SIEMENS

RUGGEDCOM SAS-GW v1.2

User Guide

11/2018
RC1226-EN-01

Disclaimer Of Liability

Siemens has verified the contents of this document against the hardware and/or software described. However, deviations between the product and the documentation may exist.

Siemens shall not be liable for any errors or omissions contained herein or for consequential damages in connection with the furnishing, performance, or use of this material.

The information given in this document is reviewed regularly and any necessary corrections will be included in subsequent editions. We appreciate any suggested improvements. We reserve the right to make technical improvements without notice.

Registered Trademarks

RUGGEDCOM™ and ROS™ are trademarks of Siemens Canada Ltd.

Other designations in this manual might be trademarks whose use by third parties for their own purposes would infringe the rights of the owner.

Security Information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit https://www.siemens.com/industrialsecurity .

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit https://support.automation.siemens.com .

Warranty

Refer to the License Agreement for the applicable warranty terms and conditions, if any.

For warranty details, visit https://www.siemens.com/ruggedcom or contact a Siemens customer service representative.

Contacting Siemens

Address
Siemens Canada Ltd
Industry Sector
300 Applewood Crescent
Concord, Ontario
Canada, L4K 5C7

Telephone
Toll-free: 1 888 264 0006
Tel: +1 905 856 5288
Fax: +1 905 856 1995

E-mail
ruggedcom.info.i-ia@siemens.com

Web
https://www.siemens.com/ruggedcom

Table of Contents

Preface

This guide describes v1.2 of the RUGGEDCOM SAS-GW Web-based user interface and software application running on RUGGEDCOM WIN subscriber stations and base stations operating in the 3.5 to 3.7 GHz frequency band. These devices are members of the RUGGEDCOM family of mobile WiMAX broadband wireless access systems based on the 802.16e mobile WiMAX standard. This guide contains instructions and guidelines on how to use RUGGEDCOM SAS-GW, as well as some general theory.

It is intended for use by network operators who are familiar with the operation of networks.

NOTE
Illustations of the management interface screens are presented for illustrative purposes and may appear with minor differences in a working system.

CONTENTS

Alerts

The following types of alerts are used when necessary to highlight important information.

DANGER!
DANGER alerts describe imminently hazardous situations that, if not avoided, will result in death or serious injury.

WARNING!
WARNING alerts describe hazardous situations that, if not avoided, may result in serious injury and/or equipment damage.

CAUTION!
CAUTION alerts describe hazardous situations that, if not avoided, may result in equipment damage.

IMPORTANT!
IMPORTANT alerts provide important information that should be known before performing a procedure or step, or using a feature.

NOTE
NOTE alerts provide additional information, such as facts, tips and details.

Related Documents

Other documents that may be of interest include:

- *RUGGEDCOM WIN5137 Installation Guide*
- *RUGGEDCOM WIN5137-V Installation Guide*
- *RUGGEDCOM WIN5137-V-GPS Installation Guide*
- *RUGGEDCOM WIN5237 Installation Guide*
- *RUGGEDCOM WIN7237 Installation Guide*

All documents are available on Siemens' Industry Online Support portal [https://support.industry.siemens.com] or mobile application.

Training

Siemens offers a wide range of educational services ranging from in-house training of standard courses on networking, Ethernet switches and routers, to on-site customized courses tailored to the customer's needs, experience and application.

Siemens' Educational Services team thrives on providing our customers with the essential practical skills to make sure users have the right knowledge and expertise to understand the various technologies associated with critical communications network infrastructure technologies.

Siemens' unique mix of IT/Telecommunications expertise combined with domain knowledge in the utility, transportation and industrial markets, allows Siemens to provide training specific to the customer's application.

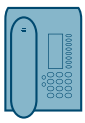
For more information about training services and course availability, visit https://www.siemens.com/ruggedcom or contact a Siemens Sales representative.

Customer Support

Customer support is available 24 hours, 7 days a week for all Siemens customers. For technical support or general information, contact Siemens Customer Support through any of the following methods:

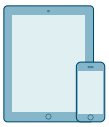
Online

Visit http://www.siemens.com/automation/support-request to submit a Support Request (SR) or check on the status of an existing SR.



Telephone

Call a local hotline center to submit a Support Request (SR). To locate a local hotline center, visit http://www.automation.siemens.com/mcms/aspa-db/en/automation-technology/Pages/default.aspx .



Mobile App

Install the Industry Online Support app by Siemens AG on any Android, Apple iOS or Windows mobile device and be able to:

- Access Siemens' extensive library of support documentation, including FAQs and manuals
- Submit SRs or check on the status of an existing SR
- Contact a local Siemens representative from Sales, Technical Support, Training, etc.
- Ask questions or share knowledge with fellow Siemens customers and the support community

1 Introduction

RUGGEDCOM SAS-GW is a standalone service that enables select RUGGEDCOM WIN base stations (and their associated subscriber unit) to operate on the Citizens Broadband Radio Service (CBRS), a shared wireless broadband spectrum scheme for the 3550 to 3700 MHz band.

CBRS uses a Spectrum Access System (SAS) to control access for registered base stations and subscriber unit (classified as Citizens Broadband radio Service Devices or CBSDs).

In accordance with Part 96 of the FCC's Code of Federal Regulations (CFR), no wireless device operating in the United States is allowed to access the 3.5 GHz band without an SAS service.

IMPORTANT!
RUGGEDCOM SAS-GW is designed to work specifically with spectrum sharing technologies developed by Federated Wireless [https://www.federatedwireless.com].

CONTENTS

Section 1.1

Features and Benefits

The following describes the many features available in RUGGEDCOM SAS-GW and their benefits:

- **Operating Environment**
  RUGGEDCOM SAS-GW can run on a Linux PC or as a virtual machine.
- **Simple Network Management Protocol (SNMP)**
  RUGGEDCOM SAS-GW uses the SNMP version 2c (SNMPv2c) to communicate with base stations and subscriber unit.
- **SMS Alerts**
  When paired with Twilio's [https://www.twilio.com] programmable SMS API, RUGGEDCOM SAS-GW can forward specific alerts to a user's phone or messaging service via text messaging. Administrators can customize which messages are sent on a per-user basis, allowing users to receive critical information related to area of responsibility.
- **Event Logging**
  RUGGEDCOM SAS-GW records all significant events to a non-volatile system log allowing for forensic troubleshooting. Events include link failure and recovery, status of base stations or subscriber units, status of spectrum requests, etc.

- **Web-Based User Interface**
  RUGGEDCOM SAS-GW provides a simple, intuitive user interface for configuration and monitoring via a standard graphical Web browser user interface.

Section 1.2

Security Recommendations

To prevent unauthorized access to RUGGEDCOM SAS-GW, note the following security recommendations:

Authentication

- Replace all default passwords before RUGGEDCOM SAS-GW is deployed.
- Use strong passwords. Avoid weak passwords such as password1, 123456789, abcdefgh, etc. An example of a strong password would be a password that contains at least eight characters, including a lowercase letter, an uppercase letter, a numeric character and a special character.
- Make sure passwords are protected and not shared with unauthorized personnel.
- Do not re-use passwords across different user names and systems.
- Record passwords in a safe, secure, off-line location for future retrieval should they be misplaced.

Physical/Remote Access

- Configure remote system logging to forward all logs to a central location.
- SNMP (Simple Network Management Protocol) community names should be unique.
- Prevent access to external, untrusted Web pages while accessing RUGGEDCOM SAS-GW via a Web browser. This can assist in preventing potential security threats, such as session hijacking.
- When possible, configure port security features on the host device's access ports to prevent an unauthorized third-party from physically connecting to the device.

Hardware/Software

- Make sure the latest version of RUGGEDCOM SAS-GW is installed, including all security-related patches. For the latest information on security patches for Siemens products, visit the Industrial Security website [http://www.industry.siemens.com/topics/global/en/industrial-security/news-alerts/Pages/alerts.aspx] or the ProductCERT Security Advisories website [http://www.siemens.com/innovation/en/technology-focus/siemens-cert/cert-security-advisories.htm]. Updates to Siemens Product Security Advisories can be obtained by subscribing to the RSS feed on the Siemens ProductCERT Security Advisories website, or by following @ProductCert on Twitter.
- Use the latest Web browser version compatible with RUGGEDCOM SAS-GW to make sure the most secure Transport Layer Security (TLS) versions and ciphers available are employed. Additionally, 1/n-1 record splitting is enabled in the latest web browser versions of Mozilla Firefox, Google Chrome and Internet Explorer, and mitigates against attacks such as SSL/TLS Protocol Initialization Vector Implementation Information Disclosure Vulnerability (e.g. BEAST).

Policy

- Periodically audit the RUGGEDCOM SAS-GW installation and configuration to make sure it complies with these recommendations and/or any internal security policies.
- Review the user documentation for other Siemens products used in coordination with RUGGEDCOM SAS-GW for further security recommendations.

Section 1.3

Architecture and Operation

RUGGEDCOM SAS-GW operates as an intermediary between an SAS service provider and Citizens Broadband radio Service Devices (CBSDs). It controls which CBSD (base station or subscriber unit) is registered with the SAS and opens access to the 3.5 GHz band when granted by the SAS. RUGGEDCOM SAS-GW will also revoke access and/or deregister devices when requested by the SAS or a user.

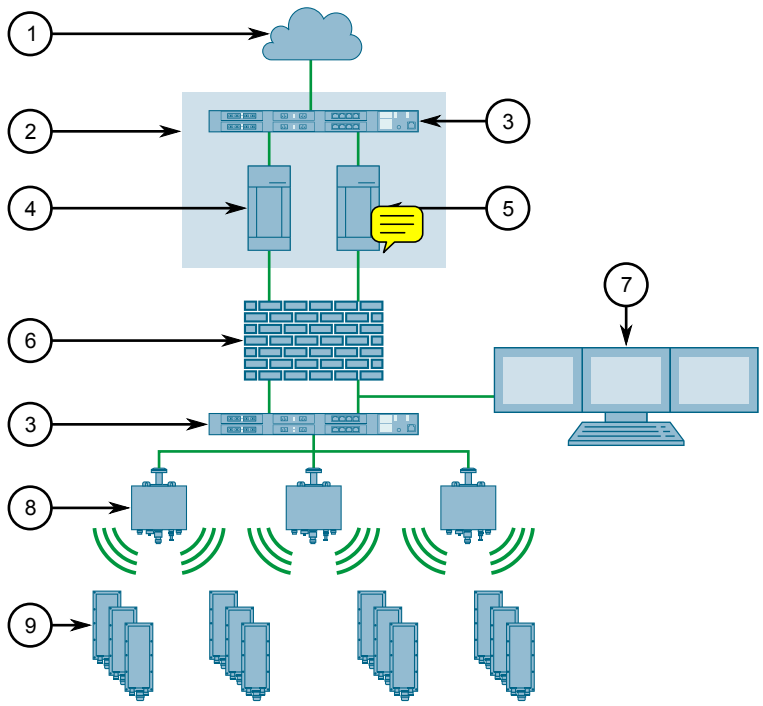


Figure 1: Architecture and Operation

1. SAS Service Provider **2.** DMZ **3.** Switch **4.** SAS Gateway **5.** Redundant SAS Gateway **6.** Firewall **7.** Control Center **8.** Base Station **9.** Subscriber Unit

CONTENTS

Section 1.3.1
Spectrum Access System

Prior to 2014, the 3.5 GHz band was largely reserved in the United States for authorized federal users, such as the Department of Defense, Fixed Satellite Systems (FSSs) and select wireless ISPs. These users were granted priority access to the full 150 MHz spectrum, but only used a small fraction at any given time. Meanwhile, mobile operators were at the limits of their allocated spectrum and facing increased demand year-over-year.

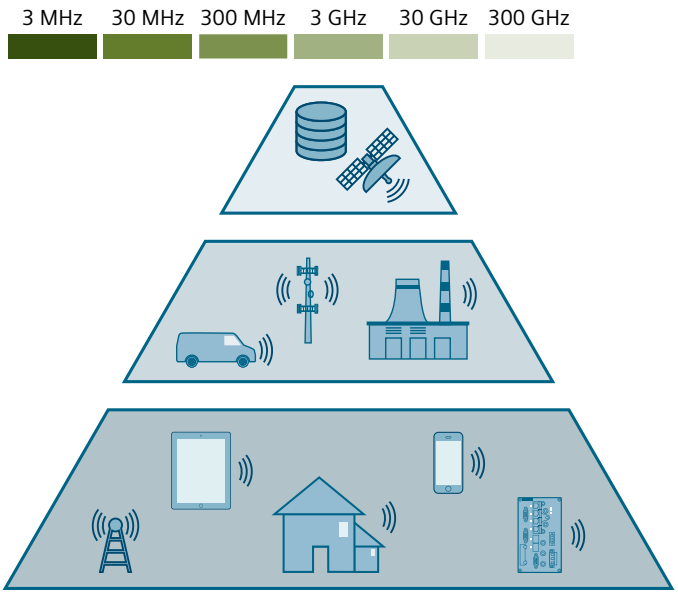
Since radio spectrum cannot be created, only reallocated, the Spectrum Access System (SAS) was developed to allow both federal and commercial users to share access to the 3.5 GHz band. Federal users are still granted priority access, but mobile operators can access the remaining spectrum not in use.

Section 1.3.2
Spectrum Access Model

Spectrum access is controlled based on a three-tiered access model that dynamically balances federal and commercial access requirements. The three tiers are as follows:

- **Incumbent Access (First Tier)**
  The **Incumbent Access** tier is reserved for authorized federal and grandfathered Fixed Satellite Service users operating in the 3.5 GHz band. This tier is protected by the SAS from any harmful interference emanating from users on the Priority Access and General Authorized Acccess tiers.
- **Priority Access (Second Tier)**
  The **Priority Access** tier is reserved for users that have purchased a Priority Access License (PAL) from the FCC. This tier is protected by the SAS from any harmful interference emanating from users on the General Authorized Acccess tiers.
- **General Authorized Access (Third Tier)**
  The **General Authorized Access** tier provides access to the 3.5 GHz band to all other potential users. A license is not required, granted the user operates within the rules set by the FCC. General Authorized Access users are permitted to use any portion of the 3.5 GHz band not reserved by a higher tier user. Users may also operate on any channel licensed to a Priority Access user that is not currently in use.

  Per FCC specifications, an SAS is required to make available 80 MHz of the spectrum to GAA users at all times.



RUGGEDCOM SAS-GW is intended for users that require access to the **General Authorized Access** tier.

Section 1.3.3
ESC Sensor

A key component of the SAS is an Environmental Sensing Capability (ESC) sensor. This sensor detects federal transmissions, such as those from the National Oceanic and Atmospheric Administation (NOAA).

When a federal transmission is received, the SAS establishes a protection zone and revokes spectrum access for all devices in the zone. RUGGEDCOM SAS-GW responds by requesting grants for another part of the spectrum band.

Section 1.3.4
RUGGEDCOM SAS-GW

RUGGEDCOM SAS-GW is a proxy for base stations (and their associated subscriber units) that require access to the 3.5 GHz band.

Primary Functions

RUGGEDCOM SAS-GW performs the following functions:

- **Registation and De-Registation**
  RUGGEDCOM SAS-GW registers new base stations and subscriber units with the SAS. Devices can then be de-registered as needed.
- **Spectrum Requests**
  RUGGEDCOM SAS-GW submits requests for spectrum on behalf of registered base stations and subscriber units. The SAS will grant access based on the devices tier and spectrum availability. Note that higher tiers have priority over lower tiers.
- **Relinquish Spectrum**
  RUGGEDCOM SAS-GW can be instructed to release spectrum back to the SAS for select base stations and subscriber units. The SAS may also request specific segments back if the spectrum is required by a device belonging to a higher tier.
- **Heartbeat**
  RUGGEDCOM SAS-GW sends heartbeat (keep-alive) messages to the SAS for every registered base station and subscriber station.

Ports

RUGGEDCOM SAS-GW uses the following ports:

Port	Protocol	Purpose
161	UDP	For SNMP management towards the private network.
443	TCP	For outgoing HTTPS communications with the SAS.

Section 1.3.5
Spectrum Acquisition

For each base station and subscriber unit added to RUGGEDCOM SAS-GW's configuration, RUGGEDCOM SAS-GW automatically registers the device with the SAS server and requests spectrum. Once granted, RUGGEDCOM

SAS-GW uses the Simple Network Management Protocol (SNMP) to monitor the status of the SAS server and the device.

Should the device stop responding, the associated spectrum will be released back to the SAS server.

Should the SAS server stop responding, the device will be allowed to continue transmitting on the assigned spectrum.

Section 1.4

Supported RUGGEDCOM WIN Devices

RUGGEDCOM SAS-GW is required by the following RUGGEDCOM WIN devices when operating in the United States within the 3.5 GHz band:

Base Stations	RUGGEDCOM WIN7237
Subscriber Units	RUGGEDCOM WIN5137 RUGGEDCOM WIN5137-V RUGGEDCOM WIN5137-V-GPS RUGGEDCOM WIN5237

Section 1.5

Licensing and Copyright

Licensing and copyright information specific to RUGGEDCOM SAS-GW v1.2 is available on the **About** screen.

To view licensing and copyright information, point to **Setup** and then click **About**.

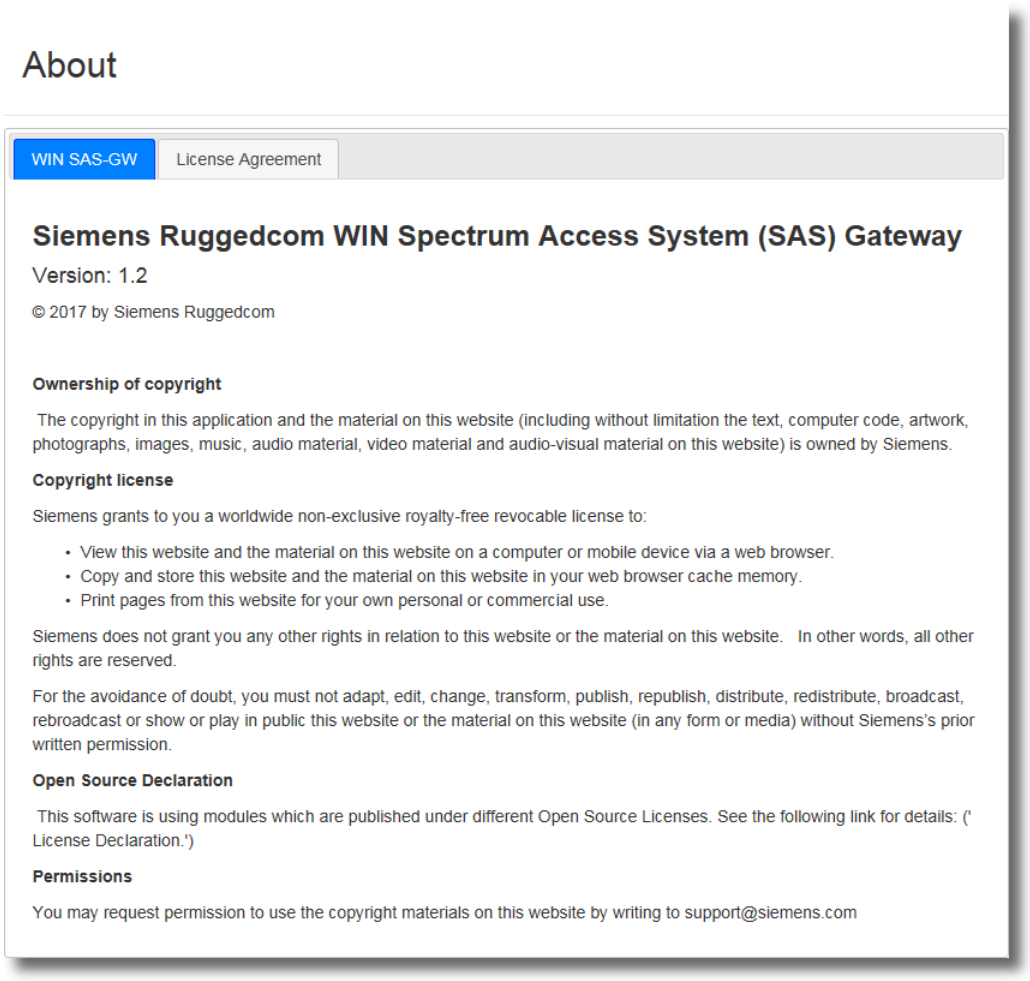


Figure 2: About Screen

The **About** screen features the following tabs:

- The **WIN SAS-GW** tab displays general information about copyright licensing, open source licensing, and permission requirements.
- The **License Agreement** tab displays the open source licensing agreement.

2 Installation and Deployment

This section describes how to install RUGGEDCOM SAS-GW and deploy it with RUGGEDCOM WIN devices as part of a 3.5 GHz network.

CONTENTS

Section 2.1

System Requirements

To guarantee reliability and responsiveness, RUGGEDCOM SAS-GW is designed to run on dedicated hardware.

The following details the client and server requirements for RUGGEDCOM SAS-GW:

IMPORTANT!
The operating system for the RUGGEDCOM SAS-GW must be installed with its default installation options. RUGGEDCOM SAS-GW is designed to be the only application running on the system. Any applications or network services running at the same time beyond what is required for the installation and function of RUGGEDCOM SAS-GW must not be installed.

» Client Side

Supported Browsers

- Chrome (v45 or higher)
- Internet Explorer (v10 or higher)
- Microsoft Edge (v40 or higher)
- Mozilla Firefox (v43 or higher)
- Opera (v35 or higher)
- Safari (v9 or higher)

Server Side

Operating Environment

- Linux PC or Virtual Machine

Operating System

- Ubuntu Server LTS v14

Hardware

- CPU: 1 GHz processor (e.g. Intel Celeron or better)
- RAM: 1.5 GB
- Available Memory: 7 GB

Section 2.2

Installing RUGGEDCOM SAS-GW

RUGGEDCOM SAS-GW runs on Ubuntu Server, which can be installed on a Personal Computer (PC) or virtual machine.

IMPORTANT!
RUGGEDCOM SAS-GW strongly recommends installing the RUGGEDCOM SAS-GW server in a Demiltarized Zone (DMZ).

To install RUGGEDCOM SAS-GW, do the following:

NOTE
Improve the performance of RUGGEDCOM SAS-GW by configuring a remote database for Ubuntu. For more information, contact Siemens Customer Support.

1. Install Ubuntu Server LTS v14 on a PC or virtual machine. During the installation, do the following:
   - When asked how to manage updates, select `No automatic updates`. Automatic updates are not recommended.
   - Install OpenSSH server.
   - Install LAMP server.
   - Install the GRUB boot loader to the master boot record.
2. Launch an SSH client and connect to the PC using the following connection settings:

Host Name	The IP address of the PC. This can also be prefixed with the desired user profile (e.g. admin@192.168.0.2).
Port	22

3. If the device's SSH key has not been cached to the PC's registry, a confirmation message will appear asking if the host is trusted. Click **Yes** to continue. The login prompt appears.

```
login as:
```

4. Enter the name of the root user.
5. Enter the root user's password.

   The following prompt appears:

```
{user}@{hostname}:~$
```

6. Copy the RUGGEDCOM SAS-GW installation file (`SAS.gz`) to the user's directory under `/home` (e.g. `/home/admin`).
7. Extract the following files from the installation file: `SAS.tar` and `install.sh`

8. At the command prompt, enter:

```
Sudo ./install.sh
```

9. When prompted, enter the root user's name and password.

   The installation begins. When completed, the following message is displayed:

```
Installation completed
```

10. If the RUGGEDCOM SAS-GW server resides in a different time zone than the SAS, configure the local time zone. For more information, refer to Section 4.1, "Configuring the Local Time Zone" .
11. Configure the connection between RUGGEDCOM SAS-GW and the SAS. For more information, refer to Section 2.3, "Connecting to the SAS" .
12. [Optional] Enable SMS alerts via the programmable SMS service offered by Twilio [https://www.twilio.com]. For more information, refer to Section 2.4, "Enabling SMS Alerts" .
13. Add base stations and subscriber units to RUGGEDCOM SAS-GW. For more information, refer to Section 2.5, "Deploying a RUGGEDCOM SAS-GW Network" .

Section 2.3

Connecting to the SAS

To configure the connection between RUGGEDCOM SAS-GW and the SAS, do the following:

NOTE
If the connection to the SAS server is lost, all devices granted spectrum will be permitted to continue operating while the connection is restored.

NOTE
All information should be available from the SAS provider.

1. Point to **Setup** and then click **Settings**. The **Update System Configuration** screen appears.

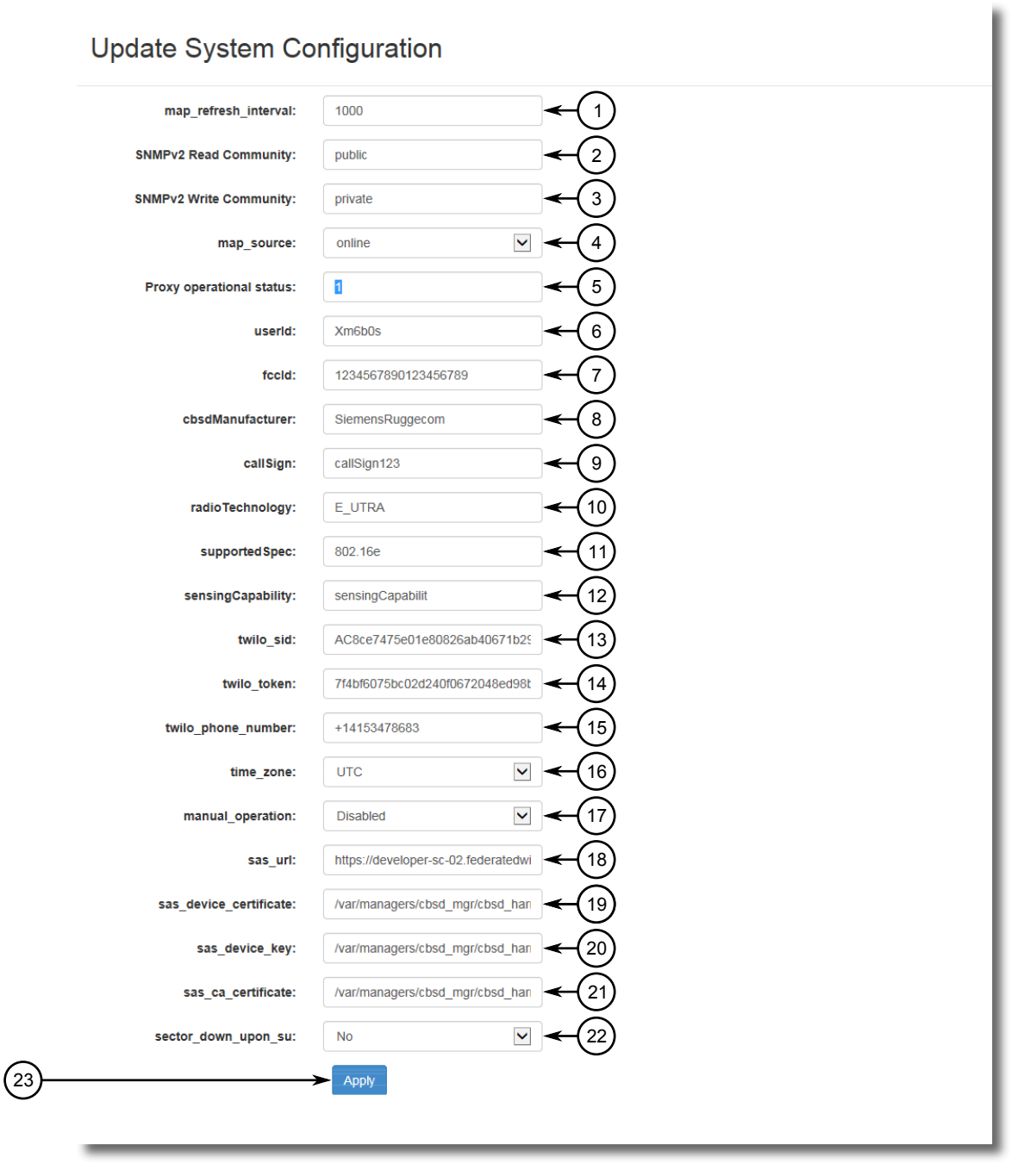


Figure 3: Update System Configuration Screen

1. Map Refresh Interval Box **2.** SNMPv2 Read Community Box **3.** SNMPv2 Write Community Box **4.** Map Source List **5.** Proxy Operational Status Box **6.** User ID Box **7.** FCC ID Box **8.** CBSD Manufacturer Box **9.** Call Sign Box **10.** Radio Technology Box **11.** Supported Specification Box **12.** Sensing Capability Box **13.** Twilio SID Box **14.** Twilio Token Box **15.** Twilio Phone Number Box **16.** Time Zone List **17.** Manual Operation List **18.** SAS URL Box **19.** SAS Device Certificate Box **20.** SAS Device Key Box **21.** SAS CA Certificate Box **22.** Sector Down Upon SU Box **23.** Apply Button

2. Configure the following parameters:

NOTE
The information defined is sent to the SAS when registering a new base station or subscriber unit.

Parameter	Description
User ID	The user ID known by the SAS for this installation of RUGGEDCOM SAS-GW.
FCC ID	**Synopsis:** A string 19 characters long The FCC certification ID for this installation of RUGGEDCOM SAS-GW.
CBSD Manufacturer	A unique name for the general CBSD manufacturer.
Call Sign	The device identifier provided by the FCC.
Radio Technology	The radio access technology used by each CBSD (e.g. LTE, HSPA, WiMAX, etc.). In the case of RUGGEDCOM WIN products, *WiMAX* is appropriate.
Supported Specification	The latest version of the radio tec gy standard supported by each CBSD (e.g. lterel10, ieee802.11ac, etc.).
Sensing Capability	A comma separated list of sensing capabilities supported by the CBSDs relavent to the SAS operation. Examples include, *es receivedInterferencePower*.
SAS URL	The URL of the SAS.

3. Click **Apply**.

Section 2.4
Enabling SMS Alerts

RUGGEDCOM SAS-GW can be configured to send SMS (Short Message Service) alerts via text message to a user's phone or messaging service when specific events (e.g. device not responding, device failed to relinquish, etc.) occur during operation. This allows users to receive the critical information they need in real time.

SMS alerts require an active account with Twilio's [https://www.twilio.com] SMS service. Twilio offers an easy-to-use API in a variety of programming languages that allows their customers to quickly create custom SMS services to suit their unique requirements.

To enable SMS alerts in RUGGEDCOM SAS-GW, do the following:

1. Sign up for Twilio's SMS service and obtain the following information:
   - SID
   - Token
   - Phone number used by the SMS service

   For more information, refer to https://www.twilio.com .
2. Log in to RUGGEDCOM SAS-GW. For more information, refer to Section 3.1, “Logging In” .
3. Point to **Setup** and then click **Settings**. The **Update System Configuration** screen appears.

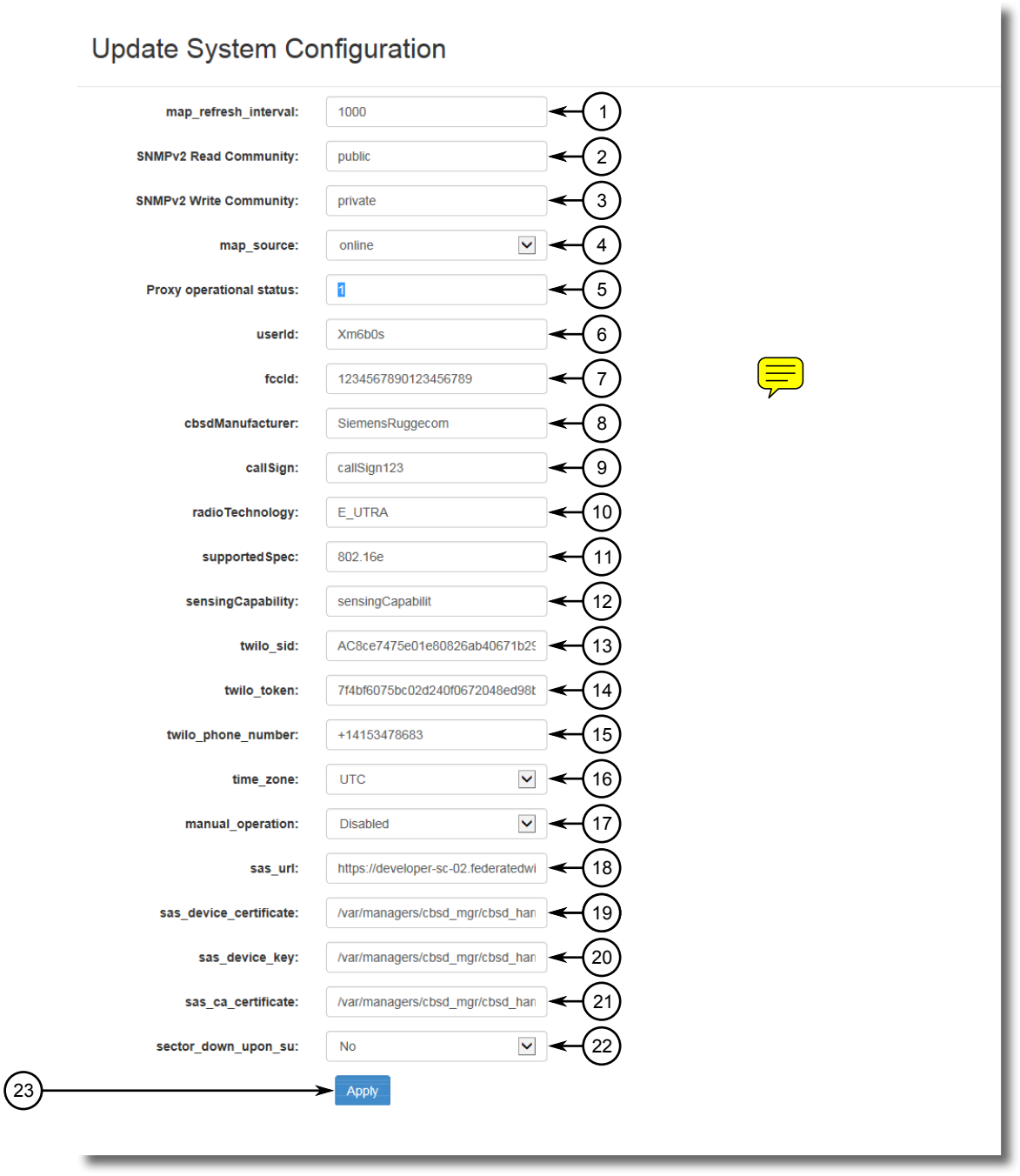


Figure 4: Update System Configuration Screen

1. Map Refresh Interval Box **2.** SNMPv2 Read Community Box **3.** SNMPv2 Write Community Box **4.** Map Source List **5.** Proxy Operational Status Box **6.** User ID Box **7.** FCC ID Box **8.** CBSD Manufacturer Box **9.** Call Sign Box **10.** Radio Technology Box **11.** Supported Specification Box **12.** Sensing Capability Box **13.** Twilio SID Box **14.** Twilio Token Box **15.** Twilio Phone Number Box **16.** Time Zone List **17.** Manual Operation List **18.** SAS URL Box **19.** SAS Device Certificate Box **20.** SAS Device Key Box **21.** SAS CA Certificate Box **22.** Sector Down Upon SU Box **23.** Apply Button

4. Configure the following parameters:

Parameter	Description
Twilio SID	The SMS API's application SID (Security Identifier).
Twilio Token	The access token used by the SMS API for authentication.
Twilio Phone Number	The phone number used by the API to send SMS alerts.

