

# Spot RFLS User's Manual

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# 1 Safety Information

In order to comply with FCC Radio Frequency (RF) exposure limits, Spot RFLS antennas must be located no closer to the human body than the distances specified below:

- Master Radio: 4.41 cm
- Beacon: 0.097 cm
- Tag: 0.06 cm
- Mini Tag: 0.05 cm

The Master Radio is intended for indoor use only unless used in an appropriately rated environmental enclosure. The Master Radio's antenna, power supply, and data cables must be indoors at all times. Data cables must be terminated indoors with certified equipment (i.e. switch, hub, etc.) if outdoor communication is desired.

## 2 Spot System Description

This document describes the use of the Spot RFLS, a Radio Frequency (RF) Tag Location System used for real-time and historical location tracking of high-value human and equipment assets.

Major sections of this document include the following topics:

- A basic description of the Spot System and its proper use
- Safety information
- User interface description
- FCC ID numbers and compliance statements

A block diagram of Spot RFLS is shown below:

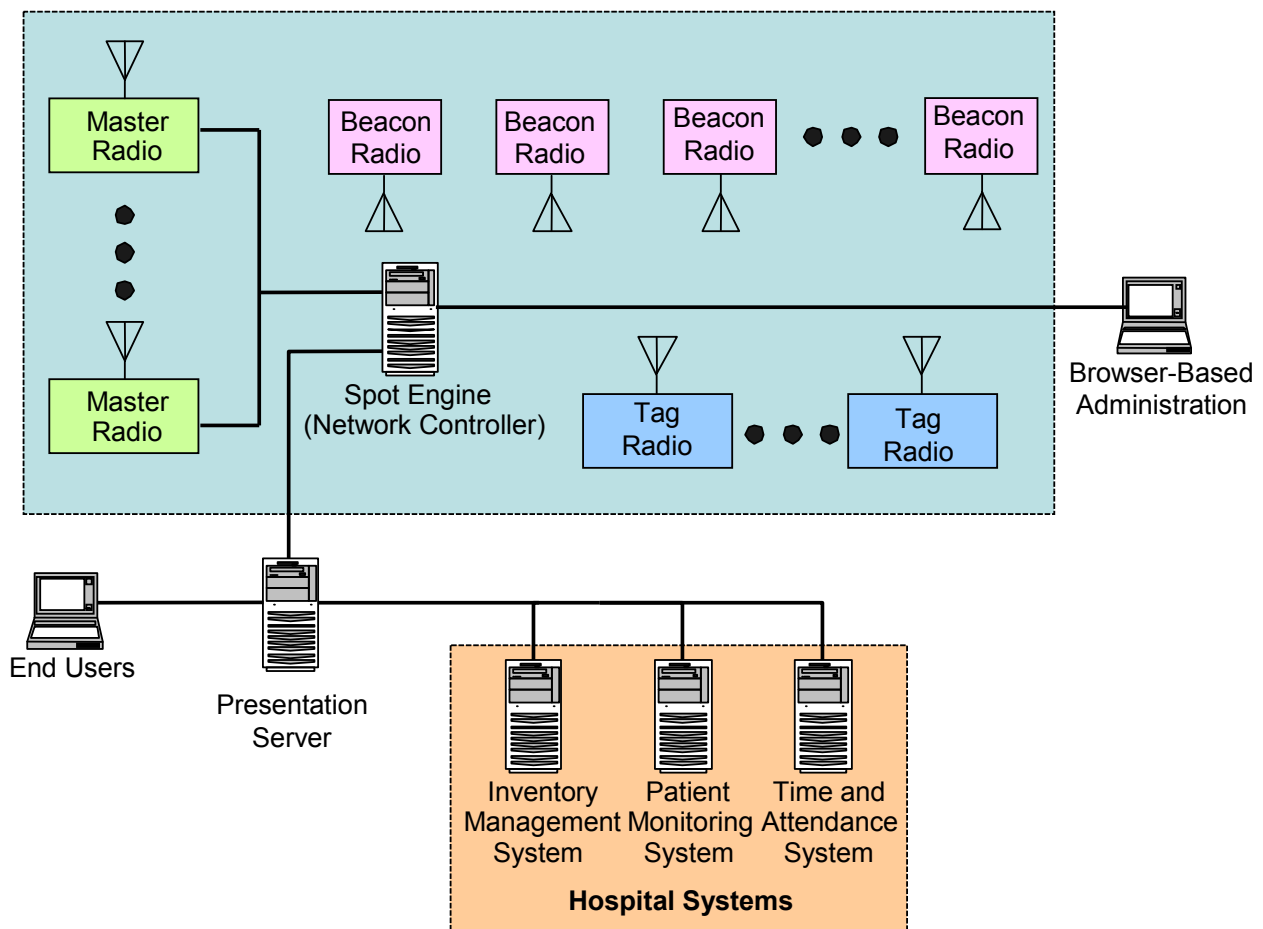


Figure 1 Spot RFLS Block Diagram

Spot uses a system of *Master Radios* and *Beacons* to locate and track the position of *Tags*.

