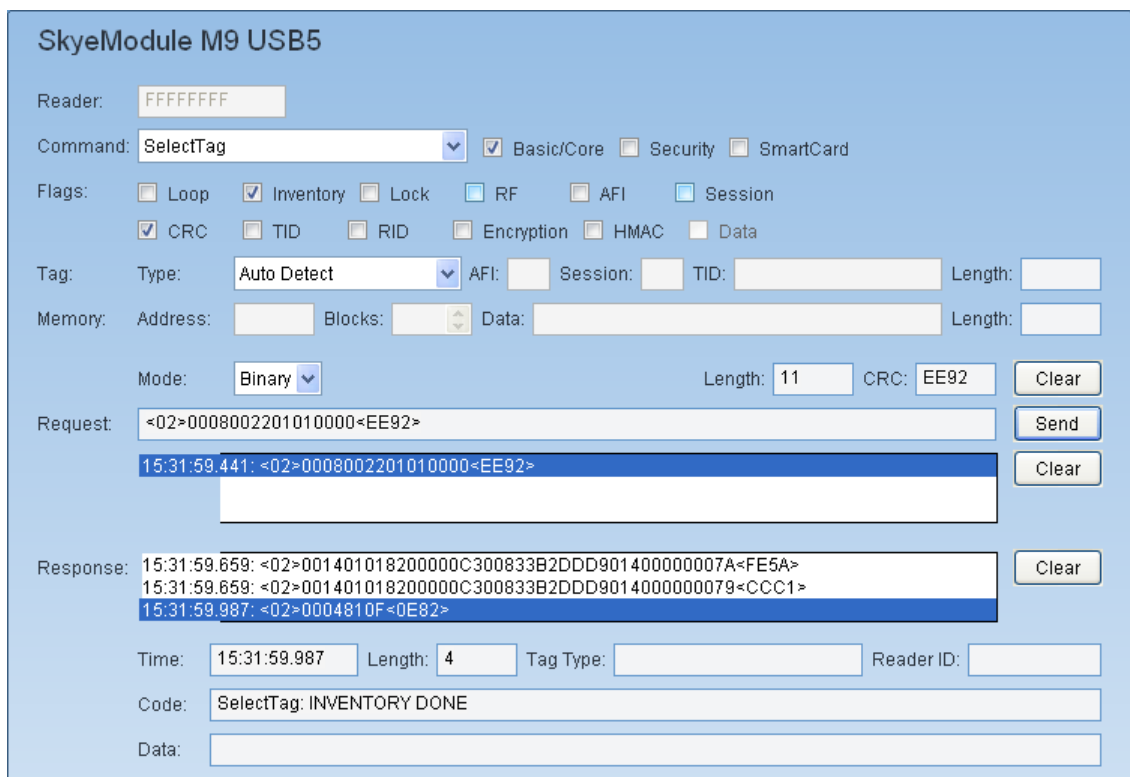
Figure 3-9   Select Tag Command Using Inventory Mode

—

Reading a Tag

The ReadTag command lets you read the contents of a tag's memory. For example, to read one block of data at address 1 of a ISO18000-6B tag:

1. Place the tag in the detection field.

2. (Required for some tags, optional for ISO18000-6B tags) Provide a Tag ID:

   a. Send a Select Tag command, as described in "Selecting a Tag" on page 34. When the reader sends a response for a successful select operation, it displays the Tag ID (TID) in the Data field at the bottom of the Response area.

   b. Copy the TID from the Data field.

   c. Click on the pull down menu arrow in the Command field and choose **ReadTag** from the list.

   d. Select the **TID** checkbox in the Flags area. (The CRC flag is automatically selected while in binary mode.)

   e. Paste the TID into the TID field in the Tag parameters area.

3. Select a tag type that matches the type of your tag from the Tag: Type pull-down menu. (ReadTag requires a specific tag type.)

4. Enter **0001** in the Memory: Address field. (ReadTag requires a specific address.)

5. Enter **1** in the Blocks field. (ReadTag requires a specific block number.)

6. Click the **Send** button. This sends the ReadTag command to the reader and displays the response. If the command is successful, SkyeWare lists the contents of block 1 at address 1 in the data field in the Response area (Figure 3-10).

Figure 3-10   Reading a Tag

Writing a Tag

The WriteTag command lets you write data to a tag's memory. For example, to write one block of data to memory at address 1 to an ISO18000-6B tag (does not require inclusion of a TID):

1. Place the tag in the detection field.

2. Select a tag type that matches the type of your tag from the Tag: Type pull-down menu. (WriteTag requires a specific tag type.)

3. Enter **0001** in the Memory: Address field. (WriteTag requires a specific address.)

4. Enter **1** in the Blocks field. (WriteTag requires a specific block number.)

5. Enter a hex string in the Memory: Data field (for example, 1234567812345678).

6. Click the **Send** button. This writes the data to the address specified and displays the response from the reader (Figure 3-11).
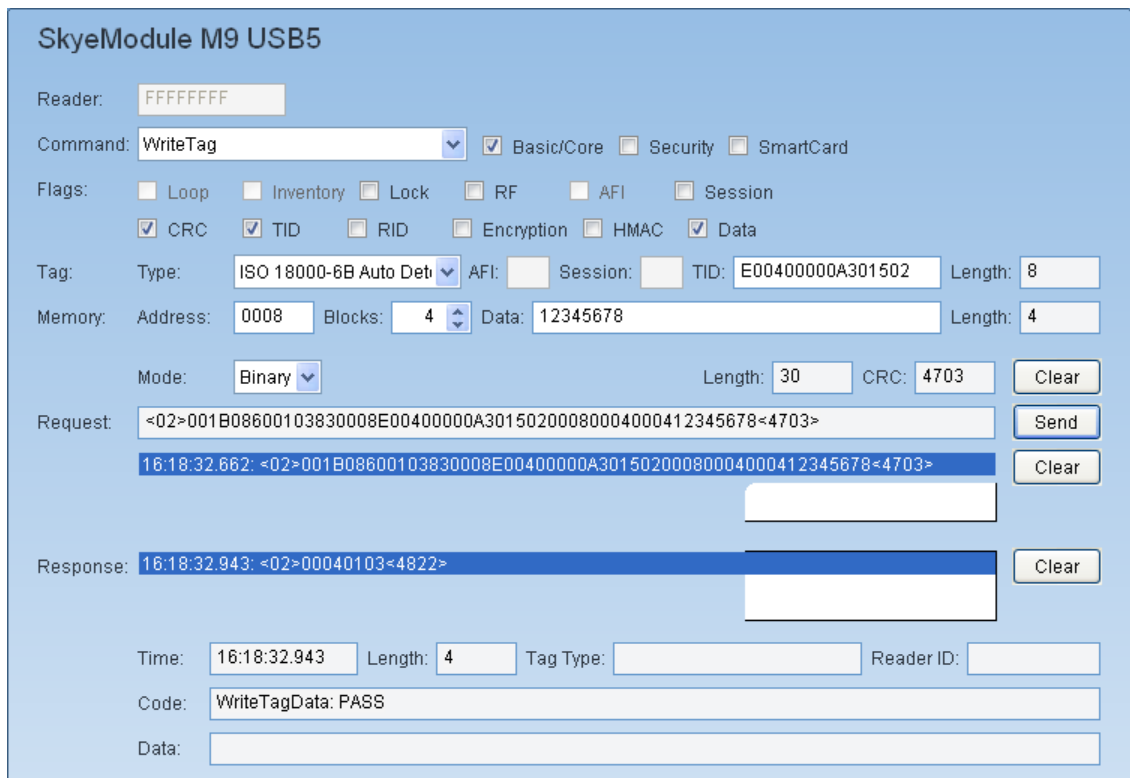
Figure 3-11   Writing to a Tag

Chapter 4

Using SkyeWare 4 Applications

Overview

The SkyeWare 4 Applications tab gives you high-level evaluation tools that demonstrate basic features of your SkyeModule M2 or M4 readers. This chapter discusses each application.

Figure 4-1   The SkyeWare 4 Applications Tab

Table 4-1   Summary of Applications (M2 and M4 only)

Application (subtab)	Description
Product Authentication	Configures tags with security and usage policies
Access Control	Encodes tags to limit access to entryways
Asset Tracking	Tracks product or asset information through different locations

Note – Not all applications work with all tags. SkyeWare 4 displays only the application subtabs available for the currently detected tag. If you are using a SkyeModule M4 reader, you must load the correct firmware to enable each application. See "Changing M4 Firmware Personalities" on page 59 for more information.

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Product Authentication

(Applies to SkyeModule M2 and M4 readers and compatible tags only.)

Note – If you are using a SkyeModule M4 reader, you must load the correct firmware to enable each application. See "Changing M4 Firmware Personalities" on page 59 for more information.