5. Click **Apply**.
6. Configure SMS alerts for individual users. For more information, refer to Section 4.3.4, "Configuring SMS Alerts" .

Section 2.5

Deploying a RUGGEDCOM SAS-GW Network

To deploy RUGGEDCOM SAS-GW with RUGGEDCOM WIN devices as part of a complete 3.5 GHz network, do the following:

1. Deploy the required base stations fully configured, making sure all radio transmissions are disabled.
2. Deploy the required subscriber units fully configured. Subscriber units will not transmit until their associated base station transmits.
3. Add each subscriber unit to RUGGEDCOM SAS-GW. For more information, refer to Section 4.5.1, "Adding a Subscriber Unit"

   NOTE
   Subscriber unit's are not accessible through RUGGEDCOM SAS-GW until spectrum is granted to their associated base station.

   RUGGEDCOM SAS-GW automatically registers each subscriber unit with the SAS and requests spectrum. When spectrum is granted, the subscribber station's operational status in RUGGEDCOM SAS-GW is updated to:

   ```
   Granted | not accessible
   ```

   For information about looking up the operational state of a subscriber unit, refer to Section 3.4, "Determining the Status of Base Stations and Subscriber Units" .
4. Add each base station to RUGGEDCOM SAS-GW. For more information, refer to Section 4.4.1, "Adding a Base Station"

   RUGGEDCOM SAS-GW automatically registers each base station with the SAS and requests spectrum. When spectrum is granted, the base station will automatically start transmitting. Subscriber units will also start connecting to the base station.

3 Using RUGGEDCOM SAS-GW

This chapter describes how to use RUGGEDCOM SAS-GW, including how to use the Web user interface, view reports and enable Troubleshooting mode.

NOTE
The configuration of base stations, subscribers stations and users is described in Chapter 4, Configuring RUGGEDCOM SAS-GW .

CONTENTS

Section 3.1

Logging In

To log in to RUGGEDCOM SAS-GW, do the following:

1. Launch a Web browser and request a connection to the RUGGEDCOM SAS-GW workstation. The **LogIn** screen appears.

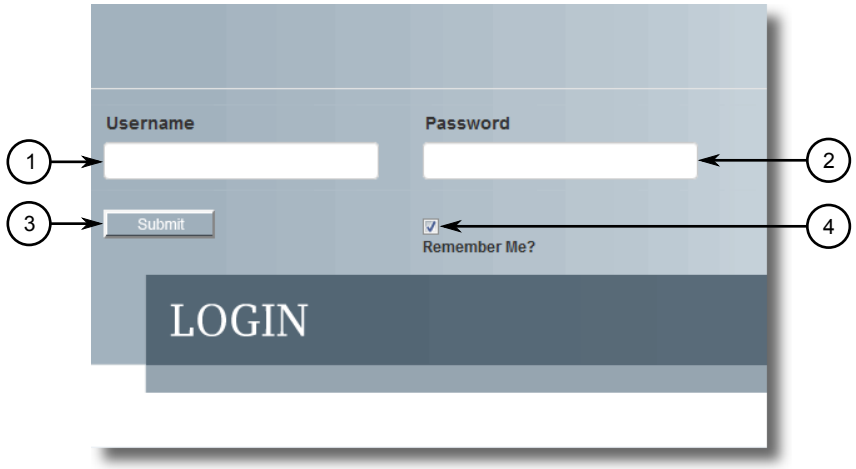


Figure 5: LogIn Screen

1. Username Box **2.** Password Box **3.** Submit Button **4.** Remember Me Check Box

2. Under **Username**, enter a user name.
3. Under **Password**, enter the password associated with the user name.
4. [Optional] Select **Remember Me?**. The user name and password will be retained for subsequent sessions until changed.
5. Click **Submit**.

Section 3.2

Logging Out

To log out of RUGGEDCOM SAS-GW, point to **User** and then click **Logout**.

Section 3.3

Using the Interface

The RUGGEDCOM SAS-GW Web user interface is designed to put all essential information at the forefront to allow users to quickly asses the status of their 3.5 GHz band network. The main screen includes the following features:

- **Toolbar**
  The toolbar provides access to configuration settings, reports and user information.
- **Interactive Map**
  The map displays the physical location of all base stations and their associated subscriber units.
- **Base Station Table**
  The **Base Station** table displays important information about any base station selected from the map.
- **SAS Alerts Table**
  The **SAS Alerts** table displays the current state of alerts broadcast by the SAS.

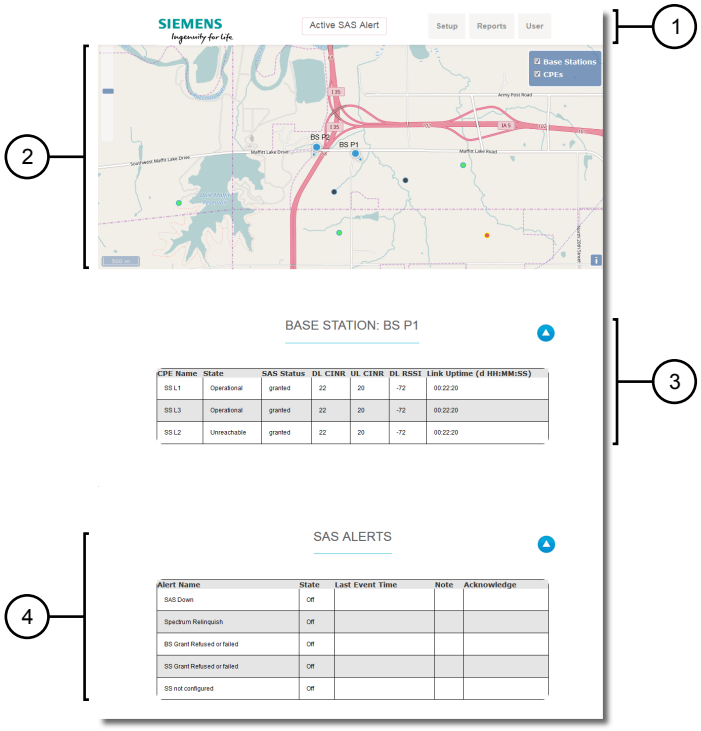


Figure 6: Main User Interface

1. Toolbar **2.** Interactive Map **3.** Base Station Table **4.** SAS Alerts Table

CONTENTS

Section 3.3.1

Menus

The top toolbar features the following menus that provide access to important functions and reports.

Setup

Menu Item	Description
Add BS	Adds a new base station to the RUGGEDCOM SAS-GW configuration.
Add SU	Adds a new subscriber unit to the RUGGEDCOM SAS-GW configuration.
All BS	Displays a list of all base stations.
Settings	Displays the general settings for RUGGEDCOM SAS-GW.

Menu Item	Description
About	Displays the currently installed version of RUGGEDCOM SAS-GW, as well as URL for the SAS.

Reports

Menu Item	Description
CBSD Activity	Displays SAS-related events recorded in the SAS Activity Log within a specified time period.
Error Log	Displays errors recorded in the Error Log within a specified time period.
System Log	Displays system-level events recorded in the System Log within a specified time period.

Users

Menu Item	Description
My Account	Displays settings for the active user profile.
Add User[a]	Adds a new user to the RUGGEDCOM SAS-GW configuration.
All User[a]	Displays a list of all users.
Logout	Logs the current user out of RUGGEDCOM SAS-GW.

[a] *Only available to admin users.*

Section 3.3.2
Help Text

Left-click the **?** next to a parameter to display a useful description of the parameter. The description defines the parameter's purpose, its value range, restrictions (if any), and any other information required to properly configure the setting.

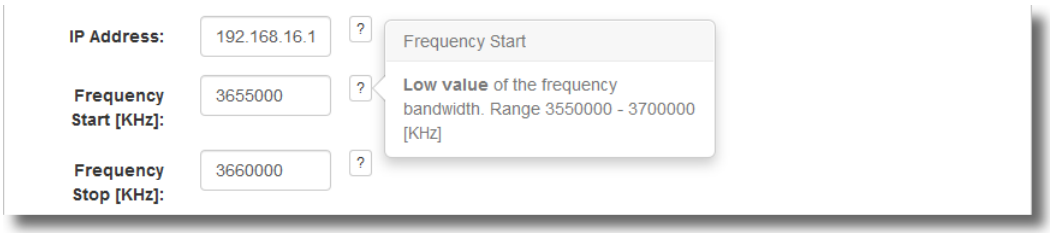


Figure 7: Help Text (Example)

Section 3.3.3
Using the Map

The map on the main screen displays the physical location in the world of the base stations and subscriber units RUGGEDCOM SAS-GW manages.

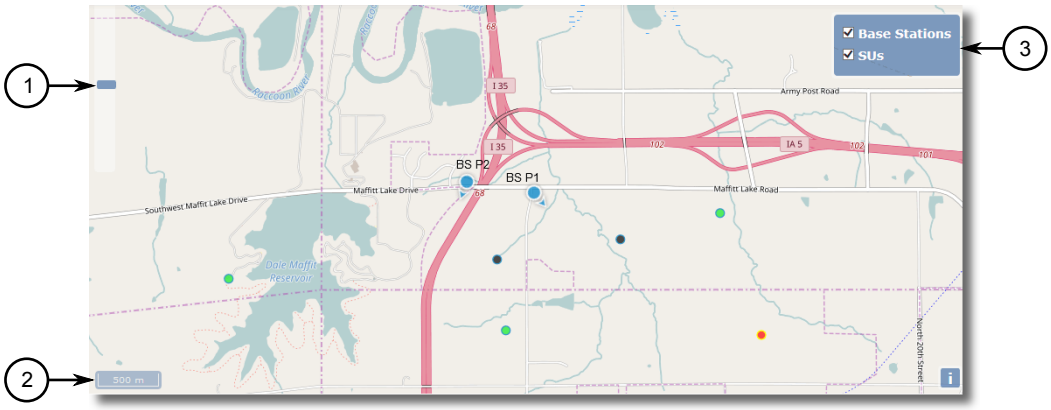


Figure 8: Map Features

1. Slider **2.** Current Magnification **3.** Filter Options

Key features of the map include:

- **Drag to Navigate**
  Navigate around the map by clicking and dragging any area of the map and moving it in the opposite direction.
- **Zoom**
  Use the mouse wheel or the slider in the top-left corner to zoom in or out of the map. The current magnification is displayed on the bottom-left corner and can range from 50 mm to 5000 km.
- **Icons**
  Circular icons on the map represent the location of the base stations and subscriber units. Each is assigned a color based on the status of the device. For more information about what each color means, refer to Section 3.4, "Determining the Status of Base Stations and Subscriber Units" .
- **Filtering**
  Use the **Base Station** and **Subscriber Unit** boxes in the top right corner of the map to hide or display devices on the map.

For information about how to configure the map source, refer to Section 3.8, "Configuring the Map" .

Section 3.4

Determining the Status of Base Stations and Subscriber Units

The color of the icons on the interactive map indicate the status of the individual base stations and subscriber units they represent.

Device Status	Base Station	Subscriber Unit
Operational, registered and approved		
Registered but not approved		

Device Status	Base Station	Subscriber Unit
Pending request		
Maximum power not approved		
Not operational		

Users can also left-click the icon to display a pop-up. The pop-up indicates the base station or subscriber unit's current operating state (e.g. operational, unreachable, etc.) and its status with the SAS (e.g. granted, unregistered, etc.).

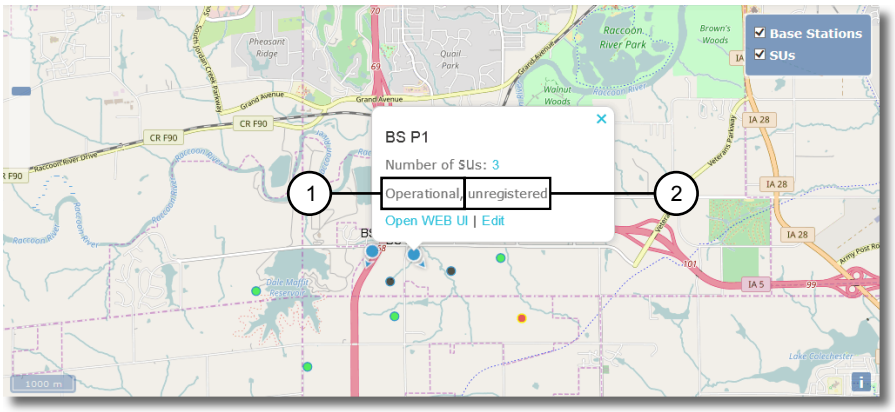


Figure 9: Pop-Up (Example)

1. Operating State **2.** SAS State

Section 3.5

Accessing a Station's Interface

The base station or subscriber unit's user interface can be opened directly from the RUGGEDCOM SAS-GW map. To access the user interface for a device, do the following:

IMPORTANT!
Base station interfaces are only accessible when the base station is transmitting. Similarly, subscriber unit interfaces are only accessible when the associated base station is transmitting.

1. Left-click the base station or subscriber unit on the map. A pop-up dialog box appears.

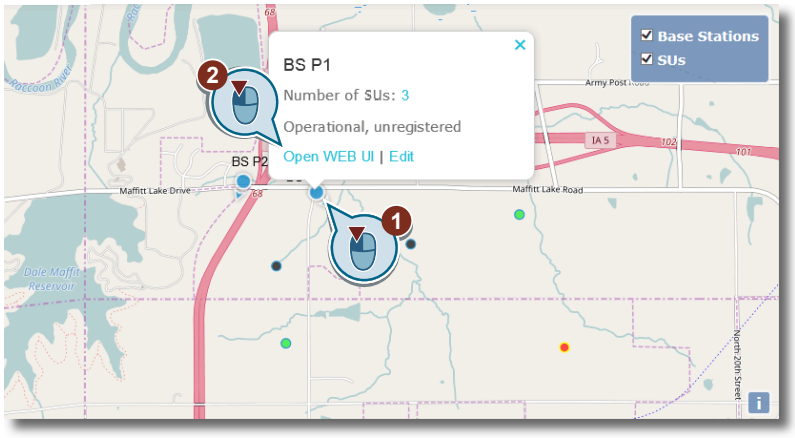


Figure 10: Accssing a Device's User Interface

2. Click **Open Web UI**. The device's user interface is loaded in a new browser window or tab.

Section 3.6

Determining the Current Version Installed

To determine which version of RUGGEDCOM SAS-GW is installed on the server, point to **Setup** and then click **About**. The **About WIN RUGGEDCOM SAS-GW** screen appears.

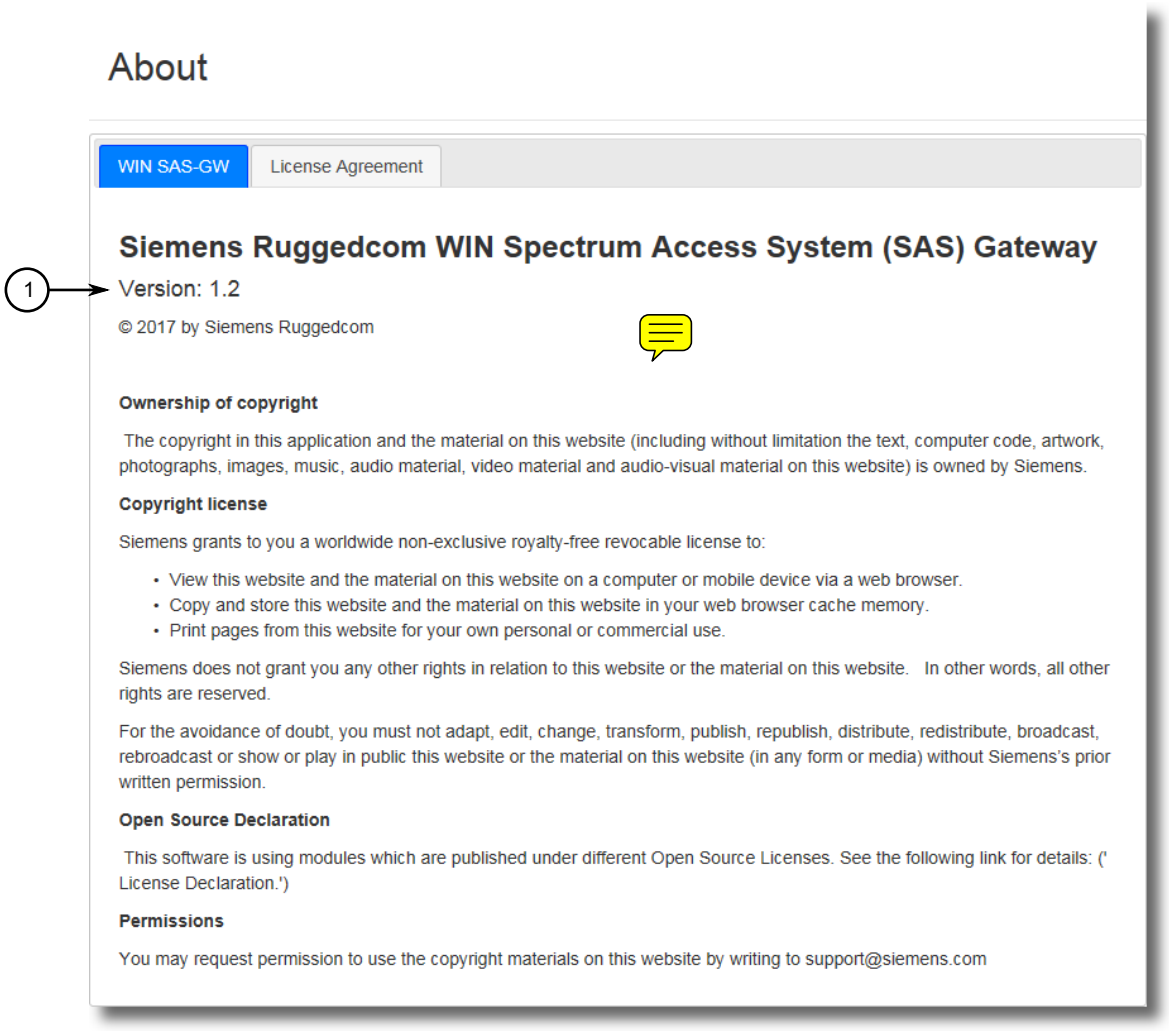


Figure 11: About WIN RUGGEDCOM SAS-GW Screen

1. Product Version

The **Product Version** box indicates the current version.

Section 3.7

Enabling/Disabling Troubleshooting Mode

When needed, RUGGEDCOM SAS-GW can be put into *troubleshooting mode* either for evaluation purposes or under debugging conditions. In this mode, SAS activity is simulated and changes to the wireless network are blocked.

To enable or disable troubleshooting mode, do the following:

1. Point to **Setup** and then click **Settings**. The **Update System Configuration** screen appears.

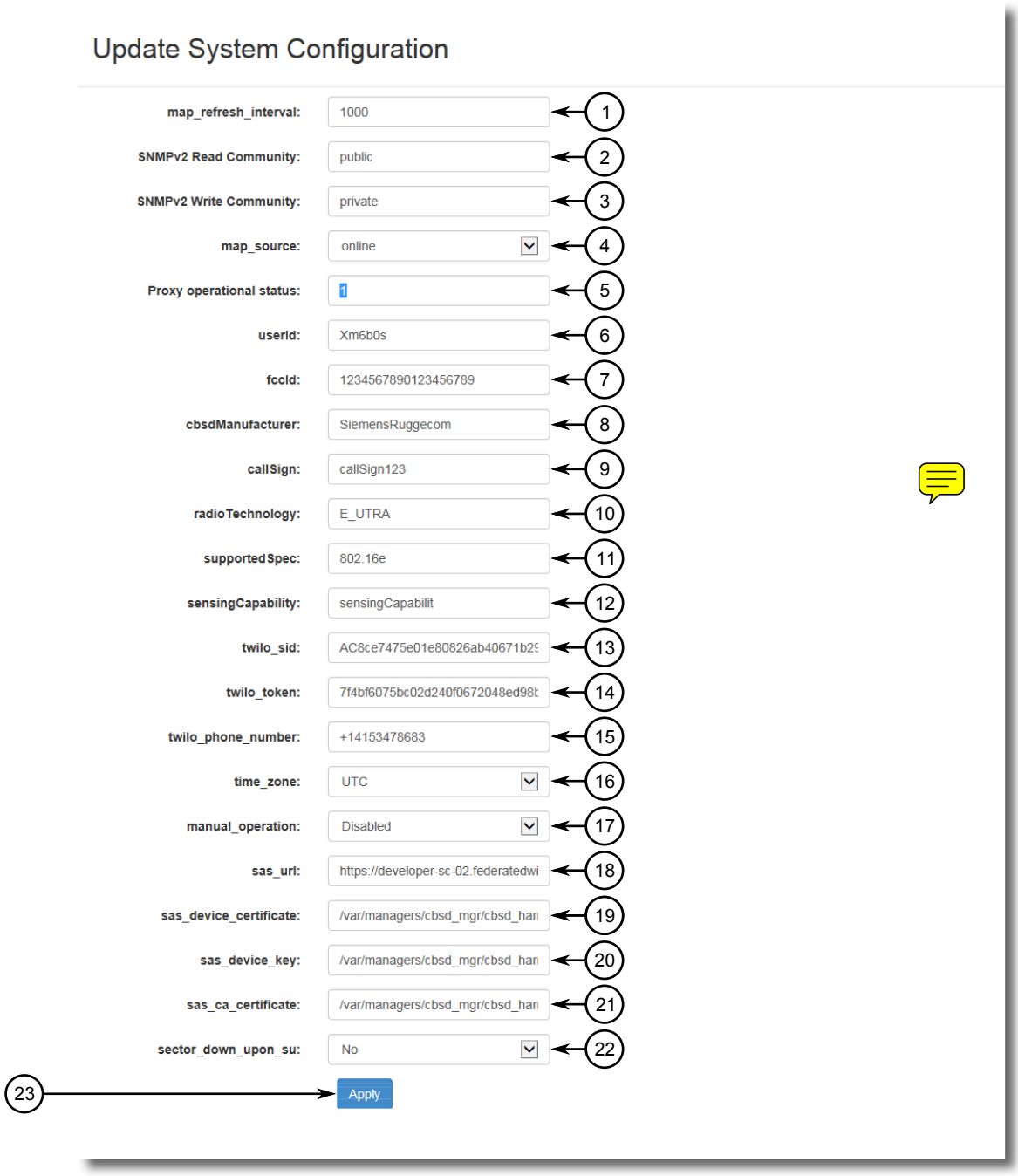


Figure 12: Update System Configuration Screen

1. Map Refresh Interval Box **2.** SNMPv2 Read Community Box **3.** SNMPv2 Write Community Box **4.** Map Source List **5.** Proxy Operational Status Box **6.** User ID Box **7.** FCC ID Box **8.** CBSD Manufacturer Box **9.** Call Sign Box **10.** Radio Technology Box **11.** Supported Specification Box **12.** Sensing Capability Box **13.** Twilio SID Box **14.** Twilio Token Box **15.** Twilio Phone Number Box **16.** Time Zone List **17.** Manual Operation List **18.** SAS URL Box **19.** SAS Device Certificate Box **20.** SAS Device Key Box **21.** SAS CA Certificate Box **22.** Sector Down Upon SU Box **23.** Apply Button

2. Under **Manual Operation**, select one of the following options:

- `Disabled` – Disables troubleshooting mode
- `Answer Positive` – RUGGEDCOM SAS-GW responds to all SAS requests positively as if the action was done
- `Answer Negative` – RUGGEDCOM SAS-GW responds to all SAS requests negatively as if the action was not done

3. Click **Apply**.

Section 3.8

Configuring the Map

The map provides a visual representation of where each base station and its associated subscriber units physically reside in relation to one another in a specific area of the world. It also acts as an interface for adding and configuring devices.

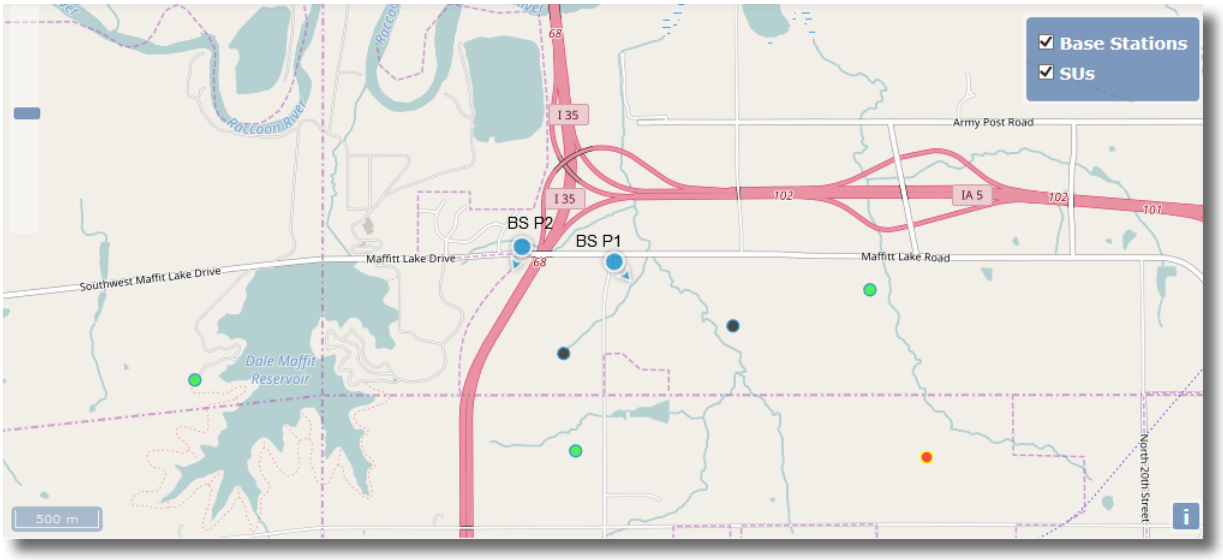


Figure 13: Map

The map source can be either local or online.

- **Local**
  Siemens offers a map file that can be saved locally under RUGGEDCOM SAS-GW. This allows users to operate RUGGEDCOM SAS-GW within a private network that is separated from the Internet.
- **Online**
  The online map is taken from https://www.OpenStreetMap.org , a free and open-source world map.

For information about how to use map, refer to Section 3.3.3, “Using the Map” .

CONTENTS

Section 3.8.1

Configuring Map Settings

To configure the source of the map and how often it is refreshed, do the following:

1. Point to **Setup** and then click **Settings**. The **Update System Configuration** screen appears.

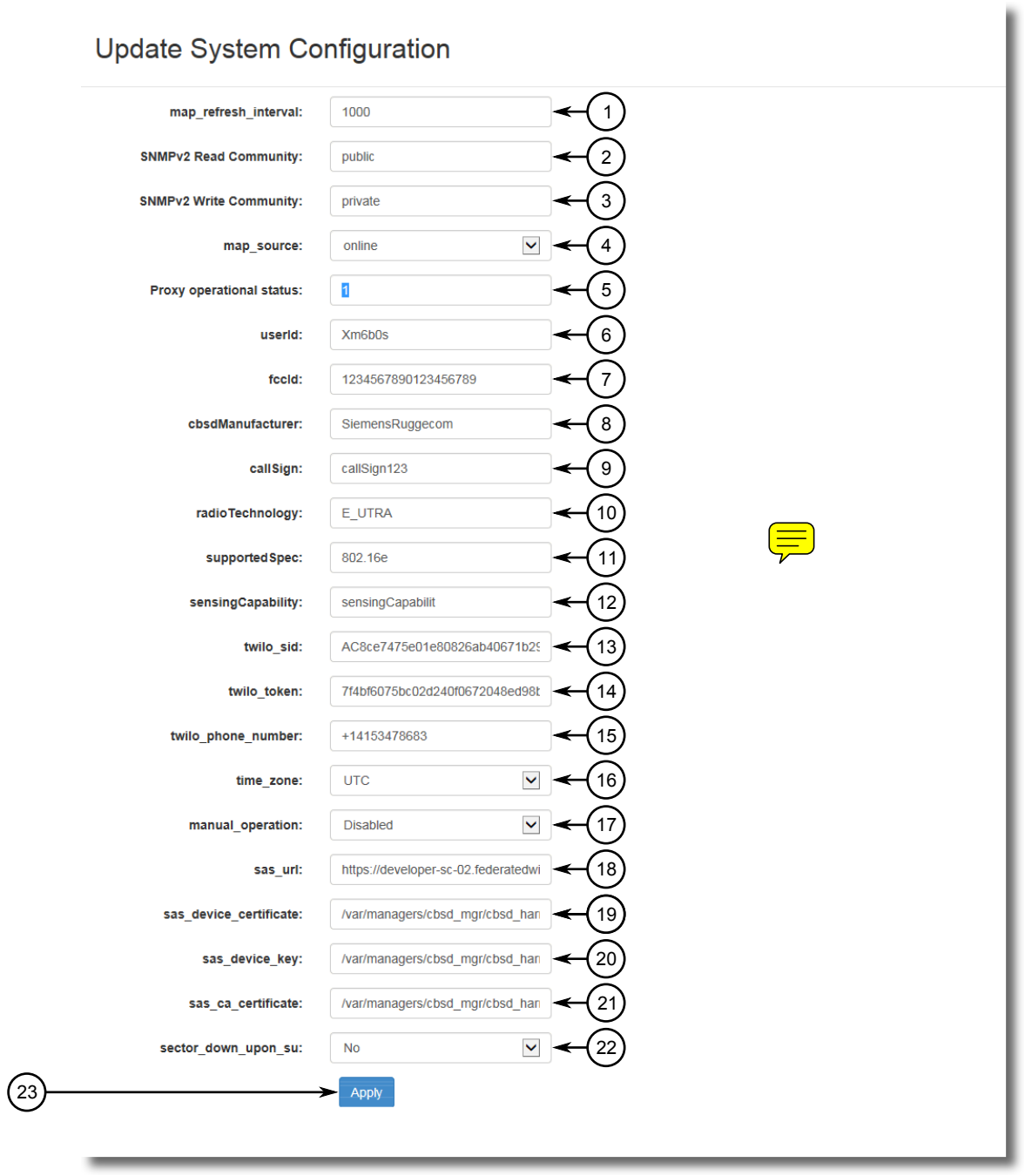


Figure 14: Update System Configuration Screen

1. Map Refresh Interval Box **2.** SNMPv2 Read Community Box **3.** SNMPv2 Write Community Box **4.** Map Source List **5.** Proxy Operational Status Box **6.** User ID Box **7.** FCC ID Box **8.** CBSD Manufacturer Box **9.** Call Sign Box **10.** Radio Technology Box **11.** Supported Specification Box **12.** Sensing Capability Box **13.** Twilio SID Box **14.** Twilio Token Box **15.** Twilio Phone Number Box **16.** Time Zone List **17.** Manual Operation List **18.** SAS URL Box **19.** SAS Device Certificate Box **20.** SAS Device Key Box **21.** SAS CA Certificate Box **22.** Sector Down Upon SU Box **23.** Apply Button

2. Under **Map Source**, select the map source. Options include:

- `Online` – The map is pulled from www.OpenStreetMap.org [https://www.openstreetmap.org].
- `Local` – The map is pulled from a local source. For information about using a local map, refer to Section 3.8.2, "Using Local Maps" .

3. Depending on the source selected, do the following:
   - If `Online` was selected, define under **Map Refresh Interval** the interval in milliseconds (ms) at which the map will be refreshed. The default is 1000 ms.
   - If `Local` was selected, install or update the local map. For more information, refer to Section 3.8.2, "Using Local Maps" .
4. Click **Apply**.

Section 3.8.2

Using Local Maps

To use a map that is saved locally under RUGGEDCOM SAS-GW, as opposed to an online version, do the following:

1. Submit a Support Request (SR) to Siemens Customer Support requesting the map file for RUGGEDCOM SAS-GW. A link to the required file(s) will be provided.

   For more information about submitting SRs, refer to "Customer Support" .
2. Download the file(s) and follow any instructions provided by Siemens Customer Support.
3. Using a file transfer utility, such as WINSCP, transfer the file(s) to the RUGGEDCOM SAS-GW server under `/tiles`.
4. Log in to RUGGEDCOM SAS-GW. The map should display on the main screen.

4 Configuring RUGGEDCOM SAS-GW

This chapter describes how to configure user profiles, base stations and subscriber units in RUGGEDCOM SAS-GW.

CONTENTS

Section 4.1

Configuring the Local Time Zone

The time zone where the RUGGEDCOM SAS-GW server resides must be defined if the SAS is in a different time zone. Log entries are timestamped with the current time zone and the current time provided by the server.