Tag location and history information is made available to other systems and applications through a browser-based interface.

The Spot System is made up of the following components:

- **Spot Engine:**
  - An appliance that controls the overall operation of the Spot System and delivers Tag location information to the Presentation Server

***CAUTION!** Never operate a Master Radio without an antenna or RF load.*

- **Master Radios:**
  - Relay information from Beacons and Tags to the Spot Engine
  - Are powered via their Ethernet network connections
  - Require no direct user operation
  
- **Beacons:**
  - Communicate with the Tags based on commands from the Master Radios
  - Are battery-powered, designed for low current consumption to maximize battery life
  - Require no direct user operation
  
- **Tags:**
  - Receive transmissions from Beacons
  - Transmit Beacon reports to Master Radios that Spot uses to compute location
  - Are optimized for low power consumption to maximize battery life. Power consumption can be optimized for tracking mobile or fixed assets.

## 3 Using the Web-Based Interface

The user-level interface of the Spot System is accessed through a web browser. It provides a basic level of access to the Spot System through the Spot Engine Administration web interface.

**NOTE:** *Your Spot System Administrator must create an account for you to access this functionality.*

*Most users will use other third-party applications (not the basic user interface described here) to access the information collected by the Spot System.*

### 3.1 Login

Using a PC attached to the same local network (LAN) as the Spot Engine, log into the Spot Engine Administration web interface as follows.

In your web browser, enter the URL for the Engine's web interface you received from your Spot System Administrator when your user account was created.

The login window is displayed as shown in the following figure.

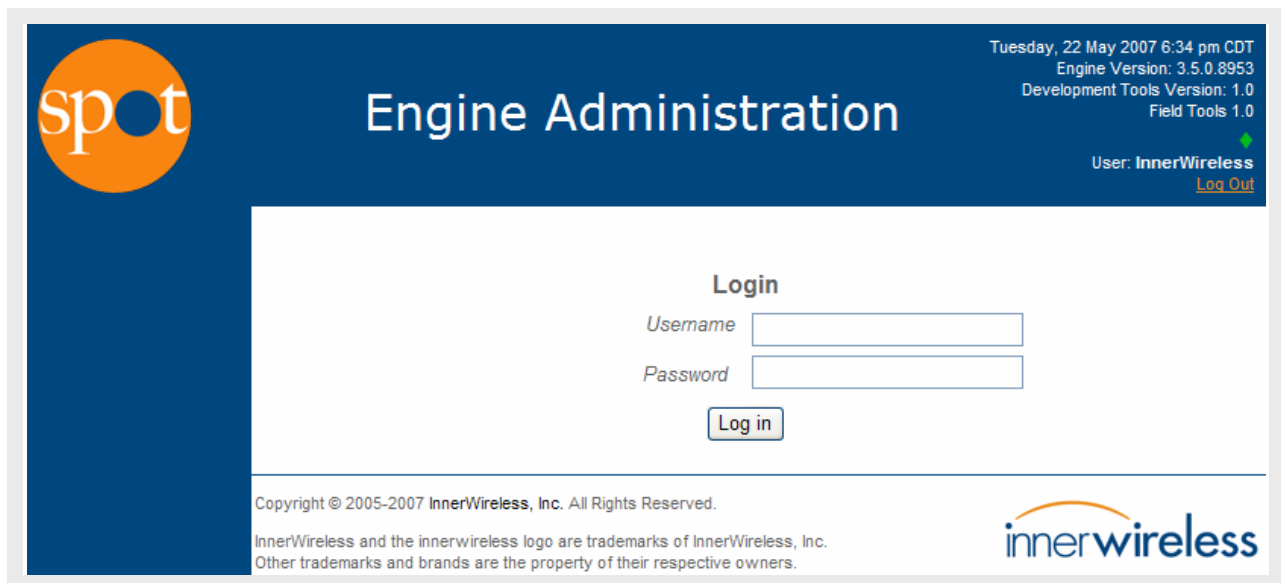


Figure 2 Spot Engine Administration Login Window

Enter your **User Name** and **Password** and click **Log in**.

The **Overview** window is displayed as shown in the following figure.