This application lets you configure tags to control product usage. A vendor can encode a product tag with a signature and product policies, and a consumer using the product can verify the policies

To access this screen, click on the **Capabilities tab**, then the **Product Authentication** tab.
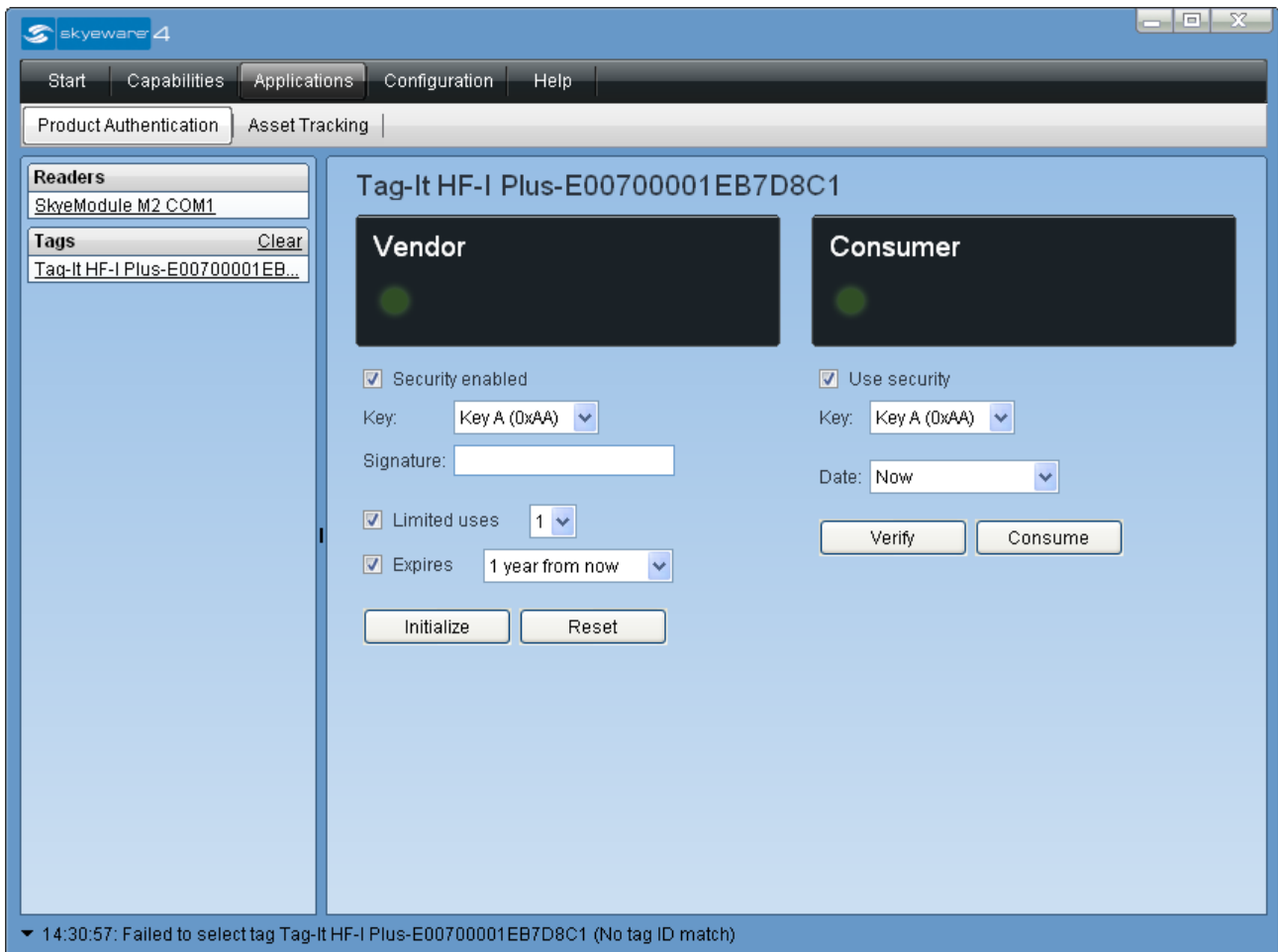
Figure 4-2 Product Authentication Application

Note – SkyeTek recommends that you use an external antenna with this application.

How to Use:

1. (Optional) On the Vendor side of the screen, click the "Security enabled" checkbox if you wish to encrypt the information on the tag. This enables the Key field.

2. If you enabled security, select an encryption key from the Key pull-down menu.

3. Type a signature into the Signature field.

4. Select a number of valid uses for the tag from the Limited Uses pull-down menu.

5. Select the length of time until expiration from the Expires pull down menu.

6. Click on the **Initialize** button. This writes the key, signature, and policy information to the tag. (The green light flashes during initialization and remains on after the write is complete.)

7. (Optional) On the Consumer side of the screen, click the "Use security" checkbox if you set up the tag with encryption on the Vendor side. This enables the Key field.

8. If you enabled security, select the corresponding key from the pull-down menu on the Consumer side of the screen. (If you select the wrong key, you cannot validate the product.)

9. Select a date within the valid date range for the tag from the Date pull-down menu.

10. Click on the **Verify** button. This verifies the security and reads the signature and policy information.

11. Click on the **Consume** button to simulate consuming the product. This deletes one of the allowed uses and displays the number of uses left. (Exceeding the allowed number of uses displays "Product Depleted.")

12. Click the **Reset** button on the Vendor side to erase all values so you can re-use the tag.

Access Control

(Applies to Skyemodule M2 and M4 readers and compatible tags only.)

Note – If you are using a SkyeModule M4 reader, you must load the correct firmware to enable each application. See "Changing M4 Firmware Personalities" on page 59 for more information.

This application simulates using RFID tags to grant access to different entryways. You configure one or more tags to have access to one or more doors and then check each tag against each door. Only tags with access granted are permitted.

To access this screen, click on the **Capabilities tab**, then the **Access Control** subtab.
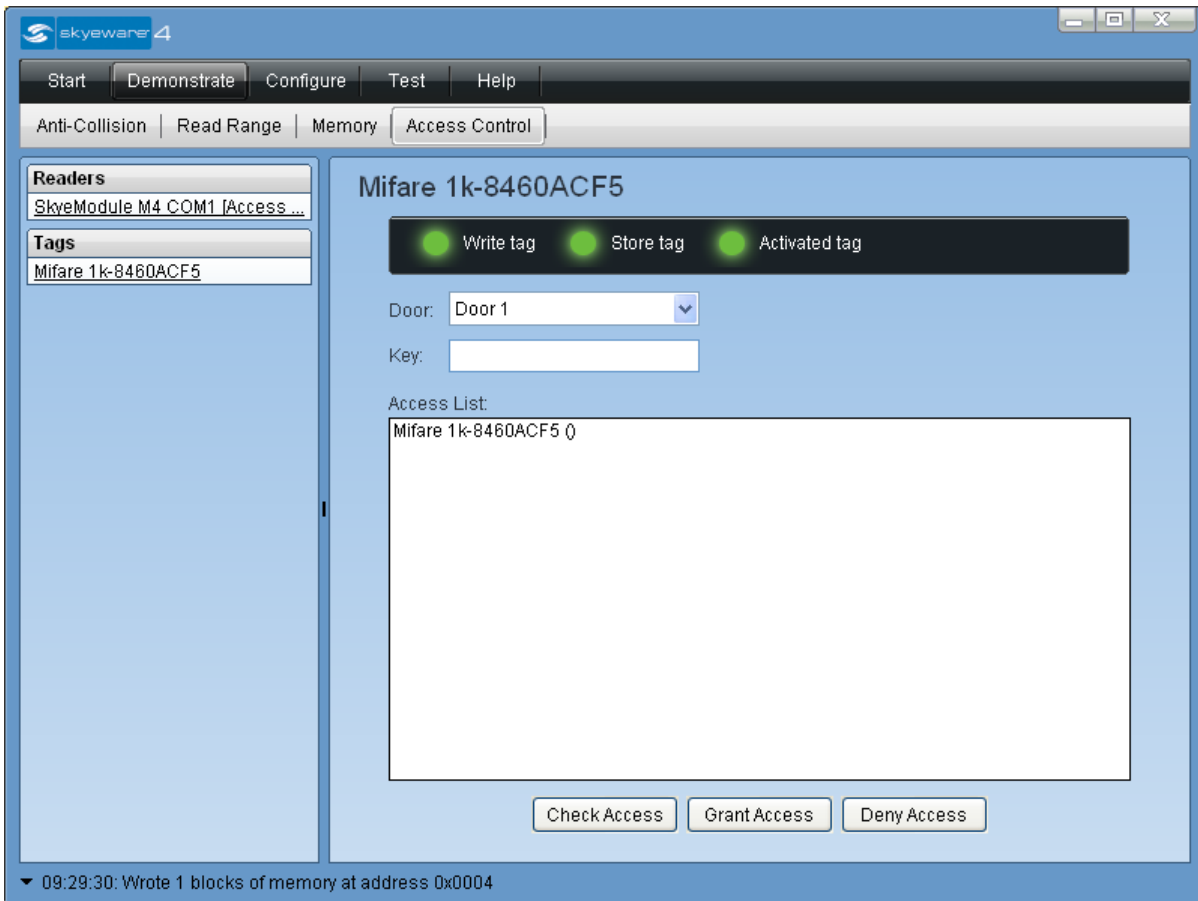
Figure 4-3   Access Control Function

<u>**How to Use**</u>:

1.   Place the tag or tags to configure in the read field. The tag information appears at the top of the panel and in the Access List display.

2. (Optional) If you are using multiple tags in the field, click on the tag you wish to work with in the tag list on the left side of the screen.

3. Select a door from the pull-down menu in the Door field.

4. Enter a unique key for that door.

5. (Optional) Grant access to the door by clicking on the **Grant Access** button. This configures the tag for access that door and adds the tag to the Access List.

6. (Optional) Deny previously granted access by selecting a tag from the Access list and clicking on the **Deny Access** button. This configures the tag to deny access to that door and removes the tag from the Access List.

7. Repeat Steps 1-4 for each tag you wish to configure.

8. (Optional) Use the following procedure to verify the access permissions:

    a. Place one of the configured tags in the read field.

    b. Click **Check Online** to check a tag against a door. If the tag is permitted, it is granted access. If the tag is not permitted, it is rejected as having invalid credentials. (This simulates the process of performing a lookup of the tag against an online database.)

Asset Tracking

(Applies to SkyeModule M2 and M4 readers and compatible tags only.)

Note – If you are using a SkyeModule M4 reader, you can load either the Product Authentication or Access Control firmware personalities to enable the Asset Tracking application. See "Changing M4 Firmware Personalities" on page 59 for more information.

This application lets you simulate the process of product or asset tracking through different locations. For example, a tagged asset such as a bottle of medicine could be tracked from warehouse to pharmacy to supply cabinet to patient location. The demo tracks the entry and exit of the tag through each location.

