

SU-I

RedMAX™ *Subscriber Unit* *Indoors*



User Manual

Copyright Information

All rights reserved July 23, 2010. The information in this document is proprietary to Redline Communications Inc. This document may not in whole or in part be copied, reproduced, or reduced to any medium without prior consent, in writing, from Redline Communications Incorporated.

Disclaimer

The statements, configurations, technical data, and recommendations in this document are believed to be accurate and reliable, but are presented without express or implied warranty. Additionally, Redline makes no representations or warranties, either expressed or implied, regarding the contents of this product. Redline Communications shall not be liable for any misuse regarding this product. The information in this document is subject to change without notice. No part of this document shall be deemed to be part of any warranty or contract unless specifically referenced to be part of such warranty or contract within this document.

Software Versions

This user manual describes operation using software release v2.3x and may include references or features that are different or unavailable in previous software releases (refer to product release notes).

TABLE OF CONTENTS

1	Important Safety Notices	6
1.1	Safety Warnings	6
1.2	Important Warning Symbols	6
1.3	Frequency Selection	7
1.3.1	General	7
1.3.2	R&TTE Directive 1999/5/EC Statements	7
1.4	CSA Information	9
1.5	Information for Use in Canada	9
1.6	Important Service Information	9
1.7	FCC Notice	10
1.8	FCC: Antenna/Tx Power Setting Combinations	10
1.9	WEEE Product Return Process.....	11
2	Overview	12
2.1	Features	13
2.1.1	IEEE 802.16 WiMAX Compliance	13
2.1.2	PHY Specification	13
2.1.3	Time Division Duplexing (TDD)	13
2.1.4	Coding Rate	13
2.1.5	Modulation	13
2.1.6	Reed Solomon Error Correction	13
2.2	Deployment Models	14
2.2.1	Channelization	14
2.2.2	PMP Deployment	14
2.2.3	Non Line-of-Sight	14
2.3	Service Flows	15
2.3.1	Service Flow Classification.....	15
2.3.2	Dynamic Service Addition	15
2.3.3	Uplink Service Flow Scheduling	16
2.3.4	Downlink Service Flow Scheduling.....	16
3	Indoor Unit Features	17
3.1	Indoor Subscriber with Integrated Antenna	17
3.2	LED Indicators	18
3.2.1	WiMAX / WAN Signal.....	18
3.2.2	LAN System	18
3.3	Indoor Subscriber Connections and Controls	19
3.3.1	Ethernet Port.....	19
3.3.2	Reset Switch	19
3.3.3	RF Port	19
3.3.4	Accessories.....	20
3.4	Antenna Alignment.....	21
4	CLI Commands	22
4.1	Introduction	22
4.2	CLI Modes	22
4.2.1	Telnet Connection	22

4.2.2	Root Commands	23
4.2.3	Factory Test Commands	23
4.3	Mode Commands.....	24
4.3.1	boardConfig - Board Setup Commands.....	25
4.3.2	bsIdTable - Base Station ID Table Commands.....	26
4.3.3	collectRadio - RF Statistics	27
4.3.4	diagStatistics - Diagnostic Statistics (debug mode)	28
4.3.5	ethTag - Ethernet Tagging	30
4.3.6	installedVer - Installed Version	31
4.3.7	ipAddress - IP Address Commands	32
4.3.8	loadImage - Download and Activate Software Image	34
4.3.9	modThresh - Modulation Threshold.....	35
4.3.10	monitor - Monitor Mode	36
4.3.11	phyConfig - Physical Layer Configuration.....	37
4.3.12	privacySS - Privacy Commands	38
4.3.13	reset - Reset Command	39
4.3.14	rfConfig - RF Setup Commands	40
4.3.15	set - Set Commands	43
4.3.16	show - Show Commands	48
4.3.17	snmpAccCtrl.....	53
4.3.18	smcIpAddress: Assign Static Remote IP Address	54
4.3.19	snmpAccCtrl.....	55
4.3.20	softwareUpdate - Software Update Commands	56
4.3.21	status - Status Information	57
4.3.22	user.....	58
4.3.23	VLAN Filtering.....	59
5	Appendices	60
5.1	Subscriber Log Messages.....	60
5.2	Upgrade Subscriber	64
5.2.1	Before Beginning the Upgrade	64
5.2.2	Update Software Procedure	64

LIST OF FIGURES

Figure 1:	Notices - WEEE Logo	11
Figure 2:	Intro - RedMAX Subscriber Indoor Modem	12
Figure 3:	System - Fresnel Zone	14
Figure 4:	System - Non-Line of Sight Deployment	15
Figure 5:	Subscriber System Features.....	17
Figure 6:	Subscriber LED Display.....	18
Figure 7:	Subscriber System Connections - Power Connector	19
Figure 8:	Subscriber Ethernet Connector (Under Base).....	19
Figure 9:	Subscriber Reset Switch (Under Base).....	19
Figure 10:	Subscriber RF Connector (Under Base)	20
Figure 11:	Subscriber Accessory Mounting Components.....	20
Figure 12:	Subscriber System Connections Diagram.....	21
Figure 13:	Subscriber CLI Interface - Login Dialog	23

Figure 14: CLI - monitor - Monitor Screen..... 36

LIST OF TABLES

Table 1: Notices - R&TTE: Countries of Use (3.4 GHz & 3.6 GHz).....	7
Table 2: R&TTE - Community Language CE Declarations.....	8
Table 3: Notices - FCC: Antenna/Tx Power Setting Combinations.....	10
Table 4: System - Indoor CPE WAN LEDs	18
Table 5: System - Indoor CPE WAN LEDs - Signal Strength	18
Table 6: System - LAN LEDs.....	18
Table 7: CLI - Command Groups.....	22
Table 8: CLI - Root Mode Commands	23
Table 9: CLI - Root Mode Commands	23
Table 10: CLI - Root Mode Commands	24
Table 11: CLI - boardConfig - Board Commands.....	25
Table 12: CLI - bsldTable - Base Station ID Commands.....	26
Table 13: CLI - bsldTable - Base Station ID Commands.....	27
Table 14: CLI - diagStatistics - Diagnostic Statistics Commands	28
Table 15: CLI - ethTag - Ethernet Tagging Commands	30
Table 16: CLI - installedVer - Installed Version Commands.....	31
Table 17: CLI - ipAddress - IP Address Commands.....	32
Table 18: CLI - ipAddress - IP Address Commands.....	33
Table 19: CLI - modThresh - Modulation Threshold Commands.....	35
Table 20: CLI - monitor - Monitor Mode	36
Table 21: CLI - phyConfig - Physical Layer Commands.....	37
Table 22: CLI - privacySS - Privacy Commands	38
Table 23: CLI - reset - Reset Commands	39
Table 24: CLI - rfConfig - Radio Frequency Commands	40
Table 25: CLI - set - Modify Subscriber Parameters	43
Table 26: CLI - show - Show Commands	48
Table 27: CLI - snmpAccCtrl.....	53
Table 28: CLI - show - Show Commands	54
Table 29: CLI - snmpAccCtrl.....	55
Table 30: CLI - softwareUpdate - Software Update Commands.....	56
Table 31: CLI - status - Status Commands	57
Table 32: CLI - User Command.....	58
Table 33: CLI - status - Status Commands	59
Table 34: Troubleshooting - Event Log Messages.....	60

2 Important Safety Notices

Models This manual covers the SU-IIR (SU-I) indoor wireless subscriber.

2.1 Safety Warnings

1. Do not exceed the described limits on product labels.
2. Position power cords to avoid damage.
3. Use only properly grounded power receptacles.
4. Do not overload wall outlets.
5. Do not place equipment on or near a direct heat source or operate near water or in a wet location.
6. Disconnect power before cleaning and use only a damp cloth for cleaning (no liquid / aerosol cleaners).
7. Disconnect power when product is not in use.
8. It is the user's responsibility to install this device in accordance with the local electrical and building codes.
9. Refer to the subscriber User Manual for a complete description of safety notices and regulatory information for this product.

Attention:

The SU-I front grill is used to dissipate heat and may feel quite warm during normal operation. Avoid direct contact with this feature when handling the SU-I.

2.2 Important Warning Symbols

The following symbols may be encountered during installation or troubleshooting. These warning symbols mean danger. Bodily injury may result if you are not aware of the safety hazards involved in working with electrical equipment and radio transmitters. Familiarize yourself with standard safety practices before continuing.



Electro-Magnetic Radiation



High Voltage

2.3 Frequency Selection

2.3.1 General

Operation in the FWA band is subject to license. The radio power and channel frequency selections must be set correctly before the installed system is allowed to transmit. The installed system must comply with all governing local, regional, and national regulations. Contact authorities in the country of installation for complete information regarding the licensing regime and operating restrictions for that regulatory domain.

2.3.2 R&TTE Directive 1999/5/EC Statements

Installation

The transceiver and antenna equipment must be installed by a qualified professional installer and must be installed in compliance with regional, national, and local regulations. It is the responsibility of the system installer and/or system operator to ensure the installed system does not exceed any operational constraints identified by local regulations. Refer to the sections in this product User Guide for detailed information about the correct installation steps to ensure power and frequency settings are set correctly before connecting the antenna. Operation in the 3.4-3.6 GHz band is subject to license. Authorities within the country of installation can provide information regarding the licensing regime and restrictions.

Community Language Declarations

Table 1: Notices - R&TTE: Countries of Use (3.4 GHz & 3.6 GHz)					
Country	3400-3600 MHz	Country	3400-3600 MHz	Country	3400-3600 MHz
Austria	✓	Hungary	✓	Poland	✓
Belgium	✓	Iceland	✓	Portugal	✓
Bulgaria	✓	Ireland	✓	Romania	✓
Cyprus		Italy		Slovakia	✓
Czech Republic	✓	Latvia	✓	Slovenia	✓
Denmark	✓	Liechtenstein	✓	Spain	✓
Estonia	✓	Lithuania	✓	Sweden	✓
Finland	✓	Luxembourg	✓	Switzerland	✓
France	✓	Malta	✓	United Kingdom	✓
Germany	✓	Netherlands	✓		
Greece	✓	Norway	✓		

The following table contains community language versions of informal statement in accordance with Article 6.3 of Directive 1999/5/EC.

Table 2: R&TTE - Community Language CE Declarations	
Community language versions of informal statement for inclusion in user information in accordance with Article 6.3 of Directive 1999/5/EC	
Danish	Undertegnede Redline Communications erklærer herved, at følgende udstyr subscriber overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF
Dutch	Hierbij verklaart Redline Communications dat het toestel subscriber in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG
	Bij deze verklaart Redline Communications dat deze subscriber voldoet aan de essentiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.
English	Hereby, Redline Communications, declares that this subscriber is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Finnish	Redline Communications vakuuttaa täten että subscriber tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
French	Par la présente Redline Communications déclare que l'appareil subscriber est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE
	Par la présente, Redline Communications déclare que ce subscriber est conforme aux exigences essentielles et aux autres dispositions de la directive 1999/5/CE qui lui sont applicables
German	Hiermit erklärt Redline Communications, dass sich <i>dieser/diese/dieses</i> subscriber in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet". (BMW i)
	Hiermit erklärt Redline Communications die Übereinstimmung des Gerätes subscriber mit den grundlegenden Anforderungen und den anderen relevanten Festlegungen der Richtlinie 1999/5/EG. (Wien)
Greek	<i>ΜΕ ΣΗΝ ΠΑΡΟΤΣΑ Redline Communications ΔΗΛΩΝΕΙ ΟΣΙ subscriber ΣΥΜΜΟΡΦΩΝΕΣΑΙ ΠΡΟΣ ΤΙΣ ΟΤΣΙΩΔΕΙΣ ΑΠΑΙΣΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΥΕΣΙΚΕΣ ΔΙΑΣΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ</i>
Italian	Con la presente Redline Communications dichiara che questo subscriber è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Portuguese	Redline Communications declara que este subscriber está conforme com os requisitos essenciais e outras provisões da Directiva 1999/5/CE.
Spanish	Por medio de la presente Redline Communications declara que el subscriber cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE
Swedish	Härmed intygar Redline Communications att denna subscriber står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

2.4 CSA Information

1. The equipment must be properly grounded according with NEC, ICEC, CEC, and others, and other local safety code and building code requirements.
2. To meet the over-voltage safety requirements on the telecommunications cables, a minimum 26 AWG telecommunication line cord must be used.

Pour être en conformité avec les exigences finies de sûreté de sur-tension sur les câbles de télécommunications un fil de télécommunication ayant un calibrer minimum de 26 AWG doit être utilisé.

2.5 Information for Use in Canada

Operation is subject to the following two conditions:

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

Usage of this subscriber modem is subject to license within Canada. Operation is restricted to the 200 MHz band from 3.450-3.650 GHz. More information regarding licensing requirements is available from Industry Canada (www.ic.gc.ca).

This device has been designed to operate with an antenna having a maximum gain of 11.3 dBi. Antennas having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

IMPORTANT NOTE: IC Radiation Exposure Statement

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. To maintain compliance with IC RF exposure compliance requirements, please avoid direct contact to the transmitting antenna during transmitting.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

SU-IIR (SU-I with integrated antenna): A separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation.

2.6 Important Service Information

1. Refer all repairs to qualified service personnel. Do not remove the covers or modify any part of this device, as this voids the warranty.
2. Disconnect the power to this product and return it for service if the following conditions apply:
 - a) The unit does not function after following the operating instructions outlined in this manual.
 - b) Liquid has been spilled or a foreign object is inside.
 - c) The product has been dropped or the housing is damaged.
3. Record the serial number on your registration card for future reference.