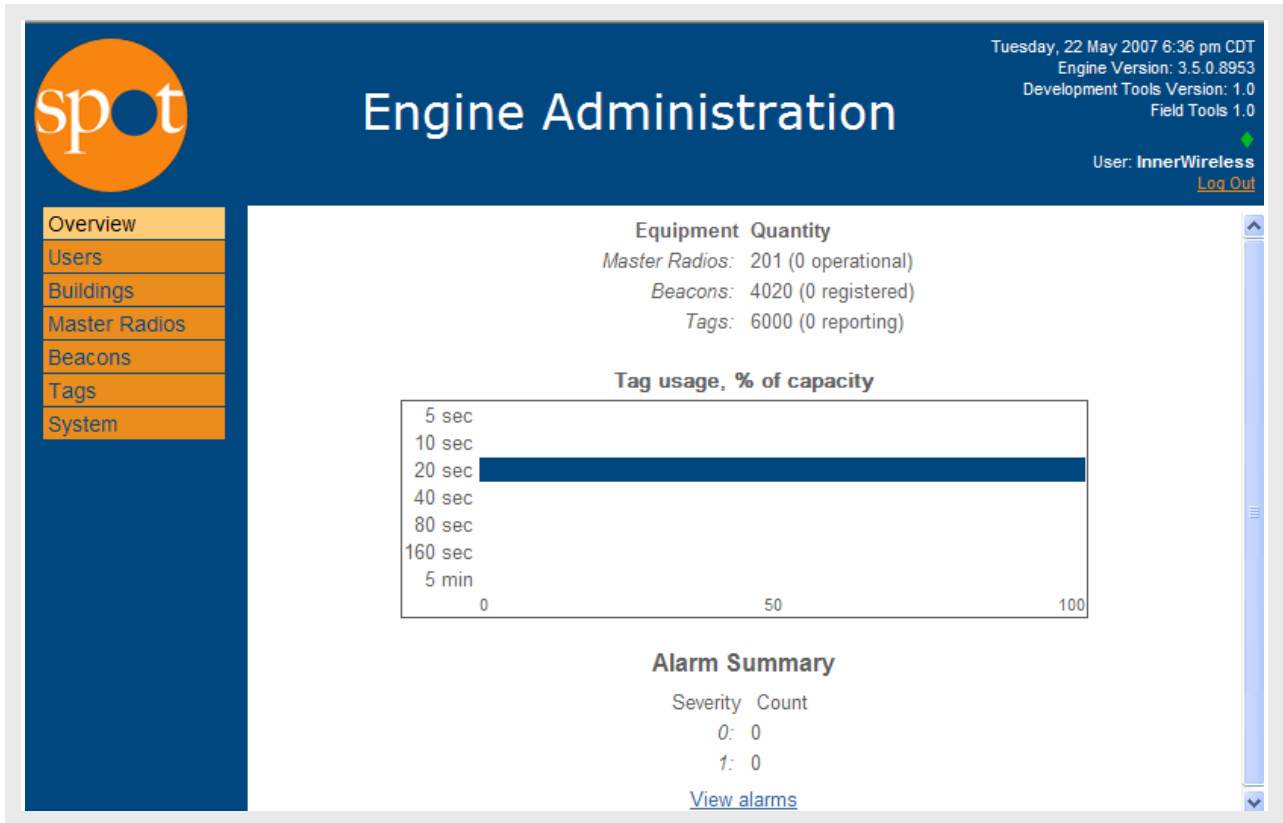


Figure 3 Spot Engine Administration Overview Window

The **Overview** displays current system status information.



## 3.2 Users

From the **Spot Engine Administration > Overview** window shown in [Figure 3](#) on page 8, click **Users**.

The following window is displayed.

The screenshot shows the 'User Accounts' window in the Spot Engine Administration interface. The top header includes the 'spot' logo, the title 'Engine Administration', and system information: 'Tuesday, 22 May 2007 6:41 pm CDT', 'Engine Version: 3.5.0.8953', 'Development Tools Version: 1.0', and 'Field Tools 1.0'. The user is identified as 'User: InnerWireless' with a 'Log Out' link. A left-hand navigation menu lists 'Overview', 'Users', 'Buildings', 'Master Radios', 'Beacons', 'Tags', and 'System', with 'Users' highlighted. The main area contains a table titled 'User Accounts' with the following data:

Login Name	Full Name	Phone	Type	Last Login	Actions
Status	E-mail Address	Mobile	Level	Date Created	
InnerWireless			Person	2007-05-22 06:34 p.m.	<a href="#">Modify</a>
Active				2007-03-09 07:13 a.m.	

Figure 4 User Accounts Window

To make changes to your personal information, click **Modify**.

The **Modify My Account Details** window is displayed.

The screenshot shows the 'Modify My Account Details' window in the Spot Engine Administration interface. The top header is identical to Figure 4, but the time is 6:44 pm. The user is still 'User: InnerWireless'. The left-hand navigation menu is the same. The main area contains a form titled 'Modify My Account Details' with the following fields:

- Login Name: InnerWireless
- Password: [Redacted] (4-12 characters, case-sensitive, no whitespace)
- Verify Password: [Redacted]
- First Name: [Empty]
- Last Name: [Empty]
- Phone Number: [Empty]
- Mobile Phone Number: [Empty]
- E-mail Address: [Empty]

At the bottom of the form are two buttons: 'Submit Changes' and 'Cancel'.