To access this screen, click on the **Capabilities tab**, then the **Asset Tracking** subtab.
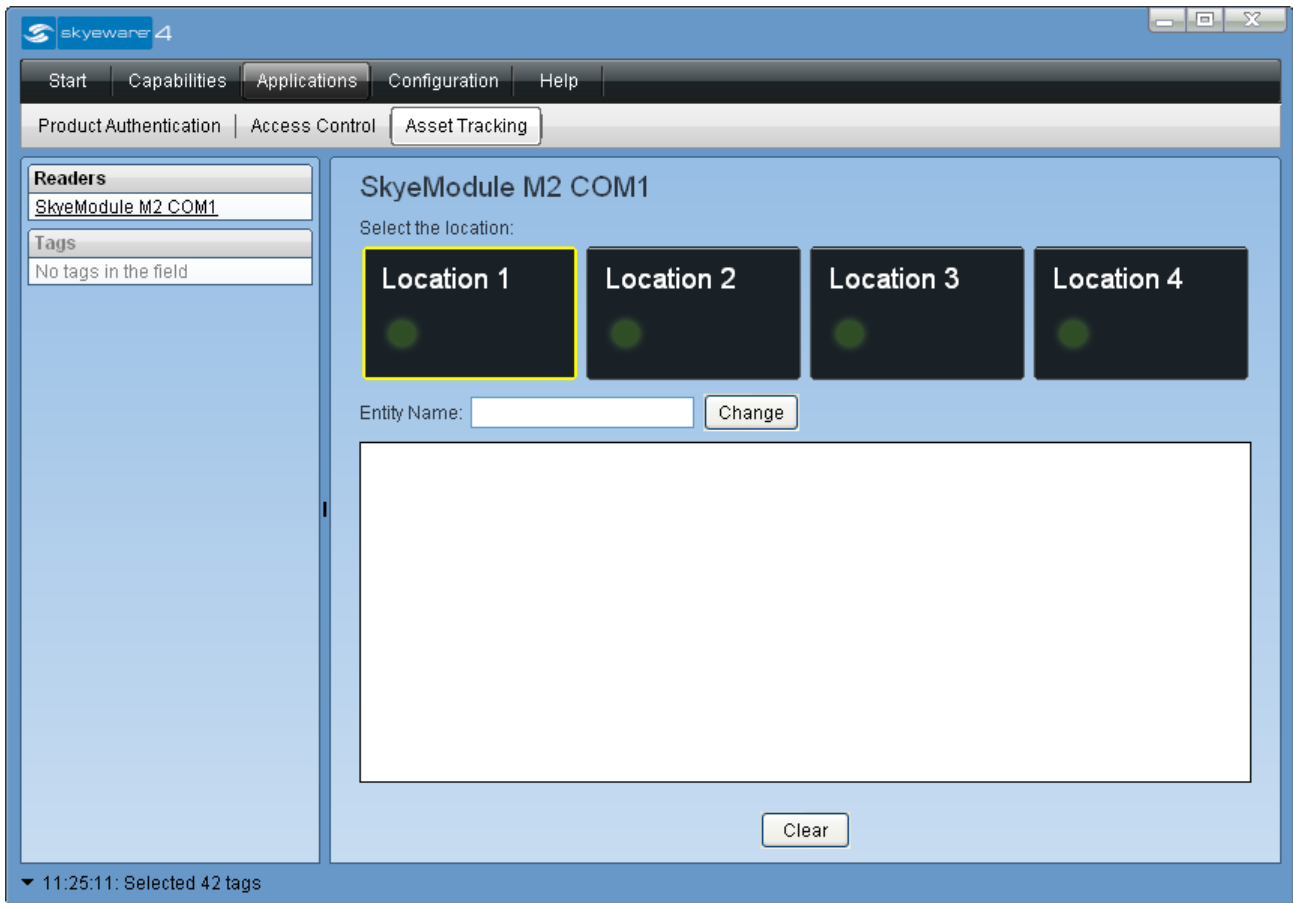
Figure 4-4   Asset Tracking Application

How to Use:

1. Place a writable tag the read field. The tag information appears at the top of the panel and in the data display.

2. Click on the Location 1 box. The green light glows and the tag is listed by its TID in the Entity Name field. (Figure 4-4).

3. (Optional) Give the tag an alias by typing a name in the Entity Name field, and then clicking the **Change** button. The data display area shows the new alias in the list of events (Figure 4-5).

Note – When you assign an alias to a tag, SkyeWare uses the alias instead of the TID in all tag lists and data lists.

4. Remove the tag from the field. The data area shows that the tag has left the Location 1 (Figure 4-6).
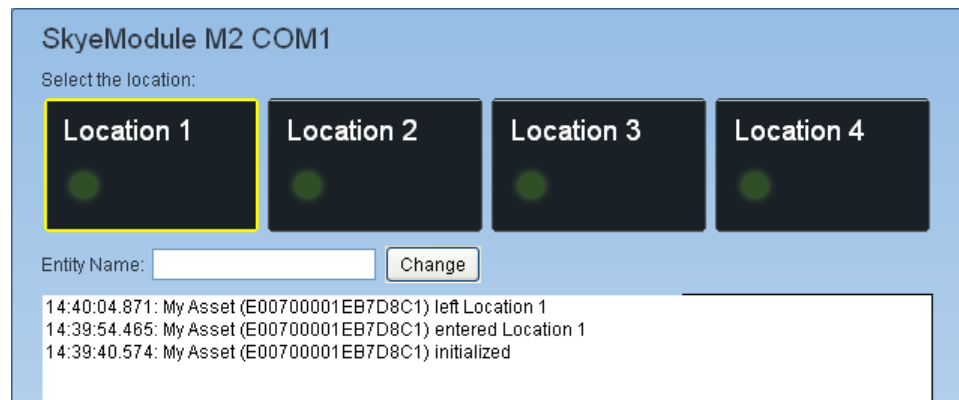
Figure 4-5   Initialized Tag at Location 1

5. Click on the Location 2 box.

6. Put the tag back into the detection field. The tag's product name is displayed, and the data area shows that the tag has entered Location 2. The green light glows to show that Location 2 is active (Figure 4-7).
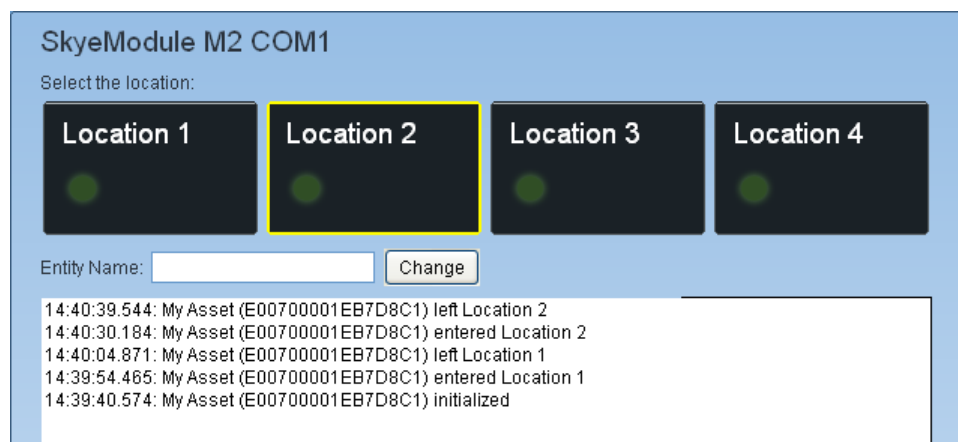
Figure 4-6   Initialized Tag Leaving Location 2

Using SkyeWare 4 Applications   45

7. Remove the tag from the field. The data area shows that the tag has left Location 2.

8. Click on the Location 3 box.

9. Put the tag back into the detection field. The tag's product name is displayed, and the data area shows that the tag has entered the Location 3. The green light glows to show that Location 3 is active.
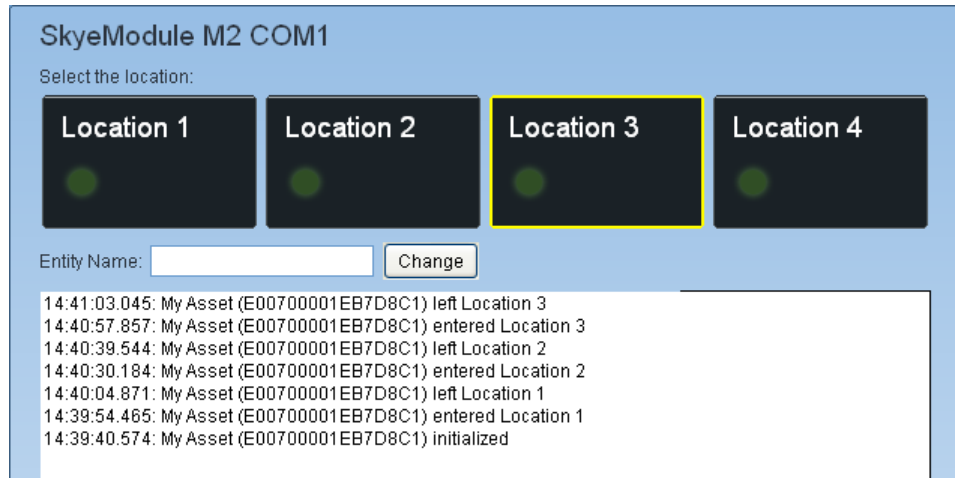
Figure 4-7   Initialized Tag Entering Location 3s

10. Remove the tag from the field. The data area shows that the tag has left Location 3.

11. Click on the Location 4 box.

12. Put the tag back into the detection field. The tag's product name is displayed, and the data area shows that the tag has entered the Location 4 area. The green light glows to show Location 4 is active.
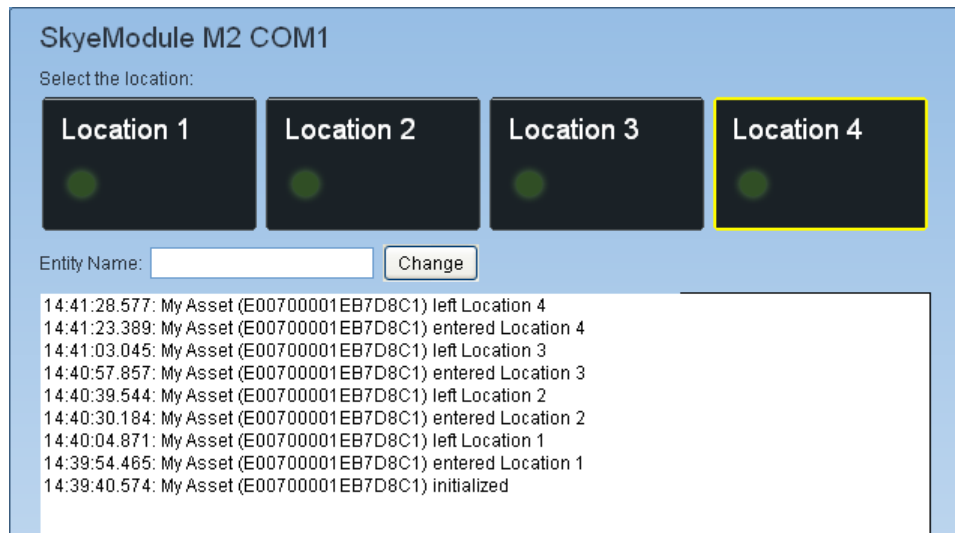
Figure 4-8   Initialized Tag Entering Location 4

13. Remove the tag from the field. The data area shows that the tag has left Location 4, simulating the end of the asset tracking cycle. The data field shows the asset history for all locations.