2.7 FCC Notice

1.  **WARNING** -- FCC RF Exposure Warnings
 To satisfy FCC RF exposure requirements for RF transmitting devices, a minimum distance of 25 cm should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna used for this transmitter must not be collocated in conjunction with any other antenna or transmitter.
2. Operation is restricted to the 25 MHz band 3.650-3.675 GHz (restricted contention based protocol for WiMAX devices).
3. FCC Information to Users @ FCC 15.21 & 15.105:
 This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
4. Warning: Changes or modifications not expressly approved by Redline Communications could void the user's authority to operate the equipment.

2.8 FCC: Antenna/Tx Power Setting Combinations

FCC regulation part 90.1321 (governing operation in the 3650-3700 MHz band in the US) states that mobile station transmissions are limited to a maximum transmit power of 40 milliwatts/MHz (peak EIRP). The SU-I has been certified for use with the maximum transmit power settings listed in the following table:

Table 3: Notices - FCC: Antenna/Tx Power Setting Combinations			
Order Number	Antenna Description	Max. Tx Power GUI Setting (dBm)	
		3.5 MHz Channel	7 MHz Channel
SU-I Integrated	80 degrees, 10.5 dBi, 3.3 - 3.8 GHz, 162 x 88 mm Flat Panel, Vertical or Horizontal Polarization	11	13

Adjustments to the transmit power settings must be made using the Tx power control settings in the rfConfig section of the command line interface (CLI).

2.9 WEEE Product Return Process

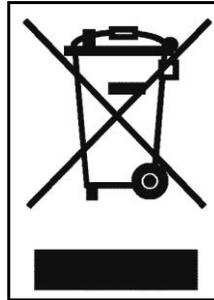


Figure 1: Notices - WEEE Logo

In accordance with the WEEE (Waste from Electrical and Electronic Equipment) directive, 2002/96/EC, Redline Communications equipment is marked with the logo shown above. The WEEE directive seeks to increase recycling and re-use of electrical and electronic equipment. This symbol indicates that this product should not be disposed of as part of the local municipal waste program. Contact your local sales representative for additional information.

3 Overview

Congratulations on your purchase of the Redline WiMAX subscriber wireless broadband product. Redline Communications is a world leader in design and production of WiMAX and proprietary Broadband Fixed Wireless (BFW) systems.

The indoor subscriber modem is carrier class high-speed IEEE 802.16-2004 WiMAX compliant for and point-to-multipoint (PMP) deployment.



Figure 2: Intro - RedMAX Subscriber Indoor Modem

3.1 Features

3.1.1 IEEE 802.16 WiMAX Compliance

The IEEE 802.16-2004 specifications describe a PMP broadband wireless access standard for systems operating in the frequency range of 2-11 GHz, and 10-66 GHz. This standard includes descriptions for both the Media Access Control (MAC) and the physical (PHY) layers. Note that the 802.16-2004 standards are subject to amendment, and the subscriber product design compliance applies to a specific revision of the standard. The outdoor subscriber product does not support mesh communication (direct subscriber-to-subscriber).

Redline is an active member of the WiMAX Forum™ and is participating in interoperability testing in the WiMAX Forum. Redline is also an active member of the IEEE 802.16-2004 standards committee and has been instrumental in creating the original 802.16-2004 standards, and is active in recommending, writing and following-up work on new amendments to the 802.16-2004 specifications.

3.1.2 PHY Specification

The subscriber system is designed for 2-11 GHz operation based on the WirelessMAN-OFDM PHY definition in the IEEE 802.16-2004 specifications. The subscriber uses Orthogonal Frequency Division Multiplexing (OFDM). OFDM is a multi-carrier transmission technique where the data stream is split and transmitted (at a reduced rate) in parallel streams on separate sub-carriers. OFDM uses the Fast Fourier Transform (FFT) algorithm to implement modulation and demodulation functions. Using adequate channel coding and bit-interleaving, OFDM performs very well in severe multipath environments, mitigates frequency-selective fading, and provides high spectral efficiency.

3.1.3 Time Division Duplexing (TDD)

The subscriber system uses time division duplexing (TDD) to transmit and receive on the same RF channel. The subscriber can also transmit and receive using separate RF channels, referred to as half-duplex FDD (HD-FDD). These are both non-contention based methods for providing an efficient and predictable two-way PTP or PMP cell deployment. All uplink and downlink transmission scheduling is managed by the WiMAX base station. The base station sends data traffic to subscribers, polls for grant requests, and sends grant acknowledgements based on the total of all traffic to all subscribers.

3.1.4 Coding Rate

Each burst of data transmitted over the air is padded with redundant information to make it resistant to errors introduced during transmission. The coding rate is the ratio of user data to the total data transmitted including the redundant error correction data. The subscriber supports coding rates of 1/2, 2/3, and 3/4.

3.1.5 Modulation

The modulation technique specifies how the data is coded within the OFDM carriers. The subscriber supports BPSK, QPSK, 16 QAM, and 64 QAM modulation.

3.1.6 Reed Solomon Error Correction

Outer Reed-Solomon and inward Convolution Coding (RS-CC) error correction is enabled for all traffic rates, with the exception of BPSK 1/2 where only inward Convolution Coding is used. These low-level processes can correct bursts of errors in received messages and reduce the number of retransmissions.

3.2 Deployment Models

The subscriber supports point to multipoint (PMP) deployment scenarios.

3.2.1 Channelization

The subscriber is a frequency-specific system, with the frequency band defined by the internal transceiver unit. The use of the operating band must be in accordance with European Conference of Postal and Telecommunications Administrations (CEPT) Recommendation 14-03.

The subscriber divides the available frequency band into channels. Allocation of channels during deployment is dependent on spectrum availability in the licensed FWA band (3400-3600 MHz) and local licensing requirements and conditions. Channel selection allows planners to obtain the maximum geographic coverage, while avoiding frequency contention in adjacent sectors.

3.2.2 PMP Deployment

When deployed in a PMP configuration the base station establishes bi-directional links to more than one subscriber. The PMP deployments typically use a wide beam (sector) antenna at the base station and a narrow beam antenna at the subscriber. Service flows are used to police service level agreements for each subscriber.

3.2.3 Non Line-of-Sight

The subscriber system supports line-of-sight (LOS), optical line-of-sight (OLOS), and non line-of-sight (NLOS) operation. A clear LOS link has no obstacles within 60% of the first Fresnel zone of the direct path. An OLOS link has obstructions within 60% of the first Fresnel zone, but a visible path exists from the base station to the subscriber.

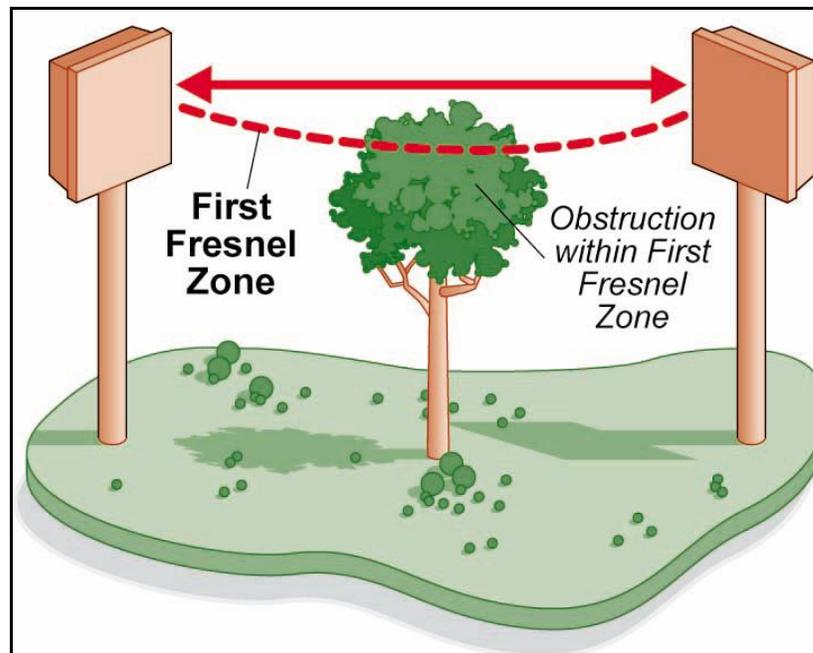


Figure 3: System - Fresnel Zone

A wireless link is considered non LOS if natural or man-made structures block the visible path between the base station and subscriber. In this case, a wireless link can be established only if a reflective path can be established between the base station and subscriber.

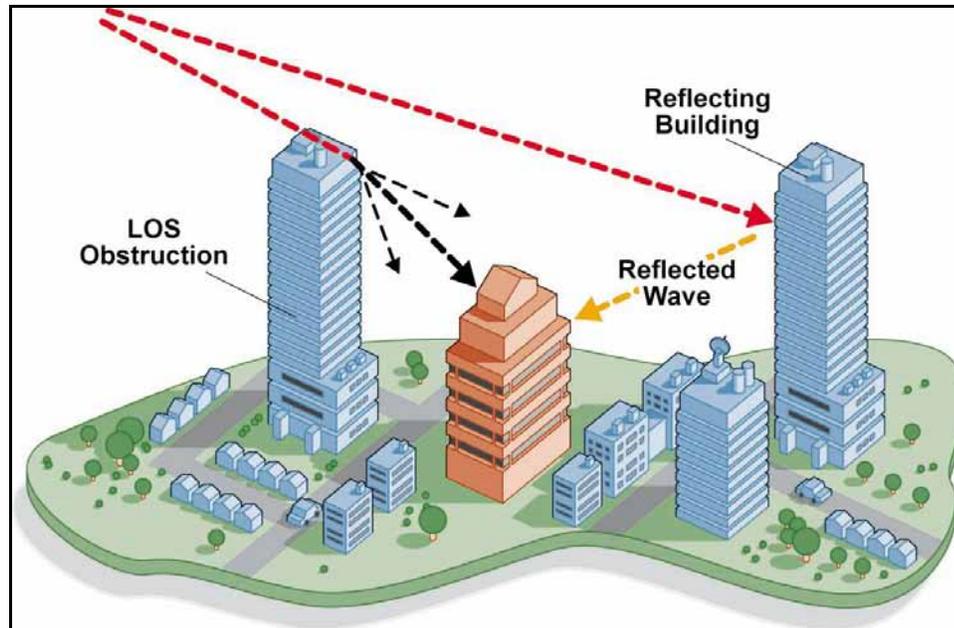


Figure 4: System - Non-Line of Sight Deployment

3.3 Service Flows

Service flows are a key feature of the 802.16 standard. A Service Flow represents a unidirectional data flow having separate QoS settings for uplink and downlink. Service flows provide the ability to set up multiple connections to each subscriber in a sector.

Separate service flows can be established for uplink and downlink traffic, where each service flow is assigned a unique service level category and separate QoS settings. This feature allows segregation of high-speed/high-priority traffic from less time-critical flows.

3.3.1 Service Flow Classification

Data packets are forwarded by the subscriber based on classification rules. Classification rules require examining each packet for pattern matches such as destination address, source address, or VLAN tag. All classification is defined at the base station and the classification parameters are downloaded to the subscriber.

A service flow is partially characterized by the following attributes:

1. A 32-bit Service Flow ID (SFID) is assigned to all existing service flows. The SFID serves as the principal identifier for the Service Flow and has an associated direction.
2. A 16-bit Connection ID (CID) is associated with each active SFID (connection active).
3. A set of QoS parameters specifying the required resources. The principal resource is bandwidth, but the specification may also include latency requirements.
4. A set of QoS parameters defining the level of service being provided.

3.3.2 Dynamic Service Addition

Service flows are defined and stored in the base station. For each service flow to be established, the base station sends a setup message to the subscriber specifying the required set of QoS parameters. The subscriber responds to each request by accepting or rejecting the setup message.

A service flow may be pre-provisioned or can be dynamically created and deleted without service outage. This is useful for supporting multiple subscribers in a single sector. New subscribers can be added and existing subscribers can be removed or have service levels modified.

Setup messages are sent by the base station following any subscriber power-cycle, loss and recovery of the wireless link to a subscriber, or any service flow add/delete operation at the base station.

3.3.3 Uplink Service Flow Scheduling

The base station enforces QoS settings for each service flow by controlling all uplink and downlink traffic scheduling. This provides non-contention based traffic model with predictable transmission characteristics. By analyzing the aggregate requests of all subscribers, the base station ensures that uplink and downlink traffic conforms with the current service level agreements (SLAs). Centralized scheduling increases traffic predictability, eliminates contention, and provides maximum opportunity for reducing overhead.

Real-Time Polling Service (rt-PS)

The base station schedules a continuous regular series of transmit opportunities for the subscriber to send variable size data packets. The grant size is based on the current data transfer requirement. Typical applications include streaming MPEG video or VOIP with silence suppression. This is efficient for applications that have a real-time component and continuously changing bandwidth requirements.

Non-Real-Time Polling Service (nrt-PS)

The base station schedules regular transmit opportunities for the subscriber to send variable size data packets. Typical applications may include high bandwidth FTP. The polling period may typically be one second or less, even during periods of network congestion.

Best Effort (BE)

The base station schedules transmit opportunities for the subscriber to send traffic based on unused bandwidth after all higher level traffic scheduling requirements are serviced. Typical applications may include Internet access and email. Best effort service flows can be assigned a priority of 0 to 7.

Unsolicited Grant Service (UGS)

The base station schedules a continuous series of transmit opportunities for the subscriber to send fixed size data packets. This schedule supports real-time applications including VoIP or TDM transport. The UGS pre-scheduled grants guarantee reserved bandwidth and reduce latency introduced by repetitive grant requests. The service flow will not transmit packets larger than nominal grant interval.

3.3.4 Downlink Service Flow Scheduling

The base station schedules downlink traffic on active service flows based on the minimum reserved data rate (CIR), traffic priority, and maximum latency.

4 Indoor Unit Features

Each operational RedMAX network is comprised of a (WiMAX compatible) base station and one or more subscriber units. The subscriber is connected to a remote Ethernet network and establishes a bi-directional data link with a designated base station.