To specify the local time zone where the base stations and subscriber stations managed by RUGGEDCOM SAS-GW reside, do the following:

1. Point to **Setup** and then click **Settings**. The **Update System Configuration** screen appears.

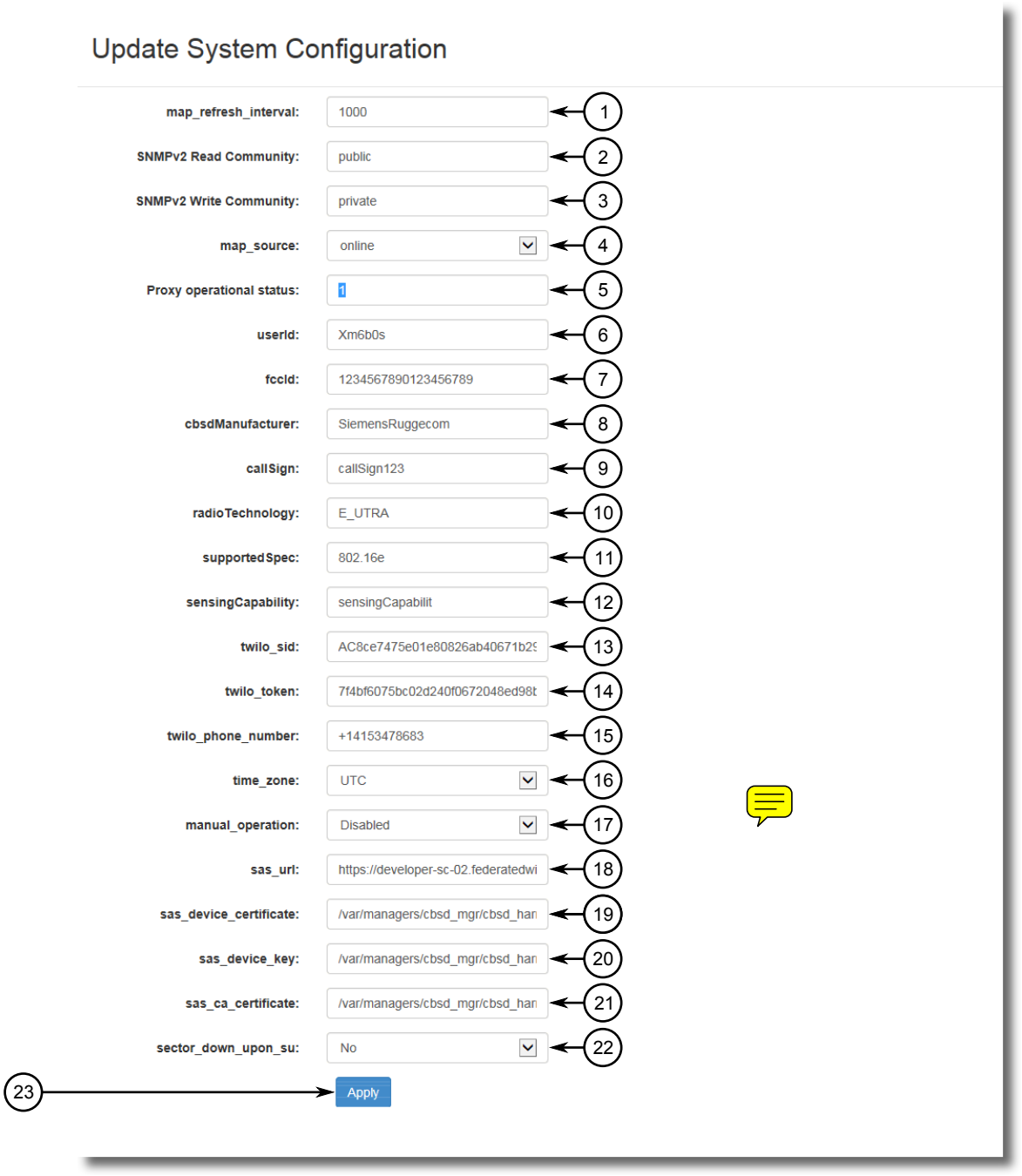


Figure 15: Update System Configuration Screen

1. Map Refresh Interval Box **2.** SNMPv2 Read Community Box **3.** SNMPv2 Write Community Box **4.** Map Source List **5.** Proxy Operational Status Box **6.** User ID Box **7.** FCC ID Box **8.** CBSD Manufacturer Box **9.** Call Sign Box **10.** Radio Technology Box **11.** Supported Specification Box **12.** Sensing Capability Box **13.** Twilio SID Box **14.** Twilio Token Box **15.** Twilio Phone Number Box **16.** Time Zone List **17.** Manual Operation List **18.** SAS URL Box **19.** SAS Device Certificate Box **20.** SAS Device Key Box **21.** SAS CA Certificate Box **22.** Sector Down Upon SU Box **23.** Apply Button

2. Under **Time Zone**, select the desired time zone. Options include:

- UTC
- UTC-4
- UTC-5
- UTC-6
- UTC-7
- UTC-8
- UTC-9
- UTC-10
- UTC-11

3. Click **Apply**.

Section 4.2

Configuring the SNMP Read/Write Communities

RUGGEDCOM SAS-GW uses SNMPv2 to poll and issue commands to base stations and their associated subscriber units. RUGGEDCOM SAS-GW and all registered devices must use the same read and write communities.

To configure the SNMP read and write communities for RUGGEDCOM SAS-GW, do the following:

1. Point to **Setup** and then click **Settings**. The **Update System Configuration** screen appears.

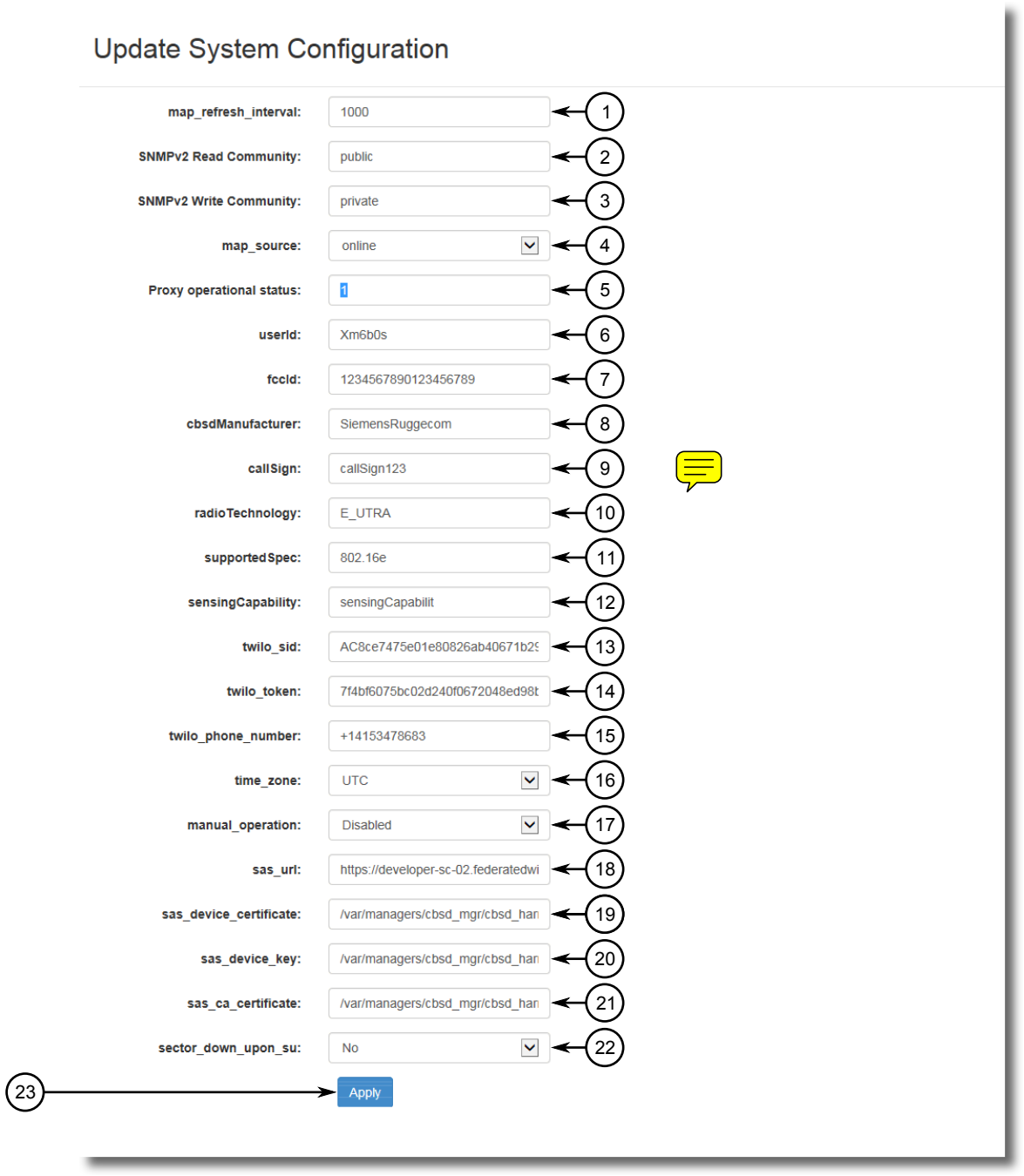


Figure 16: Update System Configuration Screen

1. Map Refresh Interval Box **2.** SNMPv2 Read Community Box **3.** SNMPv2 Write Community Box **4.** Map Source List **5.** Proxy Operational Status Box **6.** User ID Box **7.** FCC ID Box **8.** CBSD Manufacturer Box **9.** Call Sign Box **10.** Radio Technology Box **11.** Supported Specification Box **12.** Sensing Capability Box **13.** Twilio SID Box **14.** Twilio Token Box **15.** Twilio Phone Number Box **16.** Time Zone List **17.** Manual Operation List **18.** SAS URL Box **19.** SAS Device Certificate Box **20.** SAS Device Key Box **21.** SAS CA Certificate Box **22.** Sector Down Upon SU Box **23.** Apply Button

2. Configure the following parameters:

Parameter	Description
SNMPv2 Read Community	**Synopsis:** A string **Default:** public The name of the SNMP read community. **The community name must match the name used by all registered base stations and subscriber units.**
SNMPv2 Write Community	**Synopsis:** A string **Default:** private The name of the SNMP write community. **The community name must match the name used by all registered base stations and subscriber units.**

3. Click **Apply**.

Section 4.3
Managing User Accounts

This section describes how to configure and manage user accounts in RUGGEDCOM SAS-GW.

IMPORTANT!
User accounts can only be added or updated by admin users.

CONTENTS

Section 4.3.1
Adding a User Account

To add a new user account, do the following:

1. Point to **User** and click **Add User**. The **Register New User** screen appears.

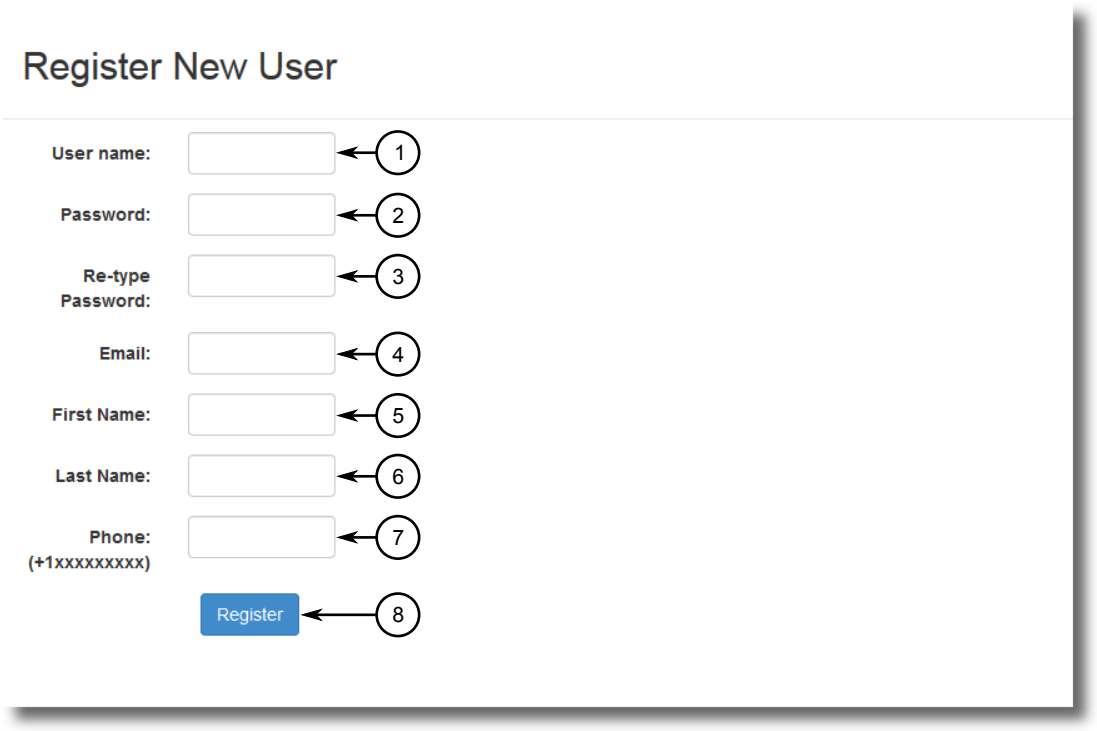


Figure 17: Add User Screen

1. User Name Box **2.** Password Box **3.** Re-Type Password Box **4.** E-Mail Box **5.** First Name Box **6.** Last Name Box **7.** Phone Box **8.** Register Button

2. Configure the following parameters:

Parameter	Description
User Name	**Synopsis:** A string 5 to 25 characters long A unique name used by the user to log in to RUGGEDCOM SAS-GW.
Password	**Synopsis:** A string 8 to 50 characters long The password used by the user to log in to RUGGEDCOM SAS-GW.
Re-Type Password	The password used by the user to log in to RUGGEDCOM SAS-GW.

3. [Optional] Configure these additional parameters to define the user's contact information:

Parameter	Description
E-Mail	The user's e-mail address.
First Name	The user's first name.
Last Name	The user's last name.
Phone	The user's phone number. This is required for the user to receive SMS alerts.

4. Click **Register**.

Section 4.3.2

Updating a User Account

To change a user's account settings, do the following:

Updating the Current User's Account

1. Point to **Users** and then click **My Account**. The **Update My Account** screen appears.

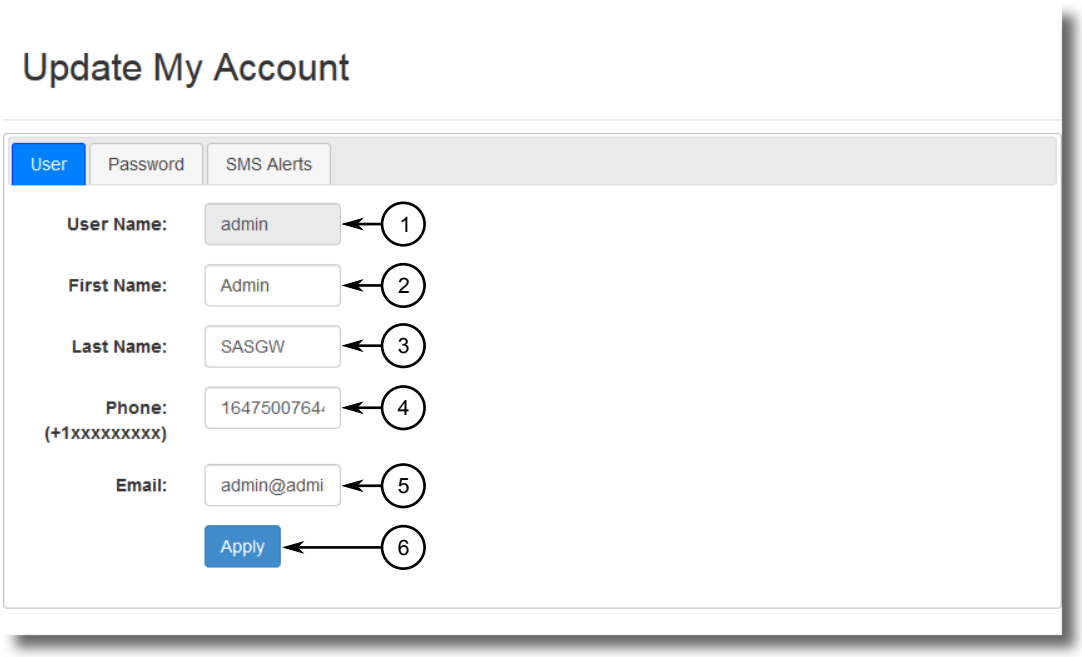


Figure 18: Update My Account Screen

1. User Name Box **2.** First Name Box **3.** Last Name Box **4.** Phone Box **5.** E-Mail Box **6.** Apply Button

2. Configure the following parameters:

Parameter	Description
First Name	The user's first name.
Last Name	The user's last name.
Phone	The user's phone number. This is required for the user to receive SMS alerts.
E-Mail	The user's e-mail address.

3. Click **Apply**.

Updating Another User's Account

1. Point to **Users** and then click **All Users**. The **View All users** screen appears.

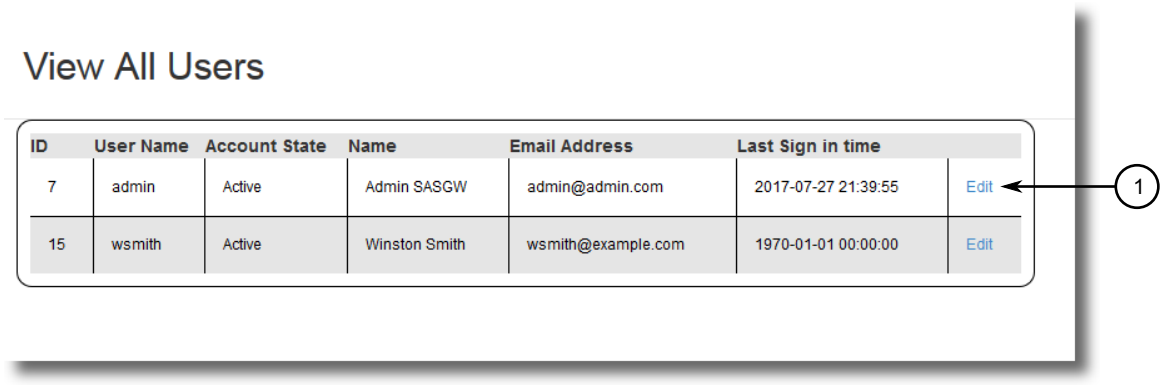


Figure 19: View All Users Screen

1. Edit Hyperlnk

2. Click **Edit**. The **Update Account** screen appears.

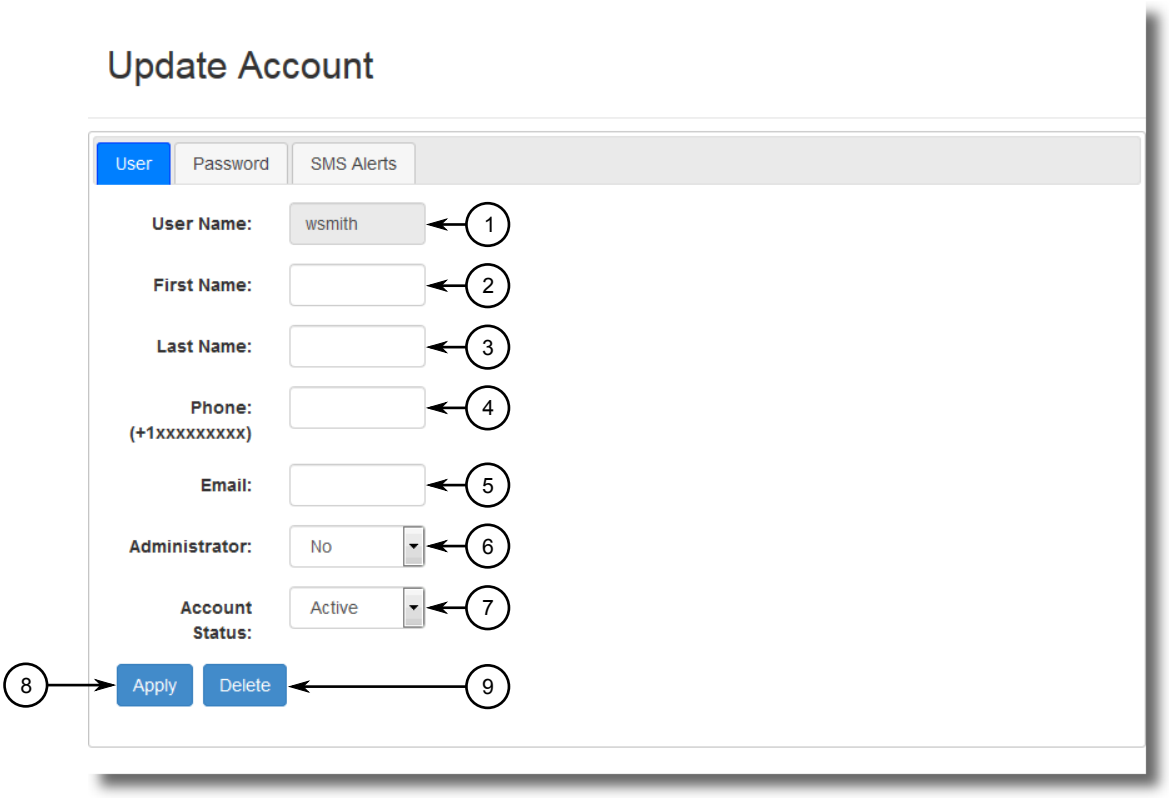


Figure 20: Update Account Screen

1. User Name **2.** First Name Box **3.** Last Name Box **4.** Phone Box **5.** E-Mail Box **6.** Administrator List **7.** Account Status List **8.** Apply Button **9.** Delete Button

3. Configure the following parameters:

Parameter	Description
First Name	The user's first name.
Last Name	The user's last name.
Phone	The user's phone number. This is required for the user to receive SMS alerts.
E-Mail	The user's e-mail address.

4. Click **Apply**.

Section 4.3.3
Changing User Password

To change the password associated with a user account, do the following:

Changing the Current User's Password

1. Point to **Users** and then click **My Account**. The **Update My Account** screen appears.

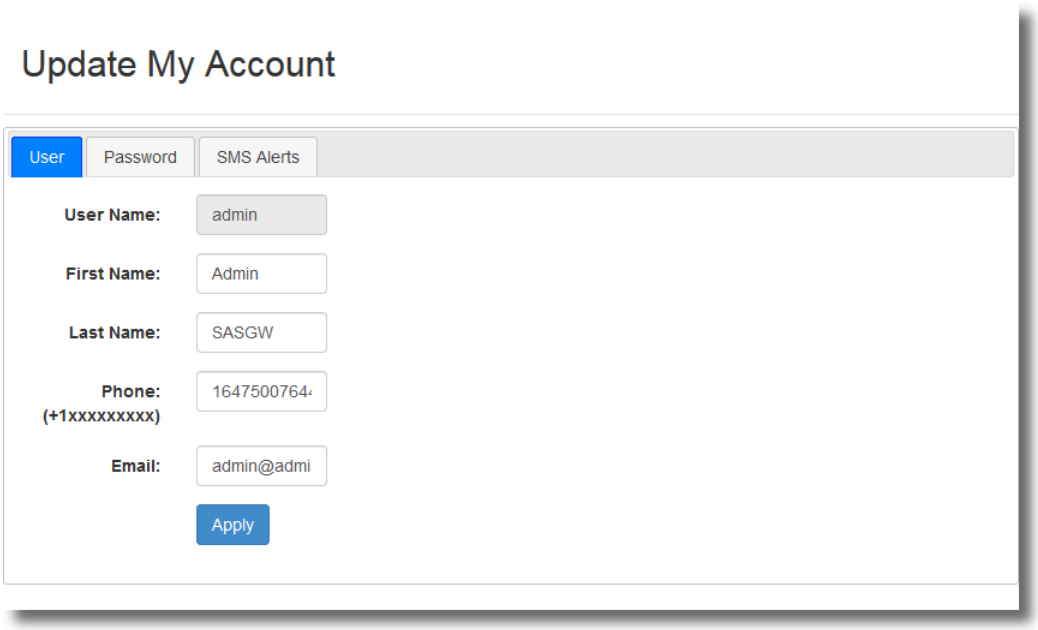


Figure 21: Update My Account Screen

2. Select the **Password** tab. The **Password** tab appears.

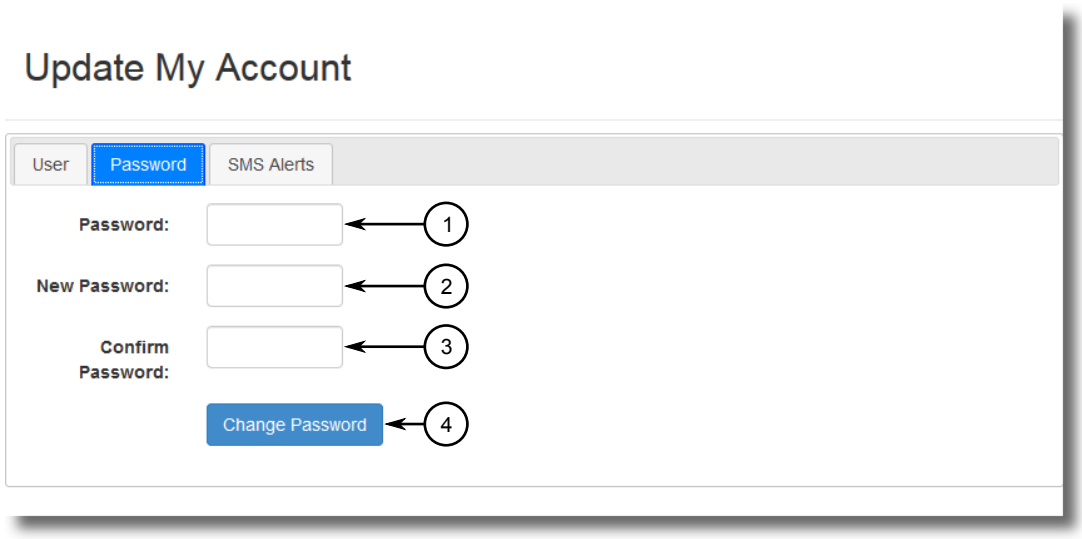


Figure 22: Password Tab

1. Password Box **2.** New Password Box **3.** Confirm Password Box **4.** Change Password Button

NOTE
Passwords must be between 8 and 50 characters.

3. Under **Password**, enter the current password.
4. Under **New Password** and **Confirm Password**, enter the new password.
5. Click **Change Password**.

Changing Another User's Password

1. Point to **Users** and then click **All Users**. The **View All users** screen appears.

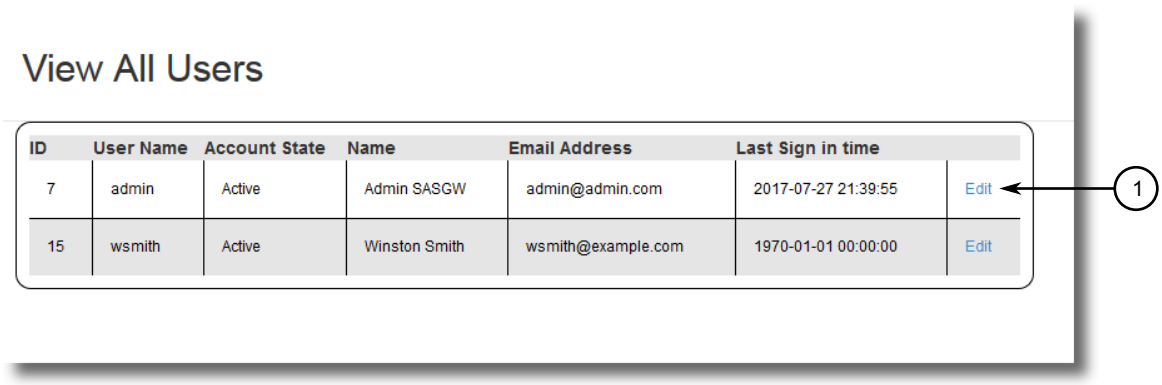


Figure 23: View All Users Screen

1. Edit Hyperlnk

2. Click **Edit**. The **Update Account** screen appears.

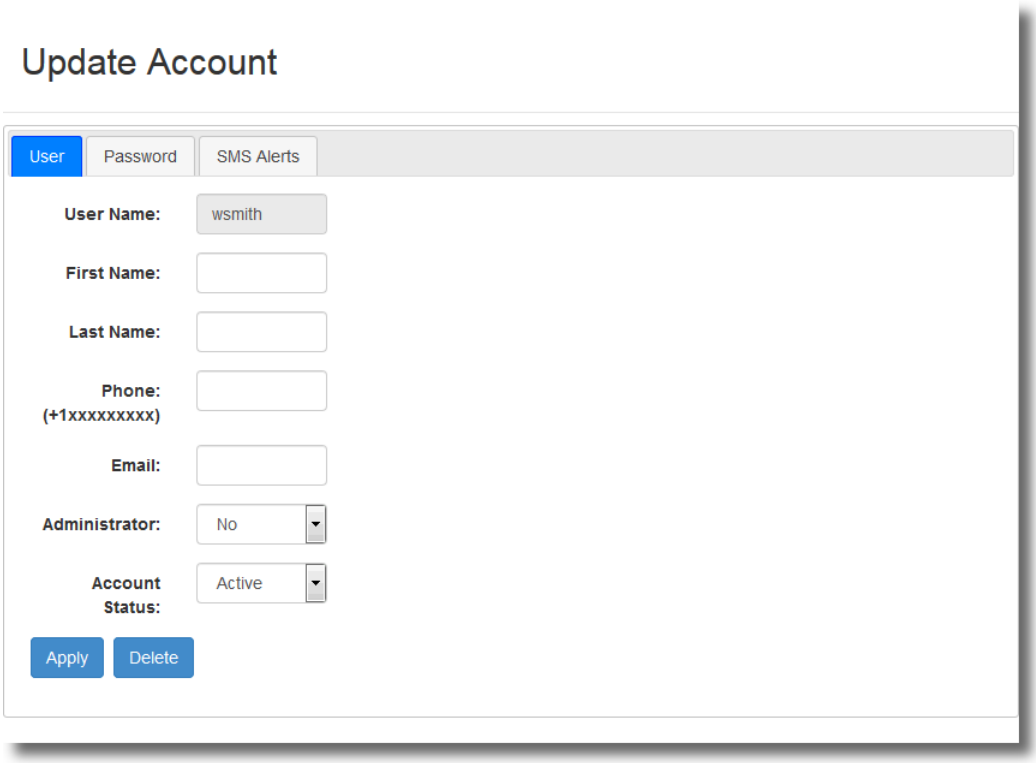


Figure 24: Update Account Screen

3. Select the **Password** tab. The **Password** tab appears.

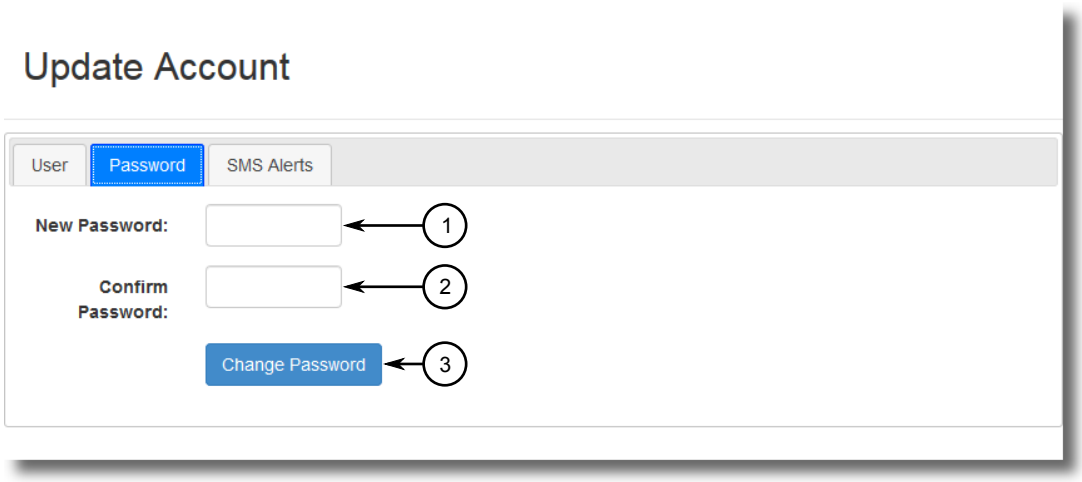


Figure 25: Password Tab

1. New Password Box **2.** Confirm Password Box **3.** Change Password Button

NOTE
Passwords must be between 8 and 50 characters.

4. Under **New Password** and **Confirm Password**, enter the new password.
5. Click **Change Password**.

Section 4.3.4

Configuring SMS Alerts

Individual user profiles can be configured to receive Short Message Service (SMS) alerts from RUGGEDCOM SAS-GW when specific events occur during operation. All alerts are sent via text message to the user's phone number.

By default, SMS alerts are disabled for each new user profile.

To configure SMS alerts for a specific user profile, do the following:

IMPORTANT!
SMS alerts must be enabled before they are configured. For more information, refer to *Section 2.4, "Enabling SMS Alerts"* .

1. Point to **Users** and then click either **My Account** to edit the current profile, or open the **View All Users** list and click **Edit** next to the desired user profile.

   For more information about accessing the **View All Users** list, refer to Section 4.3.6, "Listing User Accounts" .

   The **My Account** or **Update Account** screen appears.

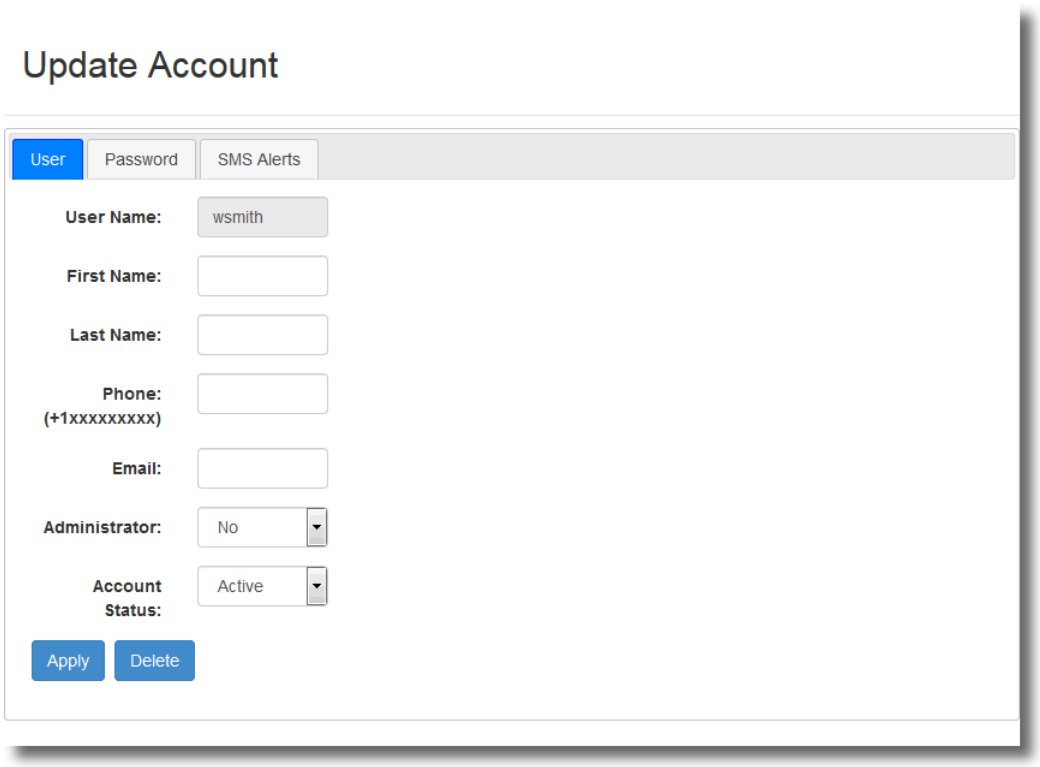


Figure 26: Update Account Screen (Example)

2. Select the **SMS Alerts** tab. The **SMS Alerts** tab appears.

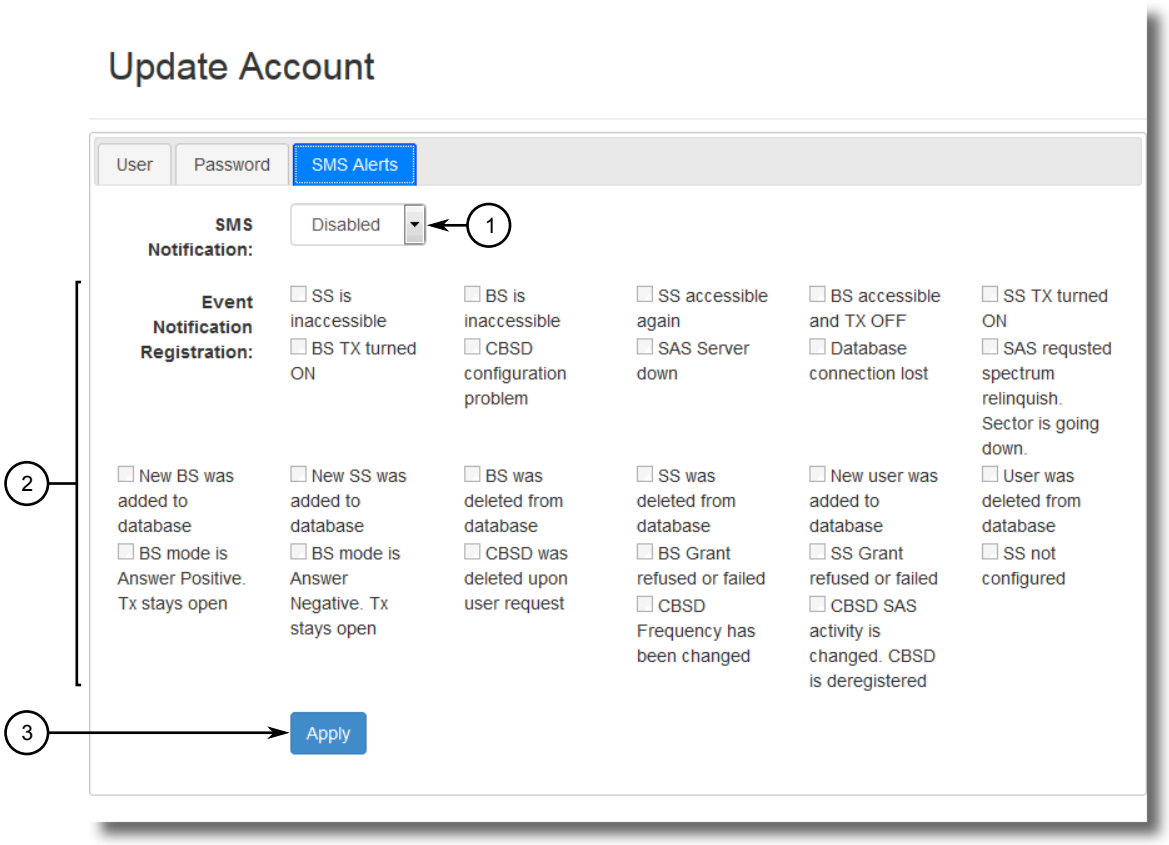


Figure 27: SMS Alerts Tab (Example)

1. SMS Notification List **2.** Event Notification Registation Options **3.** Apply Button

3. Under **SMS Notification**, select `Enabled`.
4. Under **Event Notification Registation**, select the events that will trigger SMS alerts. For more information about each event, refer to Section 5.5, "Tracked Events" .
5. Click **Apply**.