Figure 5 Modify My Account Details Window

Make changes as required and then click **Submit Changes** to exit and save.

### 3.3 List Tags

From the **Spot Engine Administration > Overview** window shown in [Figure 3](#) on page 8, click **Tags**.

The **Tags > List** window is displayed.

The screenshot shows the 'Engine Administration' interface. The main content area displays a table of tags. The table has the following columns: ESN (with a dropdown arrow), Reporting Period, Base Reporting Period, Most Recent Location (with an up arrow), Last Known Battery State (with an up arrow), Last Report (with an up arrow), Last Registration (with an up arrow), Firmware Version, and Actions. The table contains several rows of data, each representing a tag with its ESN, reporting period, location, battery state, and last report time. The 'Actions' column for each row contains links for 'History', 'Change', and 'Delete'. On the left side, there is a sidebar with a 'Tags' section containing 'List', 'Add', 'Maps', 'History', and 'Tools'. Below that is a 'System' section with a 'Refresh rate' input field set to '0' and a 'Set' button, along with a 'Reset' button. At the bottom of the sidebar is a 'List Filter' section with options for 'No Filter', 'ESN', 'Report Rate', 'Battery', and 'Location'. The top right corner of the interface shows the date and time: 'Tuesday, 22 May 2007 6:51 pm CDT', 'Engine Version: 3.5.0.9350', 'Development Tools Version: 1.1', 'Field Tools 1.1', and 'User: InnerWireless' with a 'Log Out' link.

ESN ↓	Reporting Period	Base Reporting Period	Most Recent Location ↑	Last Known Battery State ↑	Last Report ↑	Last Registration ↑	Firmware Version	Actions
20:00:00:00:00:00:00:00	10 Seconds	10 Seconds	Ground → LZ 008 (Barlow)	Good	00:00:01 ago	03:09:55 ago	10	History Change Delete
20:00:00:00:00:00:00:25	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:01 ago	03:09:52 ago	10	History Change Delete
20:00:00:00:00:00:00:27	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:01 ago	03:09:54 ago	10	History Change Delete
20:00:00:00:00:00:00:52	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:01 ago	03:09:50 ago	7	History Change Delete
20:00:00:00:00:00:00:56	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:01 ago	03:09:49 ago	7	History Change Delete
30:00:00:00:00:00:00:05	10 Seconds	10 Seconds	Ground → LZ 002 (Price)	Good	00:00:01 ago	03:09:50 ago	7	History Change Delete
30:00:00:00:00:00:00:06	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:01 ago	03:09:50 ago	7	History Change Delete
30:00:00:00:00:00:00:09	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:06 ago		7	History Change Delete

Figure 6 Tags > List Window

Click the link in the **ESN** column of the Tag you wish to track.

A **Tags > Maps** window similar to the following figure is displayed.