4.1 Indoor Subscriber with Integrated Antenna

The subscriber is a fully integrated unit with a built-in antenna. The subscriber system includes:

- Subscriber with integrated antenna
- Indoor Power adapter with AC power cord (NA/UK/EU)
- Desktop Stand
- Universal mounting bracket



Figure 5: Subscriber System Features

4.2 LED Indicators

The subscriber features LED indicators to assist with installation and troubleshooting of the wireless interface and the Ethernet interface.

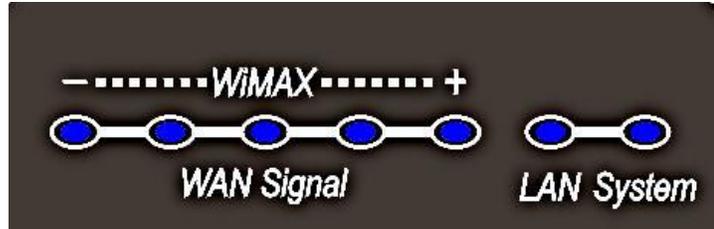


Figure 6: Subscriber LED Display

4.2.1 WiMAX / WAN Signal

The subscriber features five LEDs to indicate signal strength. If no signal or a weak signal is detected, only the left LED (-) will be lit. As signal strength increases, more LEDs will be lit. A strong signal is indicated by all LEDs being lit.

Table 4: System - Indoor CPE WAN LEDs		
Phase	Activity	Description
1	Power-on / Reset	Shortly after power-on or reset, all LEDs blink on for a short period and then turn off.
2	Frequency Scanning	All LEDs cycle on and off in a walking pattern.
3	Network Entry	While attempting to register with the wireless network, the number of LEDs blinking represent the received signal strength (see table below).
4	Subscriber is Registered	When registered with the wireless network, the number of LEDs blinking represent the received signal strength (see table below).

Table 5: System - Indoor CPE WAN LEDs - Signal Strength	
LED Indicators Lit	Signal Strength (RSSI) in dBm
5	< -45
4	-45 to -58.9
3	-58 to -75.3
2	-75 to -86.5

4.2.2 LAN System

The LAN LEDs indicate connectivity and activity on the Ethernet port. Refer to the following table for details.

Table 6: System - LAN LEDs	
Left LED	LED is on when the Ethernet port connection is active.
Right LED	LED blinks when there is Ethernet data traffic.

4.3 Indoor Subscriber Connections and Controls

All external connectors and controls are located on the bottom of the subscriber unit. Refer to the following sections for details.

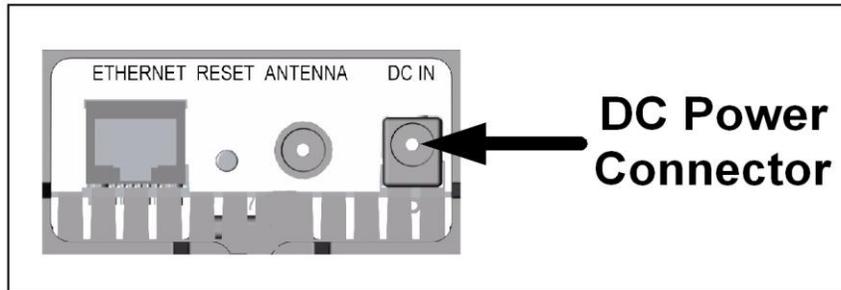


Figure 7: Subscriber System Connections - Power Connector

4.3.1 Ethernet Port

The auto-sensing 10/100Base-T Ethernet port connects through the Ethernet cable to the customer network equipment. The subscriber exchanges data with the network through this port (auto-sensing polarity). It is recommended to use a flexible Ethernet cable.

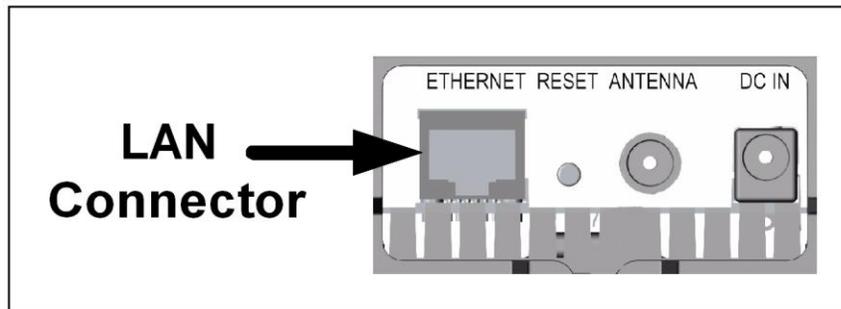


Figure 8: Subscriber Ethernet Connector (Under Base)

4.3.2 Reset Switch

The subscriber features a reset switch recessed in the bottom of the subscriber unit. You may require a narrow pointed item (ex. paper clip) to activate the reset switch.

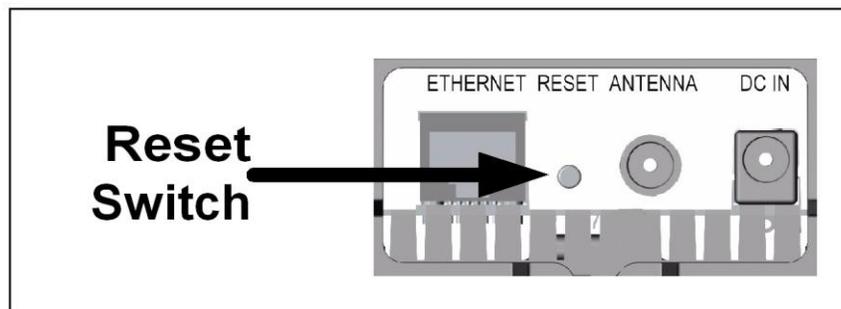


Figure 9: Subscriber Reset Switch (Under Base)

4.3.3 RF Port

An RF connector is provided for connection to the integrated antenna. The transceiver RF port is used for sending/receiving the RF signal to/from the integrated antenna. A short coaxial cable connects the transceiver to the integrated antenna.

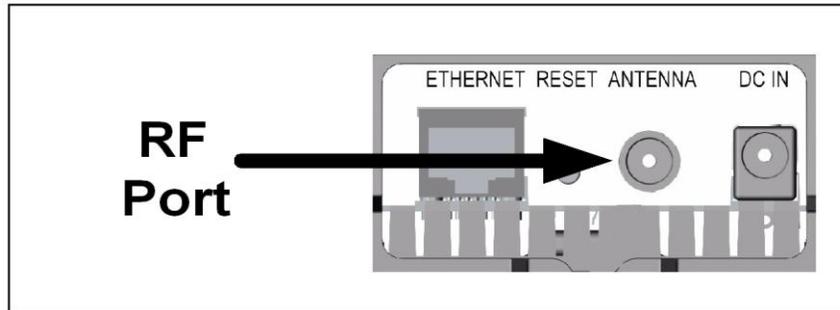


Figure 10: Subscriber RF Connector (Under Base)

4.3.4 Accessories

The subscriber is powered using the supplied auto-sensing 110-240 (nominal) VAC indoor power adapter. The power input connection is located on the bottom of the subscriber unit. The subscriber includes mounting options to accommodate desktop, windowsill, and wall mount.

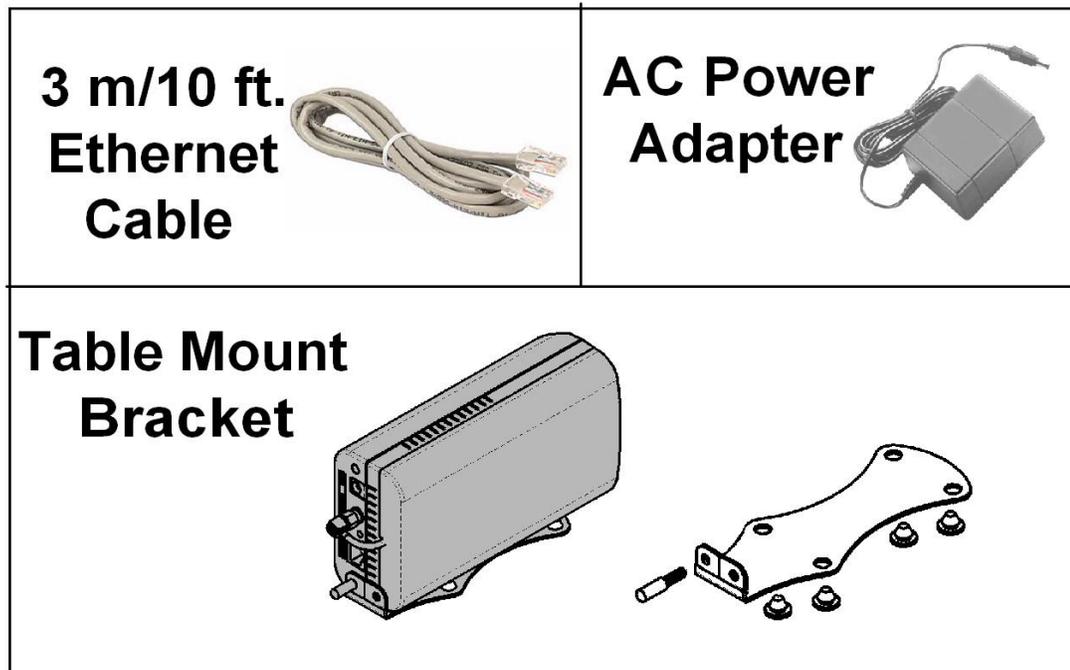


Figure 11: Subscriber Accessory Mounting Components

4.4 Antenna Alignment

Refer to the RedMAX Installation Guide (P/N: 70-00079) for detailed installation instructions.

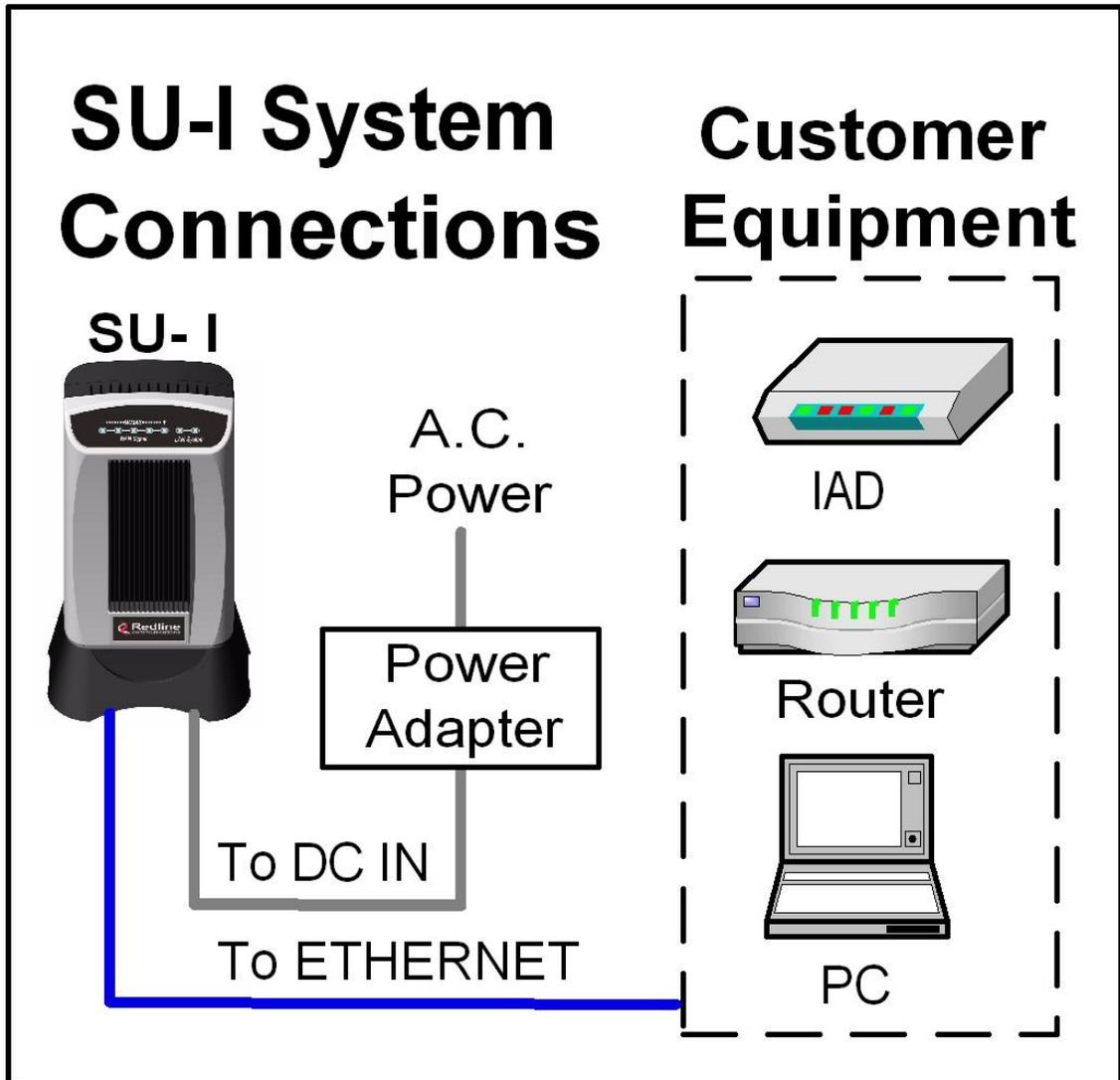


Figure 12: Subscriber System Connections Diagram

5 CLI Commands

This section describes the subscriber CLI commands.

Important: Access to these commands is password protected. Only authorized professional installation and service personnel are allowed access to these controls.