14. (Optional) Click **Clear** to erase the tracking information in the data area.

Asset Tracking

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Chapter 5

Configuring Your System

Overview

SkyeWare 4's Configuration tab lets you easily customize the full functionality of the SkyeModule reader and the tags it supports. This chapter discusses each configuration function.

Figure 5-1   SkyeWare 4 Capabilities Tab

You can:

- Configure SkyeModule reader settings (see page 50)
- Set radio parameters (see page 53)
- Upgrade firmware (see page 57)
- Change between firmware personalities (M4 only; see page 59)
- Configure tag settings (see page 61)

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Configuring the Reader

Display the Reader Configuration panel by clicking on the **Configuration** tab and then the **Reader** subtab.
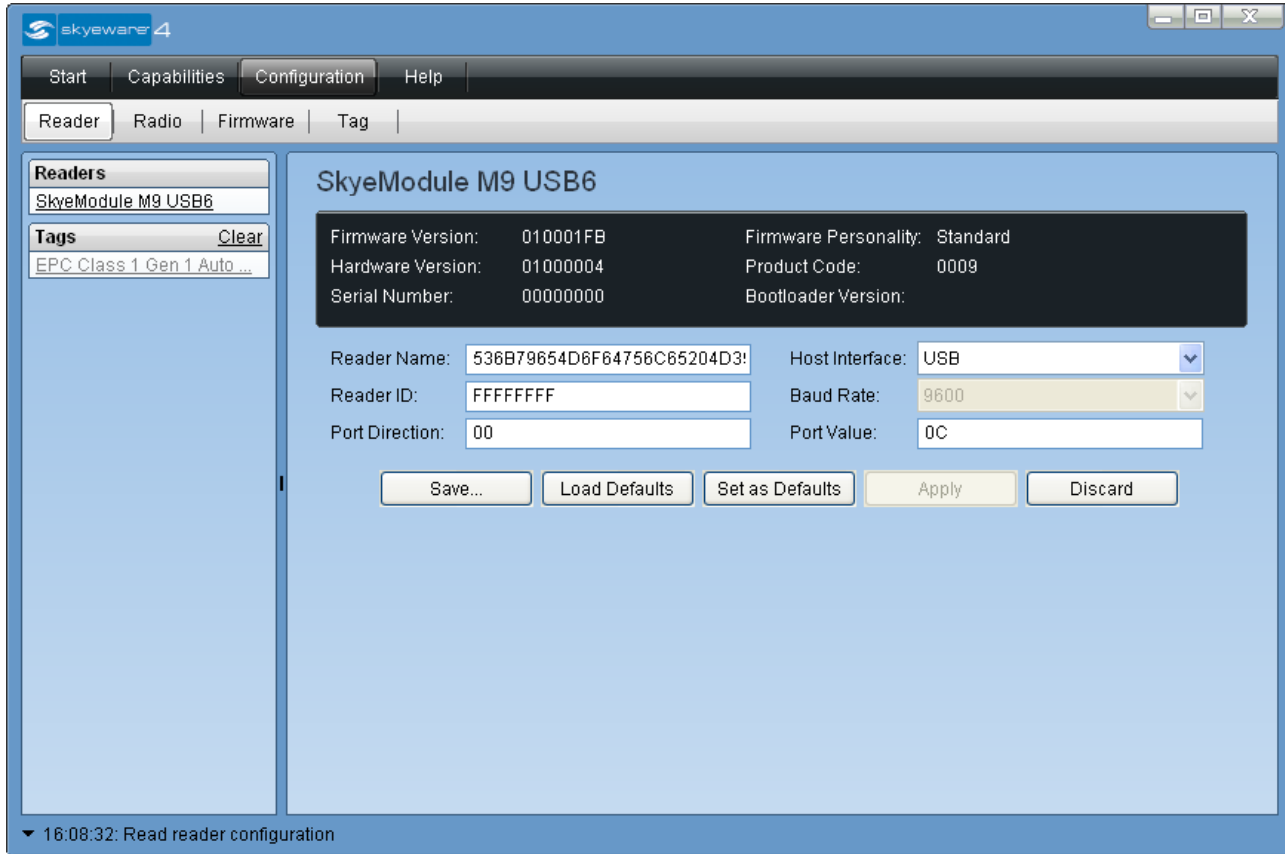
Figure 5-2   Reader Configuration Panel

The reader configuration panel lets you configure system parameters for the SkyeModule reader.

- The panel title shows the name of the currently-connected reader.

- The black display box shows read-only parameters, including the firmware type.

- The rest of the screen shows editable parameters and actions.

All readers and tags are automatically discovered by the software.

How to Use:

To change the reader settings:

1. Edit any of the fields in the middle of the screen. The following options are available:

   ● **Reader name**—a text name that you assign to identify the reader (e.g., MyReader, Access Controller, DockDoor, Supply Manager, etc.)

   ● **Reader ID**—a hex value that uniquely identifies a reader.

Note – Loop mode is designed for demonstrations and read range testing. Therefore, loop mode only works when the reader ID is set to the factory default of FFFFFFFF. In typical working applications, readers with unique reader ID's are grouped together on one port or host; they do not need to remain in loop mode because the host system usually switches between different readers quickly and frequently. (See "Configuring the Reader" on page 50 for more information about reader IDs.)

   ● **Port direction**—specifies whether a GPIO pin is used for input or output. A value of one indicates an input, and a zero value indicates an output. GPIO pins can be used to light LEDs, activate sound buzzers, or provide feedback to other devices.

   Refer to the system parameters section of the reference guide for your SkyeModule reader for more information.

   ● **Host interface**—specifies the host interface (USB, serial, SPI, or I^{2}C).

   ● **Baud rate**—sets the baud rate for serial communications only. Default rate is 34800.

   ● **Port value**—function varies according to the port direction:

      ● When the GPIO port is an input, the port value reads the line state. If the state is above 3.3 V, it reports back a value of one. If the state is below 0.8 V, it reports back a value of zero.

      ● When the GPIO port is an output, the port value sets the state of the GPIO line. A one value specifies a 3.3 V output, and a zero value specifies a 0.0 V output. (For the state to be set correctly, the most significant bit of the value must be set to one.)

   Refer to the system parameters section of the reference guide for your SkyeModule reader for more information.

2. (Optional) To erase the typing in the editable fields without saving them or sending them to the reader, click on the **Discard** button.

3. Click the **Apply** button. This sets the reader to use the current values for the writable fields.

The following actions are also available:

- To save the current settings to a file, click on the **Save** button. (This can be useful if you wish to revert to the current reader settings after changing them or to help capture information if you have a support issue.)

- To load the reader's default settings, click on the **Load Defaults** button.

- To make the current settings for the reader into the new defaults, click on the **Set as Defaults** button.

Configuring Radio Settings

(Applies to SkyeModule M7, M9 and M10 readers only.)