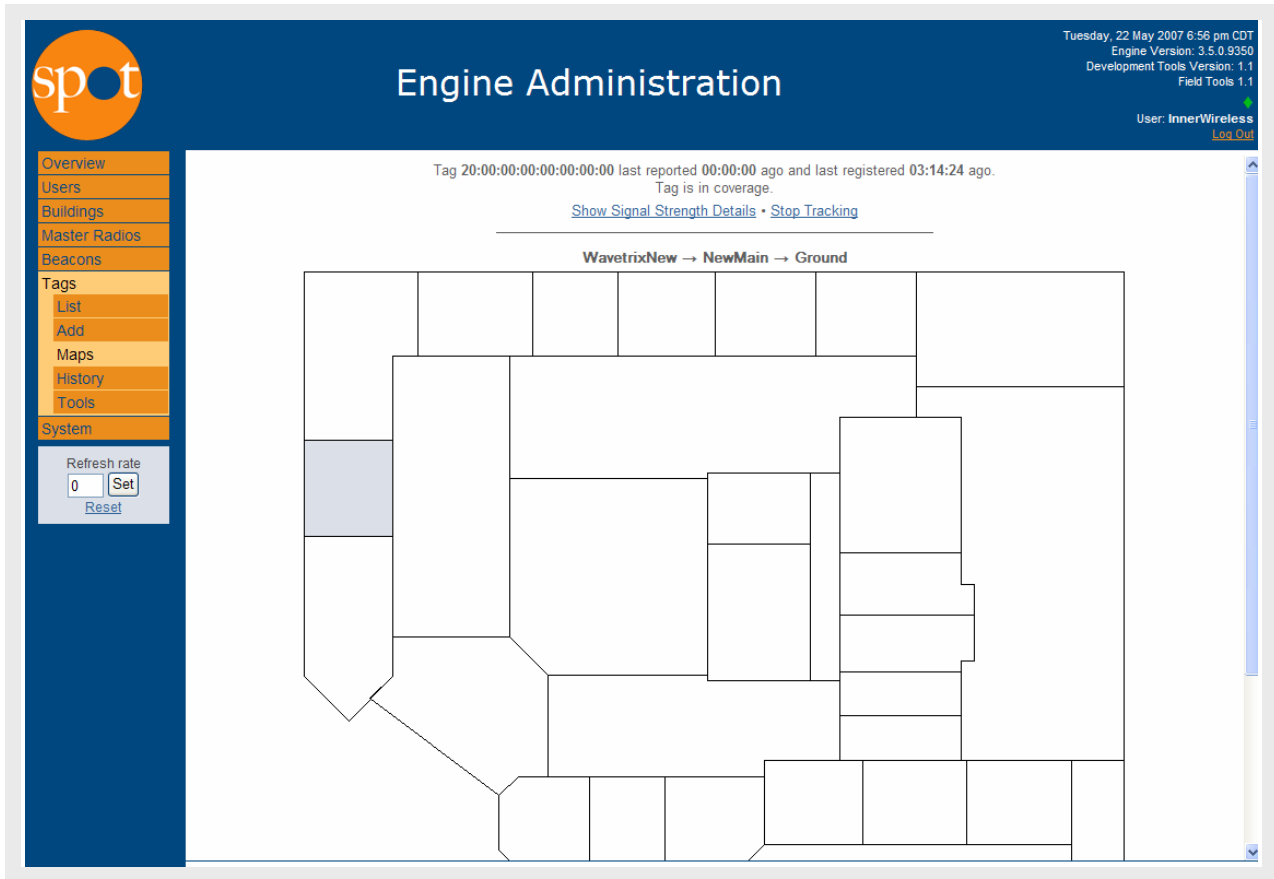


Figure 7 Tags > Maps Window

The highlighted area indicates Tag location.

Click **Tags > History** to display the following window.

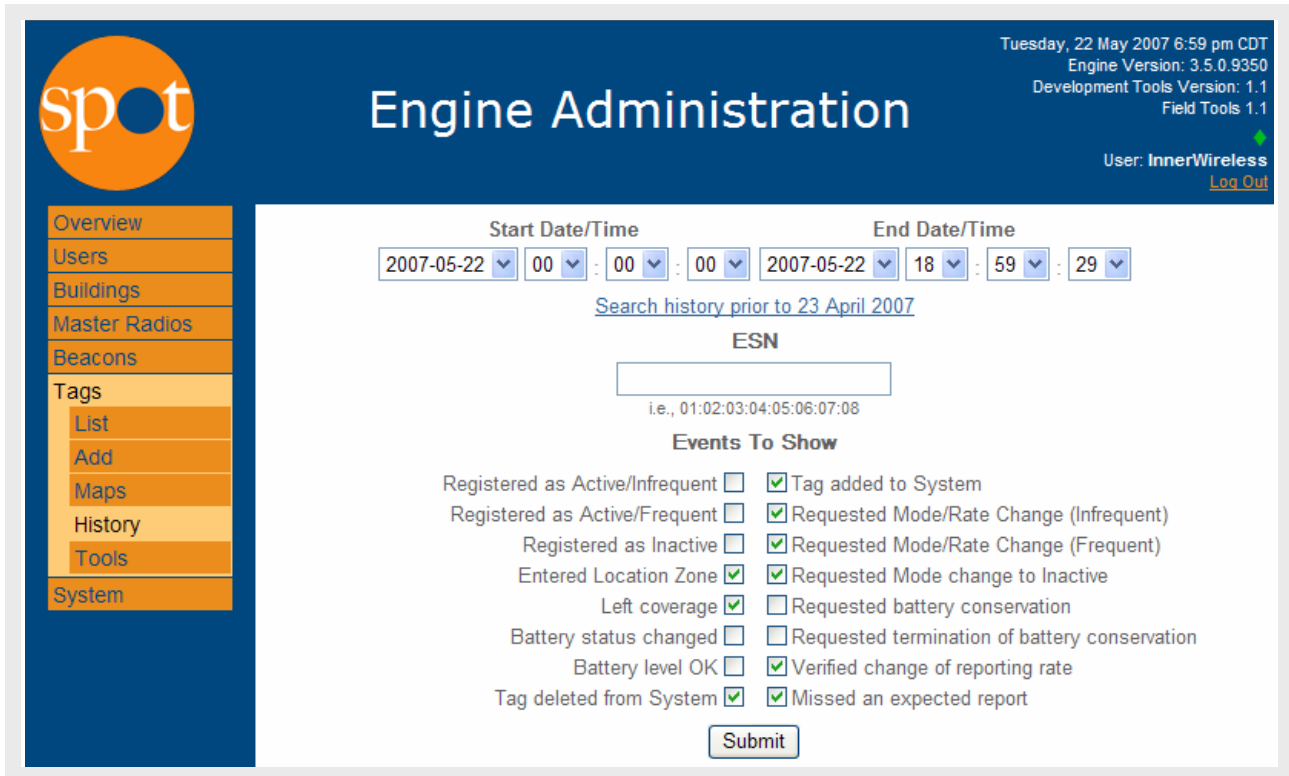


Figure 8 Tags > History Window

Enter the Tag **ESN** and select particular **Events To Show** to recall the location history of a particular Tag.