5.1 Introduction

The subscriber can be configured using a Telnet connection established through the subscriber Ethernet port or over the wireless interface from the base station. The CLI can not be used to setup service flows. All service flows will be setup by the base station.

5.2 CLI Modes

The subscriber CLI interface supports several modes of operation. From root mode you can display a list of all user modes, reboot the subscriber system, and logout from the Telnet session. Monitor mode provides a dynamic display of the current system statistics, updated each few seconds. Configuration modes allow you to view and adjust the subscriber network and wireless settings.

5.2.1 Telnet Connection

Telnet Login

Type 'telnet' followed by the IP address of the subscriber system, depress ENTER, and enter the account and password when prompted. The subscriber supports two separate user accounts:

Table 7: CLI - Command Groups		
Account	Password	Description
admin	admin	Full system control
guest	guest	Read-only with some functional restrictions (e.g., not allowed to use the 'set' command).

Telnet Logout

To exit from the Telnet session, you must be in the root directory. Go to the root directory by typing:

Exit [ENTER] or CTRL-Z (hold down the CTRL key and depress Z)

Exit from a CLI session by typing:

logout [ENTER]

The system prompts for logout confirmation. Depress 'Y' to complete the logout process.

The system displays a welcome message when successfully logged in.

Figure 13: Subscriber CLI Interface - Login Dialog	
Login:	admin
Password:	admin
SUI#>	

5.2.2 Root Commands

The following CLI commands are common to all configuration modes.

Table 8: CLI - Root Mode Commands	
Command	Description
?	Use the '?' character as an alternative to typing 'help <ENTER>'. <u>Example:</u> Enter the following command string to list all parameters that can be changed using the 'set' command: set ?
CTRL-Z	Return to root mode.
exit	Return to root mode.
help	Type 'help' alone to display the available commands. Type a command followed by 'help' to display a command set. <i>help <ENTER> Help for all functions/fields.</i>
logout	Exit the current Telnet session.
collectRadio	Factory test only.
reboot	Reset the system. Confirmation is required.
remoteFSinit	Factory test only.
shell	Factory test only.
wm*	Factory test only.

5.2.3 Factory Test Commands

The following CLI commands are for factory test only. Unauthorized use of these commands may result in unexpected behavior and loss of the wireless link..

Table 9: CLI - Root Mode Commands	
Command	Description
collectRadio	Factory test only.
remoteFSinit	Factory test only.
shell	Factory test only.
wm*	Factory test only.

5.3 Mode Commands

The system defaults to root mode when you login to the subscriber. The following table lists commands that have their own mode. From each mode, you can directly display and modify (if applicable) each of the modes parameters. Enter 'exit' or CTRL-Z to return to root mode. All commands are case-sensitive.

The following table lists mode commands available from the root directory.

Table 10: CLI - Root Mode Commands	
Command	Description
boardConfig	Display/modify the board parameter configuration.
bsIdTable	Access the Management Base Station ID table.
diagStatistics	View/modify the Diagnostic Status.
ethTag	View/modify the Ethernet Tagging.
installedVer	View the installed software version(s).
ipAddress	View/modify the IP address.
loadImage	Download and run a new software image.
modThresh	View/modify thresholds for adaptive modulation.
monitor	View dynamically updating values for all status table statistics.
phyConfig	View/modify the PHY configuration.
privacySS	View/modify privacy settings.
reset	Reset table of detected base stations.
rfConfig	View /modify the RF configuration.
set	Enter new parameters values.
show	Display current parameter settings.
smclpAddress	View /modify SMC IP address settings.
snmpAccCtrl	SNMP access control
softwareConfig	Backup/restore configuration settings.
softwareUpgrade	Upgrade software and select the active version.
status	Display the Management Status.
user	View/modify user account settings.
vlanFilters	View/modify the VLAN filter settings.

5.3.1 boardConfig - Board Setup Commands

The boardConfig mode allows you to view and modify the subscriber board level settings. The following table lists all commands available in this mode.

Table 11: CLI - boardConfig - Board Commands																			
Command	Description																		
reset	Set all parameters to factory default values. Confirmation required.																		
set	<p>Change parameter settings.</p> <p>RefOscFreq: Enter an unsigned integer as the new RefOscFreq value (Hz). Value can be only 32000000 or 40000000.</p> <p>TxIfFreq: Enter the TxIfFreq (Hz) value (around 44000000).</p> <p>RxIfFreq: Enter the RxIfFreq (Hz) value (around 44000000).</p> <p>RfType: Enter an unsigned char as the new RfType value. One of: 0 - None 1 - Radia 3.5 GHz 2 - Radia 5.8 GHz 3 - SMI 4 - Factory Test</p> <p>IfPresent: Enter an unsigned char as the new IfPresent value. 0 - Baseband only 1 - IF present</p> <p>TxSpectrumInv: Enter a boolean as the new TxSpectrumInv value.</p> <p>RxSpectrumInv: Enter a boolean as the new RxSpectrumInv value.</p> <p>Buzzer: Antenna positioning buzzer. 0 - Disabled 1 - Enabled.</p> <p>DebugLog: Factory debug messages. 0 - Disabled. 1- Enabled.</p>																		
show	<p>Display the current setting for all parameters. For example:</p> <p><i>Structure --- <<SS Mmgt Board Configuration Parameter>></i></p> <table border="0"> <thead> <tr> <th style="text-align: left;"><i>Transmit</i></th> <th style="text-align: left;"><i>Receive</i></th> <th style="text-align: left;"><i>Others</i></th> </tr> </thead> <tbody> <tr> <td><i>IfFreq: 44000000Hz</i></td> <td><i>IfFreq: 44000000Hz</i></td> <td><i>RefOscFreq: 32000000Hz</i></td> </tr> <tr> <td><i>SpectrumInv: disabled(0)</i></td> <td><i>SpectrumInv: disabled(0)</i></td> <td><i>RfType: SMI(3)</i></td> </tr> <tr> <td></td> <td></td> <td><i>IfPresent: IF_Present(1)</i></td> </tr> <tr> <td></td> <td></td> <td><i>Buzzer: disabled(0)</i></td> </tr> <tr> <td></td> <td></td> <td><i>DebugLog: disabled(0)</i></td> </tr> </tbody> </table>	<i>Transmit</i>	<i>Receive</i>	<i>Others</i>	<i>IfFreq: 44000000Hz</i>	<i>IfFreq: 44000000Hz</i>	<i>RefOscFreq: 32000000Hz</i>	<i>SpectrumInv: disabled(0)</i>	<i>SpectrumInv: disabled(0)</i>	<i>RfType: SMI(3)</i>			<i>IfPresent: IF_Present(1)</i>			<i>Buzzer: disabled(0)</i>			<i>DebugLog: disabled(0)</i>
<i>Transmit</i>	<i>Receive</i>	<i>Others</i>																	
<i>IfFreq: 44000000Hz</i>	<i>IfFreq: 44000000Hz</i>	<i>RefOscFreq: 32000000Hz</i>																	
<i>SpectrumInv: disabled(0)</i>	<i>SpectrumInv: disabled(0)</i>	<i>RfType: SMI(3)</i>																	
		<i>IfPresent: IF_Present(1)</i>																	
		<i>Buzzer: disabled(0)</i>																	
		<i>DebugLog: disabled(0)</i>																	

5.3.2 bsldTable - Base Station ID Table Commands

The bsldTable includes the MAC addresses of up to sixteen base stations. The subscriber is authorized to register only with the base stations listed in this table. If this table is empty, the subscriber can register with any base station detected during the frequency scan (see 5.3.14: rfConfig - RF Setup Commands on page 40).

The operator can specify a preferred base station (bsldTable). This selection receives priority whenever the subscriber must select a base station. Each base station ID table entry includes a priority value from 0 (highest) to 15. When multiple entries have the same priority (default priority is 7), selection is based on CINR.

Table 12: CLI - bsldTable - Base Station ID Commands	
Command	Description
add	<p>Add or modify a base station ID entry. The count value will be adjusted to reflect the current number of effective entries. If the table position value is not specified, the entry will be made following the last valid entry.</p> <p>BsId - Base station MAC address Priority - Priority (0-15) <EntryNumber> - Entry position in the table (0-15)</p> <p>For example, add a new base station entry with priority 7 in position 1: SUI# bsldTable add BsId 00:09:02:00:a3:5d Priority 7 1</p>
delete	<p>Delete a base station ID entry. The count value will be adjusted to reflect the current number of effective entries. If the table position value is not specified, the last valid entry in the table is deleted.</p> <p>EntryNumber: The entry position in the table.</p>
show	<p>Display the base station ID table entries. If the table position value is not specified, all entries in the table are displayed. If the keyword 'monitor' is used, the display is updated continually.</p> <p>EntryNumber: The entry position in the table. Monitor: Dynamically updated display of table values.</p>

Notes:

The following actions are taken when the bsldTable is modified:

5. A 'Detected BS table reset' log message is generated.
6. An 'Add detected BS...' log message is generated if a new entry is added to the table.
7. A frequency scan is initiated (see 5.3.14: rfConfig - RF Setup Commands on page 40).

5.3.3 collectRadio - RF Statistics

The collectRadio command is used to continuously transmit Rssi, Snr, FreqOffset, RfRssi and Link Status information. This is intended as a machine-to-machine interface (e.g., CelSignal interface for the Cell Plan application).

Table 13: CLI - bsldTable - Base Station ID Commands	
Command	Description
time	Display or set the period to sample data (milliseconds). time [milliseconds]
get	Begin continuously (once per second) sending information for the following parameters: Rssi, Snr, FreqOffset, RfRssi and Link Status. Transmission continues until any key is pressed. get (no parameters) Parameter values are sent in the following format: 27 fieldId1 fieldLen1 dataString1 fieldId2 fieldLen2 dataString2 ...

5.3.4 diagStatistics - Diagnostic Statistics (debug mode)

Use the Diagnostic Statistics commands to monitor specific operations for the subscriber. The following table lists all commands available in this mode.

Table 14: CLI - diagStatistics - Diagnostic Statistics Commands	
Command	Description
list	<p>Display the current values for all statistics.</p> <p>TxPowerMin: Minimum transmit power level used.</p> <p>TxPowerMax: Maximum transmit power level used.</p> <p>TxPowerAvg: Average transmit power level used.</p> <p>DIModCodeMin: Minimum downlink coding value used.</p> <p>DIModCodeMax: Maximum downlink coding value used.</p> <p>DIModCodeAvg: Average downlink coding value used.</p> <p>UIModCodeMin: Minimum uplink coding value used.</p> <p>UIModCodeMax: Maximum uplink coding value used.</p> <p>UIModCodeAvg: Average uplink coding value used.</p> <p>CinrMin: Minimum measured CINR value.</p> <p>CinrMax: Maximum measured CINR value.</p> <p>CinrAvg: Average measured CINR value.</p> <p>PhyRssiMin: Minimum measured RSSI value (physical layer).</p> <p>PhyRssiMax: Maximum measured RSSI value (physical layer).</p> <p>PhyRssiAvg: Average measured RSSI value (physical layer).</p> <p>RfRssiMin: Minimum measured RSSI value (radio).</p> <p>RfRssiMax: Maximum measured RSSI value (radio).</p> <p>RfRssiAvg: Average measured RSSI value (radio).</p> <p>CableCompMin: Minimum cable compensation value used.</p> <p>CableCompMax: Maximum cable compensation value used.</p> <p>CableCompAvg: Average cable compensation value used.</p> <p>FreqOffsetMin: Minimum frequency offset used.</p> <p>FreqOffsetMax: Maximum frequency offset used.</p> <p>FreqOffsetAvg: Average frequency offset used.</p> <p>MacResets: Number of times MAC layer has been reset.</p> <p>CRCErrors: Number for CRC errors detected.</p> <p>HeaderErrors: Number for packet header errors detected.</p> <p>DISdus: Number of downlink SDUs received.</p> <p>DIMpdus: Number of downlink PDUs received.</p> <p>UISdus: Number of uplink SDUs sent.</p> <p>UIMpdus: Number of uplink PDUs sent.</p> <p>tx: Show transmit group of statistics.</p> <p>dl: Show downlink group of statistics.</p> <p>ul: Show uplink group of statistics.</p> <p>cinr: Show CINR group of statistics.</p> <p>phy: Show PHY group of statistics.</p> <p>rf: Show RF group of statistics.</p> <p>cable: Show Cable Compensation group of statistics.</p> <p>freq: Show Frequency Offset group of statistics.</p> <p>other: Show Others group of statistics.</p>
reset	<p>Set all parameters to the last measured value. Can also be applied to groups of statistics (i.e., tx group).</p>

Table 14: CLI - diagStatistics - Diagnostic Statistics Commands

show	<p>Display the current setting for all parameters. For example:</p> <pre> Structure --- <<SS Diagnostic Statistics>> Transmit Downlink General Uplink General CINR ----- PowerMin:....-4.1 dBm ModCodeMin:....6 ModCodeMin:....6 Min:.....30.5 dB PowerMax:....-4.1 dBm ModCodeMax:....6 ModCodeMax:....6 Max:....38.3 dB PowerAvg:....-4.1 dBm ModCodeAvg:....6 ModCodeAvg:....6 Avg:.....34.5 dB Sdus:.....116 Sdus:.....51 Mpdus:.....516 Mpdus:.....68 PHY RF Cable Compensation Frequency Offset ----- RssiMin:....-16.8 dB RssiMin:....-49.6 dB CompMin:.....0 OffsetMin:....-1 RssiMax:....-15.8 dB RssiMax:....-48.6 dB CompMax:.....0 OffsetMax:..4 RssiAvg:....-16.2 dB RssiAvg:....-49.0 dB CompAvg:.....0 OffsetAvg:....0 RxCalStatus:..1 TxCalStatus:..1 Others ----- MacResets:.....0 CRRErrors:.....0 HeaderErrors:..0 </pre>
-------------	--

5.3.5 ethTag - Ethernet Tagging

Use these commands to identify data traffic through this subscriber by using 802.1Q VLAN tags. The following table lists all commands available in this mode.