Section 4.3.5

Removing a User Account

To remove a user account, do the following:

1. Point to **Users** and then click **All Users**. The **View All users** screen appears.

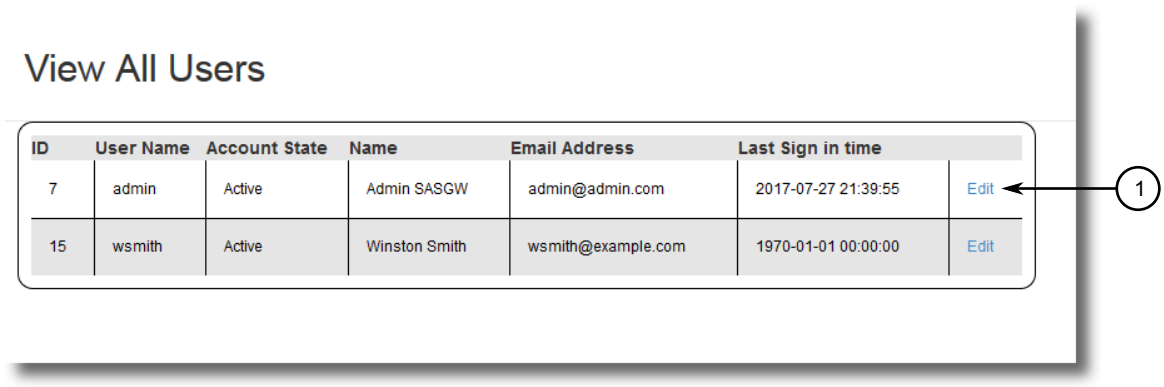


Figure 28: View All Users Screen

1. Edit Hyperlnk

2. Click **Edit**. The **Update Account** screen appears.

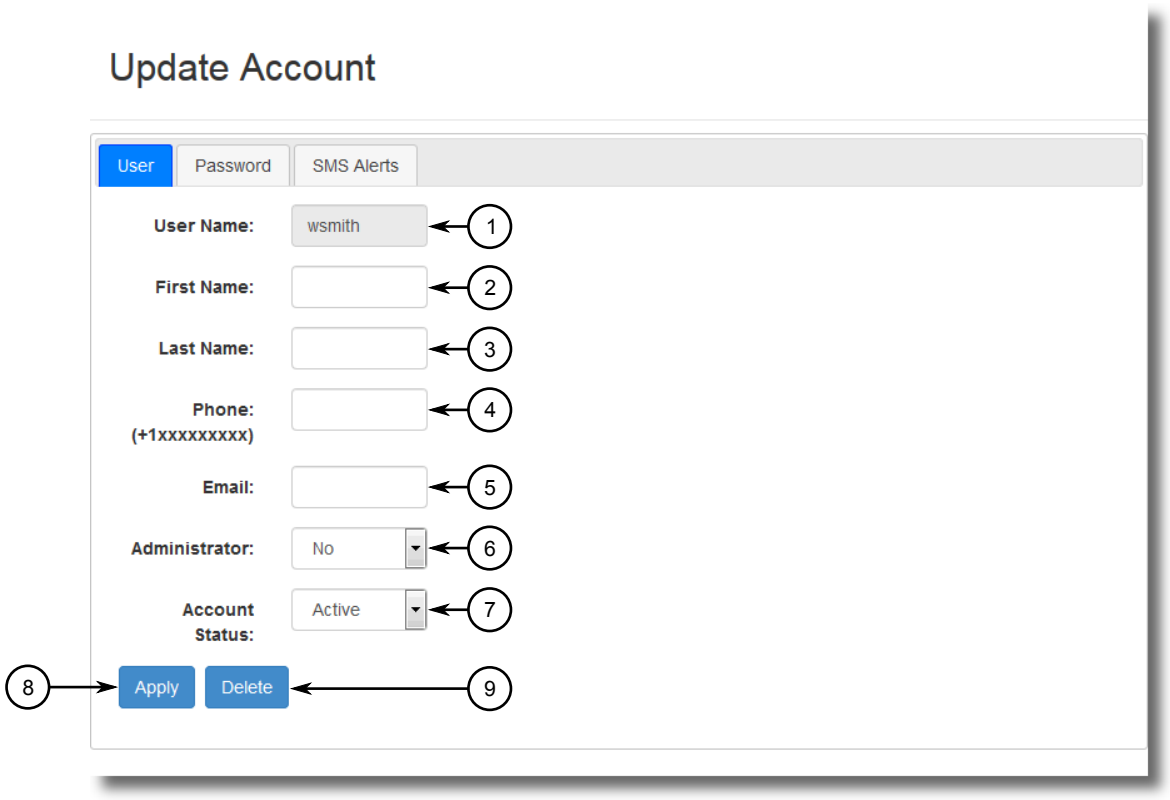


Figure 29: Update Account Screen

1. User Name **2.** First Name Box **3.** Last Name Box **4.** Phone Box **5.** E-Mail Box **6.** Administrator List **7.** Account Status List **8.** Apply Button **9.** Delete Button

3. Click **Delete**. A confirmation message appears.

4. Click **Yes**.

Section 4.3.6
Listing User Accounts

To view a list of user accounts configured for RUGGEDCOM SAS-GW, point to **User** and then click **All Users**. The **View All Users** screen appears.

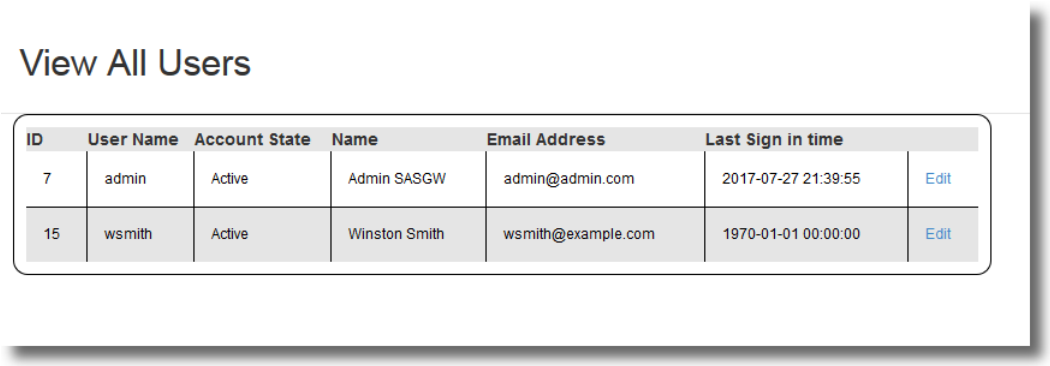


Figure 30: View All Users Screen

This screen displays the following information about each user:

Column	Description
ID	A numeric identifier assigned automatically to the user.
User Name	The user's user name.
Account State	The user's current state. `Active` indicates the user is currently logged in.
Name	The user's first and last name.
E-Mail Address	The user's e-mail address.
Last Sign In Time	The date and time when the user last logged on.

Section 4.4
Managing Base Stations

This section describes how to configure and manage base stations in RUGGEDCOM SAS-GW.

CONTENTS

Section 4.4.1

Adding a Base Station

To add a new base station to RUGGEDCOM SAS-GW, do the following:

1. Point to **Setup** and then click **Add BS**. The **Create New Base Station** screen appears.

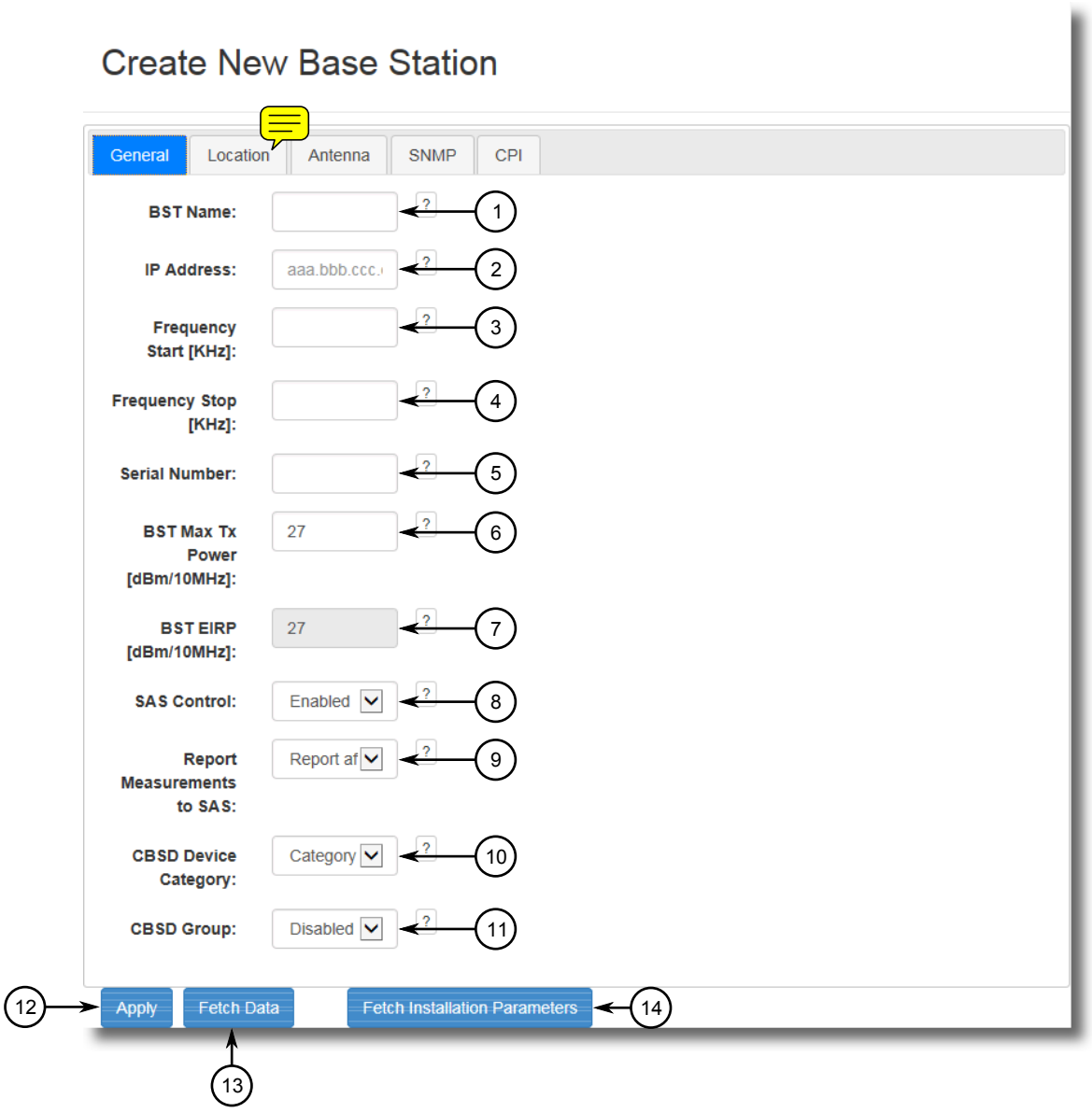


Figure 31: Create New Base Station Screen

1. BST Name Box **2.** IP Address Box **3.** Frequency Start Box **4.** Frequency Stop Box **5.** Serial Number **6.** BST Max Tx Power Box **7.** BST Max EIRP Box **8.** SAS Control List **9.** Report Measurements to SAS List **10.** CBSD Device Category List **11.** CBSD Group List **12.** Apply Button **13.** Fetch Data Button **14.** Fetch Installation Parameters Button

2. Configure the following parameters.

Parameter	Description
BST Name	**Synopsis:** A string A unique name for the base station.
IP Address	**Synopsis:** An IPv4 address The base station's IP address.

Parameter	Description
SAS Control	**Synopsis:** { Enabled, Disabled, Off the Grid } **Default:** Enabled Defines how RUGGEDCOM SAS-GW will handle the base station. Options include: • `Enabled` – The base station will be reported to the SAS. • `Disabled` – The base station will not be reported to the SAS. However, RUGGEDCOM SAS-GW will still query the device for its status. • `Off the Grid` – The base station will not be registered or queried. Any subscriber units connected to the base station will also be unknown to RUGGEDCOM SAS-GW.

3. Select the **SNMP** tab. The **SNMP** tab appears.

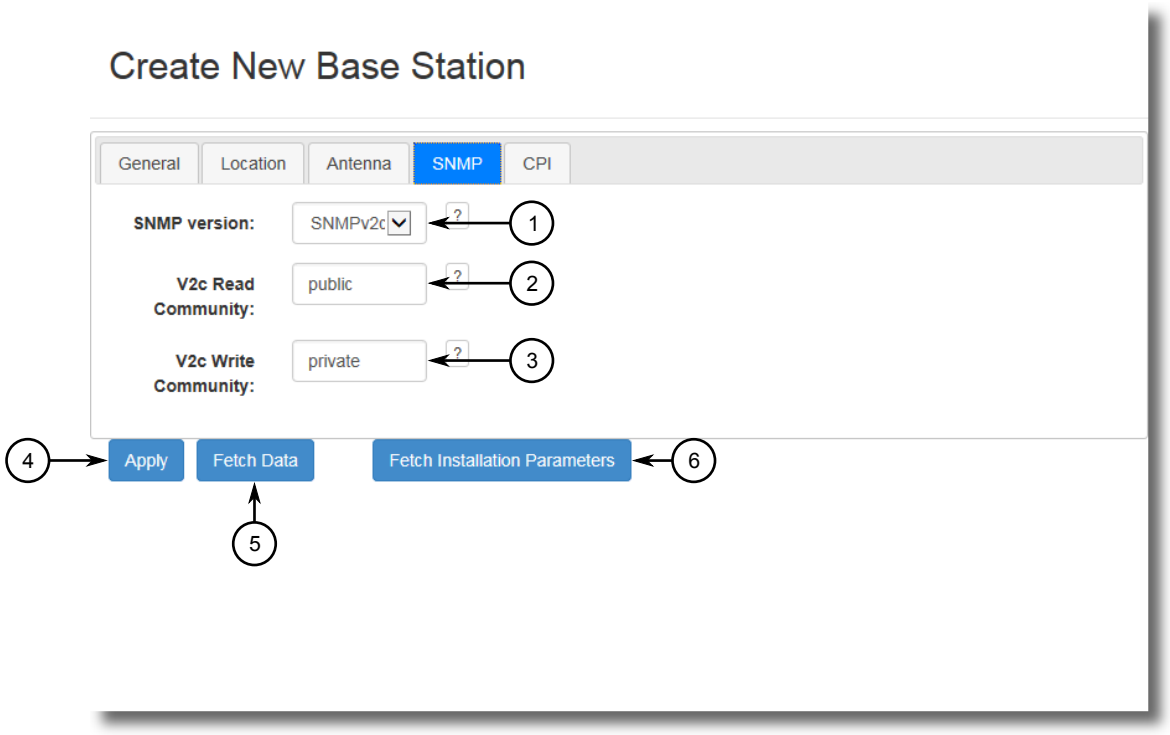


Figure 32: SNMP Tab

1. SNMP Version List **2.** V2c Read Community Box **3.** V2c Write Community Box **4.** Apply Button **5.** Fetch Data Button **6.** Fetch Installation Parameters Button

4. Configure the following parameters:

Parameter	Description
SNMP Version	**Synopsis:** { SNMPv2c, SNMPv3-NA } **Default:** SNMPv2c The version of SNMP used by the base station.
V2c Read Community	**Synopsis:** A string **Default:** public The name of the SNMP read community.

Parameter	Description
	The community name must match the name defined in the base station's SNMP configuration.
V2c Write Community	**Synopsis:** A string **Default:** private The name of the SNMP write community. **The community name must match the name defined in the base station's SNMP configuration.**

5. Click **Apply**.
6. Click **Fetch Data**. RUGGEDCOM SAS-GW begins polling the base station for select information.
7. Review each tab and verify the values of each parameter.

Section 4.4.2
Updating a Base Station's Configuration

To update the configuration of a base station, do the following:

1. Left-click the base station on the map and then click **Edit**, or open the **View All Base Stations** list and click **Edit** next to the desired base station.

   For information about accessing the **View All Base Stations** list, refer to Section 4.4.8, "Viewing Available Base Stations" .

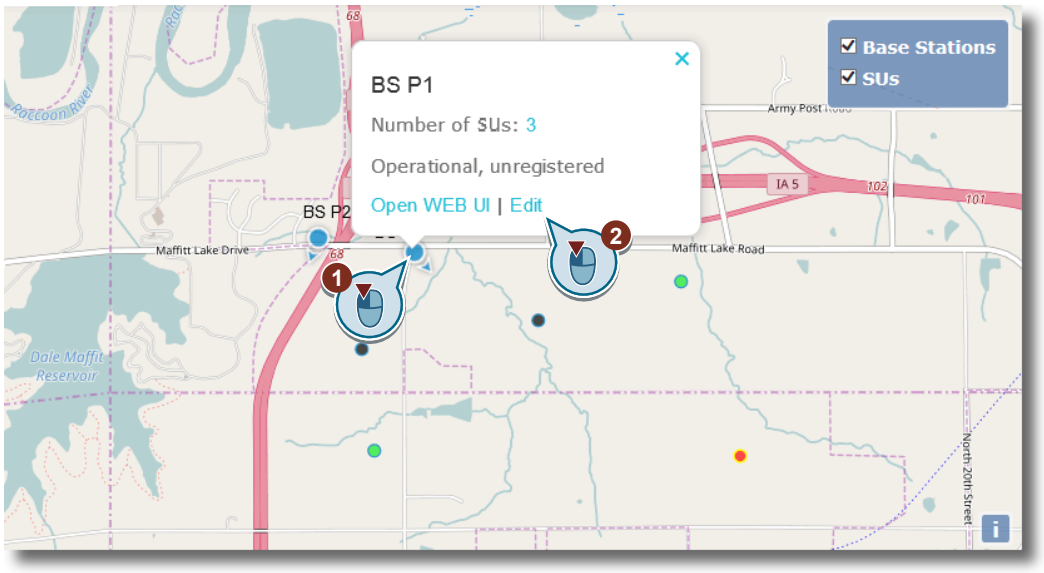


Figure 33: Editing a Base Station from the Map

Once clicking **Edit**, the **Update Base Station** screen appears.

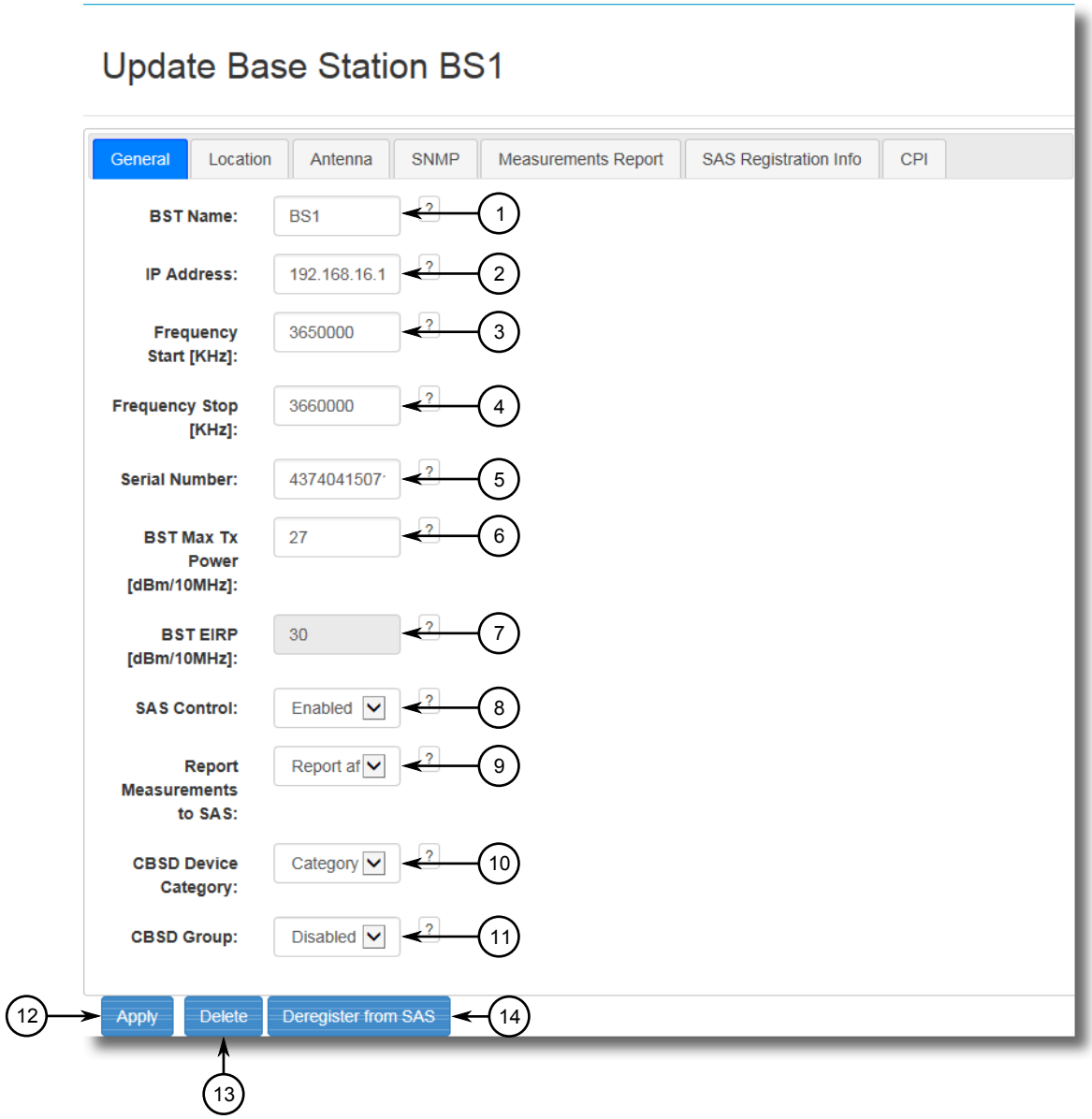


Figure 34: Update Base Station Screen

1. BST Name Box **2.** IP Address Box **3.** Frequency Start Box **4.** Frequency Stop Box **5.** Serial Number **6.** BST Max Tx Power Box **7.** BST Max EIRP Box **8.** SAS Control List **9.** Report Measurements to SAS List **10.** CBSD Device Category List **11.** CBSD Group List **12.** Apply Button **13.** Delete Button **14.** Deregister from SAS Button

2. On the **General** tab, update the following parameters as needed:

Parameter	Description
BST Name	**Synopsis:** A string A unique name for the base station.
IP Address	**Synopsis:** An IPv4 address The base station's IP address.

Parameter	Description
Frequency Start	**Synopsis:** A number between 3550000 and 37700000 The low value of the frequency bandwidth, measured in kilohertz (KHz), in which the base station operates.
Frequency Stop	**Synopsis:** A number between 3550000 and 37700000 The high value of the frequency bandwidth, measured in kilohertz (KHz), in which the base station operates.
Serial Number	**Synopsis:** A string The serial number assigned to the base station by the vendor.
BST Max Tx Power	**Synopsis:** A number between 17 and 27 The maximum transmission (Tx) power in dBm/10 MHz.
BST Max EIRP	**Synopsis:** A number The maximum EIRP, measured in decibels-per-minute/megahertz (dBm/MHz) permitted by the grant.
SAS Control	**Synopsis:** { Enabled, Disabled, Off the Grid } **Default:** Enabled Defines how RUGGEDCOM SAS-GW will handle the base station. Options include: • `Enabled` – The base station will be reported to the SAS. • `Disabled` – The base station will not be reported to the SAS. However, RUGGEDCOM SAS-GW will still query the device for its status. • `Off the Grid` – The base station will not be registered or queried. Any subscriber units connected to the base station will also be unknown to RUGGEDCOM SAS-GW.
Report Measurements to SAS	**Synopsis:** { No Reports, Report after Grant } **Default:** Report after Grant Controls whether the received power measurement is reported to the SAS. Options include: • `No Reports` – No reports are sent to the SAS • `Report after Grant` – Power measurement is reported when spectrum has been granted
CBSD Category	**Synopsis:** { a, b } **Default:** a The CBSD category that applies to all devices behind the RUGGEDCOM SAS-GW. Options include: • `a` – Category A CBSDs are lower power devices that meet all general FCC requirements and those set forth in sections 96.41 and 96.45 of the FCC's Code of Federal Regulations (CFR) • `b` – Category B CBSDs are higher power devices that meet all general FCC requirements and those set forth in sections 96.41 and 96.45 of the FCC's Code of Federal Regulations (CFR) **IMPORTANT!** *When `a` is selected, information about the device installer is required. For more information, refer to* *Section 4.4.6, "Updating CPI Information"*.
CBSD Group	**Synopsis:** { Disabled, Enabled } **Default:** Disabled Controls whether grouping parameters are sent with registration requests. Options include: • `Disabled` – Registration requests are sent to the SAS without grouping parameters • `Enabled` – Registration requests are sent to the SAS with grouping parameters

3. Click **Apply**.

Section 4.4.3

Updating a Base Station's Location

To define a base station's location, do the following:

> **NOTE**
> *RUGGEDCOM SAS-GW automatically polls each base station for its current GPS coordinates and updates its database when a change occurs. Coordinates that are manually entered will be overwritten if they do not match the base station's actual GPS coordinates.*

1. Left-click the base station on the map and then click **Edit**, or open the **View All Base Stations** list and click **Edit** next to the desired base station.

   For information about accessing the **View All Base Stations** list, refer to Section 4.4.8, "Viewing Available Base Stations" .

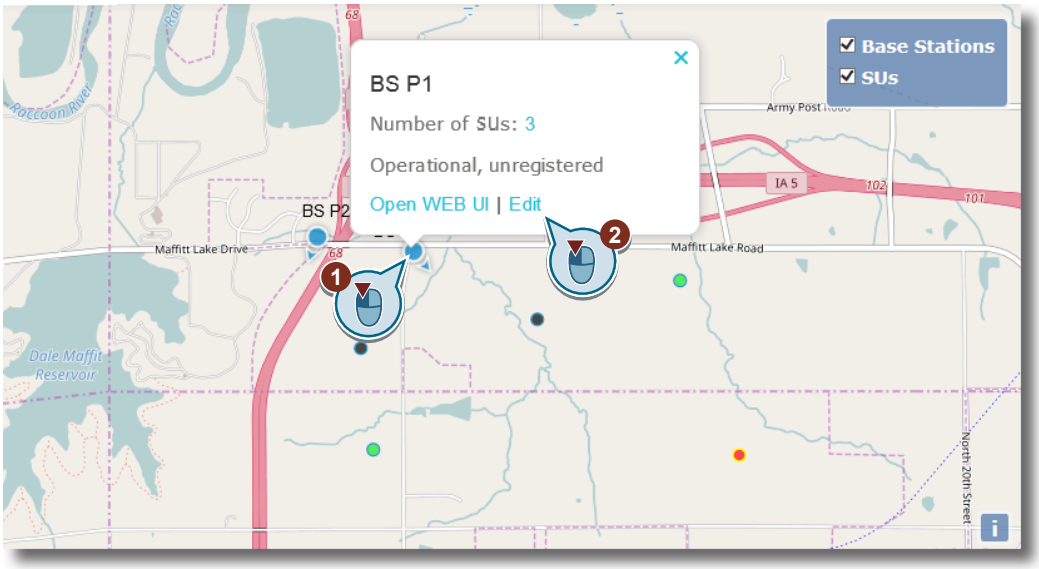


Figure 35: Editing a Base Station from the Map

Once clicking **Edit**, the **Update Base Station** screen appears.

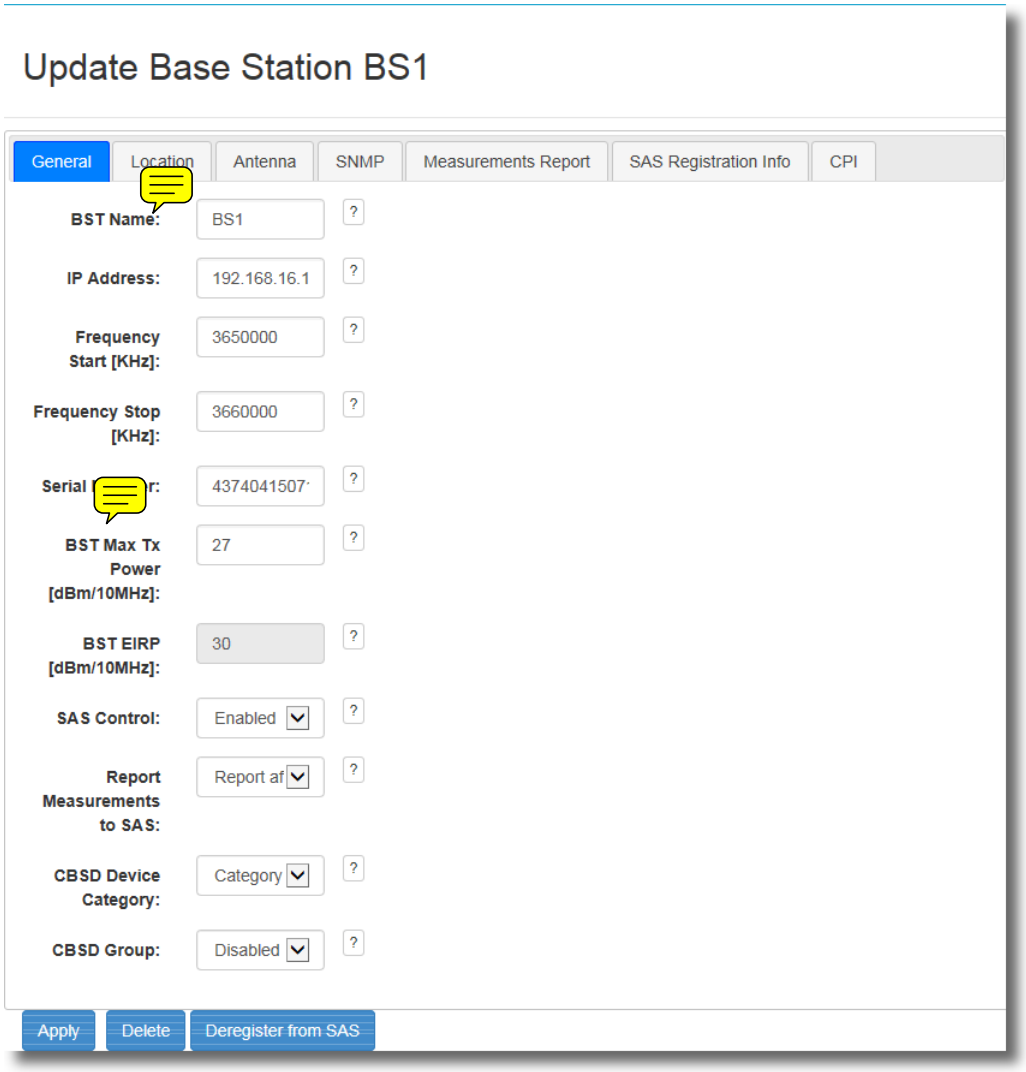


Figure 36: Update Base Station Screen

2. Select the **Location** tab. The **Location** tab appears.

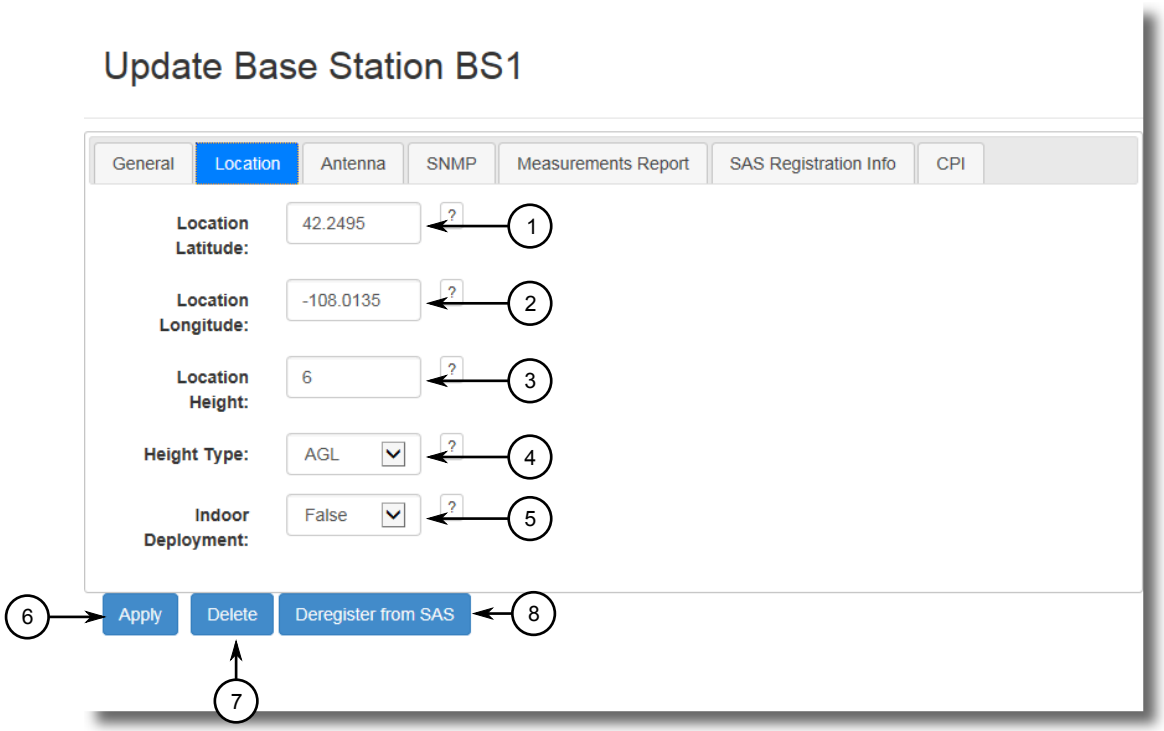


Figure 37: Location Tab

1. Location Latitude Box **2.** Location Longitude Box **3.** Location Height Box **4.** Height Type List **5.** Indoor Deployment List **6.** Apply Button **7.** Delete Button **8.** Deregister from SAS Button

3. Update the following parameters as needed:

Parameter	Description
Location Latitude	Latitudinal position of the base station's antenna in degrees (°), relative to the World Geodetic System (WGS) 1984 datum.
Location Longitude	Longitudinal position of the base station's antenna in degrees (°), relative to the World Geodetic System (WGS) 1984 datum.
Location Height	The height of the base station's antenna above ground level in meters (m).
Height Type	**Synopsis:** { AGL, AMSL } **Default:** AGL Indicates whether the height was measure relative to ground level or sea level. Options include: • `AGL` – Above Ground Level (AGL) indicates the height was measure relative to ground level • `AMSL` – Above Mean Sea Level (AMSL) indicates the height was measure relative to sea level
Indoor Deployment	**Synopsis:** { False, True } **Default:** False Indicates whether or not the device is operated indoors or outdoors. Options include: • `False` – The device is operated outdoors • `True` – The device is operated indoors

4. Click **Apply**.

Section 4.4.4

Updating a Base Station's Antenna Characteristics

To update the charactistics of the antenna installed on a base station, do the following:

1. Left-click the base station on the map and then click **Edit**, or open the **View All Base Stations** list and click **Edit** next to the desired base station.