Display the Reader Configuration panel by clicking on the **Configuration** tab and then on the **Reader** subtab.
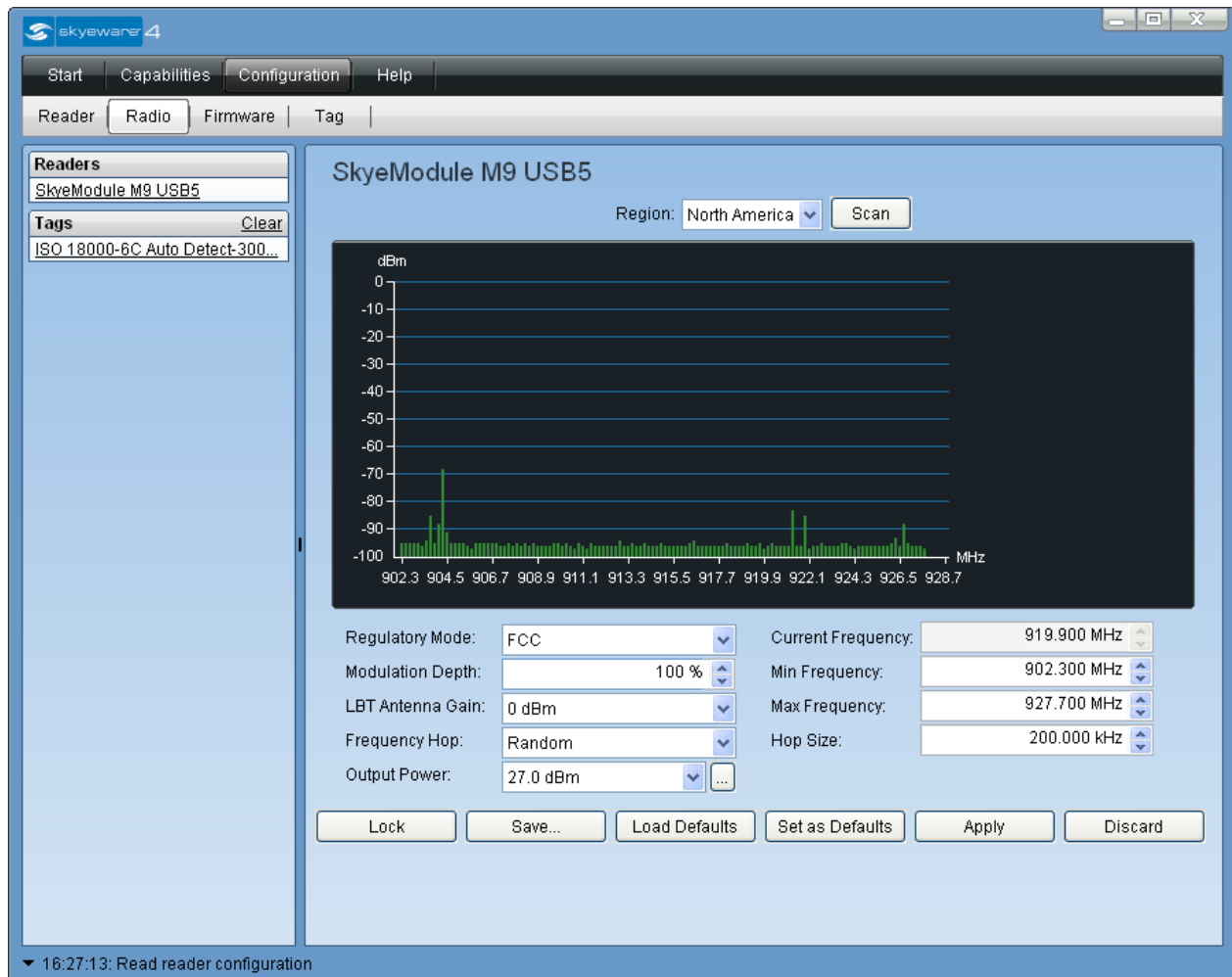
Figure 5-3 Radio Configuration Panel

The reader configuration panel lets you configure the SkyeModule system parameters.

● The panel title shows the name of the currently-connected reader.

● The black display box contains the radio frequency scan graph, which shows the power and frequencies at which interference is detected by the reader.

● The rest of the screen shows editable parameters and actions.

How to Use:

1. (Optional) Select a Region setting (North America, ETSI, China, etc.) from the pull-down list at the top of the main panel. The reader automatically lists the radio settings for that region standard while the display shows a graphic of the range and active radio channels.

   ● Click the **Apply** button to applies any changes to the Region setting.

   ● Click the **Set as Defaults** button to write the current settings to the reader as the new default settings. This causes the reader to use the current settings the next time it restarts.

   ● Click the **Discard** button to erases any change without saving the values or sending them to the reader. (Clicking **Discard** will *not* undo changes after you have clicked the **Apply** button.)

2. (Optional) Click the **Scan** button at the top of the main panel to scan the active radio channels for signs of interferences, which are shown in the frequency graph. Click **Stop** to end the scan.

3. To change the reader settings, edit the writable fields in the middle of the screen. (The changes will not take effect until you click the Apply button, as described in Step 4 below.) There are fields for:

   Regulatory Mode—Enables pulse shaping, listen before talk, and timing modifications for regions with special regulatory requirements, such as Europe or Japan. Select a regulatory mode from the pull-down menu.

   Modulation Depth—Sets the modulation depth of the reader-to-tag transmissions. Click on the up or down arrows to increase or decrease the depth setting.

   LBT Antenna Gain (Applies only to European (ETSI) or Japanese regional settings)—Use the pull-down menu to adjust between the sensitivity of the listen-before-talk receiver when the LBT radio is on. Adjusting this parameter can cancel out the gain from an external antenna when listening for other transmitting signals.

   Frequency Hop—Use the pull-down menu to select between Random or Sequential frequency hopping.

   Output Power—Lets you specify the maximum output power.

   To adjust the output power according to what will work best for a given tag type.

   a. Place the tag for which you wish to optimize power in the read field.

   b. Click on the ⬜ dialog button beside the Output Power field. This opens the Power Help dialog (Figure 5-4 on page 55)
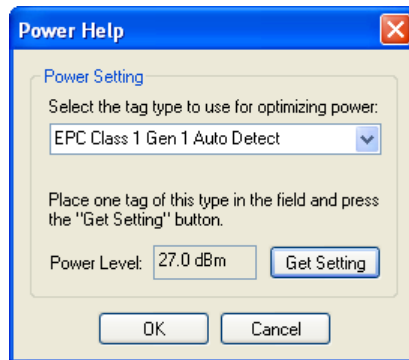
Figure 5-4   Power Help Dialog

    c.   Select the tag type from the pull-down list.

    d.   Click the **Get Setting** button. SkyeWare causes the reader to repeatedly read the tag at different output power levels and determines which the power level results in the most successful reads for the tag. The resulting power level shows in the Power Level field.

    e.   Click **OK**. This closes the dialog and automatically the reader to use the new power setting.

Current Frequency—Displays the current frequency with which the reader detects tags.

Min Frequency—The low end of the frequency range at which the reader operates. (Also known as Start Frequency.)

Max Frequency—The high end of the frequency range at which the reader operates. (Also known as Stop Frequency.)

Hop Size—Controls the hop channel spacing when frequency hopping is enabled.

Note – Refer to the system parameters section of the reference guide for your SkyeModule reader for more information about each specific parameter.

  4.   (Optional) Click on the function buttons at the bottom of the panel to use additional functions:

    ●   **Apply**—applies any changes you have made to the editable fields.

    ●   **Discard**—erases the typing in the editable fields without saving the values or sending them to the reader. (WARNING: Clicking **Discard** will not undo changes after you have clicked the **Apply** button.)

    ●   **Save**—Opens a file section window so you can save the current settings to a text file. (This can be useful if you wish to revert to the current reader settings after changing them or to help capture information if you have a support issue.)

    ●   **Load Defaults**—Re-applies the reader's default settings.

- **Set as Defaults**—Writes the current settings to the reader as the new default settings. This causes the reader to use the current settings the next time it restarts.

- **Lock**—Opens the Lock Settings dialog, which lets you lock specific settings so that they cannot be changed (Figure 5-5).

WARNING – Locking a radio setting permanently disables that setting on your reader. There is no way to unlock the setting using SkyeWare 4.

To lock settings, click the checkbox for each setting you want to lock, and then click the **OK** button.
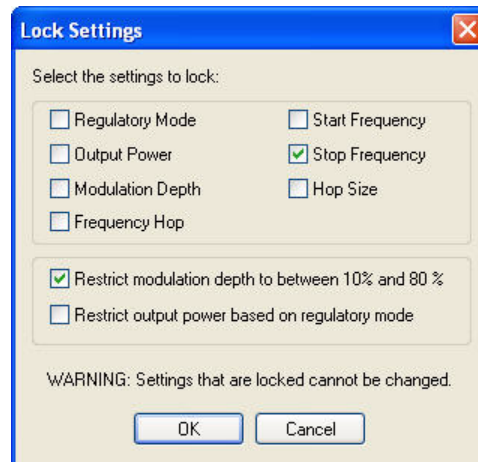
Figure 5-5   Lock Settings Dialog

Firmware

The Firmware tab lets you display firmware information and upgrade or reload firmware for your SkyeModule. To display the Firmware tab, click on the **Configuration** tab and then on the **Firmware** subtab.
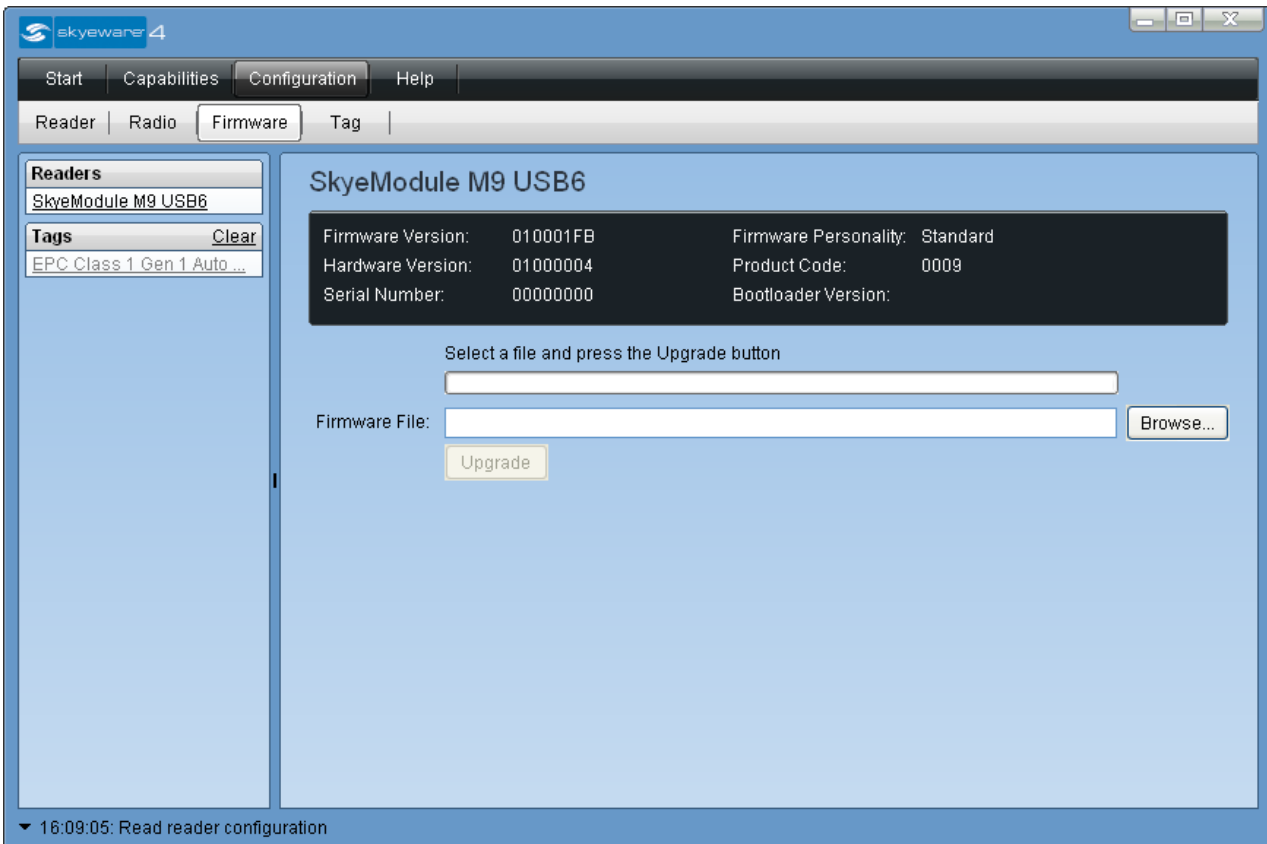
Figure 5-6   Firmware Configuration Panel

<u>**How to Use**</u>**:**

1.   Check the SkyeTek support portal at **support.skyetek.com** for announcements of updates to the SkyeModule M2, M4, M7, M9 or M10 firmware. SkyeTek will provide an updated SkyeTek hex format (.shf) file.