Table 15: CLI - ethTag - Ethernet Tagging Commands	
Command	Description
reset	Set all ethTag parameters to factory default values.
set	<p>Change parameter settings.</p> <p>Active: 0: Disabled - All ethTag features are disabled. 1: Enabled - Each upstream packet received on the subscriber Ethernet port is tagged with the specified VID (value field). If the packet has an existing VLAN tag, a new outermost tag is added (Q in Q). The modified packet is then forwarded over the wireless interface to the base station.</p> <p>FilterOn: 0: Disabled - All packets are forwarded unmodified. 1: Enabled - All downlink packets are classified according to the outermost VLAN tag. Packets with a VLAN tag matching the Value field have the VLAN tag removed and are then forwarded to the subscriber Ethernet port. All non-matching packets are discarded.</p> <p>Priority: Enter the priority to be assigned to each VLAN tagged packet to be sent over the wireless interface (uplink) to the sector controller.</p> <p>PriorityCopy: 0: Disabled - The Priority field value is inserted into the VLAN tags. 1: Enabled - If the received packet has a VLAN tag, the tags priority value is copied to the new VLAN tag being added (Q in Q), otherwise, the Priority field value is used.</p> <p>Value: Enter the VLAN ID. This is the VLAN tag added to uplink packets (active=1), and used to filter downlink packets (FilterOn=1).</p>
show	<p>Display the current setting for all parameters. For example:</p> <pre>Structure --- <<SS Ethernet Tagging Data>> Active:.....inactive(0) Priority:.....0 FilterOn:.....0 PriorityCopy...0 Value:.....0</pre>

Note: The base station passes all ingress and egress traffic without modification.

5.3.6 installedVer - Installed Version

Use the installed version command to view information about the binary files saved in the subscriber non-volatile RAM, and to select the active version of software. See also installedVer, loadImage, and version commands. The following table lists all commands available in this mode.

Table 16: CLI - installedVer - Installed Version Commands	
Command	Description
set	Switch the active version of image. Active - Load the binary file from the selected partition: 0 - Load from partition #0. 1 - Load from partition #1.
show	Display the current setting for all parameters. Partition #0: MajorNumber: Major software release number. MinorNumber: Minor software release number. ReleaseNumber: Software release build number. Designation: Software release designation. Partition #1: MajorNumber: Major software release number. MinorNumber: Minor software release number. ReleaseNumber: Software release build number. Designation: Software release designation. Active: Indicate the active partition. 0: Partition 0 will be loaded at reboot. 1: Partition 1 will be loaded at reboot. For example: <pre> Partition #0 Partition #1 Others ----- MajorNumber:.....1 MajorNumber:.....1 Active:.....1 MinorNumber:.....0 MinorNumber:.....0 ReleaseNumber:...100 ReleaseNumber:...98 Designation:.....1 Designation:.....1 </pre>

5.3.7 ipAddress - IP Address Commands

Use the IP address commands to view network address settings and modify subscriber IP address settings. The following table lists all commands available in this mode.

Table 17: CLI - ipAddress - IP Address Commands	
Command	Description
set	Change IP address parameter settings. Address: IP address assigned to subscriber. Static address only. Mask: 255.255.255.0 <i>Example: Set a static IP address and mask value:</i> <i>set ipAddress 192.168.20.33 Mask 255.255.255.0</i>
show	Display the current IP address settings. For example: show ipAddress Structure --- <<SS IP Address Data>> Address:.....192.168.25.100 Mask:.....255.255.255.0
reset	Reset the IP address to factory default. Requires confirmation.

Local Ethernet Port (Secondary Management) IP

All factory-shipped subscribers have the following local Ethernet port IP addresses:

- Fixed: 192.168.101.1 (well-known, can not be modified)
- Default: 192.168.101.2 (can be modified using CLI)

Over-the Air (Secondary Management) IP

When a subscriber is enabled for remote management (managedSS=1), the over-the-air secondary management channel (SMC) IP address can be assigned by:

- a) DHCP request through the base station (acting as a DHCP relay agent).
- b) The operator assigning a static IP address (see smclpAddress command).

The DHCP exchange includes a request for the address of a ToD server, and the time offset (option 2) specifying the time zone where the subscriber is operating (seconds from GMT). The DHCP server must be located on the network connected to the base station Ethernet port. The subscriber can not use any DHCP server on the network connected directly to the subscriber Ethernet port.

The subscriber does not keep a record of the previously assigned IP, and the IP request field is empty during its initial request. If the lease has expired since the last time the subscriber requested an address, the DHCP server may assign a new IP address. Use one of the following methods to ensure the subscriber always receives the same IP:

- a) Use an indefinite lease timeout (if supported).
- b) Create a static address reservation for your subscriber (if supported).

Time-of-Day Server

The use of ToD service is optional. When a Time-of-Day (ToD) server is required, the server must be located on the network connected to the base station Ethernet port. The subscriber can not use a ToD server located on the network connected directly to the subscriber Ethernet port.

Table 18: CLI - ipAddress - IP Address Commands	
ToD Server	
Available	If the subscriber is able to contact the ToD server following each reboot, the subscriber clock will be synchronized to the received time.
Not Available	Subscriber log message time-stamps will <u>not</u> be synchronized with the base station time. Following each reboot, the subscriber system clock is set to midnight January 1, 1970 GMT.

5.3.8 loadImage - Download and Activate Software Image

The loadImage command can be used to update the subscriber software using a remote TFTP server. The following provides an example update session. After a successful download, a reboot will cause the subscriber to automatically load the new software image.

Example Download Dialog with Subscriber

```
Login: admin
Password:
admin, welcome to the SS CLI. (Version 0.3)
SUI#> loadImage
Server IP Address: [enter ftp server IP address here]
File Name: [enter binary file name here]
Opening FTP connection.....Done
Downloading image
.....
Done
Programming update.....Done
Erasing setup partition. Done.
Writing setup partition. Done.
Erasing boot block. Done
Programming boot block. Done
Flash programming complete.
SUI#>reboot
```

5.3.9 modThresh - Modulation Threshold

Use the modulation threshold commands to view and adjust the settings for adaptive modulation. These setting are made at the factory and should only be adjusted by experienced personnel. The following table lists all commands available in this mode.

Table 19: CLI - modThresh - Modulation Threshold Commands	
Command	Description
reset	Set all parameters to factory default values. Requires confirmation.
set	Change parameter settings. Rate1Exit: RW Rate 1 exit threshold. Value > 0 Rate1Entry: RW Rate 1 entry threshold. Value > Rate1Exit Rate2Exit: RW Rate 2 exit threshold. Value > Rate1Entry Rate2Entry: RW Rate 2 entry threshold. Value > Rate2Exit Rate3Exit: RW Rate 3 exit threshold. Value > Rate2Entry Rate3Entry: RW Rate 3 entry threshold. Value > Rate3Exit Rate4Exit: RW Rate 4 exit threshold. Value > Rate3Entry Rate4Entry: RW Rate 4 entry threshold. Value > Rate4Exit Rate5Exit: RW Rate 5 exit threshold. Value > Rate4Entry Rate5Entry: RW Rate 5 entry threshold. Value > Rate5Exit Rate6Exit: RW Rate 6 exit threshold. Value > Rate5Entry Rate6Entry: RW Rate 6 entry threshold. Value > Rate5Exit
show	Display the current setting for all parameters. For example: <i>Structure --- <<Modulation Rate Threshold Parameters>></i> <i>Rate1Exit:.....9.50 dB</i> <i>Rate1Entry:.....10.50 dB</i> <i>Rate2Exit:.....12.00 dB</i> <i>Rate2Entry:.....13.00 dB</i> <i>Rate3Exit:.....16.50 dB</i> <i>Rate3Entry:.....17.50 dB</i> <i>Rate4Exit:.....19.50 dB</i> <i>Rate4Entry:.....20.50 dB</i> <i>Rate5Exit:.....23.00 dB</i> <i>Rate5Entry:.....24.00 dB</i> <i>Rate6Exit:.....26.00 dB</i> <i>Rate6Entry:.....27.00 dB</i>

5.3.10 monitor - Monitor Mode

The **monitor** command allows you to view a dynamically updated screen of statistics for the subscriber.

Table 20: CLI - monitor - Monitor Mode	
Command	Description
monitor	Monitor subscriber RF parameters in real time (one second updates).

Rssi: -15.3	Snr: 30.7	FreqOffset: 0	TCnt: 0
ModemResets: 2	DlfpCount: 93855713	DlfpErrCount: 0	DlfpCrcCount: 0
DlMapCount: 3753920	DlMapErrCount: 0	DlMapCrcCount: 0	UlMapCount: 93855713
UlMapErrCount: 0	UlMapCrcCount: 0	DcdRxCount: 469240	DcdErrCount: 0
DcdCrcCount: 0	UcdRxCount: 469240	UcdErrCount: 0	UcdCrcCount: 0
MgmtRxCount: 15313	MgmtErrCount: 0	MgmtCrcCount: 0	LostFrames: 0
FrameDuration: 10000	DcdChangeCount: 0	RngTimeCorrection: -63	DlByteCount: 0
DlSduCount: 313891	DlMpduCount: 313899	DlHCrcErrCount: 0	DlCrcErrCount: 0
UlByteCount: 77488873	UlSduCount: 313827	UlMpduCount: 313982	TotalHCrcErrors: 0
TotalCrcErrors: 0	TotalTxBurstCount: 5222017	TotalRngReqCount: 2	TotalBwReqCount: 324155
TotalMgmSentCount: 15299	TotalPaddingCount: 318898	RfRssi: -35.0	TxPower: -12.0
LinkStatus: Registered(1)			
Press any key to exit monitor mode ...			

Figure 14: CLI - monitor - Monitor Screen

5.3.11 phyConfig - Physical Layer Configuration

The phyConfig mode allows you to view and modify the subscriber physical layer (PHY) settings. The following table lists all commands available in this mode.

Table 21: CLI - phyConfig - Physical Layer Commands	
Command	Description
reset	Set all parameters to factory default values. Requires confirmation.
set	<p>Change physical layer parameter settings.</p> <p>Bandwidth: Channel size (KHz). Selections are: 3500, and 7000.</p> <p>FftSize: OFDM fft size. Settings are: 128, 256, 512, and 1024. <i>Note: Only 256 fft is valid for IEEE 802.16-2004 base stations.</i></p> <p>PsPerOFDMSymbol: Physical slots per OFDM symbol value in PS.</p> <p>SmplFactorNum: Above the fraction line in the sampling factor (ns). Normally set to 8 nsec.</p> <p>SmplFactorDen: Under the fraction line in the sampling factor (ns). Normally set to 7 nsec.</p> <p>CyclicPrefix: Cyclic prefix (CP). The guard interval is used to factor out multipath effect. Valid settings are: 4 and 16 (default).</p> <p><i>Example: Enter the following command string to set the channel size to 3500 KHz:</i> <i>set Bandwidth 3500 [Enter]</i></p>
show	<p>Display the current setting for all parameters. For example:</p> <pre>Structure --- <<SS Mngt PHY Configuration Parameter>> Bandwidth:.....3500 kHz FftSize:.....256 PsDuration:.....1000 PsPerOFDMSymbol:....68 SmplFactorNum:.....8 SmplFactorDen:.....7 nsec CyclicPrefix:.....16 PS</pre>

5.3.12 privacySS - Privacy Commands

The privacySS mode allows you to view and modify the privacy settings for the subscriber. The following table lists all commands available in this mode.

Table 22: CLI - privacySS - Privacy Commands	
Command	Description
set	Change privacy related settings on subscriber. All times are in seconds. Enable: 0 -- Disable privacy. 1 -- Enable privacy. UseTestTimers: 0 -- Use programmed timers 1-- Use test defaults.
show	Display privacy related settings on subscriber. For example: <i>Structure --- <<SS privacy Data>></i> <i>Enabled:.....Disabled(0)</i> <i>UseTestTimers:.....Normal(0)</i> <i>AuthWaitTime:.....10</i> <i>ReauthWaitTime:.....10</i> <i>AuthGraceTime:.....600</i> <i>OperationalWaitTime:1</i> <i>RekeyWaitTime:.....1</i> <i>TekGraceTime:.....3600</i> <i>AuthRejectWaitTime:60</i>

5.3.13 reset - Reset Command

The reset command is allows you to change the specified parameter (set) to factory default values. The following table lists all commands available in this mode.

Table 23: CLI - reset - Reset Commands	
Command	Description
detectedBS	Clear all entries and associated settings from the detectedBS table.

5.3.14 rfConfig - RF Setup Commands

The rfConfig mode allows you to view and modify the subscriber RF settings. The following table lists all commands available in this mode.