   For information about accessing the **View All Base Stations** list, refer to Section 4.4.8, "Viewing Available Base Stations" .

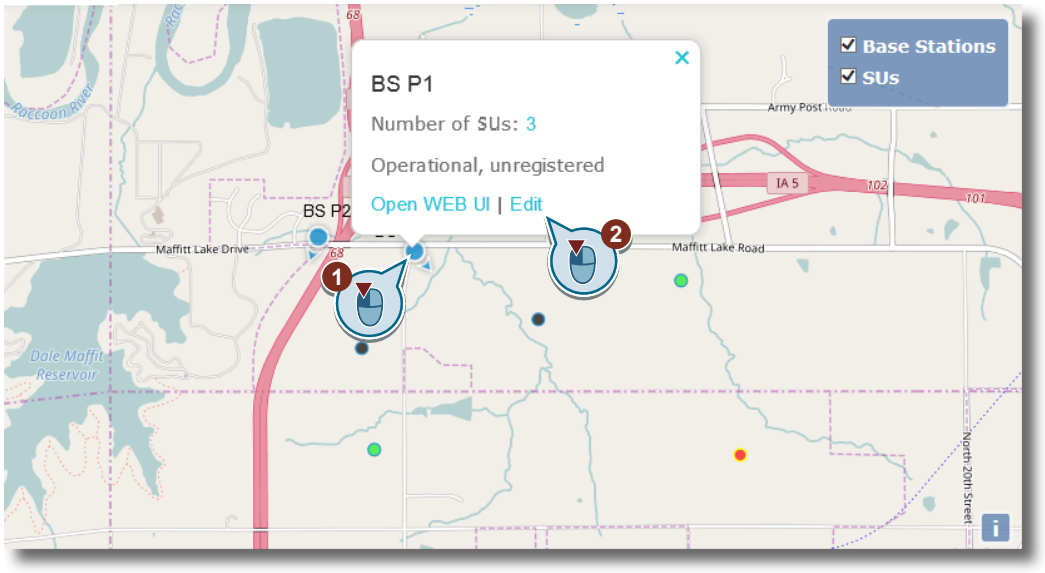


Figure 38: Editing a Base Station from the Map

Once clicking **Edit**, the **Update Base Station** screen appears.

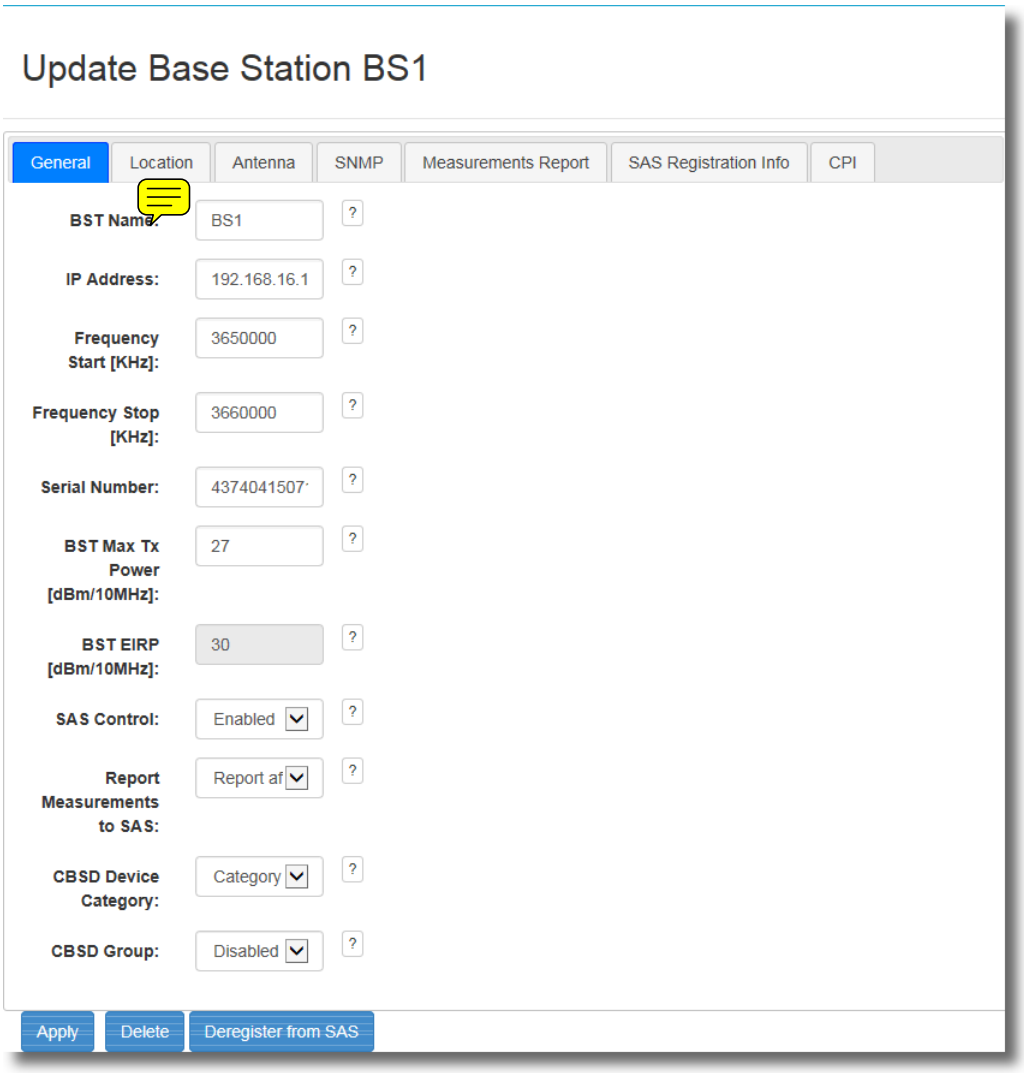


Figure 39: Update Base Station Screen

2. Select the **Antenna** tab. The **Antenna** tab appears.

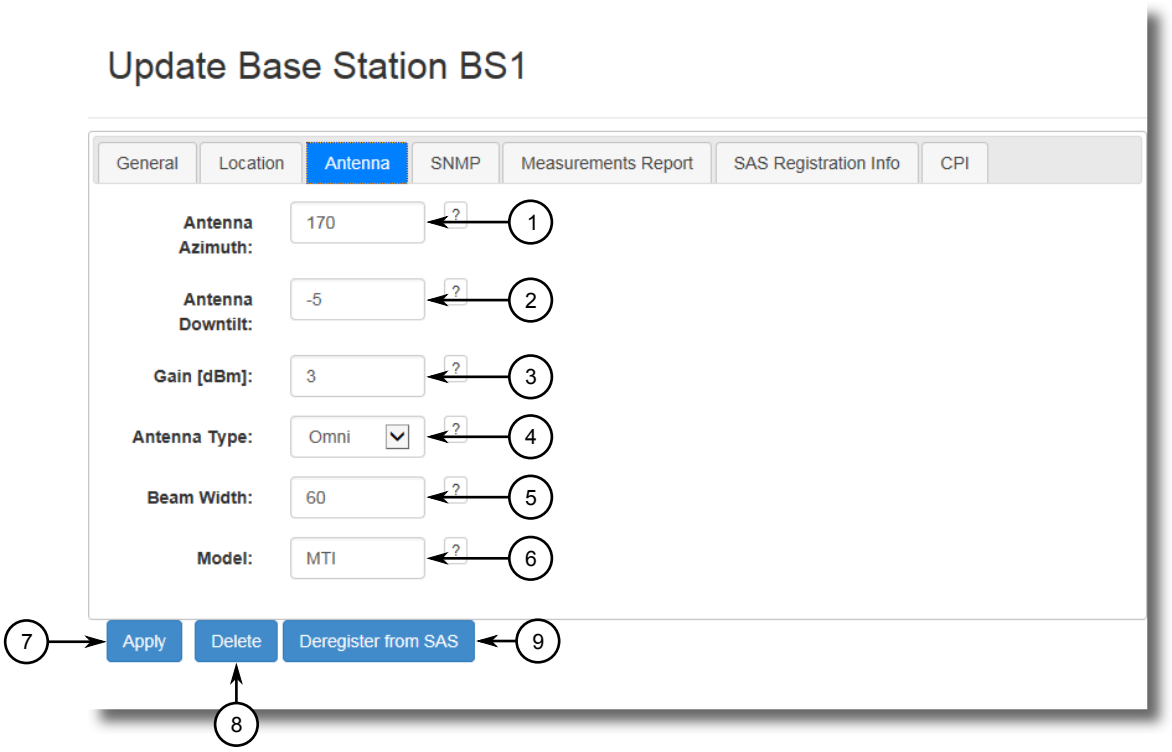


Figure 40: Update Base Station Screen

1. Antenna Azimuth Box **2.** Antenna Downtilt Box **3.** Gain Box **4.** Antenna Type List **5.** Beam Width Box **6.** Model Box **7.** Apply Button **8.** Delete Button **9.** Deregister from SAS Button

3. Update the following parameters as needed:

Parameter	Description
Antenna Azimuth	**Synopsis:** A number between 0 and 359 The angle between true north and the perpendicular projection of the base station onto the horizon.
Antenna Downdrift	**Synopsis:** A number between -90 and +90 The degree of beamtilt compared to the horizon. A negative value means the antenna is tilted up (above horizontal).
Gain	**Synopsis:** A number between -127 and +128 The antenna's peak gain, measured on the decibel logarithmic scale (dBi).
Antenna Type	**Synopsis:** { Omni, Directional } **Default:** Omni The type of antenna used by the subscriber unit. Options include: • `Omni` – Omni-directional antenna • `Directional` – Directional antenna
Beam Width	**Synopsis:** A number between 0 and 360 The width of the antenna's beam, measured in degrees (°), on the horizontal-plane. A value of 360 means the antenna has an omni-directional radiation pattern in the horizontal plane.

4. [Optional] Configure the following additional parameter:

Parameter	Description
Model	**Synopsis:** A string between 1 and 128 characters The platform name or part number of the antenna (e.g. WIN7237).

5. Click **Apply**.

Section 4.4.5
Updating SNMP Settings

The Simple Network Management Protocol (SNMP) allows SNMP managers to monitor and manage devices on their IP network. In the case of RUGGEDCOM SAS-GW, SNMP allows base stations and their subscriber units to send information to RUGGEDCOM SAS-GW about important events related to their status. RUGGEDCOM SAS-GW can also query devices for specific information and modify their configurations (e.g. enable/disable transmission).

NOTE
For information about traps sent by the base and subscriber units, refer to the base or subscriber unit's user documentation.

RUGGEDCOM SAS-GW specifically supports SNMPv2c, a variant of SNMPv2 that features community string-based authentication. Read-only access is granted if the RUGGEDCOM SAS-GW belongs to the SNMP *read* community. Full read/write access is granted if RUGGEDCOM SAS-GW belongs to the SNMP *write* community.

To update the SNMP settings for a specific base station, do the following:

1. Left-click the base station on the map and then click **Edit**, or open the **View All Base Stations** list and click **Edit** next to the desired base station.

   For information about accessing the **View All Base Stations** list, refer to Section 4.4.8, "Viewing Available Base Stations" .

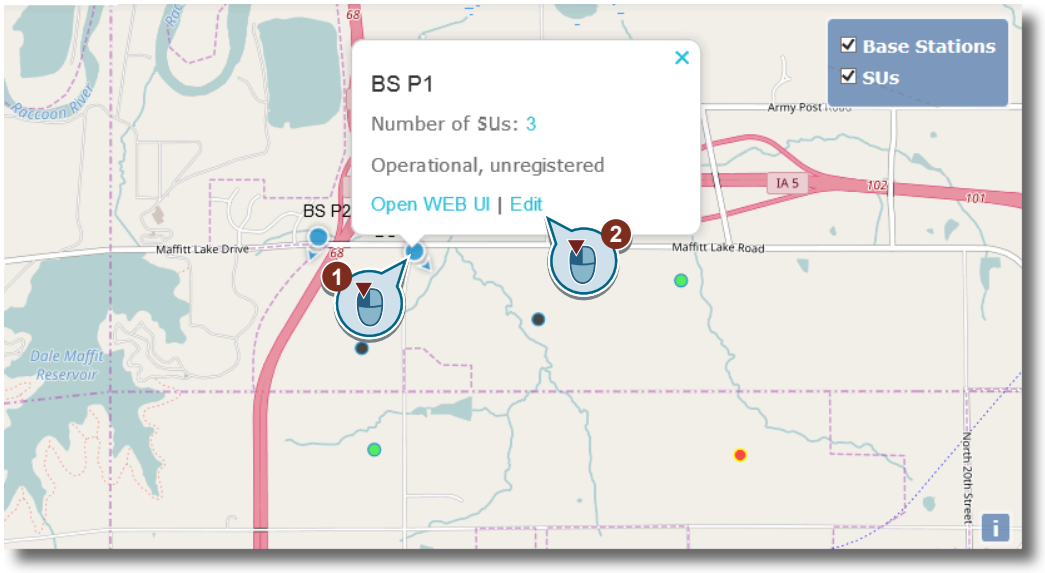


Figure 41: Editing a Base Station from the Map

Once clicking **Edit**, the **Update Base Station** screen appears.

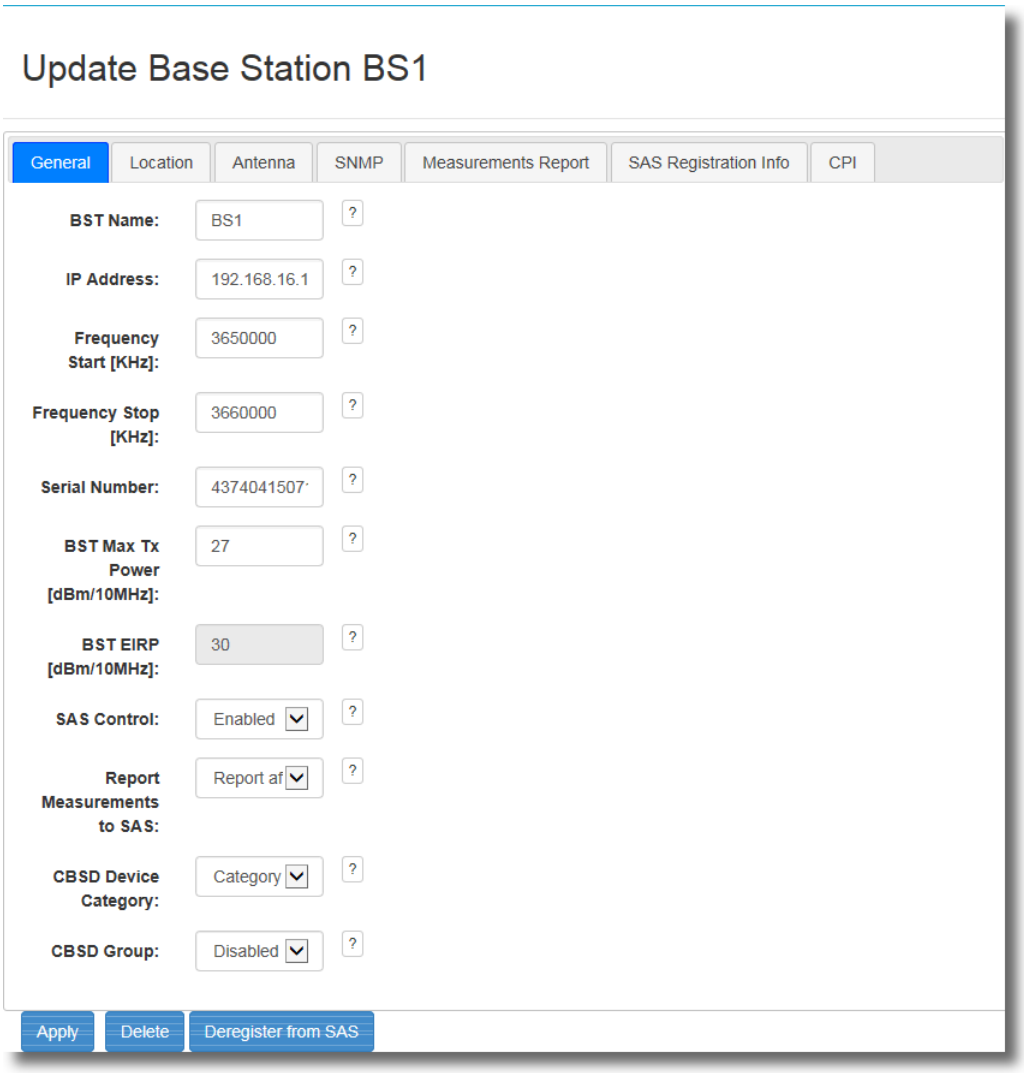


Figure 42: Update Base Station Screen

2. Select the **SNMP** tab. The **SNMP** tab appears.

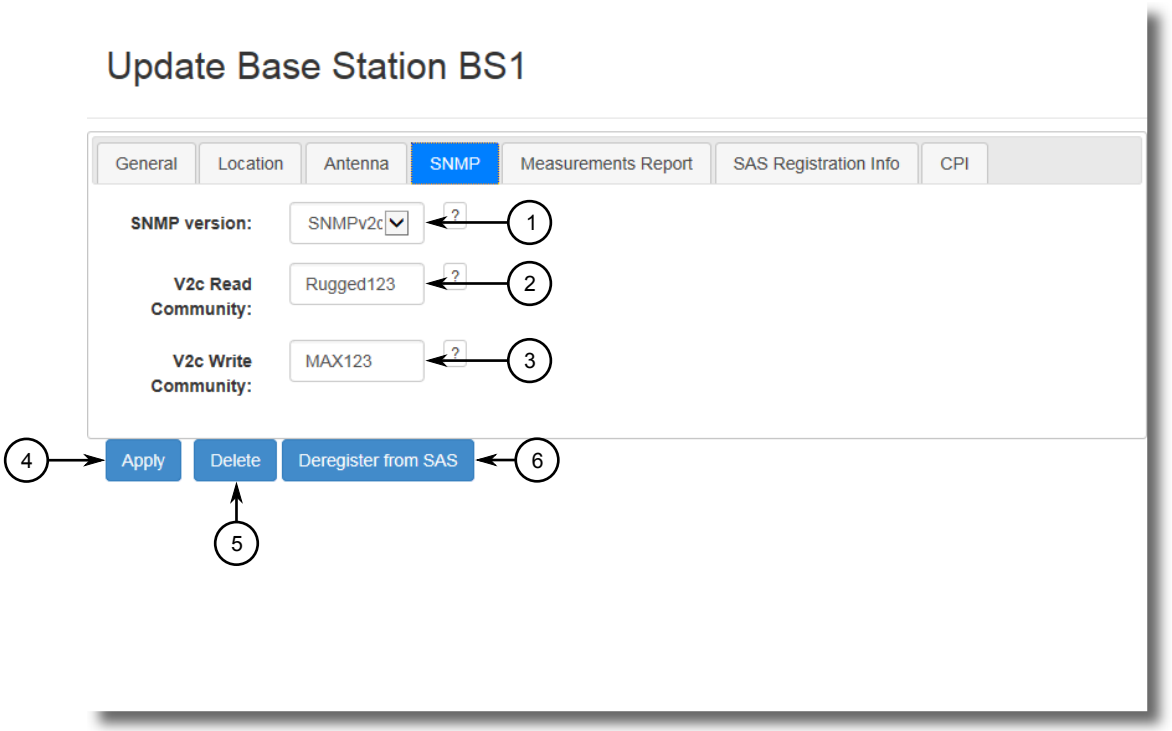


Figure 43: SNMP Tab

1. SNMP Version List **2.** V2c Read Community Box **3.** V2c Write Community Box **4.** Apply Button **5.** Delete Button **6.** Deregister from SAS Button

3. Update the following parameters as needed:

Parameter	Description
SNMP Version	**Synopsis:** { SNMPv2c, SNMPv3-NA } **Default:** SNMPv2c The version of SNMP used by the base station.
V2c Read Community	**Synopsis:** A string **Default:** public The name of the SNMP read community. **The community name must match the name defined in the base station's SNMP configuration.**
V2c Write Community	**Synopsis:** A string **Default:** private The name of the SNMP write community. **The community name must match the name defined in the base station's SNMP configuration.**

4. Click **Apply**.

Section 4.4.6

Updating CPI Information

All Category A devices must indicate to the SAS if they will be operated indoors or outdoors. If this information is relayed by a Certified Professional Installer (CPI), information about the installer must be defined.

To indicate whether or not the required information will be relayed by a CPI, do the following:

1. Left-click the base station on the map and then click **Edit**, or open the **View All Base Stations** list and click **Edit** next to the desired base station.

   For information about accessing the **View All Base Stations** list, refer to Section 4.4.8, "Viewing Available Base Stations" .

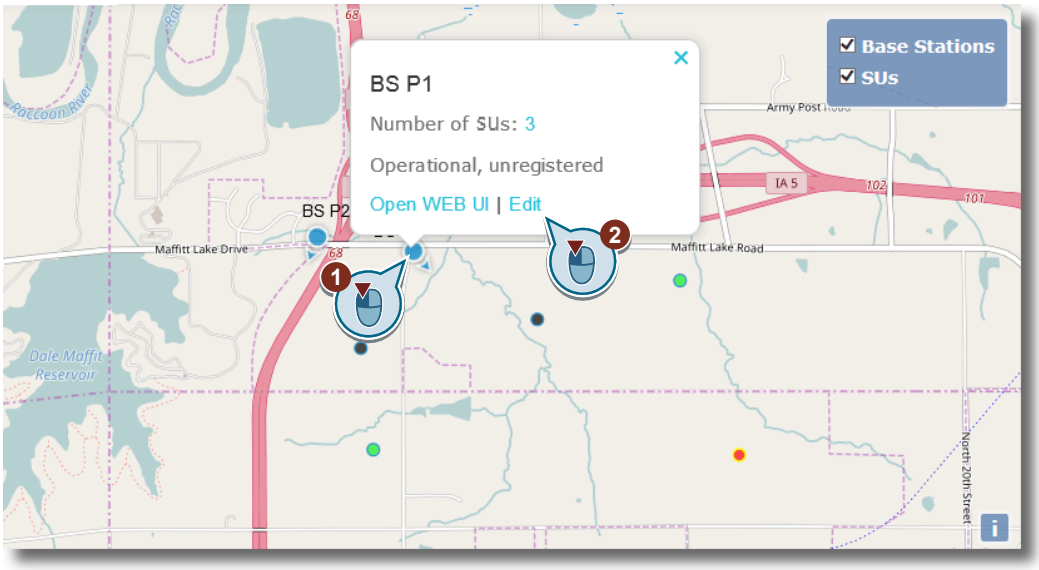


Figure 44: Editing a Base Station from the Map

Once clicking **Edit**, the **Update Base Station** screen appears.

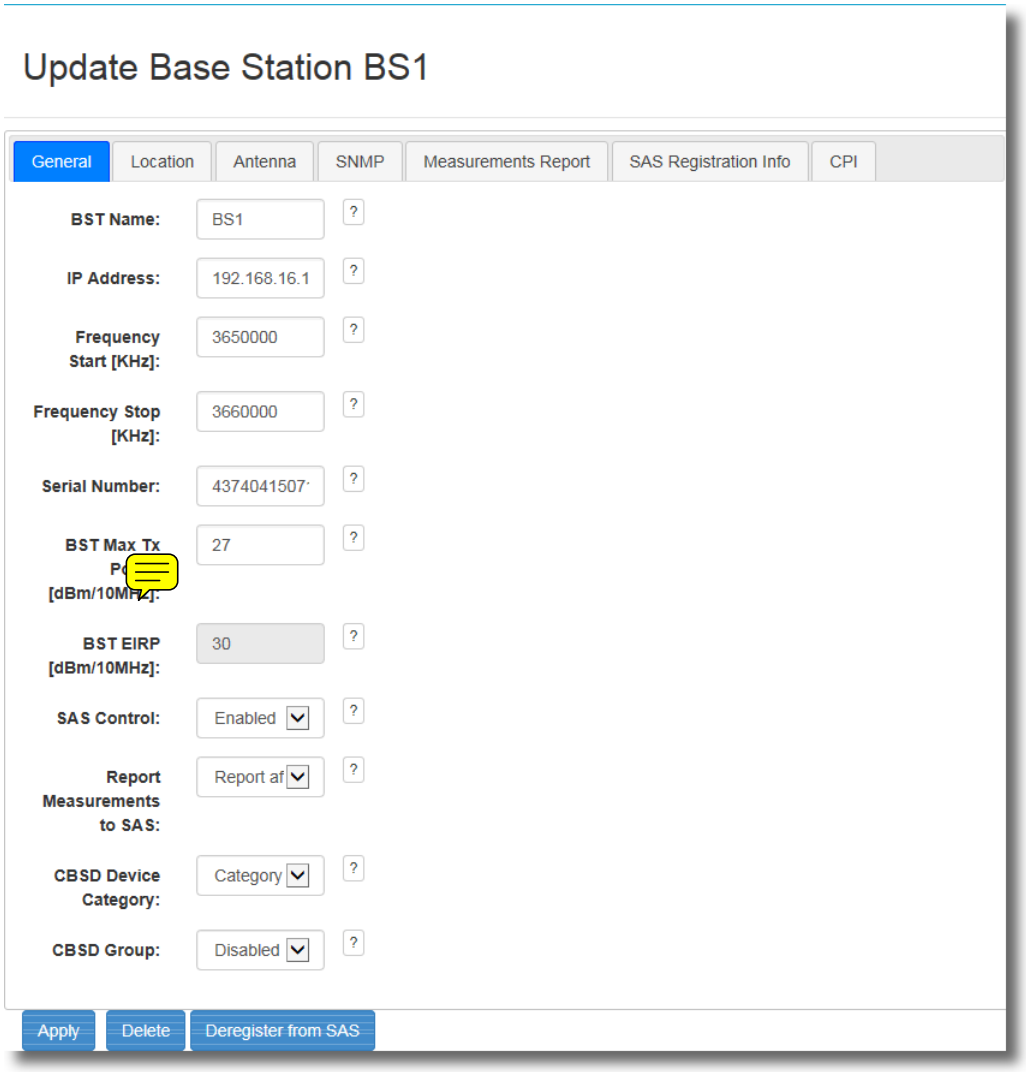


Figure 45: Update Base Station Screen

2. Select the **CPI** tab. The **CPI** tab appears.

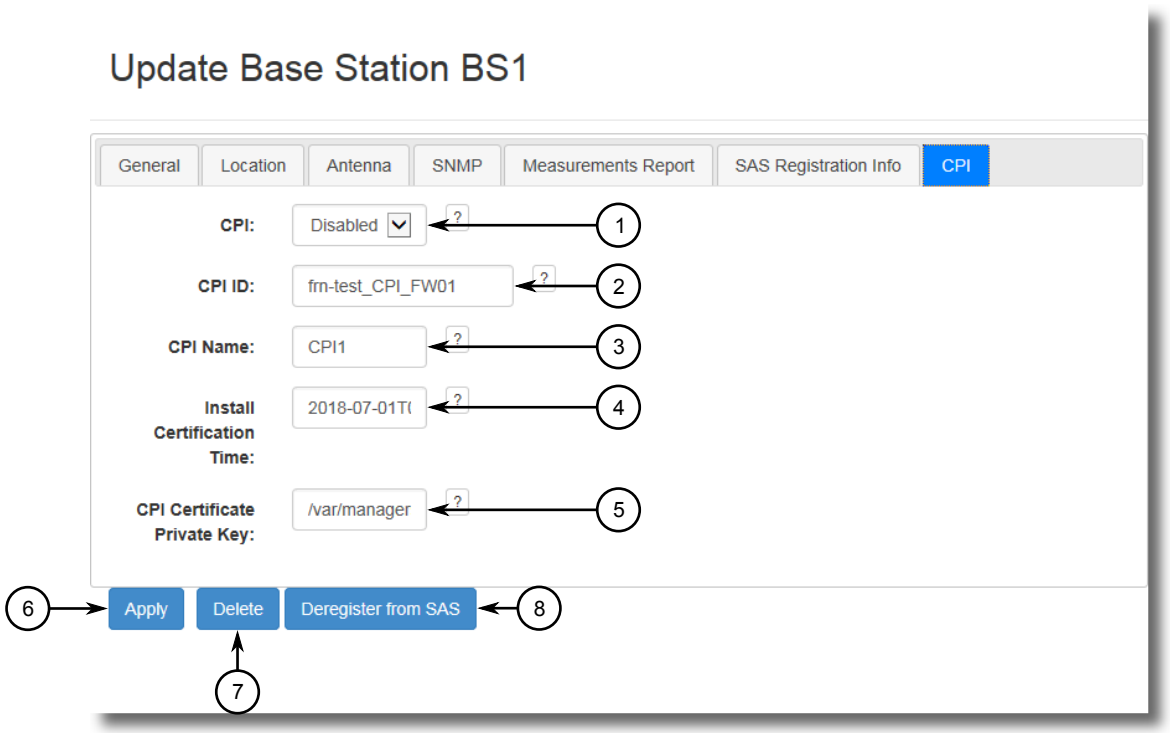


Figure 46: CPI Tab

1. CPI List **2.** CPI ID Box **3.** CPI Name Box **4.** Install Certification Time Box **5.** CPI Certificate Private Key Box **6.** Apply Button **7.** Delete Button **8.** Deregister from SAS Button

3. Under **CPI**, select one of the following options:
   - `Disabled` – The information is not relayed by a CPI
   - `Enabled` – The information is relayed by a CPI

   If `Disabled` is selected, skip the next step.
4. Configure the following remaining parameters:

Parameter	Description
CPI ID	**Synopsis:** A string of up to 256 characters The ID of the CPI providing the information to the SAS.
CPI Name	**Synopsis:** A string of up to 256 characters The name of the CPI providing the information to the SAS.
Install Certification Time	The UTC date and time when the CPI installed the device. The value must be defined in the form of *YYYY-MM-DDThh:mm:ssZ*. For example: 2018-01-01T00:00:00Z
CPI Certificate Privatization Key	The path on the device to the certificate private key file.

5. Click **Apply**.

Section 4.4.7

Removing a Base Station

To remove a base station from RUGGEDCOM SAS-GW, do the following:

1. Left-click the subscriber unit on the map and then click **Edit**. The **Update Base Station** screen appears.

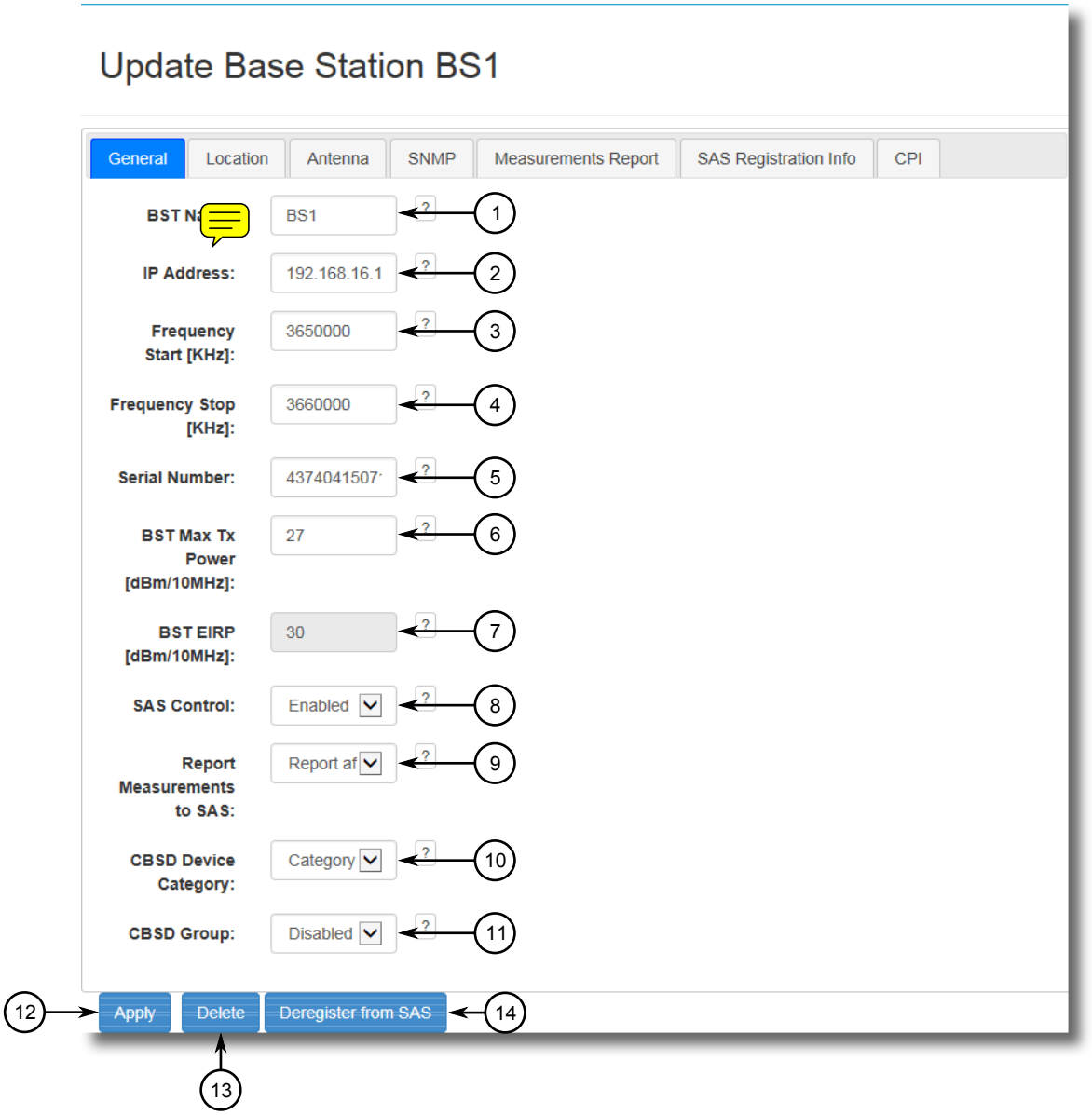


Figure 47: Update Base Station Screen

1. BST Name Box **2.** IP Address Box **3.** Frequency Start Box **4.** Frequency Stop Box **5.** Serial Number **6.** BST Max Tx Power Box **7.** BST Max EIRP Box **8.** SAS Control List **9.** Report Measurements to SAS List **10.** CBSD Device Category List **11.** CBSD Group List **12.** Apply Button **13.** Delete Button **14.** Deregister from SAS Button

2. Click **Delete**. A confirmation dialog box appears.

3. Click **OK**. RUGGEDCOM SAS-GW begins de-registering the base station from the SAS and removing it from the configuration. Allow a few minutes for the process to complete.