2.   Save the .shf file to the folder:

C:\\Program Files\SkyeWare 4 \Firmware

3.   Start SkyeWare 4.

4.   Click on the **Configuration** tab and then the **Firmware** subtab.

5. Click on the **Browse...** button to open a file selection window.
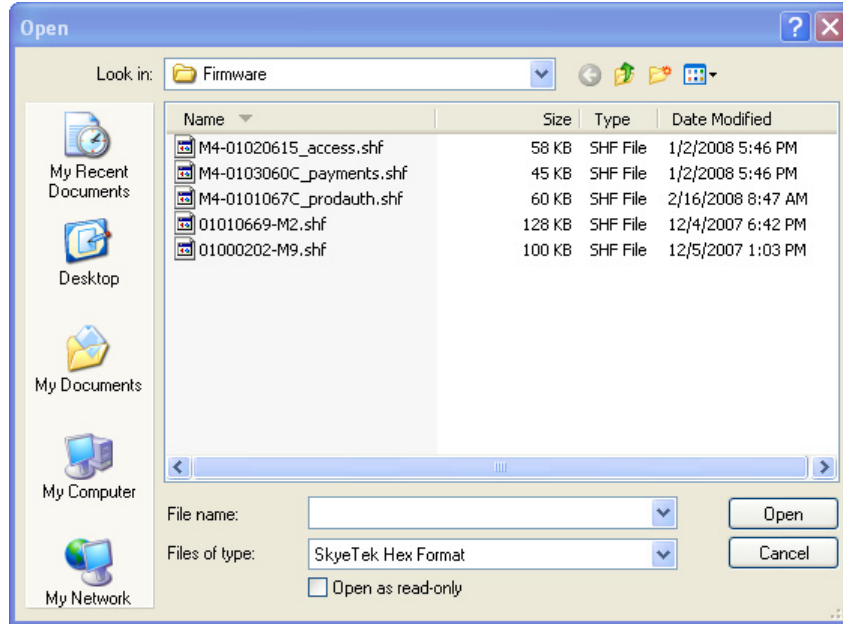
Figure 5-7   Firmware File

6. Click on the new firmware file in the file list.

7. Click **Open**. This closes the file selection window and displays the filename in SkyeWare 4.

8. Click **Upgrade** to start the upgrade process. The panel displays the update information and a progress meter. When the update is complete, the panel refreshes the reader information by querying the reader again. The personality is displayed on the Firmware Configuration panel title and information box.

9. Check the display area to verify that the new firmware information is correct.

You can also create your own firmware update utility. For more information:

1. Log on to the SkyeTek support portal at **http://support.skyetek.com**. (Contact SkyeTek to get an authorized login.)

2. Under the **Firmware** heading, click on **Creating Custom Update Utilities for SkyeModule Readers**. This PDF document contains the specifications you will need to create your own firmware update application.

Changing M4 Firmware Personalities

The SkyeModule M4 supports multiple firmware personalities:

● Product Authentication, also known as Consumables (ISO 15693 tags)

● Access Control (ISO 14443A and ISO 14443B tags)

● Asset Tracking (enabled by either the Product Authorization or the Access Control firmware)

Installing each personality enables feature sets that tailor the reader to the specific needs of your application and tag protocol.

To change between personalities:

1. Click on the **Configure** tab and then the **Firmware** subtab.

2. Click on the **Browse...** button to open a file selection window. Unless you specified a different folder when you installed SkyeWare 4, the default location for the firmware files is the folder:

   C:\\Program Files\SkyeWare 4\Firmware

3. Click on the firmware (.shf) file for the personality you want to install (Figure 5-8).

   ● `M4-*_prodauth.shf` enables the Product Authorization personality.

   ● `M4-*_access.shf` enables the Product Authorization personality

   ● Selecting either `M4-*_prodauth.shf` or `M4-*_access.shf` also enables the Asset Tracking personality.
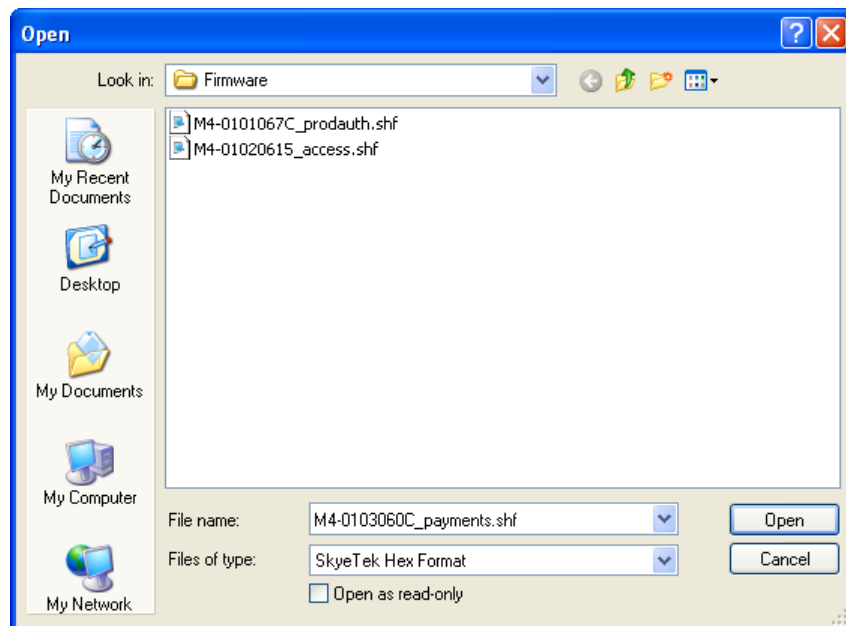
Figure 5-8 Firmware Personality Files

4. Click **Open**. This returns you to the Firmware Configuration panel.

5. Click **Upgrade** to start the upgrade process. The panel displays the update information and a progress meter. When the update is complete, SkyeWare queries the reader and refreshes the reader information displayed.

6. Check the firmware information to verify that the correct firmware personality has loaded.

Configuring Tags

The Tag panel lets you set the various settings for configurable tags. To display the Tag Configuration panel, click on the **Configuration** tab and then on the **Tag** subtab.
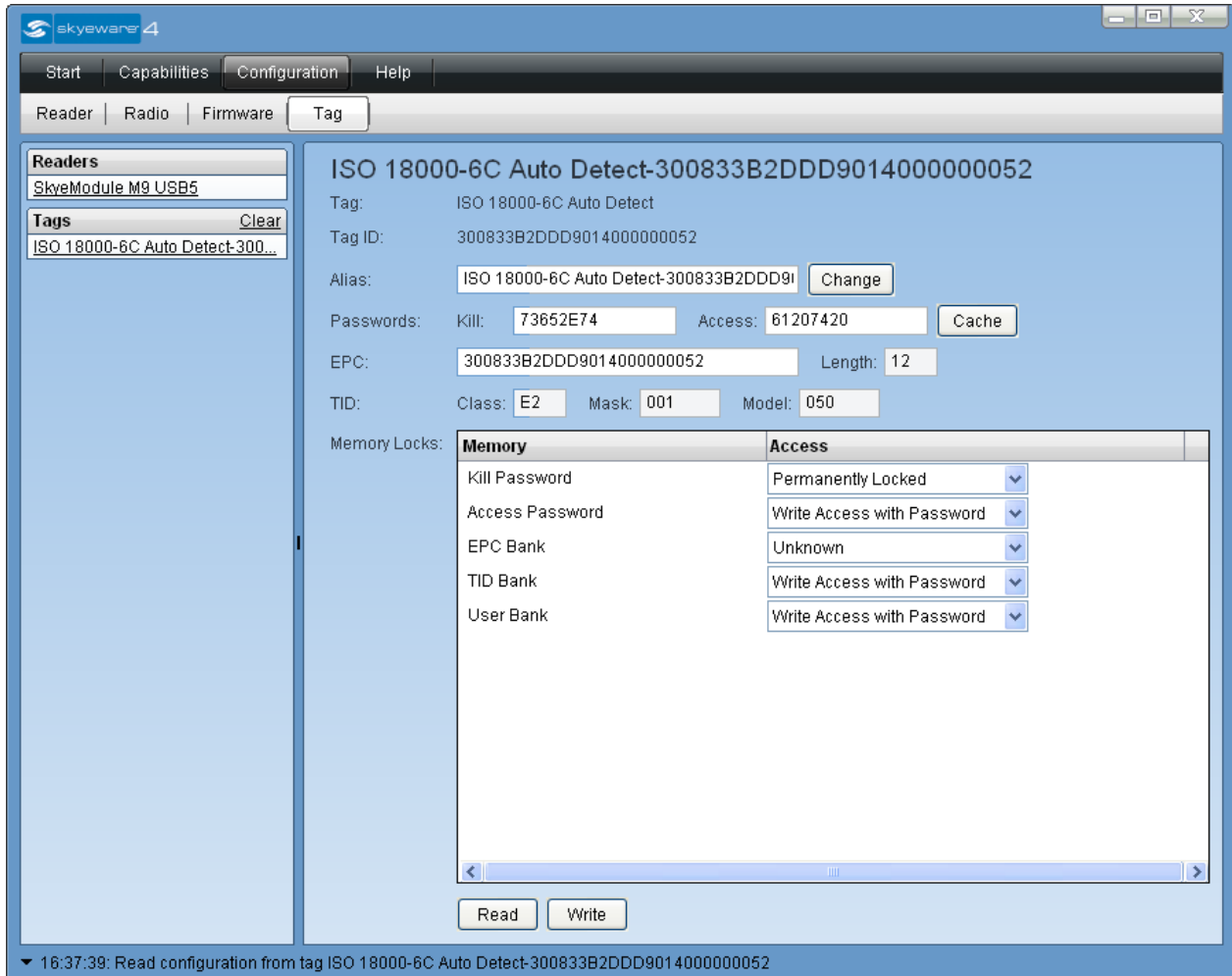
Figure 5-9   Typical UHF Tag Configuration Panel