Important: The subscriber must be rebooted before changes to the rfConfig frequency settings become effective

Table 24: CLI - rfConfig - Radio Frequency Commands	
Command	Description
reset	Reset all RF parameters to factory default values. Requires confirmation.
set	<p>Modify RF parameters.</p> <p>MaxRngRetries: Max number of retries for initial ranging</p> <p>MaxTxPower: Tx Max Power value for ATPC control (-12.00 to 20.00)</p> <p>ModThreshold: Minimum coding/modulation required for the subscriber to register with a base station.</p> <p>0 -- BPSK 1/2 1 -- QPSK 1/2 2 -- QPSK 3/4 3 -- 16QAM 1/2 4 -- 16QAM 3/4 5 -- 64QAM 2/3 6 -- 64QAM 3/4</p> <p>Nomadic: When enabled, subscriber performs frequency scan following any reboot/power-cycle.</p> <p>0 - Disable 1 - Enable</p> <p>RxAgc: Receive automatic gain control AGC).</p> <p>0 - Enable 1 - Disable</p> <p>RxGain: Set Rx gain (-19.00 to 80.00). Not accessible when RxAgc is enabled.</p> <p>StickinessTimer: When non zero, specifies the timeout in seconds when attempting to re-register with the same base station following any deregistration event.</p> <p>TxFixedGain: Perform Tx power scan during network entry.</p> <p>0 - Enable 1 - Disable</p> <p>TxFixedPower: Tx Gain. Value between: -10.00 and +20.00.</p> <p>LoRfFreq1: Lower limit of the 1st Frequency Scan Interval (KHz).</p> <p>HiRfFreq1: Upper limit of the 1st Frequency Scan Interval (KHz).</p> <p>FreqPriority1: Priority of the 1st Frequency Scan Interval.</p> <p>LoRfFreq2: Lower limit of the 2nd Frequency Scan Interval (KHz).</p> <p>HiRfFreq2: Upper limit of the 2nd Frequency Scan Interval (KHz).</p> <p>FreqPriority2: Priority of the 2nd Frequency Scan Interval.</p> <p>...</p> <p>LoRfFreq16: Lower limit of the 6th Frequency Scan Interval (KHz).</p> <p>HiRfFreq16: Upper limit of the 6th Frequency Scan Interval (KHz).</p> <p>FreqPriority16: Priority of the 1st Frequency Scan Interval.</p>

Table 24: CLI - rfConfig - Radio Frequency Commands	
Command	Description
show	<p>Show the current setting for all parameters. Structure --- <<SS Mmgt RF Configuration Parameter>></p> <pre> Transmit Receive ----- FixedPower:.....10.00 dBm Gain:.....20.00 dB ActualPower:.....5.30 dBm RfRssi:.....-61.60 dBm Lock:.....yes(1) Lock:.....yes(1) FixedGain:.....false(0) Agc:.....enabled(1) Frequency others ----- LoRfFreq1:.....3410000 kHz RfTemp:.....25 Celsius HiRfFreq1:.....3410000 kHz MaxRngRetries:.....30 Priority1:.....7 StickinessTimer:.....30 sec LoRfFreq2:.....0 kHz MaxTxPower:.....20.00 dBm HiRfFreq2:.....0 kHz ModThreshold:.....BPSK1/2(0) Priority2:.....7 Nomadic:.....Enabled(1) ... </pre>

Notes:

8. LoRfFreqN/HiRfFreqN: Scanning ranges must not intersect or overlap. When changing settings, the order of data entry must ensure the 'Hi' setting is always greater than the 'Lo' setting. For example, when changing from the default setting 'Hi=0, Lo=0' you must enter the Hi setting first. When specifying a single channel, enter the RF frequency in the 'Hi' setting, and then enter the identical value in the 'Lo' setting.
9. Nomadic: The subscriber can now be configured for fixed or nomadic service. In fixed mode the subscriber attempts to re-register with the same base station following a power-cycle (does not perform frequency scan). This reduces the subscriber startup time. In nomadic mode, it is assumed the subscriber will operate at different locations. The subscriber performs a frequency scan after each power-cycle to assess the current availability of base stations.
10. StickinessTimer: Subscribers may occasionally experience unexpected deregistrations (e.g., not power-cycle). If the timer is set to a non-zero value, the subscriber will attempt to reconnect with the same base station. If the subscriber is unable to re-register within the specified period, the regular process will be used to select the next base station.
11. MaxTxPower: When Automatic Transmit Power Control (ATPC) is enabled, the base station automatically adjusts the Tx power level for the subscriber to match link conditions. The operator may now set a limit for the maximum Tx power level. For example, set the subscribers maximum Tx power to 8 dBm:
SUI# rfConfig set MaxTxPower 8
12. FreqPriorityN: Specify a priority value from 0 (highest) to 15 (lowest) for each programmed channel frequency. When multiple entries have the same priority, the base station selection is based on CINR.
For example, set frequency range #1 to priority 7:
SUI# rfConfig set FreqPriority1 7

Frequency scanning

A frequency scan is triggered by any of the following events:

- i) The RF parameters or bsIdTable are modified.
- ii) Subscriber reboot/power-cycle when Nomadic is enabled.
- iii) There are no base stations in the scanning results table.

Frequency scanning is performed in 250 KHz steps, monitoring each step for approximately four seconds. The subscriber always completes the entire scan for all non-zero frequency ranges. If

all frequency ranges are zero, the subscriber will scan the entire 200 MHz range of the radio (approx. 55 minutes).

During the frequency scan, the subscriber compiles a table of detected base stations. Information for any base station not listed in the bsldTable, or capable of the required minimum modulation/coding level (ModThreshold) is discarded. and the results are ordered based on priority and signal level (CINR). Once the scan is completed, the table is saved in non-volatile RAM and preserved through subscriber reboot/power-cycle.

After saving the scanning results, the subscriber attempts to register with a base station in the scanning results table. Once registered, the subscriber will remain connected to that base station until the connection is lost, or the signal level drops below the required minimum modulation/coding level (ModThreshold). If the StickinessTimer is non zero, the subscriber will attempt to reconnect to the same base station.

If connection to the base station is lost while the subscriber is online (e.g., base station rebooted), and the StickinessTimer period expires, that base station is removed from the results table and the subscriber attempts to register with the next base station in the results table. When all entries have been removed, the scanning process is repeated.

5.3.15 set - Set Commands

The set mode can be used to directly modify all available subscriber parameters. The parameters listed in this table do not have a separate mode, and can openly be modified by the set command.

Enter a new value for one or more fields in mode.

set [Enter] Display all fields.

Modify selected field(s).

set [mode] [field] [value] [value] [field] [...] <ENTER>

Table 25: CLI - set - Modify Subscriber Parameters	
Command	Description
boardConfig	<p>RefOscFreq: Enter the reference oscillator frequency (Hz). Must be 32000000 or 40000000.</p> <p>TxIfFreq: Enter Tx IF frequency (Hz): Around 44000000 Hz</p> <p>RxIfFreq: Enter Rx IF frequency (Hz): Around 44000000 Hz</p> <p>RfType: Select RF type.</p> <ul style="list-style-type: none"> 0 - None 1 - Radia 3.5 GHz 2 - Radia 5.8 GHz 3 - SMI 4 - Factory test <p>IfPresent: Enter IF present indication.</p> <ul style="list-style-type: none"> 0 - Baseband only. 1 - IF present. <p>TxSpectrumInv: Tx Spectrum inversion mode.</p> <ul style="list-style-type: none"> 0 - disabled 1 - Enabled. <p>RxSpectrumInv: Rx spectrum inversion mode.</p> <ul style="list-style-type: none"> 0 - disabled 1 - Enabled. <p>Buzzer: Enable or disable the audible antenna alignment buzzer.</p> <ul style="list-style-type: none"> 0 - disabled 1 - Enabled. <p>DebugLog:</p> <ul style="list-style-type: none"> 0 - Disable debug log messages. 1 - Enable debug messages in event log.
bridgeFilter	<p>Enable or disable the bridge filter. Valid for software version 2.0.21 and later (replaces dlLearnFilter command).</p> <ul style="list-style-type: none"> 0 -- Disable bridge filter. 1 -- Enable bridge filter.
bsldTable	<p>Bsld: Enter MAC address of base station.</p> <p>Priority: Enter priority from 0 to 7 (highest).</p> <p>EntryNumber: The entry position in the table (first available free entry if unspecified).</p> <p>Note: Modifying the BsldTable will trigger a frequency scan. Refer to section 5.3.14: rfConfig - RF Setup Commands on page 40 .</p>
dataTraffic	<p>The operator can remotely disable and enable user access to the wireless interface (e.g., enforcing restricted hours of service). When this feature is</p>

Table 25: CLI - set - Modify Subscriber Parameters	
	<p>enabled, user data traffic received on the Ethernet port is not forwarded to the wireless interface. This feature does not affect remote wireless access to manage the subscriber or local Ethernet access for maintenance and troubleshooting. For example, disable user data traffic on the subscriber:</p> <p>0 -- Disable data traffic. 1 -- Enable data traffic.</p>
dhcpRelayAgent	<p>Use this setting to enable or disable the DHCP relay setting.</p> <p>0 -- Disable DHCP relay agent. 1 -- Enable DHCP relay agent.</p> <p>This feature <u>must</u> be enabled to use DHCP Option 82.</p>
dlLearnFilter	<p>Use this setting to enable or disable the DL learning filter. Valid for software version 2.0.20 and earlier (replaced by bridgeFilter command).</p> <p>0 -- Disable filter - Do not filter DL packets. 1 -- Enable filter - Only forward DL packets based on learned hosts.</p>
ethTag	<p>Setup the Ethernet tagging parameters.</p> <p>Active: Select Ethernet tagging mode. 0 - tagging inactive 1 - tagging active</p> <p>Priority: Enter priority from 0 to 7 (highest).</p> <p>Value: Enter VLAN tag ID (1-4096).</p> <p>FilterOn: Select filtering mode: 0 - filter inactive 1 - filter active</p> <p>PriorityCopy: Select priority mode. 0 - Use value entered in Priority field. 1 - Copy 802.1p tag.</p>
ethernet	<p>Use this setting to modify the Ethernet port auto negotiation, link speed, and duplex settings.</p> <p>AutoNegEnabled <value> 0 -- Disabled 1 -- Enabled.</p> <p>LinkSpeed <value> 0 -- 10M 1 -- 100M.</p> <p>LinkDuplex <value> 0 -- Half 1 -- Full.</p>
ipAddress	<p>Enter the subscriber IP address.</p> <p>Address: Enter IP address. Mask: Enter subnet mask. Yes: Confirmation to proceed without prompting, 'Are you sure?'</p>
managedSS	<p>The managedSS command allows you to configure the subscriber for independent operation, or enable management using the RedMAX EMS system. The managedSS parameter is controlled from root mode. The following table lists all commands available for managedSS.</p> <p>0 - Disable remote management 1 - Enable remote management</p>
modThresh	<p>Enter the modulation threshold values for connection to the base station.</p> <p>Rate1Exit: RW Rate 1 exit threshold. Value > 0</p>

Table 25: CLI - set - Modify Subscriber Parameters																					
	<p>Rate1Entry: RW Rate 1 entry threshold. Value > Rate1Exit Rate2Exit: RW Rate 2 exit threshold. Value > Rate1Entry Rate2Entry: RW Rate 2 entry threshold. Value > Rate2Exit Rate3Exit: RW Rate 3 exit threshold. Value > Rate2Entry Rate3Entry: RW Rate 3 entry threshold. Value > Rate3Exit Rate4Exit: RW Rate 4 exit threshold. Value > Rate3Entry Rate4Entry: RW Rate 4 entry threshold. Value > Rate4Exit Rate5Exit: RW Rate 5 exit threshold. Value > Rate4Entry Rate5Entry: RW Rate 5 entry threshold. Value > Rate5Exit Rate6Exit: RW Rate 6 exit threshold. Value > Rate5Entry Rate6Entry: RW Rate 6 entry threshold. Value > Rate6Exit</p>																				
nomadic	<p>Select the nomadic mode. 0 - Disable nomadic mode. 1 - Enable nomadic mode.</p>																				
phyConfig	<p>Configure PHY parameters. Bandwidth: Enter the Bandwidth value (KHz): Accepted values are: 1750, 3500 or 7000. FftSize: Enter the FFT size. Accepted values are: 128, 256, 512, 1024 SmplFactorNum: Enter the sampling factor numerator (typ. 8). SmplFactorDen: Enter the sampling factor denominator (typ. 7). CyclicPrefix: Enter the cyclic prefix (as a fraction 1/x). Accepted values are: 4, 8, 16, and 32.</p>																				
pppoe	<p>Select the DSL Forum VSA in PPPoE Vendor-Specific Tag (RFC4679) mode. 0 - Disable pppoe 1 - Enable pppoe</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">0</td> <td style="width: 25%; text-align: center;">4</td> <td style="width: 25%; text-align: center;">8</td> <td style="width: 25%; text-align: center;">12</td> </tr> <tr> <td colspan="2" style="text-align: center;">FF:FF:FF:FF:FF:FF</td> <td colspan="2" style="text-align: center;">HostMac</td> </tr> <tr> <td>Session ID=0</td> <td>Length</td> <td>Tag=0x0101</td> <td>Len=0x0</td> </tr> <tr> <td>Type=1</td> <td>Len (<= 65)</td> <td>Tag=0x0105</td> <td>Len</td> </tr> <tr> <td>Type=2</td> <td>Len (<= 65)</td> <td colspan="2" style="text-align: center;">Agent Remote ID ...</td> </tr> </table>	0	4	8	12	FF:FF:FF:FF:FF:FF		HostMac		Session ID=0	Length	Tag=0x0101	Len=0x0	Type=1	Len (<= 65)	Tag=0x0105	Len	Type=2	Len (<= 65)	Agent Remote ID ...	
0	4	8	12																		
FF:FF:FF:FF:FF:FF		HostMac																			
Session ID=0	Length	Tag=0x0101	Len=0x0																		
Type=1	Len (<= 65)	Tag=0x0105	Len																		
Type=2	Len (<= 65)	Agent Remote ID ...																			
privacySS	<p>Select the privacy mode. Enabled - 0 -- to disable privacy, 1 -- to enable privacy. UseTestTimers - 0 -- Use programmed timers, 1-- Use test defaults.</p>																				
rfConfig	<p>Configure RF parameters. TxFixedPower - Enter the new Tx Gain value between: <-12.00 - 20.00> RxGain - Inaccessible due to AGC enabled ! TxFixedGain - 0 - Use Tx power scan during network entry 1 - Use fixed Tx power (disables power scan). RxAgc - 0 - Disable AGX on Rx. 1 - Enable AGC on Rx. LoRfFreq1 - Lower limit of the 1st Frequency Scan Interval. All frequency range settings must not intersect with any other active interval. Enter 0 to reset range. HiRfFreq1 - Upper limit of the 1st Frequency FreqPriority1 - Priority attached to the freq range 1</p>																				