Click **Submit** to display the location history of the Tag in question.

The Tag's location history is displayed as shown in the following example.

**spot** Engine Administration

Tuesday, 22 May 2007 7:08 pm CDT  
 Engine Version: 3.5.0.9350  
 Development Tools Version: 1.1  
 Field Tools 1.1  
 User: InnerWireless [Log Out](#)

Start Date/Time: 2007-05-22 00:00:00 End Date/Time: 2007-05-22 19:08:41  
 Search history prior to 23 April 2007

ESN: 30:00:00:00:00:00:75  
 i.e., 01:02:03:04:05:06:07:08

Events To Show

- Registered as Active/Infrequent   Tag added to System
- Registered as Active/Frequent   Requested Mode/Rate Change (Infrequent)
- Registered as Inactive   Requested Mode/Rate Change (Frequent)
- Entered Location Zone   Requested Mode change to Inactive
- Left coverage   Requested battery conservation
- Battery status changed   Requested termination of battery conservation
- Battery level OK   Verified change of reporting rate
- Tag deleted from System   Missed an expected report

Viewing records 1 through 5 of 5

Date/Time	Event	Reporting Rate	Battery Level	Report Count	Location	Time in Location	Notes
2007-05-21 18:12:09 CDT	Entered Location Zone	10 seconds	Good	5398	WavetrixNew, NewMain, Ground, LZ 008, Barlow	14:59:41	
2007-05-22 09:11:50 CDT	Entered Location Zone	10 seconds	Good	1	WavetrixNew, NewMain, Ground, LZ 010, 10	00:00:10	
2007-05-22 09:12:00 CDT	Entered Location Zone	10 seconds	Good	89	WavetrixNew, NewMain, Ground, LZ 008, Barlow	00:14:50	
2007-05-22 09:26:50 CDT	Entered Location Zone	10 seconds	Good	1	WavetrixNew, NewMain, Ground, LZ 010, 10	00:00:10	
2007-05-22 09:27:00 CDT	Entered Location Zone	10 seconds	Good	3492	WavetrixNew, NewMain, Ground, LZ 008, Barlow	09:41:50	This is the Tag's most recent location.

Figure 9 Sample Tag Location History

### 3.4 List Filters

List Filters are available to aid in the sorting of Tag, Beacon and Master Radio list views. The following figure illustrates the **List Filter** feature available in the **Tags > List** window.

The screenshot shows a web interface for managing tags. On the left is a sidebar with navigation options: Overview, Users, Buildings, Master Radios, Beacons, Tags, List, Add, Maps, History, Tools, and System. Below these are controls for 'Refresh rate' (set to 0) and 'List Filter'. The 'List Filter' section includes options for 'No Filter', 'ESN', 'Report Rate', 'Battery', and 'Location'. An 'ESN' input field is present with an 'Apply' button. Examples of ESN formats are provided: 10\*, \*20, 10-\*20\*-30, 12:34:56:78:90:AB:CD:EF, and FEDCBA9876543210. The main area displays a table of tags with columns for 'ESN', 'Reporting Period', 'Base Reporting Period', 'Most Recent Location', 'Last Known Battery State', 'Last Report', 'Last Registration', 'Firmware Version', and 'Actions'. A red arrow points from the 'List Filter' section in the sidebar to the 'ESN' column header in the table.

ESN ↓	Reporting Period	Base Reporting Period	Most Recent Location ↑	Last Known Battery State ↑	Last Report ↑	Last Registration ↑	Firmware Version	Actions
20-00-00-00-00-00-00-00	10 Seconds	10 Seconds	Ground → LZ 008 (Barlow)	Good	00:00:07 ago	03:42:21 ago	10	<a href="#">History</a> <a href="#">Change</a> <a href="#">Delete</a>
20-00-00-00-00-00-00-25	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:07 ago	03:42:18 ago	10	<a href="#">History</a> <a href="#">Change</a> <a href="#">Delete</a>
20-00-00-00-00-00-00-27	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:07 ago	03:42:20 ago	10	<a href="#">History</a> <a href="#">Change</a> <a href="#">Delete</a>
20-00-00-00-00-00-00-52	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:07 ago	03:42:16 ago	7	<a href="#">History</a> <a href="#">Change</a> <a href="#">Delete</a>
20-00-00-00-00-00-00-56	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:07 ago	03:42:15 ago	7	<a href="#">History</a> <a href="#">Change</a> <a href="#">Delete</a>
30-00-00-00-00-00-00-05	10 Seconds	10 Seconds	Ground → LZ 002 (Price)	Good	00:00:07 ago	03:42:16 ago	7	<a href="#">History</a> <a href="#">Change</a> <a href="#">Delete</a>
30-00-00-00-00-00-00-06	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:07 ago	03:42:16 ago	7	<a href="#">History</a> <a href="#">Change</a> <a href="#">Delete</a>
30-00-00-00-00-00-00-09	10 Seconds	10 Seconds	Ground → LZ 019 (Conf. B)	Good	00:00:02 ago	03:42:56 ago	7	<a href="#">History</a> <a href="#">Change</a> <a href="#">Delete</a>
30-00-00-00-00-00-00-0E	10 Seconds	10 Seconds	Ground → LZ 007 (Conf. A)	Good	00:00:07 ago	03:42:14 ago	7	<a href="#">History</a> <a href="#">Change</a> <a href="#">Delete</a>
30-00-00-00-00-00-00-10	10 Seconds	10 Seconds	Ground → LZ 003 (Mays/Repman)	4 weeks left	00:00:02 ago	03:42:56 ago	7	<a href="#">History</a> <a href="#">Change</a> <a href="#">Delete</a>