Section 4.4.8

Viewing Available Base Stations

To view a summary of all base stations, do the following:

- Point to **Setup** and then click **All BS**. The **View All Base Stations** screen appears.

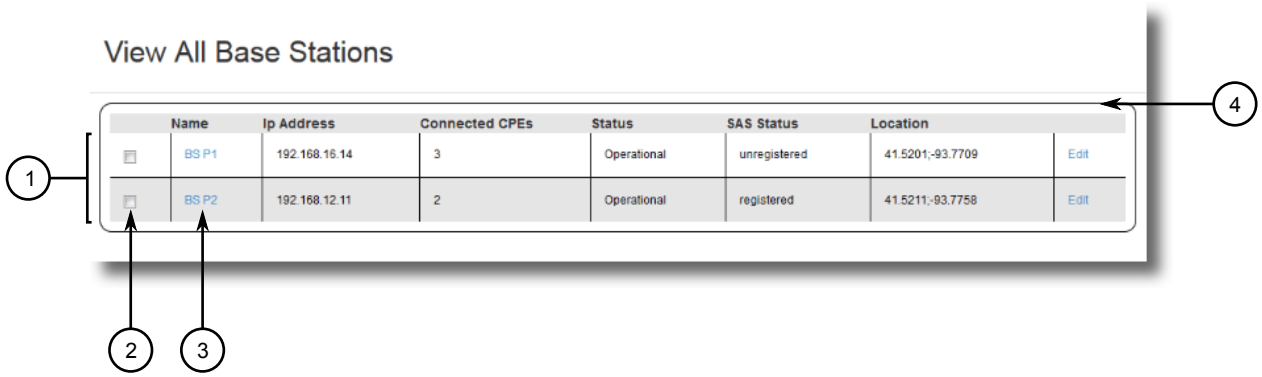


Figure 48: View All Base Stations Screen

1. Available Base Stations **2.** Select Check Box **3.** Name Link **4.** Edit Link

This table displays the following information for each base station:

Column	Description
Name	The name assigned to the base station. The name is hyperlnked. Click the name to view all subscriber units connected to the base station. For more information, refer to Section 4.5.7, "Viewing Available Subscriber Units" .
IP Address	The base station's IP address.
Connected CPI	The number of subscriber units connected to the base station. For more information about how to view a summary of all subscriber units connected to a base station, refer to Section 4.5.7, "Viewing Available Subscriber Units" .
Status	The base station's current state. • `Operational` – The base station is connected and in full operation • `Unreachable` – The base station is not responding to queries • `Connected` – The base station is connected, but not transmitting • `NA` – The default value of new base stations that have not been configured yet in RUGGEDCOM SAS-GW
SAS Status	The base station's current status with the SAS. • `registered` – The device is registered with the SAS • `granted` – The SAS granted the last spectrum request • `granted_failed` – The SAS denied the last spectrum request • `hb_ok` – The SAS is operating normally • `hb_failed` – The SAS is not in operation • `relinquished` – The SAS accepted the last relinquish request

Column	Description
	• `relinquished_failed` – The SAS denied the last relinquish request • `unregistered` – The device is not registered with the SAS • `register_failed` – The SAS denied the last registration request • `configuration_error` – An error has been detected in the SAS's configuration
Location	The base station's latitude and longitude.

Section 4.4.9

Viewing the Measurements Report

The measurements report provides information to the SAS about the power received by the device.

To view the measurements report, do the following:

1. Left-click the base station on the map and then click **Edit**, or open the **View All Base Stations** list and click **Edit** next to the desired base station.

   For information about accessing the **View All Base Stations** list, refer to Section 4.4.8, "Viewing Available Base Stations" .

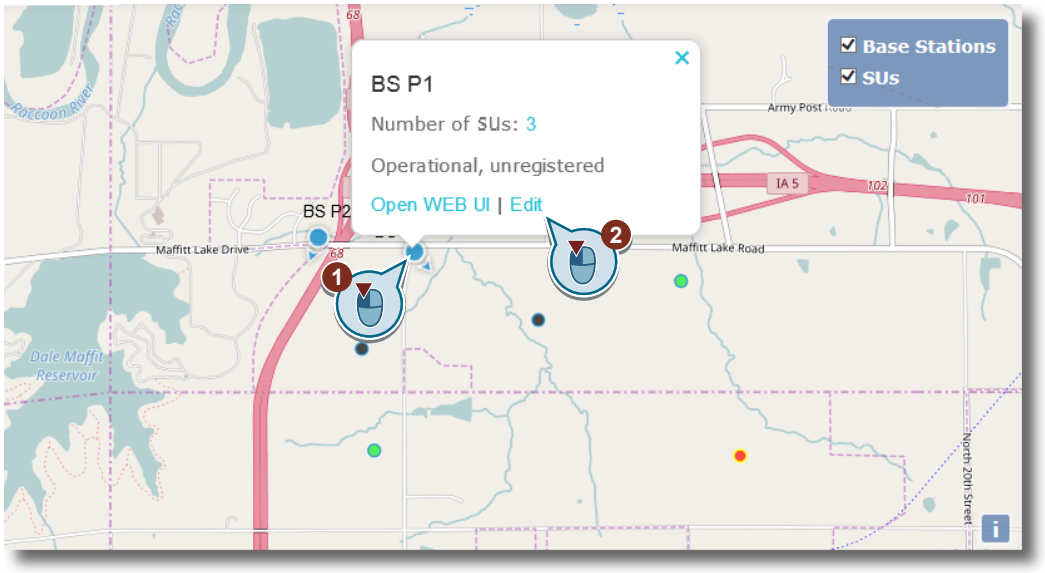


Figure 49: Editing a Base Station from the Map

Once clicking **Edit**, the **Update Base Station** screen appears.

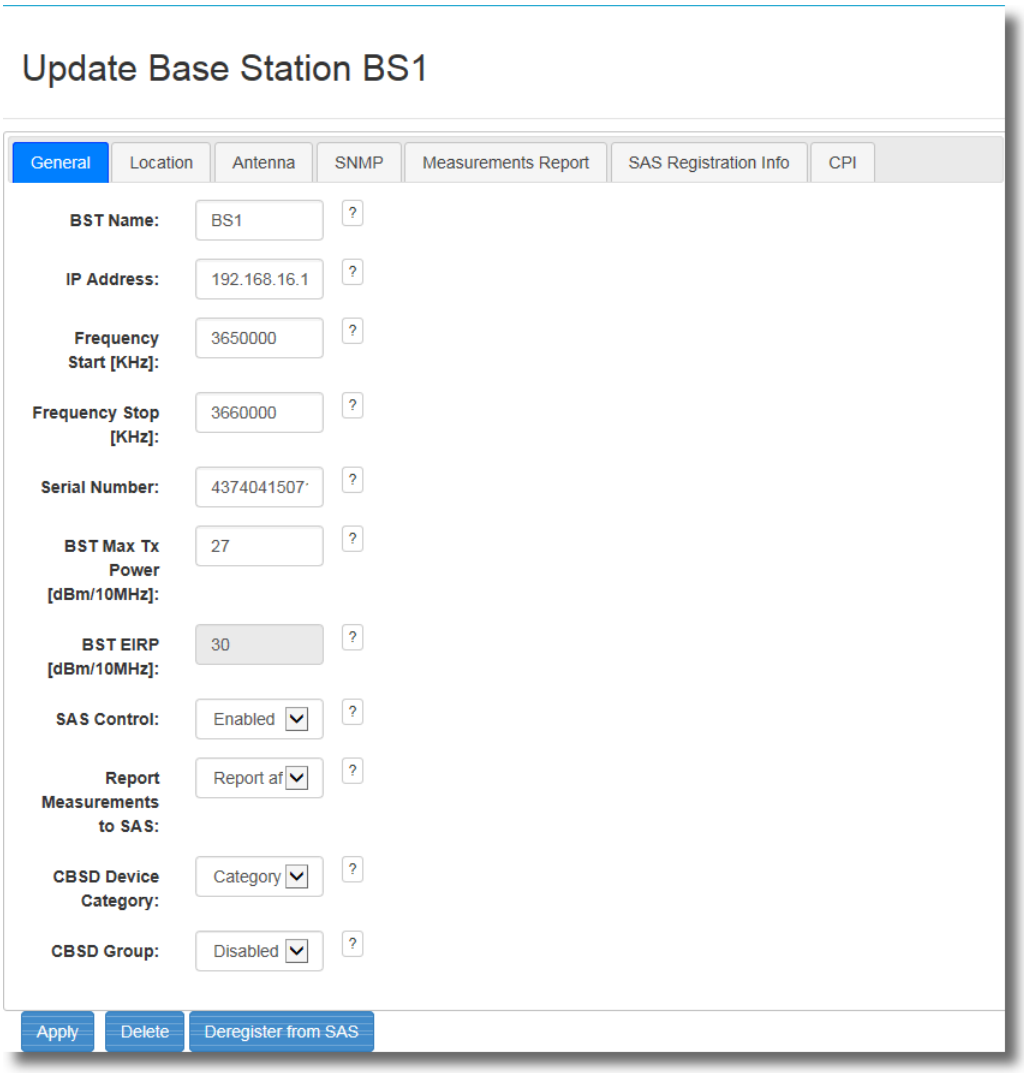


Figure 50: Update Base Station Screen

2. Select the **Measurements Report** tab. The **Measurements Report** tab appears.

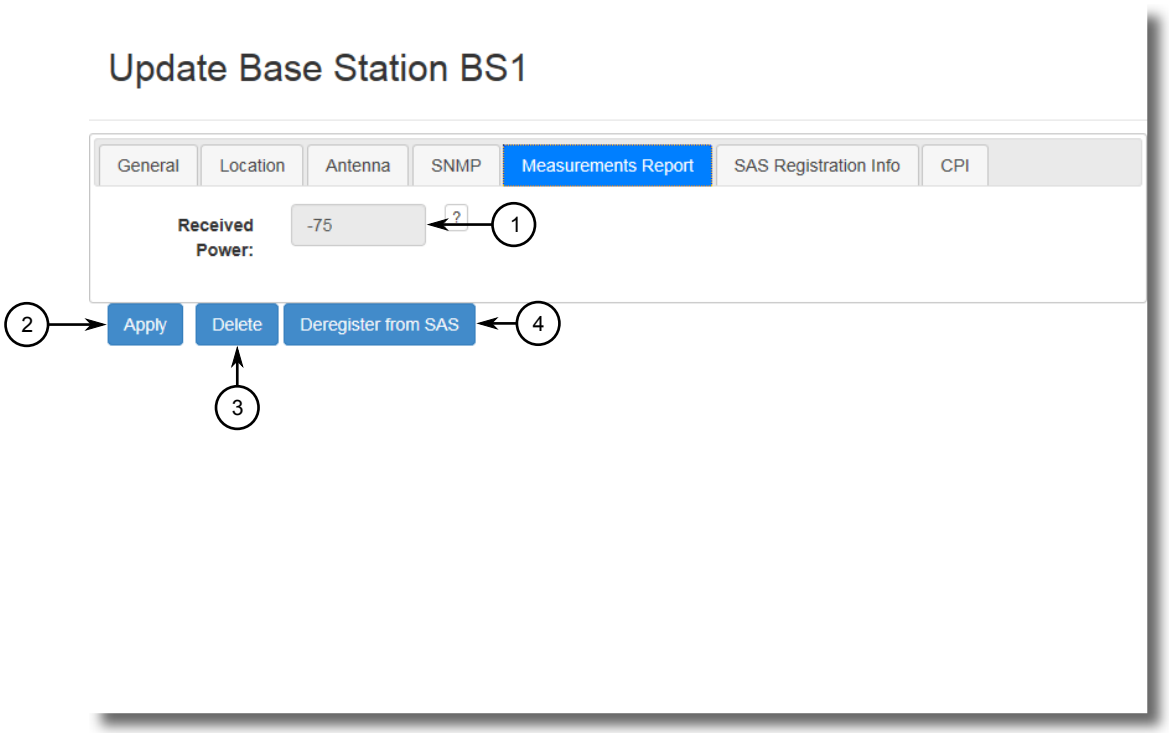


Figure 51: Measurements Report Tab

1. Received Power **2.** Apply Button **3.** Delete Button **4.** Deregister from SAS Button

The **Received Power** parameter indicates the power measured and reported to the SAS after spectrum has been granted to the base station. The number represents the average of the uplink RSSI value reported by all subscriber stations connected to a base station.

Section 4.4.10

Viewing the SAS Registration Information

To view information about the current registration with the SAS, do the following:

1. Left-click the base station on the map and then click **Edit**, or open the **View All Base Stations** list and click **Edit** next to the desired base station.

   For information about accessing the **View All Base Stations** list, refer to Section 4.4.8, "Viewing Available Base Stations" .

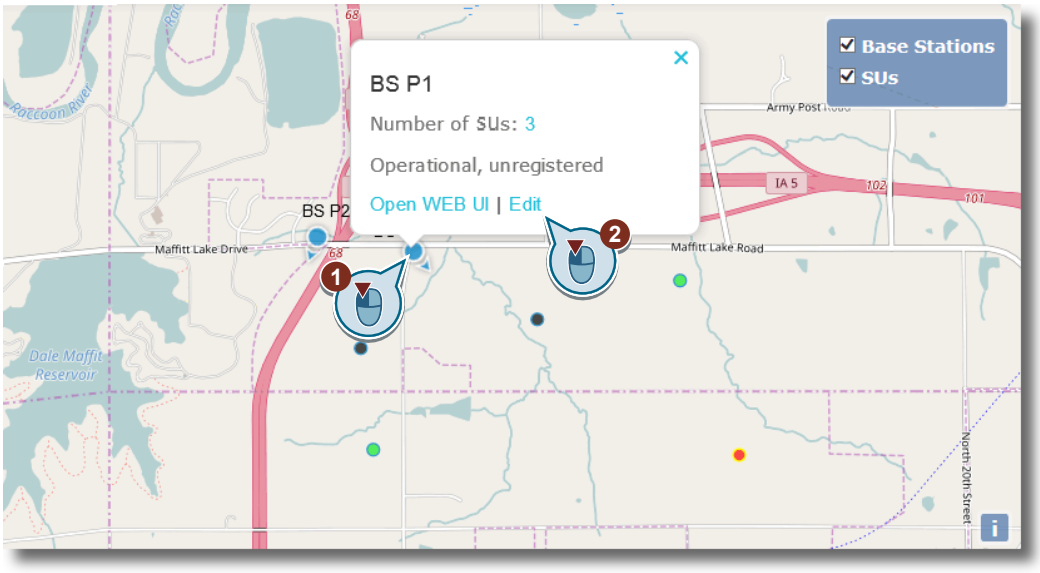


Figure 52: Editing a Base Station from the Map

Once clicking **Edit**, the **Update Base Station** screen appears.

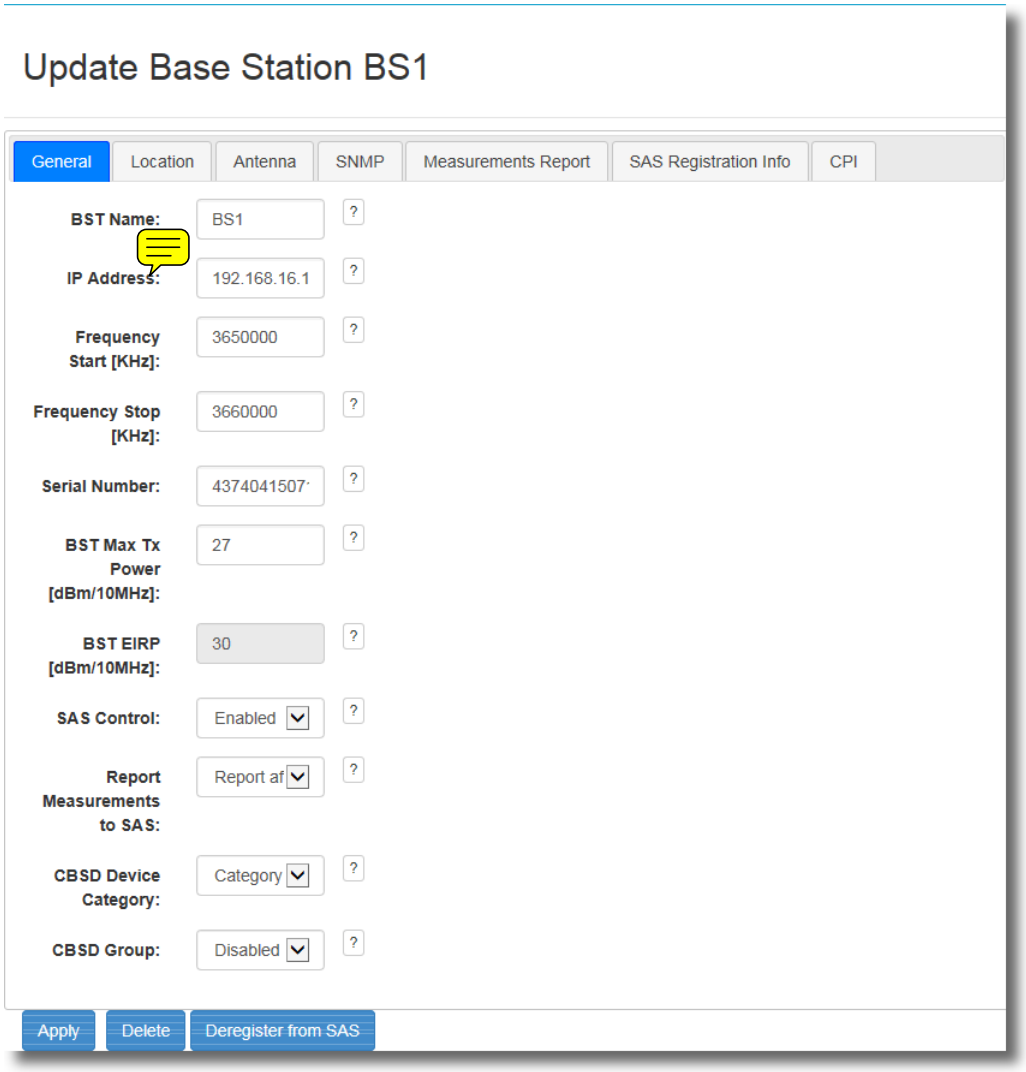


Figure 53: Update Base Station Screen

2. Select the **SAS Registration Info** tab. The **Location** tab appears.

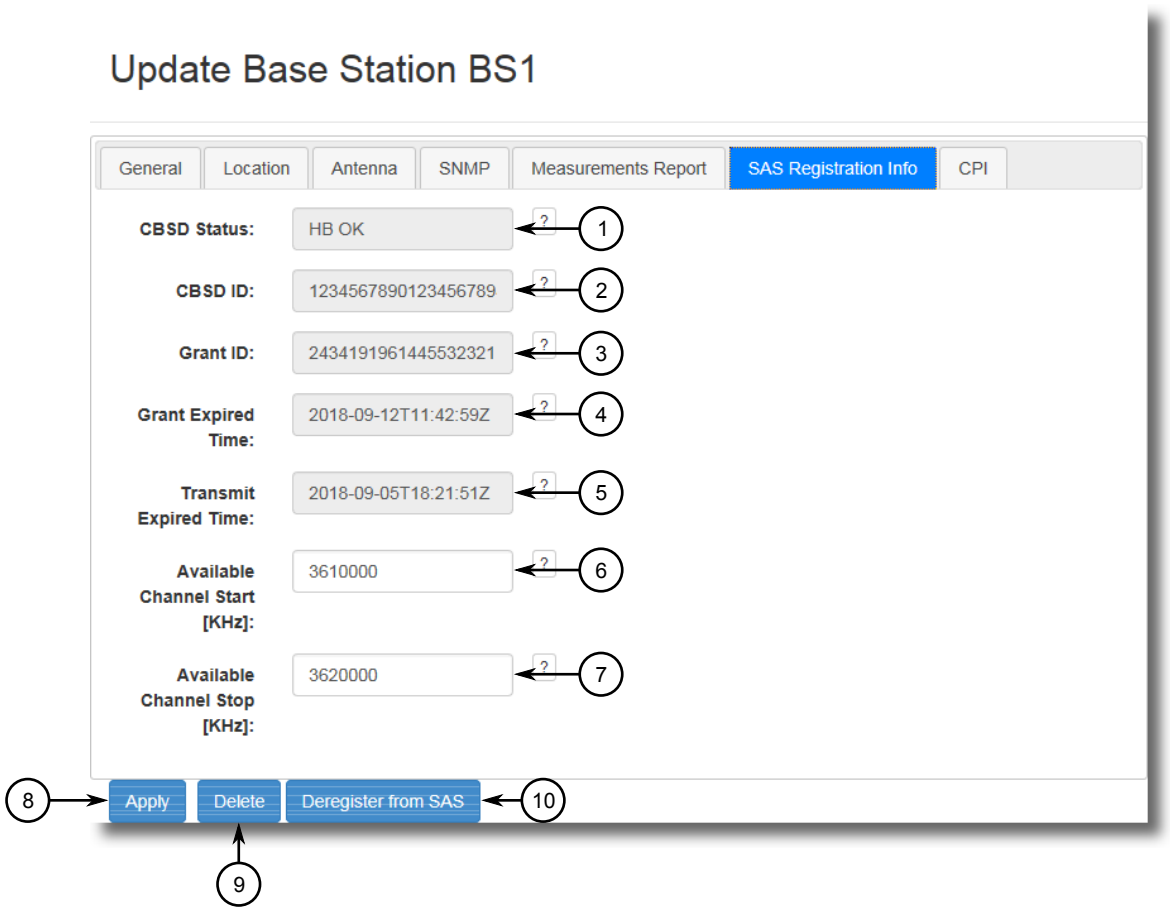


Figure 54: SAS Registration Info Tab

1. CBSD Status **2.** CBSD ID **3.** Grant ID **4.** Grant Expired Time **5.** Transmit Expired Time **6.** Available Channel Start **7.** Available Channel Stop **8.** Apply Button **9.** Delete Button **10.** Deregister from SAS Button

The **SAS Registration Info** tab displays the following information:

Parameter	Description
CBSD Status	The current status of the device. Possible values include: • `Registered` – The device is registered with the SAS • `Granted` – The SAS granted the last spectrum request • `HB OK` – The SAS is operating normally • `Unregistered` – The device is not registered with the SAS
CBSD ID	The CBRS-wide unique identifier given to the device by the SAS.
Grant ID	An ID given to the device by the SAS for the duration of the current grant.
Grant Expired Time	The date and time when the current grant is set to expire.
Transmit Expired Time	The date and time when permission to transmit expires. The device will stop transmitting 60 seconds after this time.
Available Channel Start	The lowest channel in the Spectrum Inquiry Response granted by the SAS.

Parameter	Description
Available Channel Stop	The highest channel in the Spectrum Inquiry Response granted by the SAS.

Section 4.5
Managing Subscriber Units

This section describes how to configure and manage subscriber units in RUGGEDCOM SAS-GW.

CONTENTS

Section 4.5.1
Adding a Subscriber Unit

RUGGEDCOM SAS-GW supports up to 20 subscriber units per base station.

NOTE
To limit over-the-air traffic, all communications between RUGGEDCOM SAS-GW and subscriber units are routed through the subscriber unit's associated base station. As such, a subscriber unit cannot be added to RUGGEDCOM SAS-GW on its own. Its associated base station must be added as well and linked to the subscriber unit.

To add a subscriber unit, do the following:

1. Add the subscriber unit.
   a. Point to **Setup** and then click **Add SS**. A blue object representing the new subscriber unit appears at the end of the cursor.

      NOTE
      If the position of the subscriber unit is not exact, this can be modified later by updating the station's coordinates. For more information, refer to Section 4.5.3, "Updating a Subscriber Unit's Location".

   b. Position the subscriber unit on the map in the desired location and then left-click. A pop-up dialog box appears.

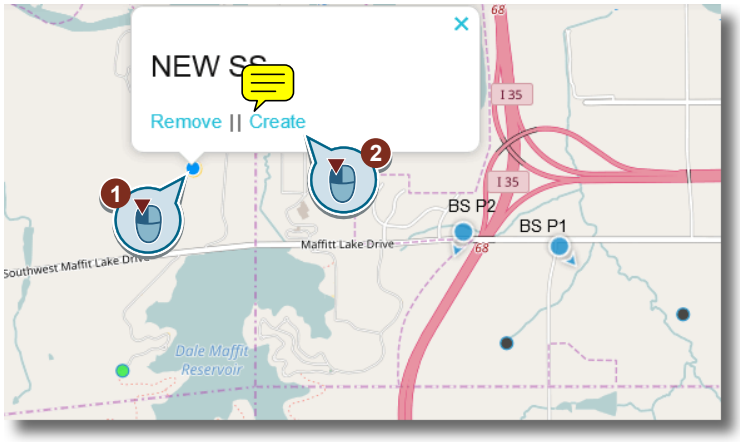


Figure 55: Adding a Subscriber Unit

c. Click **Create**. The **Create New Subscriber Unit** screen appears.

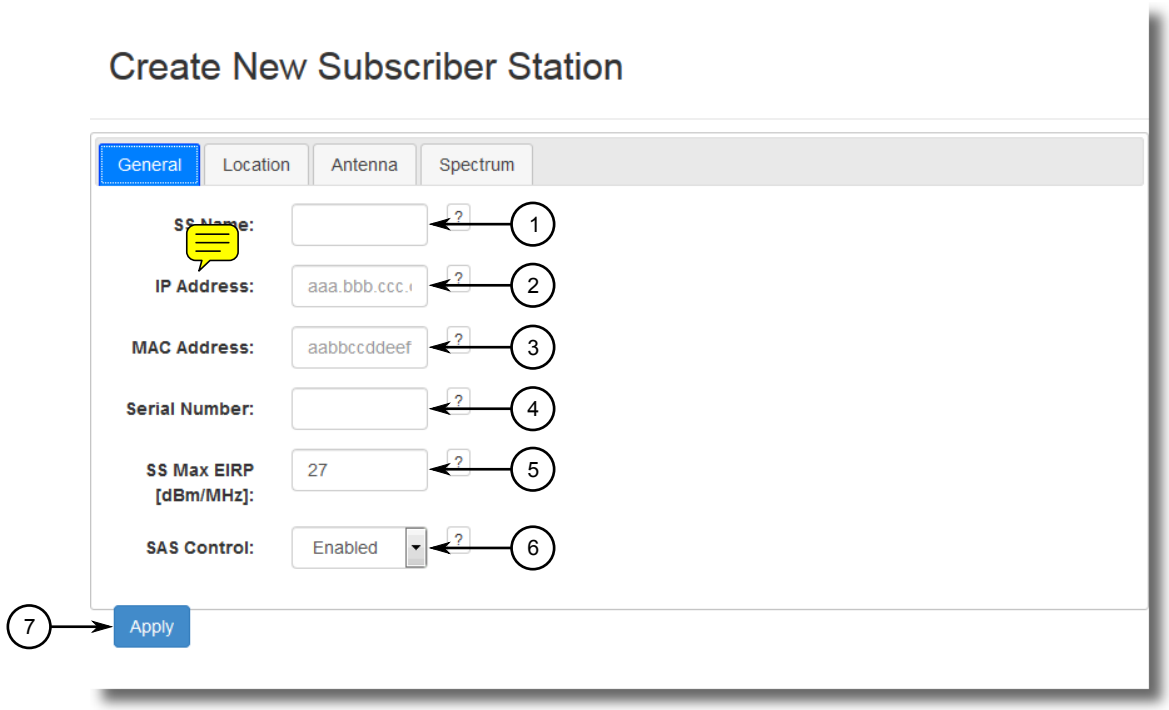


Figure 56: Create New Subscriber Unit

1. CPE Name Box **2.** IP Address Box **3.** MAC Address Box **4.** Serial Number Box **5.** SS Max Tx Power Box **6.** SS Max EIRP Box **7.** SAS Control List **8.** Report Measurements to SAS List **9.** CBSD Device Category List **10.** CBSD Group List **11.** Apply Button

d. Configure the following paramters:

Parameter	Description
CPE Name	**Synopsis:** A string A unique name for the subscriber unit.
IP Address	**Synopsis:** An IPv4 address The subscriber unit's IP address.
MAC Address	**Synopsis:** A string The subscriber unit's MAC address.
Serial Number	**Synopsis:** A string The serial number assigned to the subscriber unit by the vendor.
SU Max Tx Power	**Synopsis:** A number between 17 and 27 The maximum transmission (Tx) power in dBm/10 MHz.
SU Max EIRP	**Synopsis:** A number The maximum EIRP, measured in decibels-per-minute/megahertz (dBm/MHz) permitted by the grant.
SAS Control	**Synopsis:** { Enabled, Disabled, Off the Grid } **Default:** Enabled Defines how RUGGEDCOM SAS-GW will handle the subscriber unit. Options include: • `Enabled` – The subscriber unit will be reported to the SAS. • `Disabled` – The subscriber unit will not be reported to the SAS. However, RUGGEDCOM SAS-GW will still query the device for its status. • `Off the Grid` – The subscriber unit will not be registered or queried.
Report Measurements to SAS	**Synopsis:** { No Reports, Report after Grant } **Default:** Report after Grant Controls whether the received power measurement is reported to the SAS. Options include: • `No Reports` – No reports are sent to the SAS • `Report after Grant` – Power measurement is reported when spectrum has been granted
CBSD Category	**Synopsis:** { a, b } **Default:** a The CBSD category that applies to all devices behind the RUGGEDCOM SAS-GW. Options include: • `a` – Category A CBSDs are lower power devices that meet all general FCC requirements and those set forth in sections 96.41 and 96.45 of the FCC's Code of Federal Regulations (CFR) • `b` – Category B CBSDs are higher power devices that meet all general FCC requirements and those set forth in sections 96.41 and 96.45 of the FCC's Code of Federal Regulations (CFR) **IMPORTANT!** *When `a` is selected, information about the device installer is required. For more information, refer to* *Section 4.4.6, "Updating CPI Information"*.
CBSD Group	**Synopsis:** { Disabled, Enabled } **Default:** Disabled Controls whether grouping parameters are sent with registration requests. Options include: • `Disabled` – Registration requests are sent to the SAS without grouping parameters

Parameter	Description
	• `Enabled` – Registration requests are sent to the SAS with grouping parameters

e. Click **Apply**.

2. [Optional] Set the latitudinal and longitudinal coordinates.

a. Click **Location**. The **Location** tab appears.

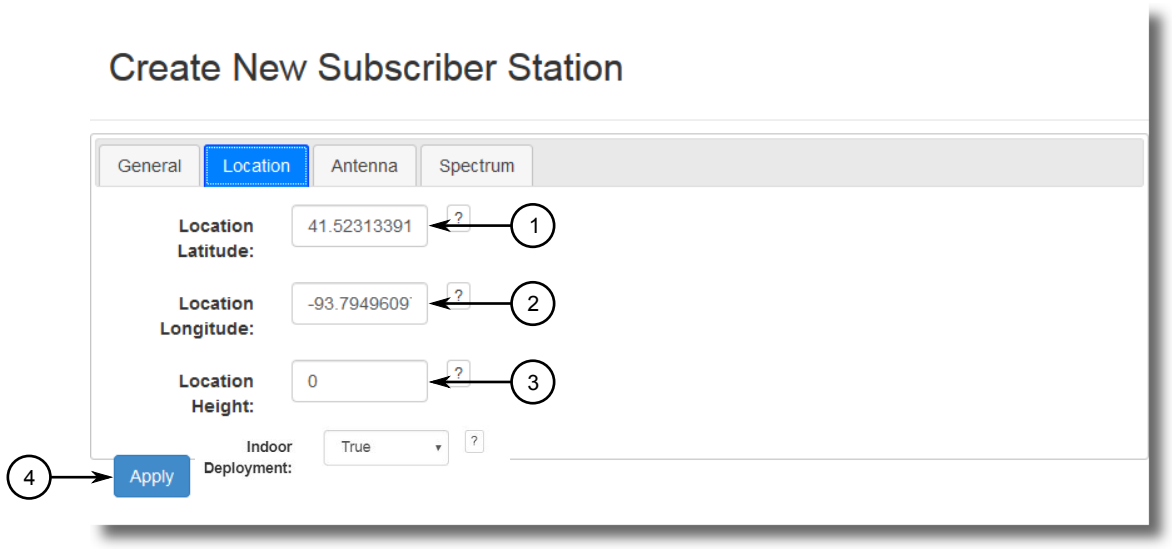


Figure 57: Location Tab

1. Location Latitude Box **2.** Location Longitude Box **3.** Location Height Box **4.** Height Type List **5.** Indoor Deployment List **6.** Apply Button

b. Configure the following parameters:

Parameter	Description
Location Latitude	Latitudinal position of the subscriber unit's antenna in degrees (°), relative to the World Geodetic System (WGS) 1984 datum.
Location Longitude	Longitudinal position of the subscriber unit's antenna in degrees (°), relative to the World Geodetic System (WGS) 1984 datum.
Location Height	The height of the subscriber unit's antenna above ground level in meters (m).
Height Type	**Synopsis:** { AGL, AMSL } **Default:** AGL Indicates whether the height was measure relative to ground level or sea level. Options include: • `AGL` – Above Ground Level (AGL) indicates the height was measure relative to ground level • `AMSL` – Above Mean Sea Level (AMSL) indicates the height was measure relative to sea level
Indoor Deployment	**Synopsis:** { False, True } **Default:** False Indicates whether or not the device is operated indoors or outdoors. Options include: • `False` – The device is operated outdoors

Parameter	Description
	• `True` – The device is operated indoors

c. Click **Apply**.