Table 25: CLI - set - Modify Subscriber Parameters	
	<p>...</p> <p>LoRfFreq16 - Lower limit of the 16th Frequency</p> <p>HiRfFreq16 - Upper limit of the 16th Frequency Scan Interval.</p> <p>FreqPriority16 - Priority attached to the freq range 16</p> <p>MaxRngRetries - Max number of retries for initial ranging</p> <p>StickinessTimer - Time-out in seconds</p> <p>MaxTxPower - Enter the new Tx Max Power value. Accepts values between 0.00 and 20.00.</p> <p>Nomadic: Configure the nomadic mode.</p> <p>0 -- Disable nomadic operation.</p> <p>1 -- Enable nomadic operation.</p>
status	<p>System statistics counters.</p> <p>DcdCrcCount - DCD CRC errors.</p> <p>DcdErrCount - DCD semantic errors.</p> <p>DcdRxCount - DCDs parsed.</p> <p>DIByteCount - DL data bytes received.</p> <p>DICrcErrCount - DL data CRC errors.</p> <p>DlfpCount - DLFPs received (eq. to frames).</p> <p>DlfpCrcCount - DLFP semantic errors.</p> <p>DlfpErrCount - DLFP semantic errors.</p> <p>DIHCrcErrCount - DL data HCRC errors.</p> <p>DIMapCount - DLMAPs parsed.</p> <p>DIMapCrcCount- DLMAP CRC errors.</p> <p>DIMapErrCount- DLMAP semantic errors.</p> <p>DIMpduCount - DL MPDUs received.</p> <p>DISduCount - DL SDUs received.</p> <p>LostFrames - Logical frames lost.</p> <p>MgmtCrcCount - Management messages CRC errors.</p> <p>MgmtErrCount - Management messages semantic errors.</p> <p>MgmtRxCount - Other management messages parsed.</p> <p>ModemResets - Modem reset due to errors.</p> <p>TotalBwReqCount - Bandwidth requests sent.</p> <p>TotalCrcErrors - Payload CRC errors.</p> <p>TotalHCrcErrors - Header CRC errors.</p> <p>TotalMgmSentCount - Other management messages sent.</p> <p>TotalPaddingCount - Padding MPDUs sent.</p> <p>TotalRngReqCount - Ranging requests sent (including initial).</p> <p>TotalTxBurstCount - Bursts Transmitted.</p> <p>UcdCrcCount - UCD CRC errors.</p> <p>UcdErrCount - UCD semantic errors.</p> <p>UcdRxCount - UCDs parsed.</p> <p>UIByteCount - UL data bytes sent.</p> <p>UIMapCount - ULMAPs parsed.</p> <p>UIMapCrcCount - ULMAP CRC errors.</p> <p>UIMapErrCount - ULMAP semantic errors.</p> <p>UIMpduCount - UL MPDUs sent.</p> <p>UISduCount - UL SDUs sent.</p>
sysContact	<p>Enter device administration contact information.</p> <p><text> - Enter a maximum of 255 text characters. Descriptions containing</p>

Table 25: CLI - set - Modify Subscriber Parameters	
	blank spaces must be quoted. Example: set sysContact AJones:123-456-7890 set sysContact "Alan Jones Phone 123-456-7890 Ext 123"
sysLocation	Enter the device location information. <text> - Enter a maximum of 255 text characters. Descriptions containing blank spaces must be quoted.
sysName	Enter the device name information. <text> - Enter a maximum of 255 text characters. Descriptions containing blank spaces must be quoted.
variable	NameValue - The variable name and value pair, (i.e. nn=x). If the value part is absent, the variable is deleted.

5.3.16 show - Show Commands

The fields in this section are available only by using the show command. The following table lists all functions available in this mode.

Table 26: CLI - show - Show Commands	
Command	Description
boardConfig	<p>Board configuration settings.</p> <p>Example: SUI#> show boardConfig Structure --- <<SS Mgmt Board Configuration Parameter>></p> <pre> Transmit Receive ----- ----- IfFreq:..... 44000000 Hz IfFreq:.....44000000 Hz SpectrumInv: .disabled(0) SpectrumInv:. disabled(0) others ----- RefOscFreq:.....32000000 Hz RfType:.....RF-Magic(4) IfPresent:.....IF_Present(1) Buzzer:.....disabled(0) DebugLog:.....disabled(0) </pre>
bridgeFilter	<p>Bridge filter control setting.</p> <p>Example: SUI#> show bridgeFilter SS DL Learn Filter status: Enabled(1)</p>
bsidTable	<p>Allowed BS table.</p> <p>Example: SUI#> show bsidTable Structure --- <<SS Mgmt BsIdTable Data>></p> <pre> BsId Entries Total Effectives ----- ----- Id0:.....00:00:00:00:00:00 Count:.....0 Priority0:.....0 Id1:.....00:00:00:00:00:00 Id15:.....00:00:00:00:00:00 Priority15:.....0 </pre>
dataTraffic	<p>Data traffic control settings.</p> <p>Example: SUI#> show dataTraffic SS DataTraffic control status: Enabled(1)</p>
detectedBS	<p>Show details for detected base stations. Including frequency and CINR. For example: << Detected BSID Table >> 0) 00:09:02:00:a3:5d Freq 3424000 kHz Cinr 305 dBm</p>
dhcpRelayAgent	<p>Show the SS DHCP Relay Agent setting.</p> <p>Example: SUI# show dhcpRelayAgent SS DHCP Relay Agent: Enabled(1)</p>
ethernet	<p>Display the Ethernet port settings:</p> <p>Example: SUI# show ethernet Structure --- <<SS Ethernet settings>> AutoNegEnabled:.....Enabled(1) LinkSpeed:.....100M(1) LinkDuplex:.....half(0)</p>
ethPortStatistics	<p>Ingress and Egress Statistics:</p> <p>Example: SUI#> show ethPortStatistics Structure --- <<Ethernet port Statistics>></p>

Table 26: CLI - show - Show Commands	
	<pre> 64 bits Ingress Counters 64 bits Egress Counters ----- Octets:....48:3920599840 Octets:.....15:511896840 UnicastPkts:..3501311040 UnicastPkts:....1082273438 MulticastPkts:.....0 MulticastPkts:.....0 BroadcastPkts:.....0 BroadcastPkts:.....0 Ingress Counters Egress Counters ----- Octets:.....3920566900 Octets:.....511896840 UnicastPkts:..3501311040 UnicastPkts:....1082273438 MulticastPkts:.....0 MulticastPkts:.....0 BroadcastPkts:.....0 BroadcastPkts:.....0 Discards:.....980060 Discards:.....0 Errors:.....0 Errors:.....0 UnknownProtos:.....0 </pre>
ethTag	<p>Ethernet tagging settings.</p> <p>Example: SUI#> show ethTag Structure --- <<SS Ethernet Tagging Data>> Active:.....active(1) Priority:.....0 Value:.....0 FilterOn:.....off(0) PriorityCopy:.....off(0)</p>
eventLog	<p>Display the event log messages. Refer to RedMAX Operations and Maintenance Guide for details.</p>
interfaces	<p>Display information about the subscriber wireless and Ethernet interfaces. For example:</p> <pre> ifIndex Desc MAC Address ifAdminStatus ifType ifMtu ----- 1 802.16 00:09:02:00:8c:7f 1 184 2048 2 802.3 00:09:02:00:8c:7f 1 6 1500 </pre>
interfaces	<p>Display information about the subscriber wireless and Ethernet interfaces. For example:</p> <pre> ifIndex Desc MAC Address ifAdminStatus ifType ifMtu ----- 1 802.16 00:09:02:00:8c:7f 1 184 2048 2 802.3 00:09:02:00:8c:7f 1 6 1500 </pre>
ipAddress	<p>SS IP address information.</p> <p>Example: SUI#> show ipAddress Structure --- <<SS IP Address Data>> Address:.....192.168.2.100 Mask:.....255.255.255.0 Dhcp:.....Disabled(0)</p>
learnedHosts	<p>MAC addresses of all learned hosts.</p> <p>Example: SUI#> show learnedHosts stored: 1, length: 10, alloc: 256</p> <pre> 00 00:00:02:00:01:00 </pre>
managedSS	<p>Managed SS control setting (where 1 = enabled).</p> <p>Example: SUI#> show managedSS SS managing status: Managed(1)</p>
modThresh	<p>Modulation level required to register with BS.</p> <p>Example: SUI#> show modThresh Structure --- <<Modulation Rate Threshold Parameters>> Rate1Exit:.....9.50 dB</p>

Table 26: CLI - show - Show Commands																					
	<pre>Rate1Entry:.....10.50 dB Rate2Exit:.....12.00 dB Rate2Entry:.....13.00 dB Rate3Exit:.....16.50 dB Rate3Entry:.....17.50 dB Rate4Exit:.....19.50 dB Rate4Entry:.....20.50 dB Rate5Exit:.....23.00 dB Rate5Entry:.....24.00 dB Rate6Exit:.....26.00 dB Rate6Entry:.....27.00 dB</pre>																				
nomadic	<p>Nomadic control setting.</p> <p>Example: SUI#> show nomadic SS Nomadic control status: Enabled(1)</p>																				
phyConfig	<p>Phy configuration settings.</p> <p>Example: SUI#> show phyConfig Structure --- <<SS Mgmt PHY Configuration Parameter>> Bandwidth:.....7000 kHz FftSize:.....256 PsDuration:.....500 PsPerOFDMSymbol:.....80 Smp1FactorNum:.....8 Smp1FactorDen:.....7 nsec CyclicPrefix:.....4 PS</p>																				
pppoe	<p>PPPoE tagging status.</p> <p>Example: SUI#> show pppoe SS PPPoE tagging status: Disabled(0)</p>																				
privacySS	<p>privacy related settings on SS.</p> <p>Example: SUI#> show privacySS Structure --- <<SS privacy Data>> Enabled:.....Disabled(0) UseTestTimers:.....Normal(0) AuthwaitTime:.....10 ReauthwaitTime:.....10 AuthGraceTime:.....600 OperationalwaitTime:.....1 RekeywaitTime:.....1 TekGraceTime:.....3600 AuthRejectwaitTime:.....60 Suites:.....0</p>																				
registeredBsId	<p>MAC address of registered BS.</p> <p>Example: SUI#> show registeredBsID Registered BS 00:09:02:00:89:94</p>																				
rfConfig	<p>RF Configuration</p> <p>Example: SUI#> show rfConfig Structure --- <<SS Mgmt RF Configuration Parameter>></p> <table border="0"> <tr> <td style="text-align: center;">Transmit</td> <td style="text-align: center;">Receive</td> </tr> <tr> <td colspan="2">-----</td> </tr> <tr> <td>FixedPower:.....0.10 dBm</td> <td>Gain:.....0.20</td> </tr> <tr> <td>ActualPower:.....0.10 dBm</td> <td>RfRssi:.....-46.30</td> </tr> <tr> <td>Lock:.....yes(1)</td> <td>Lock:.....yes(1)</td> </tr> <tr> <td>FixedGain:.....true(1)</td> <td>Agc:.....enabled(1)</td> </tr> </table> <table border="0"> <tr> <td style="text-align: center;">Frequency</td> <td style="text-align: center;">Others</td> </tr> <tr> <td colspan="2">-----</td> </tr> <tr> <td>LoRfFreq1:....3450000 kHz</td> <td>RfTemp:.....25 Celsius</td> </tr> <tr> <td>HiRfFreq1:....3450000 kHz</td> <td>MaxRngRetries:.....3</td> </tr> </table>	Transmit	Receive	-----		FixedPower:.....0.10 dBm	Gain:.....0.20	ActualPower:.....0.10 dBm	RfRssi:.....-46.30	Lock:.....yes(1)	Lock:.....yes(1)	FixedGain:.....true(1)	Agc:.....enabled(1)	Frequency	Others	-----		LoRfFreq1:....3450000 kHz	RfTemp:.....25 Celsius	HiRfFreq1:....3450000 kHz	MaxRngRetries:.....3
Transmit	Receive																				

FixedPower:.....0.10 dBm	Gain:.....0.20																				
ActualPower:.....0.10 dBm	RfRssi:.....-46.30																				
Lock:.....yes(1)	Lock:.....yes(1)																				
FixedGain:.....true(1)	Agc:.....enabled(1)																				
Frequency	Others																				

LoRfFreq1:....3450000 kHz	RfTemp:.....25 Celsius																				
HiRfFreq1:....3450000 kHz	MaxRngRetries:.....3																				