Figure 10 List Filter Location

The default list filter sorts by **ESN**. Type the ESN number of the item in question and click **Apply** to display the search result.

Another Tag List Filter option is to sort by **Report Rate** as illustrated below.

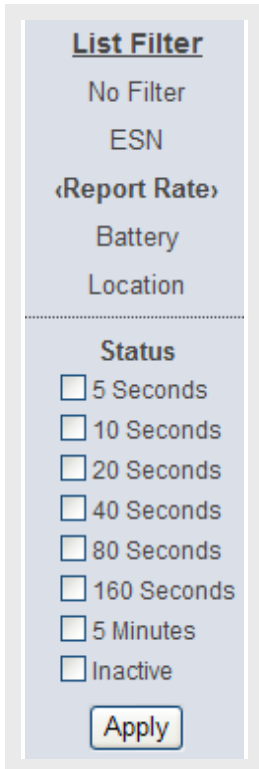


Figure 11 Report Rate List Filter

The Report Rate List Filter sorts Tags by how often they are set to report their location to the Spot Engine.

Click the Report Rate you wish to list under **Status** and click **Apply**.

The **Battery** List Filter option lists Tags with **Good** or **Not Good** batteries as shown below.

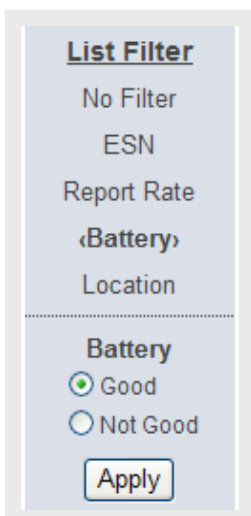


Figure 12 Tag Battery Status List Filter

The following figure illustrates the features of the **Location** List Filter.

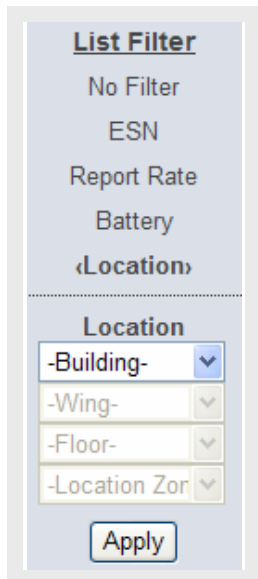


Figure 13 Location List Filter

Options for the Location List Filter include sorting by **Building**, **Wing**, **Floor**, or **Location Zone**. The pull-down menus are only active if these locations have been mapped into your Spot System.

The following table lists the available list filter sorting parameters for Tags, Master Radios and Beacons.

Table 1 List Filters

List Type	Filter Categories	Available Sort Parameters
Tag	ESN	Enter ESN number
	Report Rate	5, 10 20, 40, 80, 160 seconds, 5 minutes, or inactive
	Battery	Good, or Not Good.
	Location	Building, Wing, Floor, or Location Zone
Master Radio	ESN	Enter ESN number
	Status	Inactive, Disconnected, Connecting, Registered, Lost Sync, Synchronizing, or Operational
	Sync Island	Default Island of Synchronization
	Type	Receive Only, Transmitter
	Sync-Source Eligible	Eligible, Not Eligible
	Location	Building, Wing, or Floor
Beacon	ESN	Enter ESN number
	Status	Unheard, Unregistered, Registering, Confirmed, Timing Out
	Battery	Good, Not Good
	Location	Building, Wing, Floor, or Location Zone



## 3.5 Log Out

To end your session, click **Log Out** in the upper right corner of any of the Engine Administration windows.

The following window is displayed.