3. Define the characteristics of the subscriber unit's antenna.

a. Click **Antenna**. The **Antenna** tab appears.

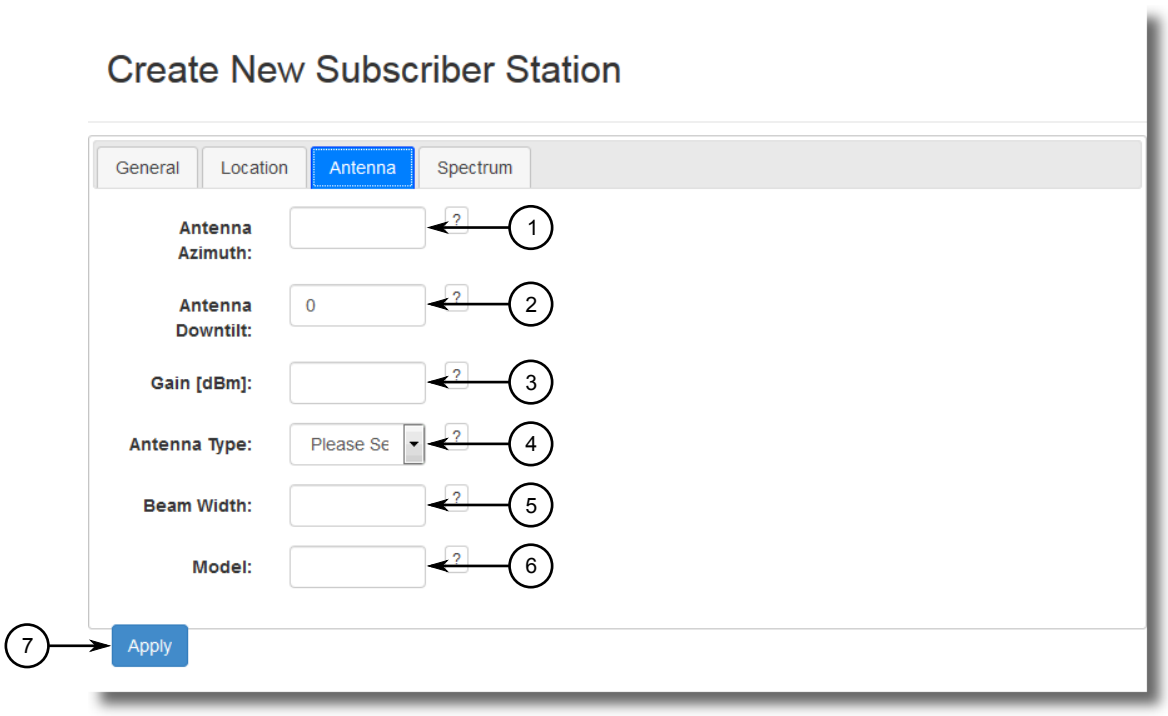


Figure 58: Antenna Tab

1. Antenna Azimuth Box **2.** Antenna Downtilt Box **3.** Gain Box **4.** Antenna Type List **5.** Beam Width Box **6.** Model Box **7.** Apply Button

b. Update the following parameters as needed:

Parameter	Description
Antenna Azimuth	**Synopsis:** A number between 0 and 359 The angle between true north and the perpendicular projection of the subscriber unit onto the horizon.
Antenna Downdrift	**Synopsis:** A number between -90 and 90 The degree of beamtilt compared to the horizon. A negative value means the antenna is tilted up (above horizontal).
Gain	**Synopsis:** A number between -127 and 128 The antenna's peak gain, measured on the decibel logarithmic scale (dBi).
Antenna Type	**Synopsis:** { Omni, Directional } **Default:** Omni The type of antenna used by the subscriber unit. Options include: • `Omni` – Omni-directional antenna

Parameter	Description
	• `Directional` – Directional antenna
Beam Width	**Synopsis:** A number between 0 and 360 The width of the antenna's beam, measured in degrees (°), on the horizontal-plane. A value of 360 means the antenna has an omni-directional radiation pattern in the horizontal plane.

c. [Optional] Configure the following additional parameter:

Parameter	Description
Model	**Synopsis:** A string between 1 and 128 characters The platform name or part number of the antenna (e.g. WIN5137).

d. Click **Apply**.

4. Define the frequency spectrum.

a. Click **Antenna**. The **Antenna** tab appears.

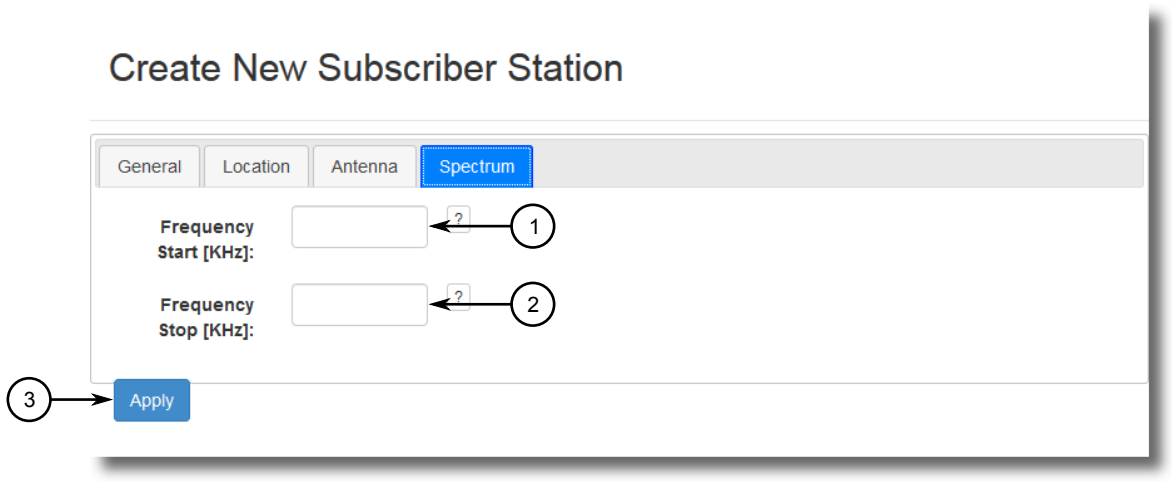


Figure 59: Antenna Tab

1. Frequency Start Box **2.** Frequency Stop Box **3.** Apply Button

b. Configure the following parameters:

Parameter	Description
Frequency Start	**Synopsis:** A number between 3550000 and 37700000 The low value of the frequency bandwidth, measured in kilohertz (KHz), in which the subscriber unit operates.
Frequency Stop	**Synopsis:** A number between 3550000 and 37700000 The high value of the frequency bandwidth, measured in kilohertz (KHz), in which the subscriber unit operates.

c. Click **Apply**.

Section 4.5.2

Updating a Subscriber Unit's Configuration

To update the configuration of a subscriber unit, do the following:

1. Left-click the subscriber unit on the map and then click **Edit**. The **Update SU** screen appears.

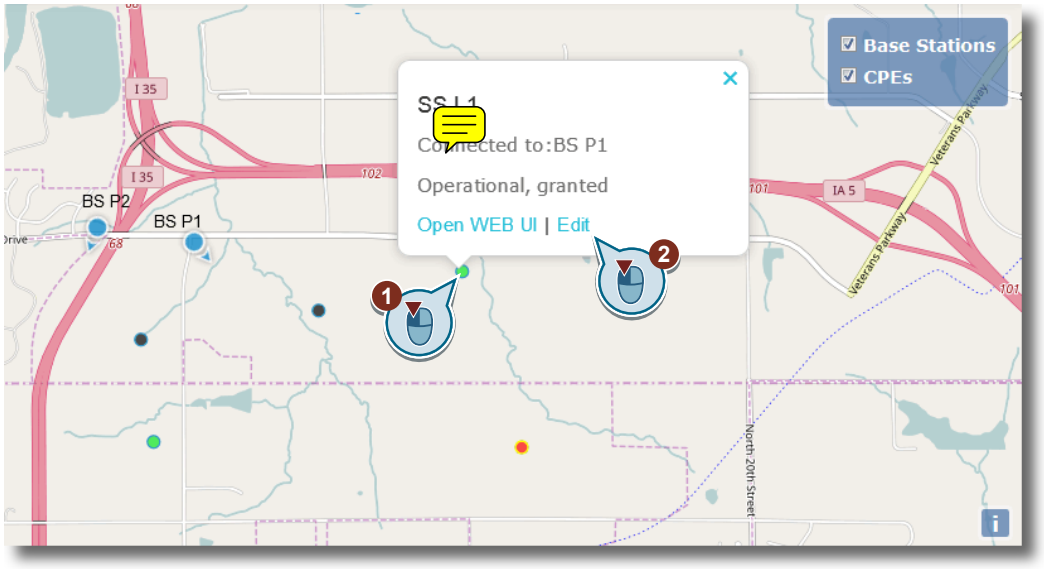


Figure 60: Editing a Subscriber Unit from the Map

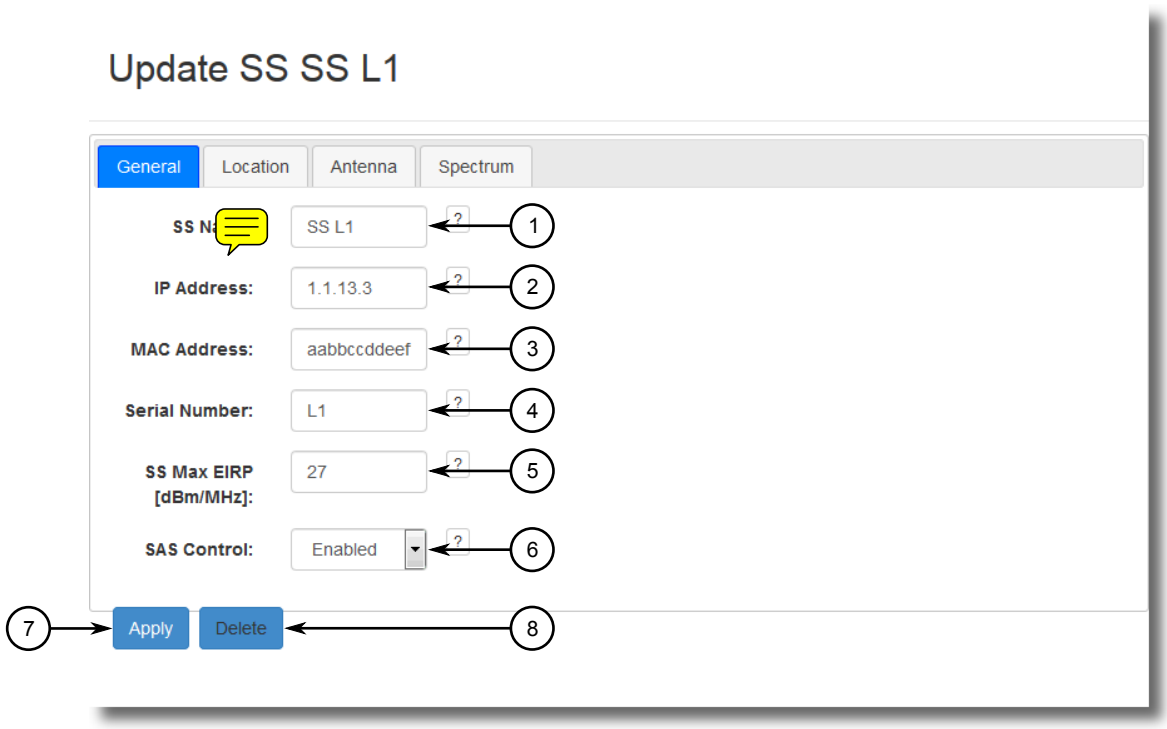


Figure 61: Update SU Screen

1. CPE Name Box **2.** IP Address Box **3.** MAC Address Box **4.** Serial Number Box **5.** SS Max Tx Power Box **6.** SS Max EIRP Box **7.** SAS Control List **8.** Report Measurements to SAS List **9.** CBSD Device Category List **10.** CBSD Group List **11.** Apply Button **12.** Delete Button

2. On the **General** tab, update the following parameters as needed:

Parameter	Description
SU Name	**Synopsis:** A string A unique name for the subscriber station.
IP Address	**Synopsis:** An IPv4 address The subscriber station's IP address.
MAC Address	**Synopsis:** A string The subscriber station's MAC address.
Serial Number	**Synopsis:** A string The serial number assigned to the subscriber station by the vendor.
SU Max Tx Power	**Synopsis:** A number between 17 and 27 The maximum transmission (Tx) power in dBm/10 MHz.
SU Max EIRP	**Synopsis:** A number The maximum EIRP, measured in decibels-per-minute/megahertz (dBm/MHz) permitted by the grant.
SAS Control	**Synopsis:** { Enabled, Disabled, Off the Grid } **Default:** Enabled

Parameter	Description
	Defines how RUGGEDCOM SAS-GW will handle the subscriber unit. Options include: • `Enabled` – The subscriber unit will be reported to the SAS. • `Disabled` – The subscriber unit will not be reported to the SAS. However, RUGGEDCOM SAS-GW will still query the device for its status. • `Off the Grid` – The subscriber unit will not be registered or queried.
Report Measurements to SAS	**Synopsis:** { No Reports, Report after Grant } **Default:** Report after Grant Controls whether the received power measurement is reported to the SAS. Options include: • `No Reports` – No reports are sent to the SAS • `Report after Grant` – Power measurement is reported when spectrum has been granted
CBSD Category	**Synopsis:** { a, b } **Default:** a The CBSD category that applies to all devices behind the RUGGEDCOM SAS-GW. Options include: • `a` – Category A CBSDs are lower power devices that meet all general FCC requirements and those set forth in sections 96.41 and 96.45 of the FCC's Code of Federal Regulations (CFR) • `b` – Category B CBSDs are higher power devices that meet all general FCC requirements and those set forth in sections 96.41 and 96.45 of the FCC's Code of Federal Regulations (CFR) **IMPORTANT!** *When `a` is selected, information about the device installer is required. For more information, refer to* *Section 4.4.6, "Updating CPI Information"*.
CBSD Group	**Synopsis:** { Disabled, Enabled } **Default:** Disabled Controls whether grouping parameters are sent with registration requests. Options include: • `Disabled` – Registration requests are sent to the SAS without grouping parameters • `Enabled` – Registration requests are sent to the SAS with grouping parameters

3. Click **Apply**.

Section 4.5.3

Updating a Subscriber Unit's Location

To define a subscriber unit's location, do the following:

1. Left-click the subscriber unit on the map and then click **Edit**. The **Update SU** screen appears.

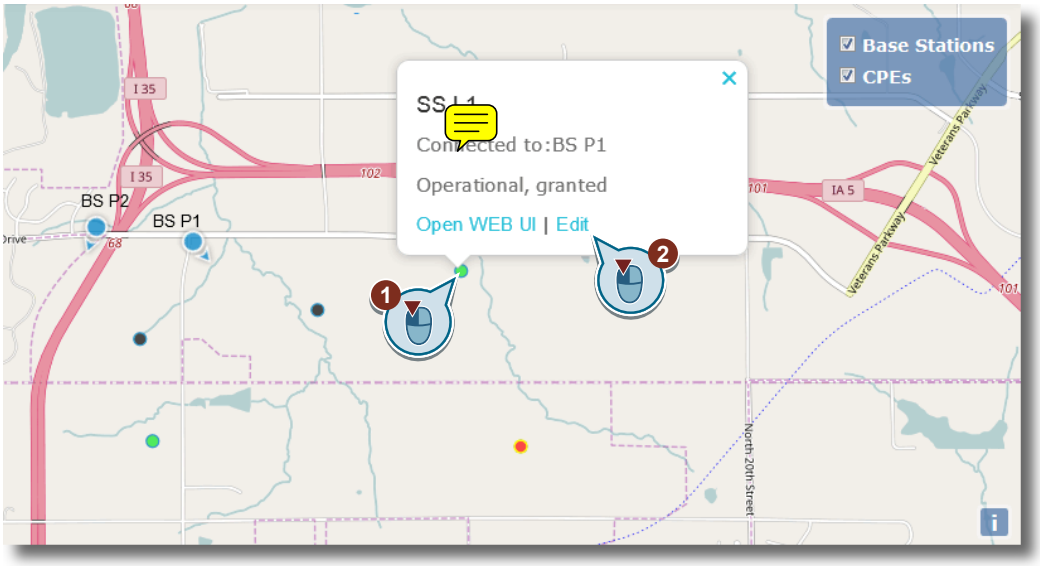


Figure 62: Editing a Subscriber Unit from the Map

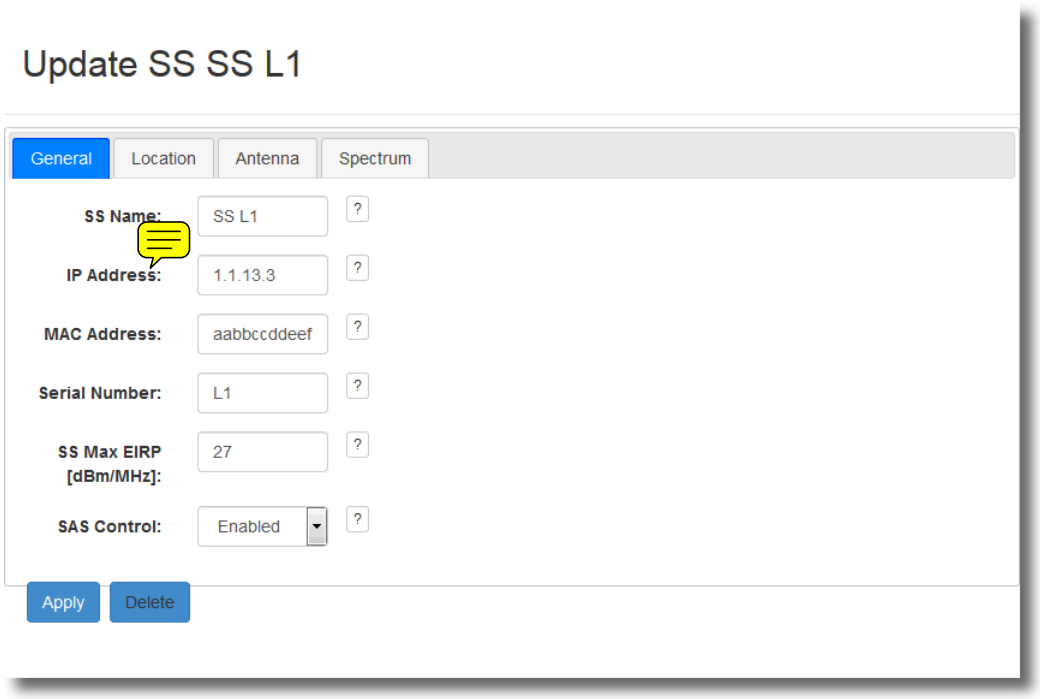


Figure 63: Update SU Screen

2. Select the **Location** tab. The **Location** tab appears.

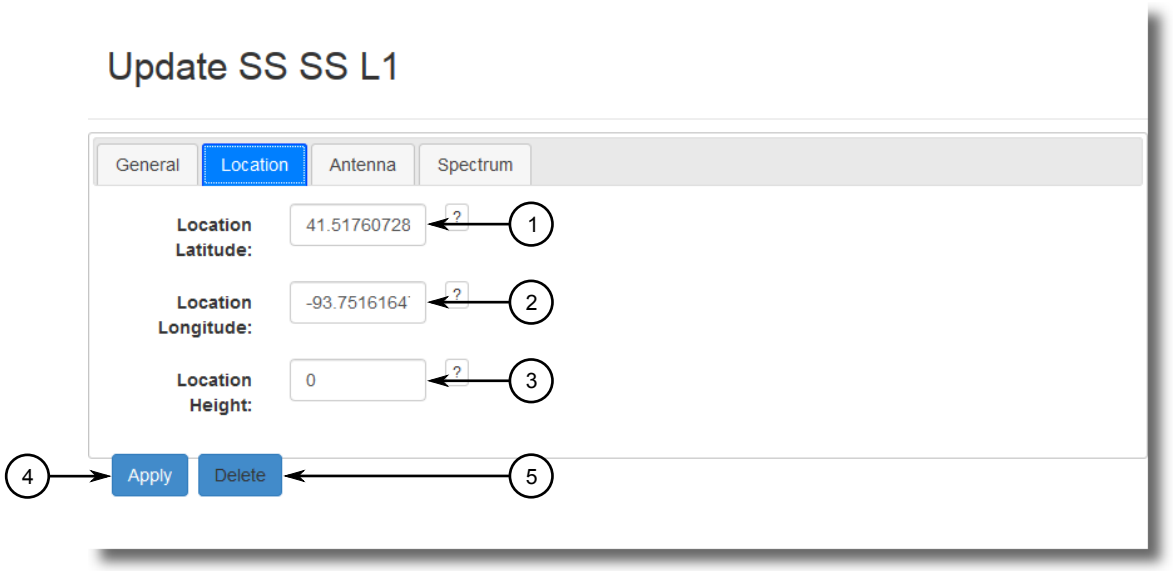


Figure 64: Location Tab

1. Location Latitude Box **2.** Location Longitude Box **3.** Location Height Box **4.** Height Type List **5.** Indoor Deployment List **6.** Apply Button **7.** Delete Button

3. Update the following parameters as needed:

NOTE
Initial values are based on the subscriber units position on the map.

Parameter	Description
Location Latitude	Latitudinal position of the subscriber unit's antenna in degrees (°), relative to the World Geodetic System (WGS) 1984 datum.
Location Longitude	Longitudinal position of the subscriber unit's antenna in degrees (°), relative to the World Geodetic System (WGS) 1984 datum.
Location Height	The height of the subscriber unit's antenna above ground level in meters (m).
Height Type	**Synopsis:** { AGL, AMSL } **Default:** AGL Indicates whether the height was measure relative to ground level or sea level. Options include: • `AGL` – Above Ground Level (AGL) indicates the height was measure relative to ground level • `AMSL` – Above Mean Sea Level (AMSL) indicates the height was measure relative to sea level
Indoor Deployment	**Synopsis:** { False, True } **Default:** False Indicates whether or not the device is operated indoors or outdoors. Options include: • `False` – The device is operated outdoors • `True` – The device is operated indoors

4. Click **Apply**.

Section 4.5.4

Updating a Subscriber Unit's Antenna Characteristics

To update the charactistics of the antenna installed on a subscriber unit, do the following:

1. Left-click the subscriber unit on the map and then click **Edit**. The **Update SU** screen appears.

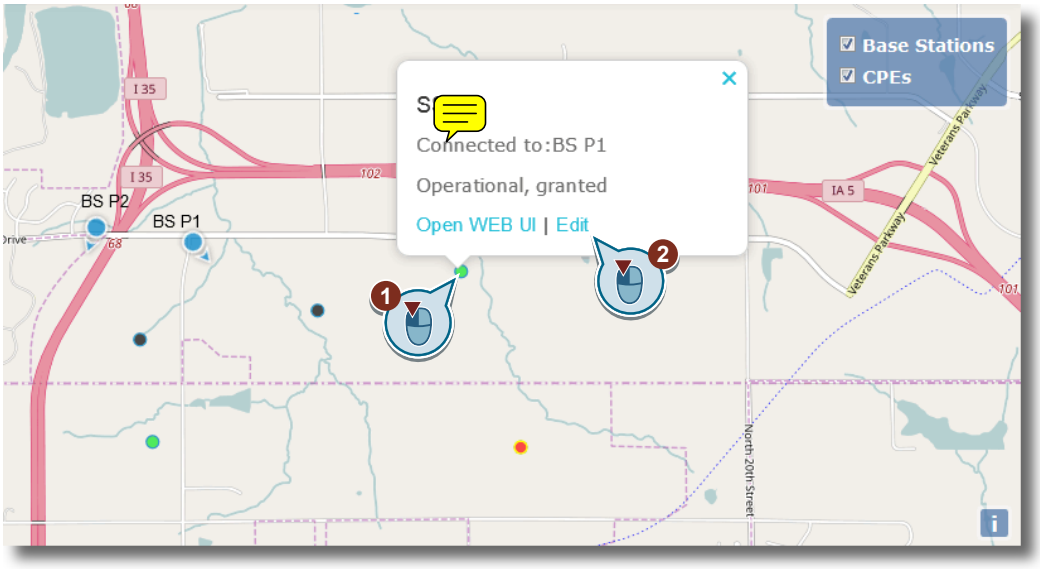


Figure 65: Editing a Subscriber Unit from the Map

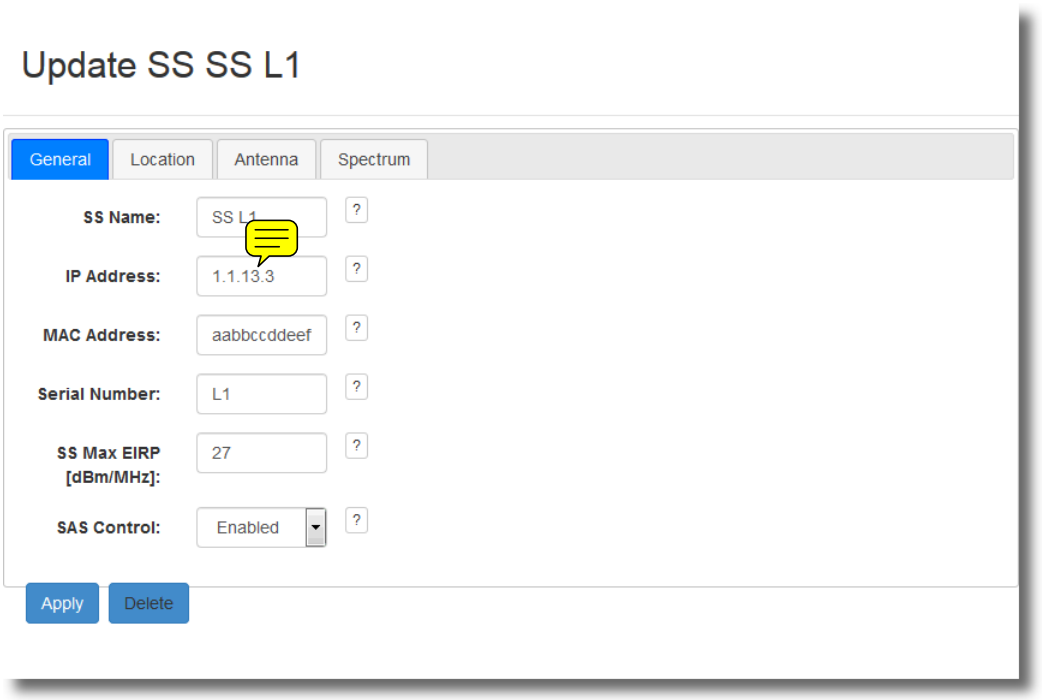


Figure 66: Update SU Screen

2. Select the **Antenna** tab. The **Antenna** tab appears.

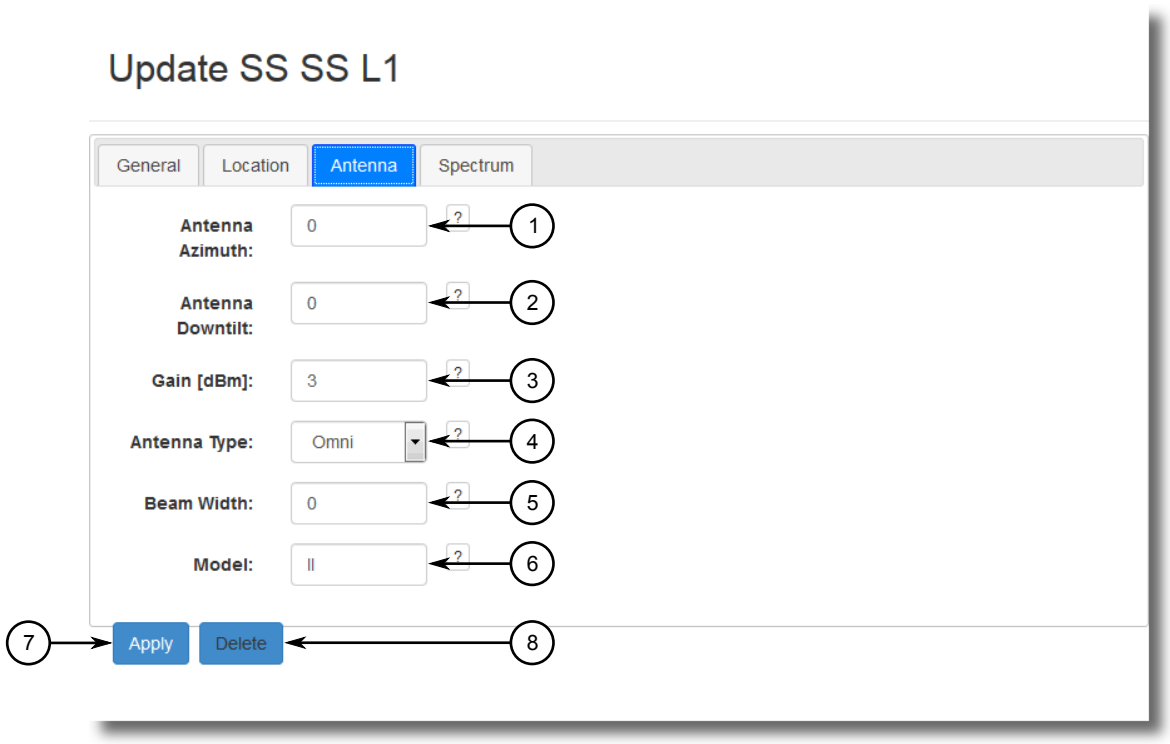


Figure 67: Antenna Tab

1. Antenna Azimuth Box **2.** Antenna Downtilt Box **3.** Gain Box **4.** Antenna Type List **5.** Beam Width Box **6.** Model Box **7.** Apply Button **8.** Delete Button

3. Update the following parameters as needed:

Parameter	Description
Antenna Azimuth	**Synopsis:** A number between 0 and 359 The angle between true north and the perpendicular projection of the subscriber unit onto the horizon.
Antenna Downdrift	**Synopsis:** A number between -90 and 90 The degree of beamtilt compared to the horizon. A negative value means the antenna is tilted up (above horizontal).
Gain	**Synopsis:** A number between -127 and 128 The antenna's peak gain, measured on the decibel logarithmic scale (dBi).
Antenna Type	**Synopsis:** { Omni, Directional } **Default:** Omni The type of antenna used by the subscriber unit. Options include: • `Omni` – Omni-directional antenna • `Directional` – Directional antenna
Beam Width	**Synopsis:** A number between 0 and 360 The width of the antenna's beam, measured in degrees (°), on the horizontal-plane. A value of 360 means the antenna has an omni-directional radiation pattern in the horizontal plane.

4. [Optional] Configure the following additional parameter:

Parameter	Description
Model	**Synopsis:** A string between 1 and 128 characters The platform name or part number of the antenna (e.g. WIN5137).

5. Click **Apply**.

Section 4.5.5

Updating the Frequency Spectrum

To update the frequency spectrum in which the subscriber unit operates, do the following:

1. Left-click the subscriber unit on the map and then click **Edit**. The **Update SS** screen appears.

Figure 68: Update SS Screen

2. Select the **Spectrum** tab. The **Spectrum** tab appears.

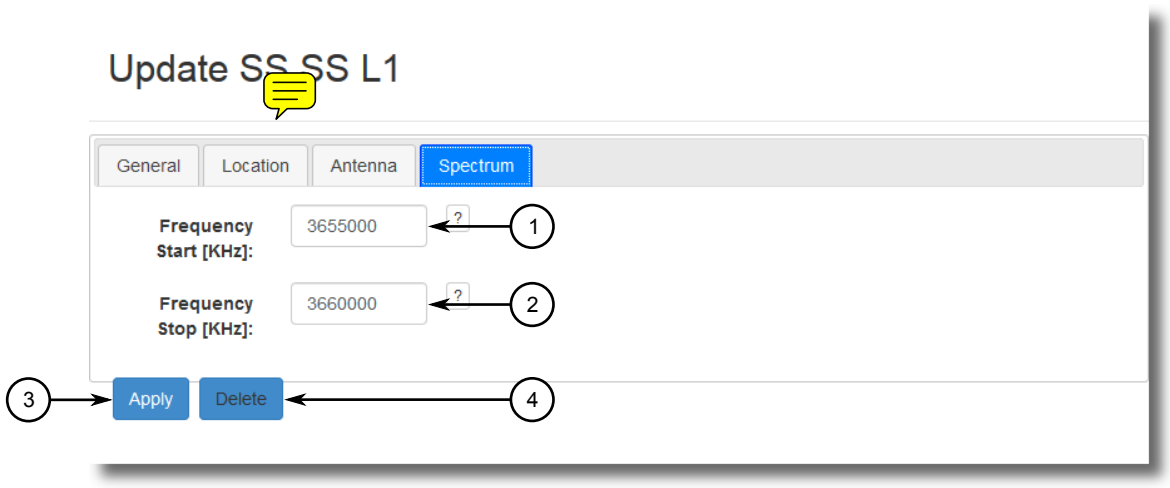


Figure 69: Spectrum Tab

1. Frequency Start Box **2.** Frequency Stop Box **3.** Apply Button **4.** Delete Button

3. Update the following parameters as needed:

Parameter	Description
Frequency Start	**Synopsis:** A number between 3550000 and 37700000 The low value of the frequency bandwidth, measured in kilohertz (KHz), in which the subscriber unit operates.
Frequency Stop	**Synopsis:** A number between 3550000 and 37700000 The high value of the frequency bandwidth, measured in kilohertz (KHz), in which the subscriber unit operates.