Note – SkyeWare displays a different screen for each tag type, showing only the fields that are configurable for that tag type. For M4 readers, the **Tag** subtab appears

How to Use (M7, M9 or M10 UHF tags):

1. Place a configurable tag in the read field. SkyeWare. The screen displays the configurable fields for the tag.

2. Specify new values using the editable fields. Typical configurable fields for EPC Class 1 Gen 2 tags are as follows:

   ● **Alias**—When you assign an alias to a tag, SkyeWare uses the alias instead of the TID in all tag lists and data lists. Type a name in the Alias field, and then click the **Change** button. (This is the only configurable parameter for many tags.)

   ● **Passwords**—Lets you set the kill and access passwords (requires that you have access permission).

      ● To enter a new password, type the password in the Kill or Access field., and then click the **Write** button. This writes the password to the tag. for future use.

      ● SkyeWare 4 can memorize passwords so that you don't have to issue a password command each time you use a password-protected tag with SkyeWare. To store the access password for the tag, click the **Cache** button.

   ● **EPC**—Lets you edit Electronic Product Code information:

      ● **NSI**—Number System Identifier, identifies the

      ● **UII**—Unique Item Identifier

   ● **Oscillator bias**—(Read-only) displays the tag's current oscillator bias setting. The oscillator supplies a clock to the tag logic and defines the transmit data rate.

   ● **TID**—(Read only) Displays the tag Class, Mask, and Model.

   ● **Memory Locks**—lets you set access permissions for the access and kill passwords and for the EPC, TID, and User memory banks. For example, you can configure the tag so that it requires entry of the access password before any data is written to the EPC bank. The following permissions are available:

      ● **Unknown**—Indicates that a permission setting has not been applied.

      ● **Read, Write, or Read/Write**— Grants read, write, or read/write permission.

      ● **Permanent Read/Write**— Permanently grants read, write, or read/write access to the tag.

      ● **Write with Password**— Requires entry of the access password before data can be written to the tag.

      ● **No Access**— Password or memory block is not readable or writable.

3. (Optional) Click on the **Write** button to apply the changes to the tag.

4. (Optional) You can view actual memory contents block by block by clicking on the **Capabilities Tab** and **Memory** subtab. See "Memory" on page 28.

How to Use (M2 or M4 HF tags):

1. Place a configurable tag in the read field. SkyeWare. The screen displays the configurable fields for the tag (Figure 5-10).
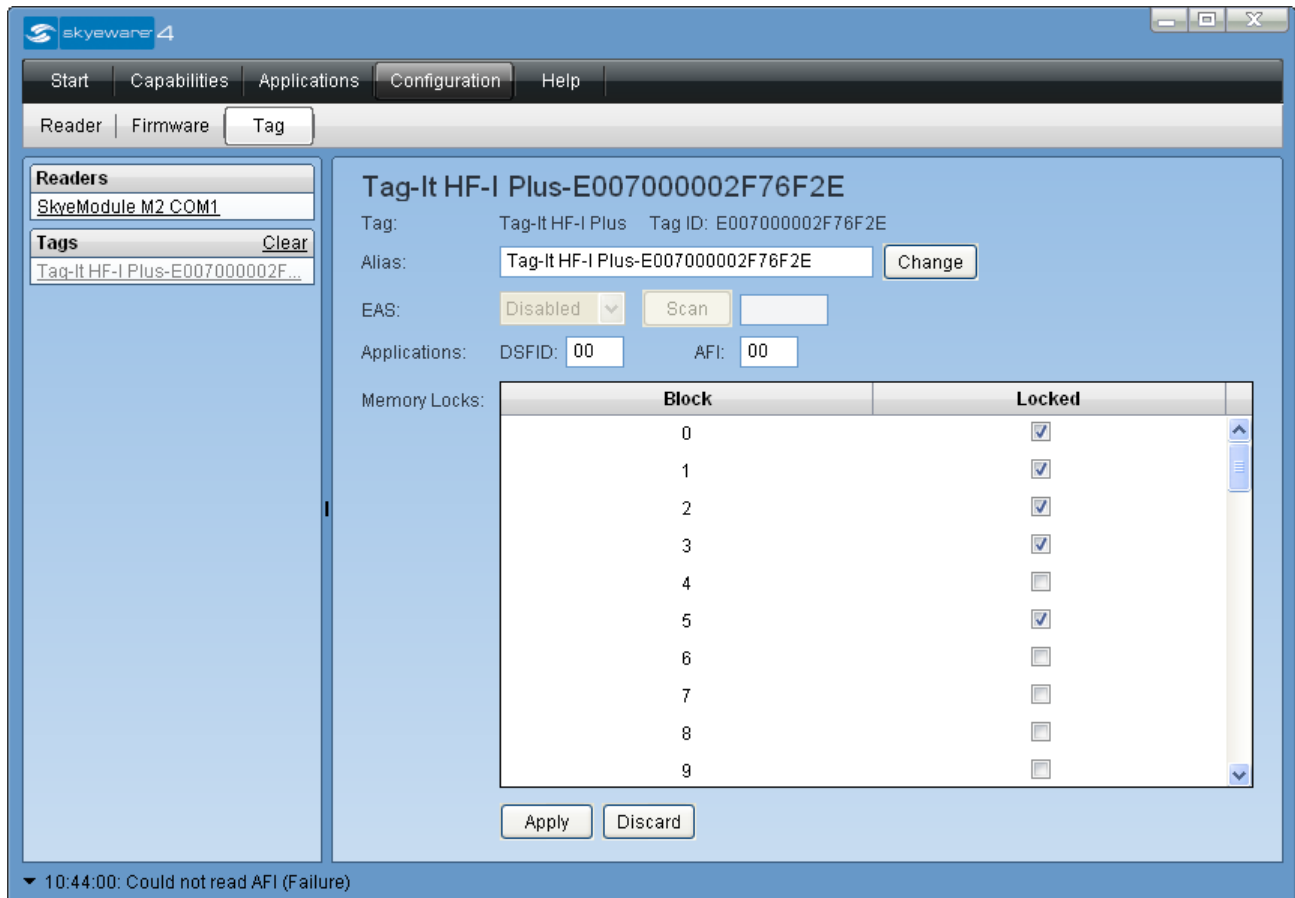
Figure 5-10 Typical HF Tag Configuration Panel

2. Specify new values using the editable fields, including Alias, EAS, and Applications. (DSFID or AFI).

3. (Optional) Lock blocks of memory on the tag by clicking on the corresponding checkbox in the Memory Locks field

4. Click on the **Apply** button to apply the changes to the tag.

5. (Optional) Click on the **Discard** button to erase changes on the screen without applying them to the tag. (This does not change the configuration information on the tag itself.)

Configuring Tags

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Appendix A

Troubleshooting

This appendix describes how to diagnose and fix common problems that you may encounter.

Q. I connected the module, but the software won't recognize the reader. Why?

A. There are a few items to look for if you can't communicate with the reader:

1. Use the LEDs to check connections (see next question for more information), then reset the SkyeModule.

    *   Make sure the SkyeModule is firmly connected to the host adapter board.

    *   Check the LED functioning for the SkyeModule. (See "Q: Are there any visual indicators to show the equipment is working properly?" on page 66.)

    *   Verify that the 6V power supply is plugged in. (Note: previous DK's without M10 support may still come with 9V power supply)

    *   If the SkyeModule LEDs are not lit after taking the above steps, try resetting the module by clicking the Reset button located on top of the host adapter board (Figure A-1).

2. Make sure the data cable is properly plugged into either the serial or USB ports on the host adapter board and the host computer.

3. Make sure that you have selected the correct host interface in SkyeWare. (Click on the **Configuration** tab, **Reader** tab to display the current settings.) If not, change the interface setting to match the actual interface you are using.

4. Shut down any software that uses the same COM port.

5. Restart SkyeWare.

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Q: Are there any visual indicators to show the equipment is working properly?

The SkyeModule M2 and M9 readers have indicator LEDs, and the host interface board has power and host/ISP LEDs.

For the host interface board v5.1:

● The CR101 and CR102 LED indicates the interface board is powered. These particualrly indicate if both regulators are receiving sufficient power. These LED's indicate the interface board on. Please consult the host interface guide for more information.

● The CR100 LED on the host interface board indicates the board is either set for external power or USB power. This LED is always on while either power selection is made. Please consult the host interface guide for more information.

For the host interface board v3.0:

● The blue LED indicates the SkyeModule is in host mode, which is required for normal operation. If this LED is not illuminated, make sure the jumper at location J8 is in place. If it is not, remove power from the module and replace the jumper, then restart.

● The red LED on the host interface board indicates the board has power. This LED is always on while the board is connected to a valid voltage source.

The SkyeModule M2 and M9 have three indicator LEDs located on the top of each reader (see Figure A-1 on page 67):

● The red LED indicates the SkyeModule has power. This LED is always on while the reader is connected to a valid voltage source.