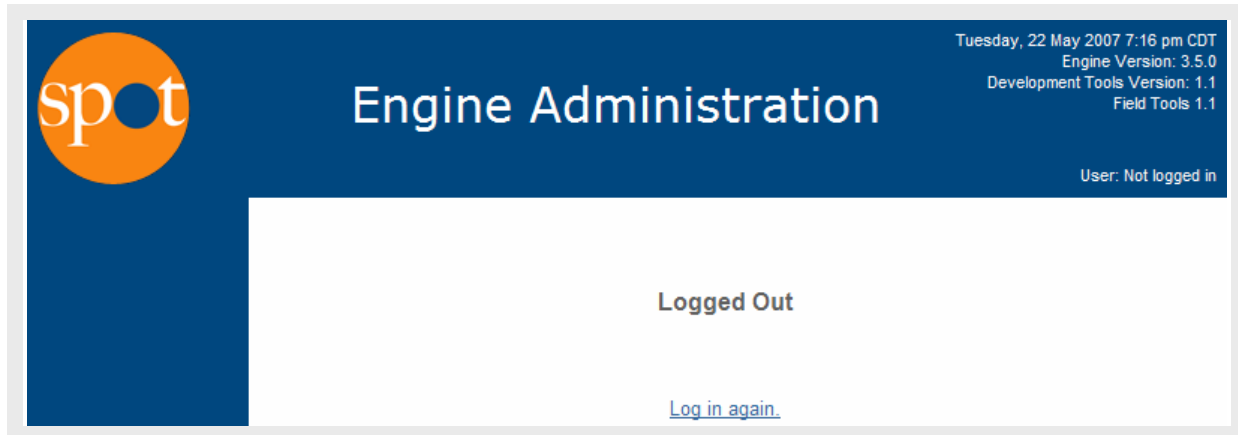


Figure 14 Logged Out Window

## Appendix A – Master Radio FCC Compliance Information

Master Radio FCC ID: RO540004A001

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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

## Appendix B – Beacon FCC Compliance Information

Beacon FCC ID: RO540001A001

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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

## Appendix C – Tag FCC Compliance Information

Tag FCC ID: RO540002A001

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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

## Appendix D – Mini Tag FCC Compliance Information

Tag FCC ID: RO540009A001

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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

## Appendix E – Antenna Specification

The Master Radio is FCC certified for use with an antenna that meets the following requirements:

1. Maximum gain: 13.3 dBi
2. Type: monopole, omnidirectional
3. Nominal Impedance: 50 Ohm

FCC re-certification is required in order to use an antenna that does not meet the above specifications.

## Appendix F – Li/MnO<sub>2</sub> Battery Disposal

The Spot RFLS uses Lithium/Manganese Dioxide (Li/MnO<sub>2</sub>) batteries in the Beacons and the Tags.

When completely discharged, this type of lithium cell is non-hazardous and may not have specific disposal regulations. Lithium batteries that are not fully discharged may be regulated as reactive hazardous waste.

The disposal of waste products in the United States is regulated by the U.S. Environmental Protection Agency (EPA). The EPA Regulations are listed in the "Code of Federal Regulations," CFR40, entitled "Protection of Environment." Individual states and local communities also may establish regulations covering the disposal of waste products. These may be more stringent than the federal regulations and may cover the disposal of household waste, which is not included in the federal regulation. Thus, state and local agencies should be contacted for their disposal guidelines.

Until such time that regulations or specified guidelines are issued, the following is recommended for the disposal of Li/MnO<sub>2</sub> batteries:

1. **Disposal**
  - a. **Discharged** - the preferred procedure is for the cells and/or batteries to be in a discharged condition for disposal. Li/MnO<sub>2</sub> cells can be considered to be "discharged" if the cell voltage, under an operational current load, is below 2 volts. "Discharged" batteries should be shipped as hazardous waste to a hazardous waste facility for disposal.
  - b. **Partial or Unknown Charge** - if the condition (state-of-charge) of the batteries cannot be identified, or if batteries are leaking, cracked, opened, vented, etc., or are otherwise no longer physically sound, they must be shipped as a hazardous waste to a qualified hazardous waste facility.
2. **Collection and Handling** - bulk quantities of spent Li/MnO<sub>2</sub> batteries should be collected and transported in a manner to prevent short circuit, compacting or mutilation, or any other abusive physical or electrical handling that would destroy their physical integrity. CFR40 provides details and regulations for collection of hazardous waste products.
3. **Shipment** - DOT and EPA regulations cover the shipment of these cells and batteries to a disposal site within the United States (reference CFR49, paragraph 173.185(j) and CFR40). Individual states may establish additional regulations. Your state regulatory agency should be contacted for additional transportation guidelines.
4. **Incineration** - Li/MnO<sub>2</sub> batteries should not be incinerated. Exposure of these batteries to high temperatures or fire can cause the batteries to vent and/or rupture.

**NOTE:** *Waste management companies can provide assistance in the disposal of these batteries.*

— End of Document