4. Click **Apply**.

Section 4.5.6

Removing a Subscriber Unit

To remove a subscriber unit from RUGGEDCOM SAS-GW, do the following:

1. Left-click the subscriber unit on the map and then click **Edit**. The **Update SS** screen appears.

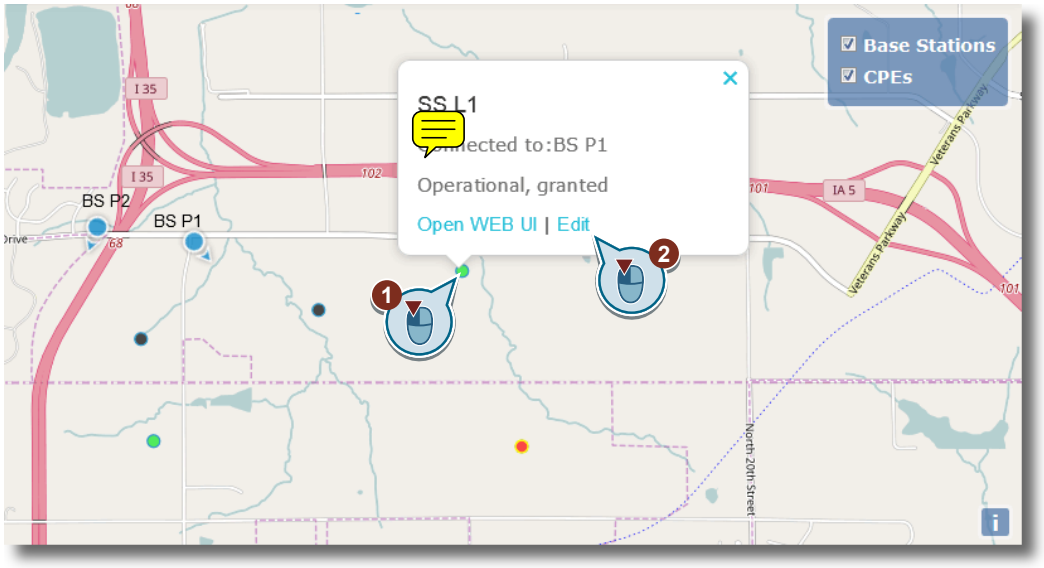


Figure 70: Editing a Subscriber Unit from the Map

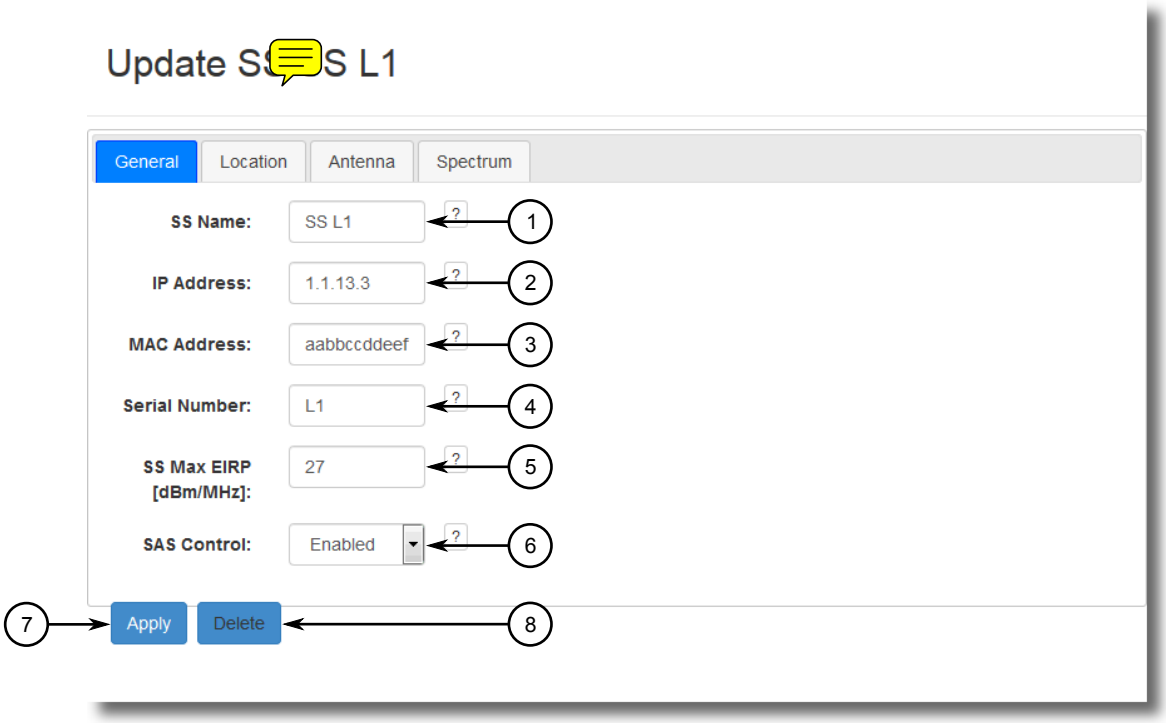


Figure 71: Update SU S n

1. CPE Name Box **2.** IP Address Box **3.** MAC Address Box **4.** Serial Number Box **5.** SU Max Tx Power Box **6.** SU Max EIRP Box **7.** SAS Control Box **8.** Report Measurements to SAS Box **9.** CBSD Device Category Box **10.** CBSD Device Group Box **11.** Apply Button **12.** Delete Button

2. Click **Delete**. A confirmation dialog box appears.
3. Click **OK**. RUGGEDCOM SAS-GW begins de-registering the subscriber unit from the SAS and removing it from the configuration. Allow a few minutes for the process to complete.

Section 4.5.7

Viewing Available Subscriber Units

There are two methods to view a list of available subscriber units.

- **Method 1**
  The simplest method is to left-click a base station on the map. The table below the map under **Base Station** then populates with information about each subscriber unit connected to the base station.

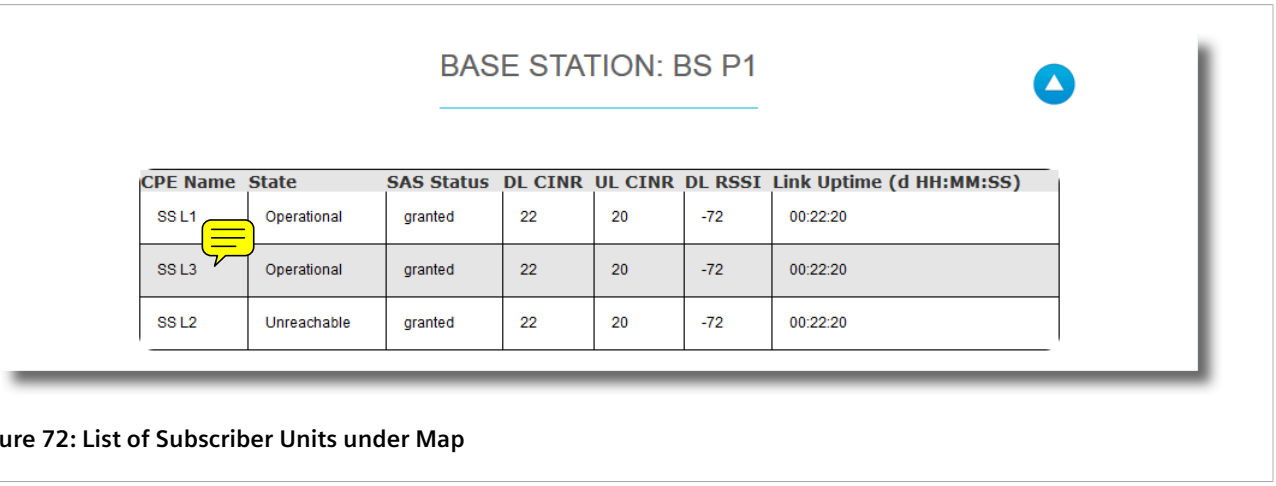


Figure 72: List of Subscriber Units under Map

- **Method 2**
  1. Point to **Setup** and then click **All BS**. The **View All Base Stations** screen appears.

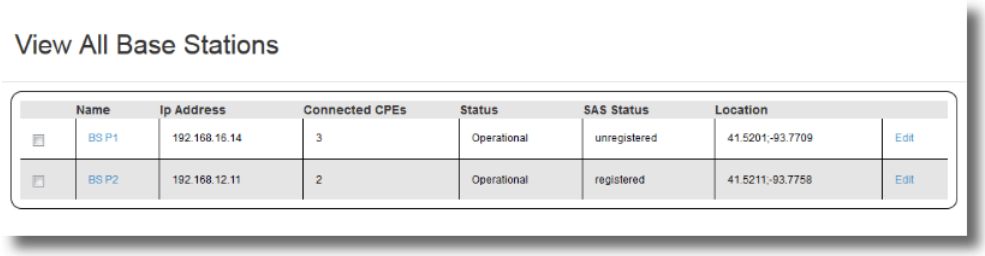


Figure 73: View All Base Stations Screen

  2. Click the name of the desired base station. The screen transitions to display a summary of the connected subscriber units.

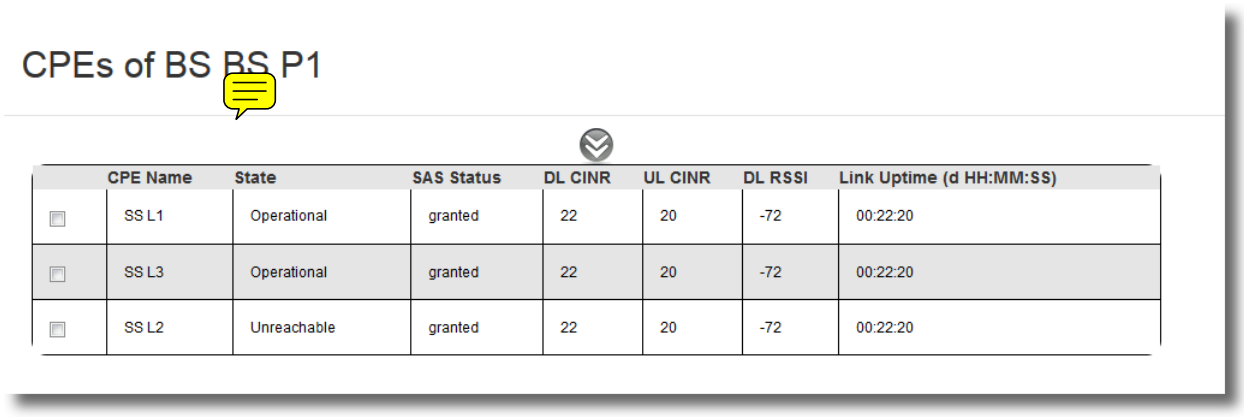


Figure 74: CPEs of BS Screen

The table in both cases displays the following information for each base station:

Column	Description
CPE Name	The name assigned to the subscriber unit.
State	The subscriber unit's current state. • `Operational` – The subscriber unit is connected and in full operation • `Unreachable` – The subscriber unit is not responding to queries • `Connected` – The subscriber unit is connected, but not transmitting • `NA` – The default value of new subscriber units that have not been configured yet in RUGGEDCOM SAS-GW
SAS Status	The subscriber unit's current status with the SAS. • `registered` – • `granted` – The SAS granted the last spectrum request • `granted_failed` – The SAS denied the last spectrum request • `hb_ok` – The SAS is operating normally • `hb_failed` – The SAS is not in operation • `relinquished` – The SAS accepted the last relinquish request • `relinquished_failed` – The SAS denied the last relinquish request • `unregistered` – The device is not registered with the SAS • `register_failed` – The SAS denied the last registration request • `configuration_error` – An error has been detected in the SAS's configuration
DL CINR	The Carrier to Interference + Noise Ratio (CINR) threshold for downlink measured in decibels (dB).
UL CINR	The Carrier to Interference + Noise Ratio (CINR) threshold for uplink measured in decibels (dB).
DL RSUI	The Received Signal Strength Indication (RSUI) for downlink measured in decibels (dB).
Link Uptime	The total time the subscriber unit has been connected with a satellite. Time is displayed in hours, minutes and seconds (i.e. HH:MM:SU).

5 Monitoring RUGGEDCOM SAS-GW

This section describes how to monitor the status of RUGGEDCOM SAS-GW, including the individual status of devices and the SAS server.

CONTENTS

Section 5.1

Viewing the System Log

The system log details specific events that have taken place during operation.

» Displaying Events

To display system events in the log, point to **Reports** and then click **System Log**. The **View All System Events** screen appears.

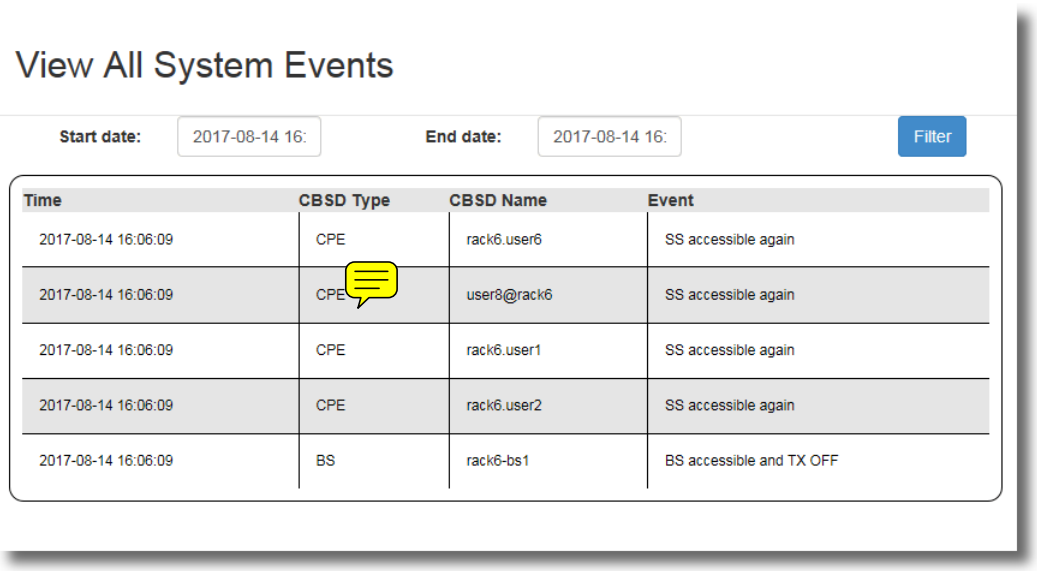


Figure 75: View All System Events Screen

The table displays the following information for each log entry:

Column	Description
Time	The exact time and date at which the event occurred. Time is displayed in the form of YYYY-MM-DD HH-MM-SS.
CBSD Type	The type of device associated with the event.
CBSD Name	The name of the device associated with the event.
Event	A description of the event that occurred. For more information about each possible event, refer to Section 5.5, "Tracked Events" .

Filtering Events

Only events that occurred during the defined time period are displayed. To widen or narrow the search, do the following:

NOTE
The date and time must be entered in the form of YYYY-MM-DD HH-MM-SS.

1. Under **Start Time**, enter the date and time at which to start the search. Clicking in the box will display the calendar tool. The date and time can be selected from the tool or entered manually.

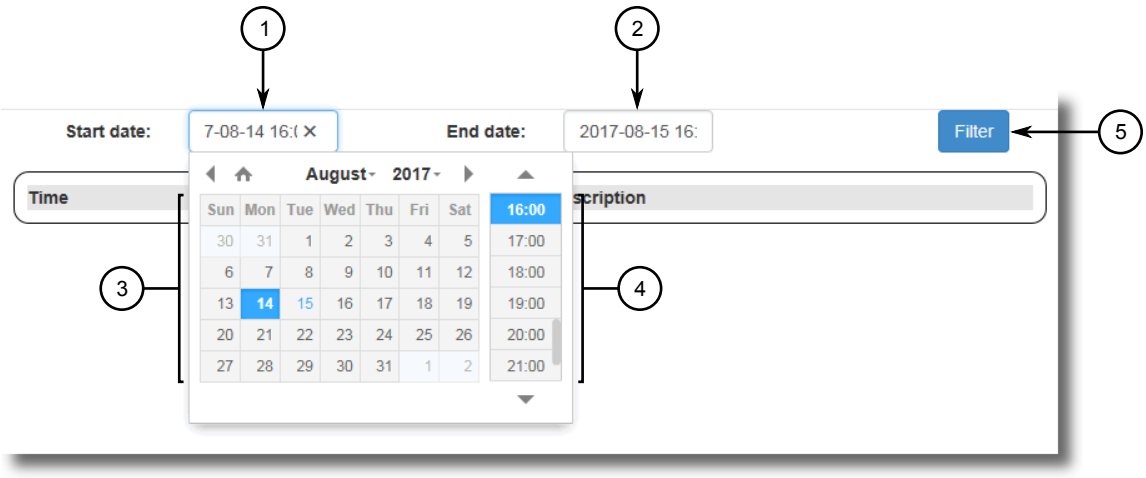


Figure 76: Filtering the System Events

1. Start Date Box **2.** End Date Box **3.** Month/Date Selector **4.** Time Selector **5.** Filter Button

2. Under **Stop Time**, enter the date and time at which to end the search. Clicking in the box will display the calendar tool. The date and time can be selected from the tool or entered manually.
3. Click **Filter**. Events that occurred during the defined time period, if any, are displayed.

Section 5.2

Viewing the Error Log

The error log records the history of errors that occurred for each base station and subscriber unit managed by RUGGEDCOM SAS-GW.

Displaying Errors

To display errors in the log, point to **Reports** and then click **Error Log**. The **Error Log** screen appears.

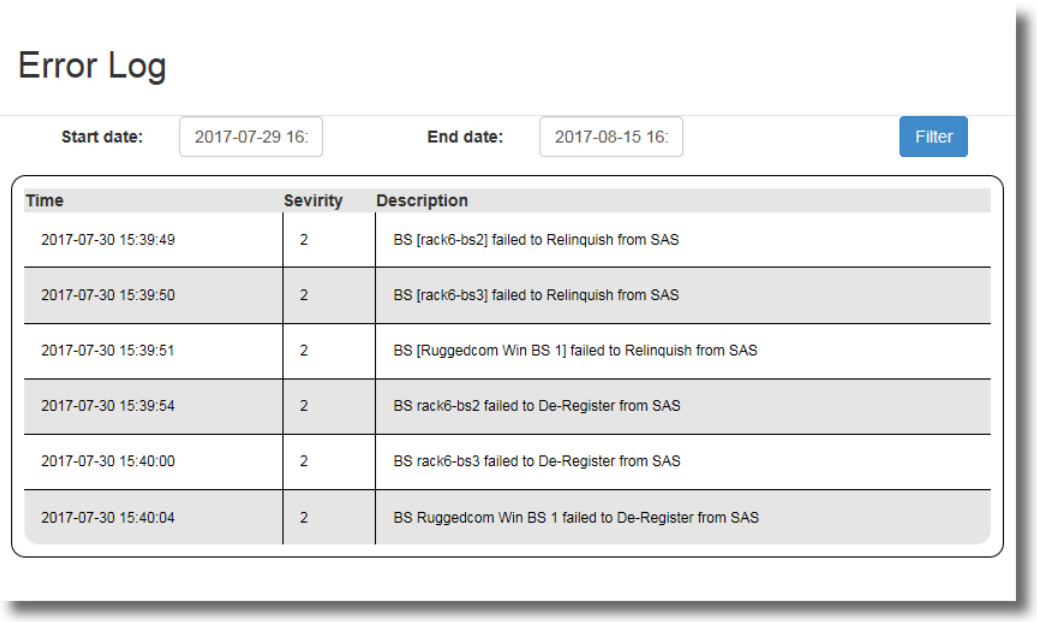


Figure 77: Error Log Screen

The table displays the following information for each log entry:

Column	Description
Time	The exact time and date at which the error occurred. Time is displayed in the form of YYYY-MM-DD HH-MM-SS.
Severity	The severity rate assigned to the event.
Description	A brief description that identifies the related device and the error that occurred.

Filtering Errors

Only errors that occurred during the defined time period are displayed. To widen or narrow the search, do the following:

NOTE
The date and time must be entered in the form of YYYY-MM-DD HH-MM-SS.

1. Under **Start Time**, enter the date and time at which to start the search. Clicking in the box will display the calendar tool. The date and time can be selected from the tool or entered manually.

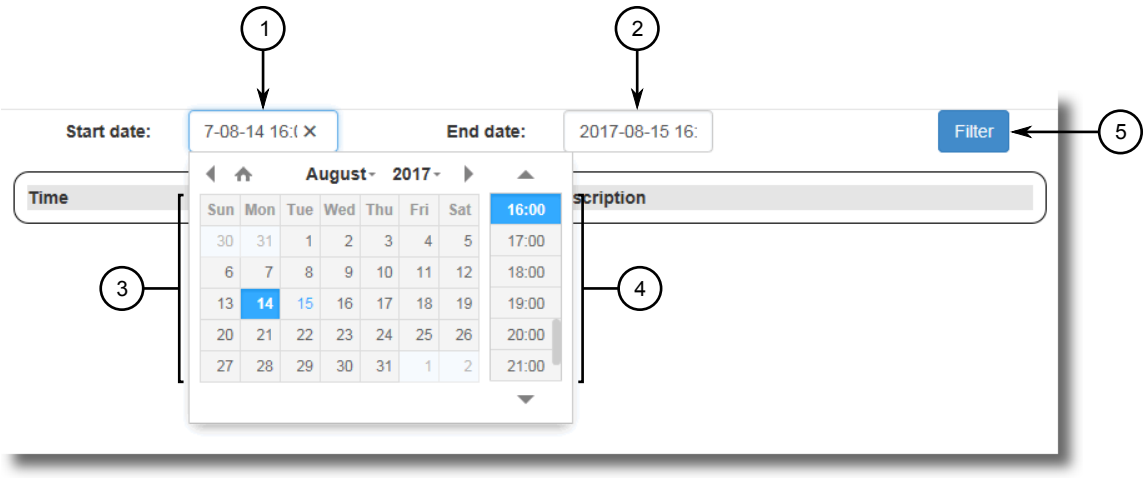


Figure 78: Filtering the Error Log

1. Start Date Box **2.** End Date Box **3.** Month/Date Selector **4.** Time Selector **5.** Filter Button

2. Under **Stop Time**, enter the date and time at which to end the search. Clicking in the box will display the calendar tool. The date and time can be selected from the tool or entered manually.
3. Click **Filter**. Errors that occurred during the defined time period, if any, are displayed.

Section 5.3

Monitoring SAS Alerts

RUGGEDCOM SAS-GW monitors five specific alerts that may be broadcast by the SAS and displays them on the main screen under the **SAS Alerts Table**.

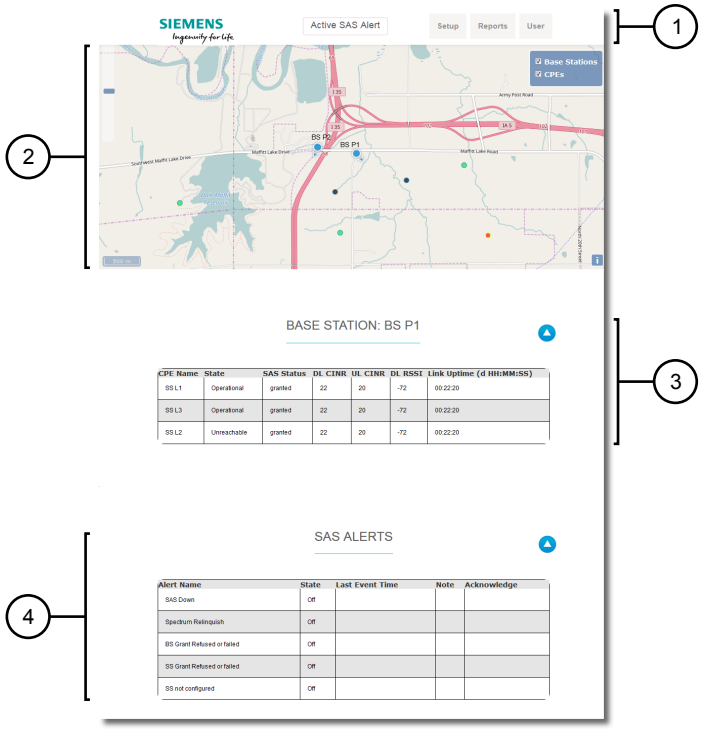


Figure 79: Main User Interface

1. Toolbar **2.** Interactive Map **3.** Base Station Table **4.** SAS Alerts Table

Tracked Alerts

Tracked alerts include:

- **SAS Down**
  The SAS server is offline.
- **Spectrum Relinquish**
  The SAS has requested all devices to relinquish a specific spectrum.
- **BS Grant Refused or Failed**
  The SAS has refused or failed to grant spectrum to the base station.
- **SS Grant Refused or Failed**
  The SAS has refused or failed to grant spectrum to the subscriber unit.
- **SS Not Configured**
  The subscriber unit is detected, but not configured in RUGGEDCOM SAS-GW.

Monitoring Alerts

To monitor the alerts broadcast by the SAS, launch RUGGEDCOM SAS-GW and click **Active SAS Launch** at the top of the main screen. The browser automatically scrolls down to the **SAS Alerts** table.

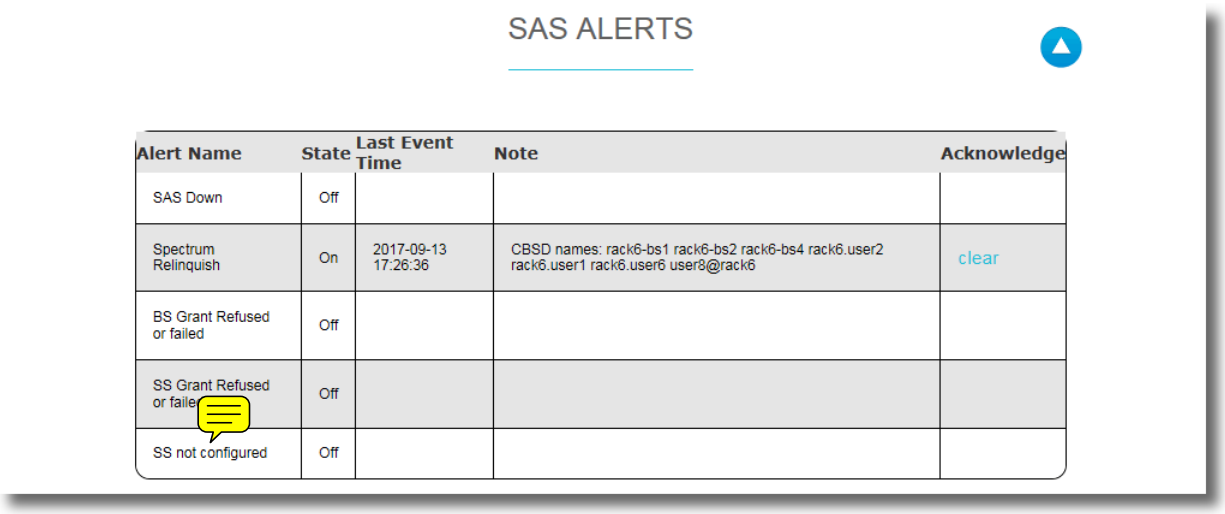


Figure 80: SAS Alerts Table

This table displays the following information for each alert:

Column	Description
Alert Name	The name of the alert.
State	The current state of the alert.
Last Event Time	The time at which the last event occurred.
Note	A list of devices involved in the event.
Acknowledge	Displays a link if an event is active. Click **clear** to acknowledge the alert.

Section 5.4

Monitoring SAS Activity

The SAS Activity log records all communications between RUGGEDCOM SAS-GW and the SAS on a device-by-device basis. Use this log to track messages sent to the SAS and the SAS's response.

» Displaying Events

To display SAS-related events, point to **Reports** and then click **CBSD Activity**. The **View All SAS Activity** screen appears.

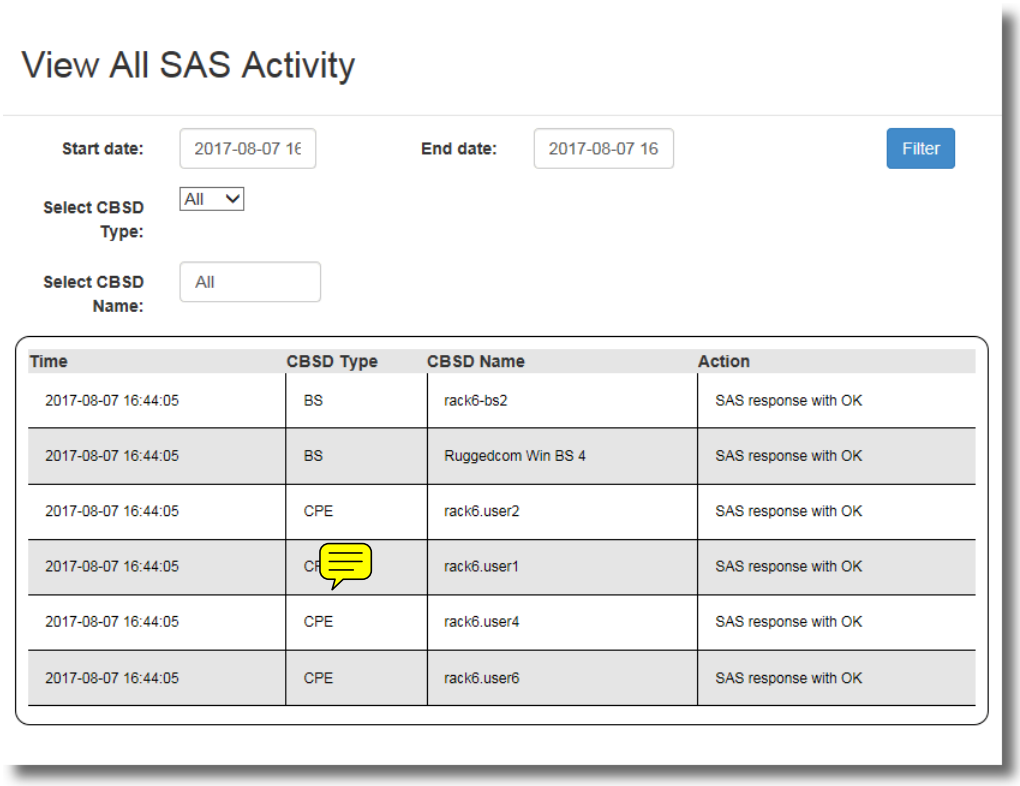


Figure 81: View All SAS Activity Screen

The table displays the following information for each log entry:

Column	Description
Time	The exact time and date at which the event occurred. Time is displayed in the form of YYYY-MM-DD HH-MM-SS.
CBSD Type	The type of CBSD (Citizens Broadcast radio Service Device) associated with the event. Possible values include: • `BS` – Base station • `CPE` – Subscriber unit
CBSD Name	The name of the associated CBSD.
Action	A description of the event.

» Filtering Events

Only events that occurred during the defined time period are displayed. To widen or narrow the search, do the following:

NOTE
The date and time must be entered in the form of YYYY-MM-DD HH-MM-SS.

1. Under **Start Time**, enter the date and time at which to start the search. Clicking in the box will display the calendar tool. The date and time can be selected from the tool or entered manually.

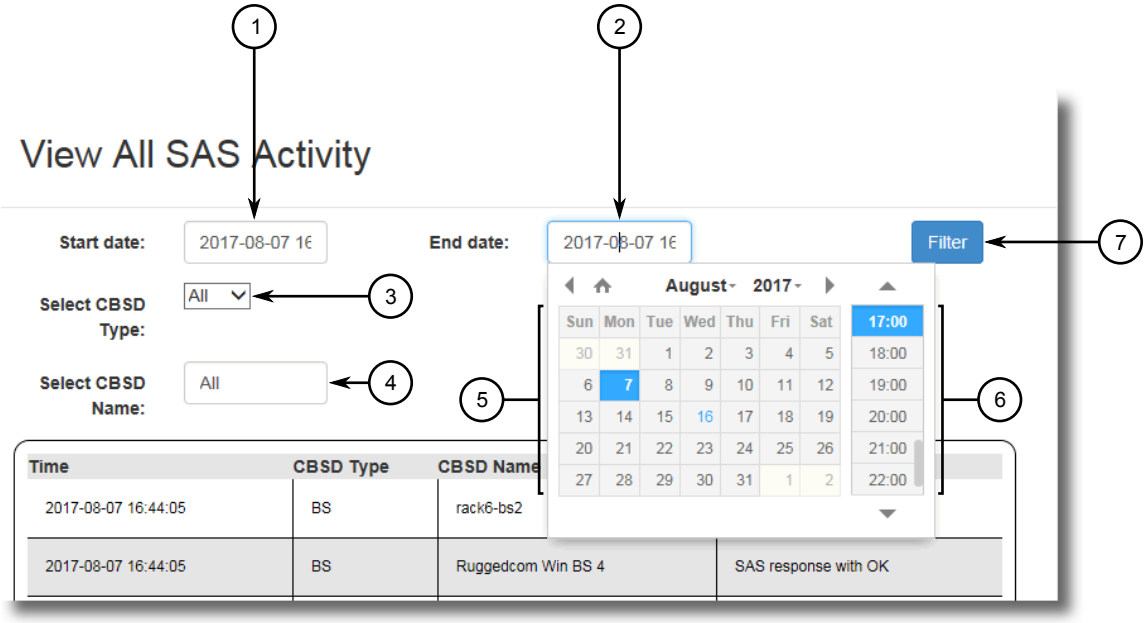


Figure 82: Filtering the SAS Events

1. Start Date Box **2.** End Date Box **3.** Select CBSD Type List **4.** Select CBSD Name List **5.** Month/Date Selector **6.** Time Selector **7.** Filter Button

2. Under **Stop Time**, enter the date and time at which to end the search. Clicking in the box will display the calendar tool. The date and time can be selected from the tool or entered manually.
3. [Optional] Under **Select CBSD Type**, select one of the following options:
   - `All` – Displays results for all base stations and subscriber units
   - `BS` – Displays results for only base stations
   - `CPE` – Displays results for only subscriber units
4. [Optional] Under **Select CBSD Name**, enter a full or partial name of a base station or subscriber unit. Entries that fully or partially match are displayed.

   The default value is `All`.
5. Click **Filter**. Events that occurred during the defined time period, if any, are displayed.

Section 5.5

Tracked Events

RUGGEDCOM SAS-GW tracks the following events during operation.

NOTE
Each event can be communicated via SMS alerts to individual users. For more information, refer to *Section 4.3.4, "Configuring SMS Alerts"* .

User Events

Event	Description
New user was added to database	A new user was added to RUGGEDCOM SAS-GW.
User was deleted from database	A user was deleted from RUGGEDCOM SAS-GW.

Subscriber Unit Events

Event	Description
SU is inaccessible	The subscriber unit is either offline or its associated base station is not transmitting.
SU TX turned on	The subscriber unit has started transmitting.
New SU was added to database	A new subscriber unit has been added to the RUGGEDCOM SAS-GW configuration.
New SU was deleted from database	A subscriber unit has been removed from the RUGGEDCOM SAS-GW configuration.
SU Grant refused or failed	The SAS has refused or failed to grant spectrum to the subscriber unit.
SU not configured	The subscriber unit is detected, but not configured in RUGGEDCOM SAS-GW.

Base Station Events

Event	Description
BS is inaccessible	The base station is offline.
BS is accessible and TX OFF	The base station is online but not transmitting.
BS TX turned on	The base station has started transmitting.
New BS was added to database	A new base station has been added to the RUGGEDCOM SAS-GW configuration.
New BS was deleted from database	A base station has been removed from the RUGGEDCOM SAS-GW configuration.
BS mode is Answer Positive. Tx stays open.	*Manual Operation* has been set to `Answer Positive` for the base station. The base station continues to transmit.
BS mode is Answer Negative. Tx stays open.	*Manual Operation* has been set to `Answer Negative` for the base station. The base station continues to transmit.
BS Grant refused or failed	The SAS has refused or failed to grant spectrum to the base station.

SAS Events

Event	Description
SAS server down	The SAS server is offline.
SAS requested spectrum relinquish. Sector is going down.	The SAS has requested all devices to relinquish a specific spectrum.
Database connection lost	The SAS database is offline.
CBSD configuration problem	An error is detected in the configuration of the SAS.
CBSD was deleted upon user request	A device is removed from RUGGEDCOM SAS-GW by a user.
CBSD Frequency has been changed	The spectrum frequency range for a device has changed.

Event	Description
CBSD SAS activity is changed. CBSD is deregistered.	A device has been de-registered from the SAS service.