● The green LED indicates that the reader achieved a radio frequency lock (phase lock loop). This LED is usually on if the frequency of operation is within the valid range. (See the RF specifications in the reference guide for your SkyeModule reader for frequency information.) If this LED is off, the reader will not function until the problem is resolved.

● The amber LED flashes on and off to indicate that a successful tag operation (suck as a tag select) has taken place.

● The GPIO3 pin connection controls LED U502.

The SkyeModule M7 has indicator LEDs located on the bottom of the reader:

● The red LED (at location D1) indicates the SkyeModule has power. This LED is always on while the reader is connected to a valid voltage source.

- The green LED (at location TP2) indicates that the M7 achieved a radio frequency lock (phase lock loop). This LED is usually on if the frequency of operation is within the valid range. (See the RF specifications in the reference guide for your SkyeModule reader for frequency information.) If this LED is off, the reader will not function until the problem is resolved.

The SkyeModule M4 has an indicator LED located on the bottom of the reader:

- The red LED (at location CR1) indicates the SkyeModule has power. This LED is always on while the reader is connected to a valid voltage source.
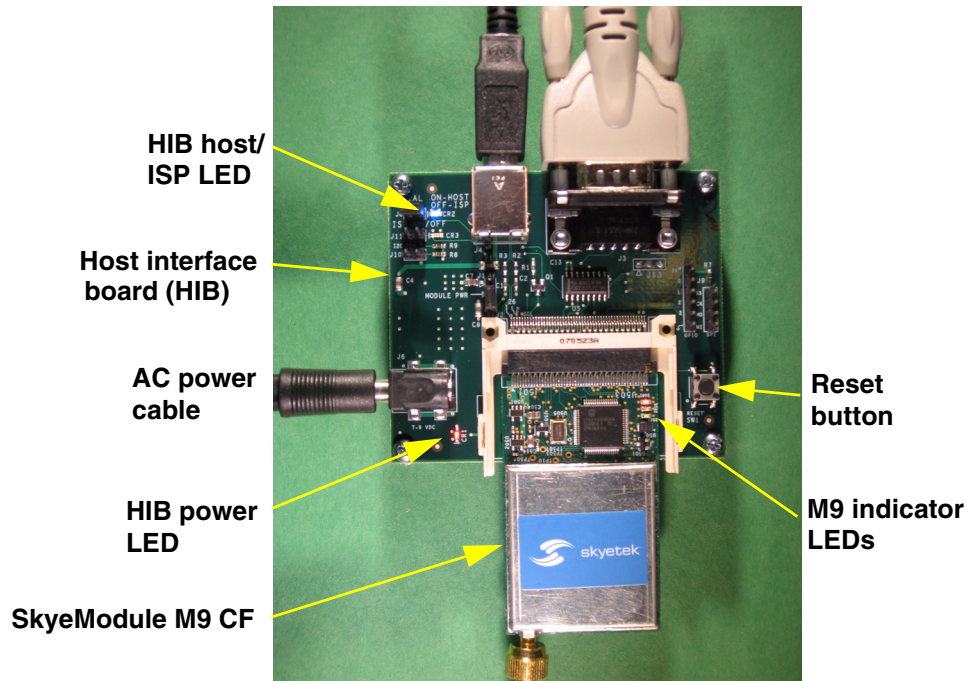
Figure A-1   HIBv3.1 LEDs and Reset, SkyeModule LEDs

Q: Can I reset my reader without disconnecting it?

Yes. Press the reset button on the host interface board (Figure A-1) and hold it down for a few seconds. This restarts the reader. SkyeWare 4 typically detects the reader a few seconds after the reset.

Q. I'm not getting the read range I expected. Why?

A. Range range is highly dependent on which antenna you have, which tag you are using, your operating/test environment, and specific system settings. See "Setting Up Your Test Environment" on page 22 for a list of factors related to your system setup that may affect read range.

Q. Where can I get the latest version of the firmware?

A. Please log-in to the SkyePortal for the latest version. If you don't have a log-in, go to the support.skyetek.com and request an account. Generally, there is a unique serial number for each developer kit that lets SkyeTek validate your account.

Q: Can SkyeWare help me diagnose problems with my test setup?

A. Yes. SkyeWare 4 has a status display line on the bottom of each screen that reports status and debug messages (Figure A-2).

Status display line
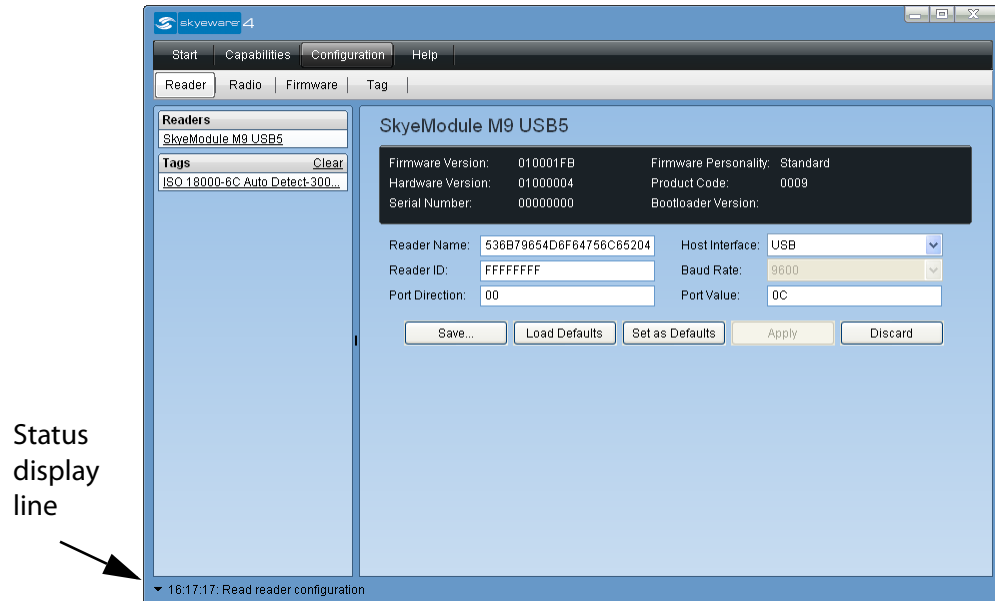
Figure A-2   Location of Status Display

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If you click on the arrow button on the status line, SkyeWare 4 displays an expanded status message history (Figure A-2).

Expanded display for status history
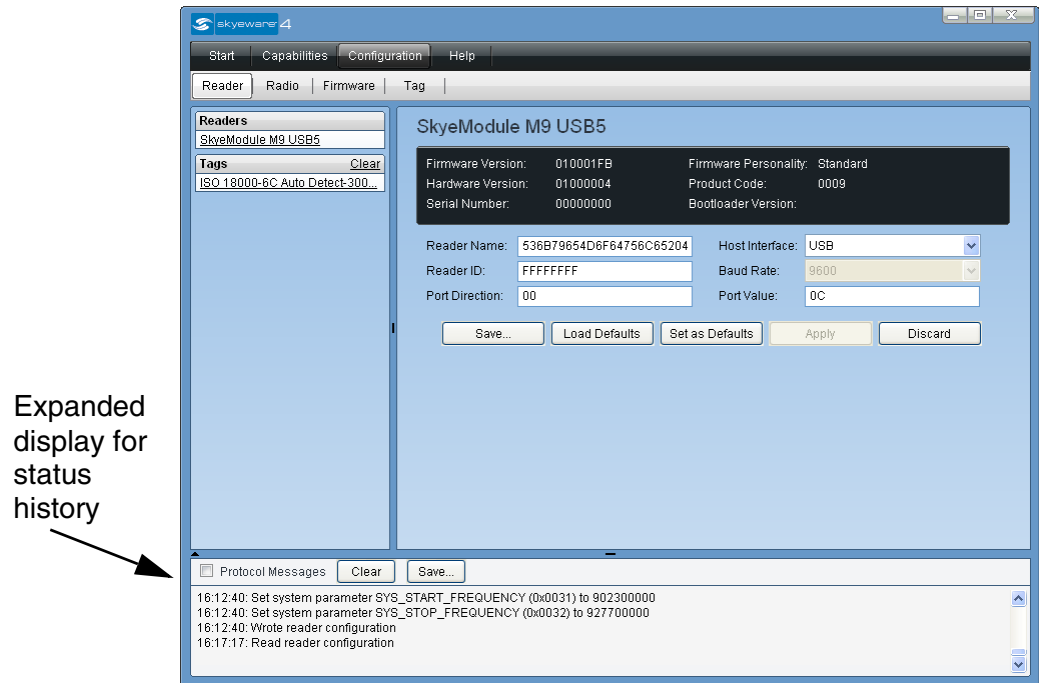
Figure A-3   Status History

To use the status history:

● Click on the **Protocol** checkbox to add display of protocol messages, such as commands sent to the reader and reader responses. (See "Protocol" on page 31 for more information.) Removing the check from the checkbox displays only normal status messages and no protocol messages.

● Click on the **Clear** button to clear the status history.

● Click on the **Save** button to save the history to a file. This can help you diagnose a problem with your application. You can also send the file to SkyeTek technical support.

Q. How do I read what is in a tag's memory?

A. Click on the **Capabilities** tab and then the **Memory** subtab to view the contents of a tag's memory. See "Memory" on page 28 for additional information. Please also see the reference guide for your SkyeModule reader for detailed examples of reading memory from tags.

Q. How do I put the reader into loop mode to continuously read tags?

A. Two utilities let you put the reader into loop mode:

- Click on the SkyeWare **Capabilities** tab, then click the **Read Range** subtab to go use the read range demonstration to continuously search for tags. (See "Read Range" on page 24, for more information.)

- Click on the SkyeWare **Capabilities** tab**, Protocol** subtab, then set up a Select Tag command and check the Loop flag check box. Send the command to activate loop mode. (See Chapter 3, "Using SkyeWare 4 Capabilities", for more information.)

Also refer to the reference guide for your SkyeModule reader for additional examples of reading tags.

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