Table 26: CLI - show - Show Commands										
	<pre>Priority1:.....7 StickinessTimer:.....10 sec LoRfFreq2:.....0 kHz MaxTXPower:.....0.20 dBm HiRfFreq2:.....0 kHz ModThreshold:.....BPSK1/2(0) Priority2:.....0 Nomadic:.....Enabled(1) ... LoRfFreq3:.....0 kHz HiRfFreq3:.....0 kHz Priority16:.....7 RfFreq:.....3450000 kHz</pre>									
serialNumber	<p>Display the serial number of this subscriber unit.</p> <p>Example: SUI(show ->)#> serialNumber Serial Number: 0009020300f6</p>									
snmpAccCtrl	<p>Display SNMP access community strings.</p> <p>For example: AN-100U(show->)#> snmpAccCtrl << SNMP Access Control Table >></p> <table border="0"> <tr> <td>Read Access string:</td> <td>Write Access string:</td> <td>IP Address:</td> </tr> <tr> <td>public</td> <td>private</td> <td>0.0.0.0</td> </tr> <tr> <td>public 1</td> <td>public 1</td> <td>0.0.0.0</td> </tr> </table>	Read Access string:	Write Access string:	IP Address:	public	private	0.0.0.0	public 1	public 1	0.0.0.0
Read Access string:	Write Access string:	IP Address:								
public	private	0.0.0.0								
public 1	public 1	0.0.0.0								
status	<p>Management Status.</p> <p>For example: SUI#> show status Structure --- <<SS Mgmt Status Data>></p> <pre> Downlink General Uplink General ----- fpCount:.....85816069 MapCount:.....85816069 fpErrCount:.....19 MapErrCount:.....0 fpCrcCount:.....1 MapCrcCount:.....0 MapCount:.....1716137 ByteCount:.....47419393 MapErrCount:.....0 SduCount:.....1646019863 MapCrcCount:.....0 MpduCount:.....1650724775 ByteCount:.....911510512 SduCount:.....1662062959 MpduCount:.....62677848 HCrcErrCount:.....0 CrcErrCount:.....30 Management Downlink Chan Desc ----- RxCount:.....6996 RxCount:.....214516 ErrCount:.....0 ErrCount:.....0 CrcCount:.....0 CrcCount:.....0 ChangeCount:.....0 Uplink Chan Desc Others ----- RxCount:.....214517 Rssi:.....-15.2 ErrCount:.....0 Snr:.....31.2 CrcCount:.....0 FreqOffset:.....-1 TCnt:.....0 ModemResets:.....49 LostFrames:.....53 FrameDuration:.....5000 RngTimeCorrection:.....-97 TotalHCrcErrors:.....0 TotalCrcErrors:.....30 TotalTxBurstCount:...77106720 TotalRngReqCount:.....6</pre>									

Table 26: CLI - show - Show Commands	
	<pre>TotalBwReqCount:.....77238250 TotalMgmSentCount:.....6988 TotalPaddingCount:...84435543 RfRssi:.....-46.1 TxPower:.....0.1 LinkStatus:.....Registered(1)</pre>
sysContact	<p>Display the system contact information.</p> <p>Example: SUI#> show sysContact sysContact: Arnold Ziffel 967-1111</p>
sysDescr	<p>Display the system description.</p> <p>Example: SUI#> show sysDescription sysDescription: Grid Sector A34</p>
sysLocation	<p>Display system location string.</p> <p>Example: SUI#> show sysLocation sysLocation: Green Acres Farm, 1234 Long Rd.</p>
sysname	<p>Display the system name.</p> <p>SUI#> show sysName sysName: Green Acres Farm - Unit 1</p>
sysUpTime	<p>Display system up time.</p> <p>Example: SUI#> show sysUpTime sysUpTime: 10 days 20:28:19</p>
version	<p>Display the currently running software version.</p> <p>Example: SUI#> show version Current S/W version: 2.2.7 24-9-2009</p>

5.3.17 snmpAccCtrl

Use the *snmpAccCtrl* command to enable access for SNMP managers. All SNMP managers are identified by IP address, port, and community read and write names (strings) and can be individually added and removed from the list.

Table 27: CLI - snmpAccCtrl

snmpAccCtrl <add> <alias> <delete> <edit> <show>

Configure SNMP account access settings.

add <EntryIndex> <ReadCommunity> <WriteCommunity> <ManagerIpAddress>

Create a new SNMP trap. The index value is assigned automatically. Up to eight settings may be entered.

EntryIndex: Unique index number to identify this table entry.

Read Community Name: The SNMP community name with read access.

Write Community Name: The SNMP community name with write access.

Manager Address: The IP address of the SNMP manager.

alias <alias name> <replacement text>

alias name: Text to be replaced

replacement text: Text to substitute for alias

delete <EntryIndex> [All | YesToAll]

<EntryIndex> - Entry index number.

All: Remove all the entries except the first one.

YesToAll: Confirmation to remove all entries.

edit <index> <ReadCommunity> <WriteCommunity> <ManagerIpAddress>

EntryIndex: Unique index number to identify this table entry.

Read Community Name: The SNMP community name with read access.

Write Community Name: The SNMP community name with write access.

Manager Address: The IP address of the SNMP manager.

show

<< SNMP Access Control Table >>

Index:	Read Access string:	Write Access string:	IP Address:
1	public	private	0.0.0.0

5.3.18 smclpAddress: Assign Static Remote IP Address

The subscriber secondary management channel (SMC) over-the-air IP address, mask, default gateway, Time-of-Day (TOD) server, and TOD time zone offset can be configured using CLI commands. This allows deployment using fixed IP addressing schemes where DHCP is not required/available (e.g., enterprise and SMB). The DHCP request (dhcpRelayAgent) must be disabled when using a static IP addresses.

For example, disable DHCP requests and set a static remote IP address and mask for the SMC channel:

```
SUI# dhcpRelayAgent 0
SUI# smcIpAddress Address 192.168.20.100 Mask 255.255.255.0
```

Table 28: CLI - show - Show Commands

Table 28: CLI - show - Show Commands	
Description	
View /modify SMC IP address settings.	
Address	IP Address
Mask	Subnet Mask
Dhcp	0 -- static address, 1 -- DHCP allocated address.
Gateway	Default Gateway IP address
ToDServer	Time-of-Day Server IP Address (only when static IP)
ToDHourOffset	Time Zone hour: [-12, 14]
ToDMinuteOffset	Time Zone minutes [0, 59]

5.3.19 snmpAccCtrl

Use the *snmpAccCtrl* command to enable access for SNMP managers. All SNMP managers are identified by IP address, port, and community read and write names (strings) and can be individually added and removed from the list.

Table 29: CLI - snmpAccCtrl	
add	<p>add <EntryIndex> <ReadCommunity> <WriteCommunity> <ManagerIpAddress></p> <p>Create a new SNMP trap. The index value is assigned automatically. Up to eight settings may be entered.</p> <p>EntryIndex: Unique index number to identify this table entry.</p> <p>Read Community Name: The SNMP community name with read access.</p> <p>Write Community Name: The SNMP community name with write access.</p> <p>Manager Address: The IP address of the SNMP manager.</p> <p>Example: SUI#> snmpAccCtrl add 2 ReadCommunity redline writeCommunity redline ManagerIpAddress 192.168.20.44</p>
alias	<p>alias <alias name> <replacement text></p> <p>alias name: Text to be replaced</p> <p>replacement text: Text to substitute for alias</p> <p>delete <EntryIndex> [All YesToAll]</p>
delete	<p>delete <EntryIndex> [All YesToAll]</p> <p><EntryIndex> - Entry index number.</p> <p>All: Remove all the entries except the first one.</p> <p>YesToAll: Confirmation to remove all entries.</p>
edit	<p>edit <index> <ReadCommunity> <WriteCommunity> <ManagerIpAddress></p> <p>EntryIndex: Unique index number to identify this table entry.</p> <p>Read Community Name: The SNMP community name with read access.</p> <p>Write Community Name: The SNMP community name with write access.</p> <p>Manager Address: The IP address of the SNMP manager.</p>
show	<p>show</p> <pre>SUI#> snmpAccCtrl show << SNMP Access Control Table >> Index: Read Access string: Write Access string: IP Address: 1 public private 0.0.0.0 2 redline redline 192.168.20.44</pre>

5.3.20 softwareUpdate - Software Update Commands

Use the softwareUpdate commands to display the software versions stored in the subscriber non-volatile memory, download software updates from an FTP server, and switch the active versions.

Table 30: CLI - softwareUpdate - Software Update Commands	
loadImage	Download software binary file and save in non-volatile memory (inactive partition). Following download, you must enter the reboot command to run the new software. On the next reboot following a successful download, the subscriber will automatically switch active partitions and run the downloaded file.
show	Display software version information for downloaded binary files. Indicates the active version.
switch	Switch to the currently inactive software version. Confirmation is required. The subscriber will be rebooted. This is done automatically following a successful file download.
sync	<p>Synchronize the binary files saved in the active and inactive partitions. This command copies the 'active' binary file into the inactive partition. Following execution of this command, both partitions (#0 and #1) will contain identical software versions.</p> <p><i>For example:</i></p> <pre>SUI#> loadImage Server IP Address: 192.168.101.102 File Name: SUI-U1-001-01-00-078.bin Opening FTP connection..... DoneDownloading image DoneProgramming update..... DoneErasing setup partition. Done.Writing setup partition. Done.Erasing boot block. DoneProgramming boot block. DoneFlash programming complete. SUI#>reboot</pre>

5.3.21 status - Status Information

The status mode allows you to view general subscriber statistics. The following table lists all commands available in this mode.

Table 31: CLI - status - Status Commands	
Command	Description
reset	Set all parameters to factory default values.
show	<p>Display the current setting for all parameters.</p> <p>DlfpCount: Downlink FPs (frames) received.</p> <p>DlfpErrCount: Downlink FP semantic errors.</p> <p>DlfpCrcCount: Downlink FP messages with CRC errors.</p> <p>DIMapCount: Downlink MAP messages.</p> <p>DIMapErrCount: Downlink MAP semantic errors.</p> <p>DIMapCrcCount: Downlink MAP messages with CRC errors.</p> <p>DIByteCount: Downlink Bytes received.</p> <p>DISduCount: Downlink SDUs received.</p> <p>DIMpduCount: Downlink MPDUs received.</p> <p>DIHCrcErrCount: Downlink data HCRC errors.</p> <p>UIMapCount: Uplink MAP messages.</p> <p>UIMapErrCount: Uplink Invalid MAP messages.</p> <p>UIMapCrcCount: Uplink MAP messages with CRC errors.</p> <p>UIByteCount: Uplink Bytes received.</p> <p>UISduCount: Uplink SDUs received from CL</p> <p>UIMpduCount: Uplink MPDUs sent.</p> <p>MgmtRxCount: Total management messages.</p> <p>MgmtErrCount: Invalid management messages.</p> <p>MgmtCrcCount: Management messages with CRC errors.</p> <p>UcdRxCount: Uplink Channel Descriptor messages.</p> <p>UcdErrCount: Uplink Channel Descriptor messages that are Invalid.</p> <p>UcdCrcCount: Uplink Channel Descriptor messages with CRC errors.</p> <p>Rssi: Received Signal Strength Indicator.</p> <p>Snr: Signal-to-Noise Ratio.</p> <p>FreqOffset: Frequency Offset.</p> <p>TCnt: Time count of the last burst received.</p> <p>ModemResets: Number of times the modem was reset due to errors.</p> <p>LostFrames: Number of logical frames lost.</p> <p>FrameDuration: Duration in microseconds: 2500 to 20000.</p> <p>RngTimeCorrection: Time correction from ranging response.</p> <p>TotalHCrcErrors: Header CRC errors.</p> <p>TotalCrcErrors: Payload CRC errors.</p> <p>TotalTxBurstCount: Transmit burst.</p> <p>TotalRngReqCount: Ranging requests.</p> <p>TotalBwReqCount: Bandwidth requests.</p> <p>TotalMgmSentCount: Management traffic sent.</p> <p>TotalPaddingCount: Padding bytes sent.</p> <p>RfRssi: Current RSSI value.</p> <p>TxPower: Current Tx output power.</p> <p>LinkStatus: Registered(1).</p>

5.3.23 VLAN Filtering

VLAN filtering can increase overall security by preventing traffic from being forwarded to unintended receivers. The operator can create a whitelist that includes up to 16 allowed VLANs. When VLAN filtering is enabled, the subscriber discards all uplink and downlink packets not matching an entry in the VLAN ID list. Filtering can be enabled and disabled globally, and each table entry can be individually enabled or disabled.

For example, set tag #3 to VID=33 and enable this tag:

```
SUI# vlanFilters set FilterTag 33 FilterActive 1 3
```

Table 33: CLI - status - Status Commands

Command	Description
vlanFilters	Filter traffic based on VLAN ID.
Enabled	Filtering mode: 0 -- Disable, 1 -- Enable.
FilterTag	VLAN tag ID
FilterActive	VLAN tag mode: 0 -- Disable, 1 -- Enable.
<EntryNum>	Entry position in the table (from 1 to 16)

6 Appendices

6.1 Subscriber Log Messages

Table 34: Troubleshooting - Event Log Messages

Log Message	Description
Add classifier [CID: XXXX, Idx: nn]	A classifier with the following CID has been added.
Broadcast Opportunity Corrupted	Opportunities have been received for initial ranging, but the opportunity is not appropriate (i.e. too short) for this subscriber.
Broadcast Ranging Opportunity Received	This message indicates that the base station has provided an opportunity for subscriber registration.
Broadcast Ranging Opportunity Timeout	This message indicates that the base station has not provided an opportunity for new subscriber registration within the last 10 seconds.
Classifier deleted [Idx: nn]	The specified classifier has been deleted.
Classifiers deleted for SF with CID XXXX	All classifiers have been cleared for the specified service flow.
DCD Receiving Timeout	The subscriber has not received downlink channel descriptors for five consecutive opportunities. The subscriber will now restart the ranging process in an attempt to re-establish wireless synchronization.
Deregistration DREG-CMD, action code: nn	The subscriber has de-registered.
Deregistration DREG-CMD, action code: nn	base station has requested that subscriber should deregister.
DHCP Error	There has been an error in obtaining a DHCP lease
Downlink Burst Profile Adjusted [BP: nn]	Downlink modulation rate has been adjusted by the base station.
Downlink Burst Profile Change Attempt [BP: nn]	A request to change the downlink modulation rate has been made based on locally configured CINR thresholds.
Downlink Channel Inoperable	This message is displayed when the subscriber detects the presence of a base station, but is unable to properly synchronize with it.
Downlink SF nn changed	Changes have been successfully applied to the specified downlink service flow.
Downlink SF nn created [CID: XXXX, No.Cls: nn]	A downlink service flow has been successfully created.
Downlink SF nn not created (no space) [CID: XXXX]	The subscriber cannot create the specified DL service flow, as there is not enough remaining memory.
DSA Err - DSA-ACK send retries exhausted [SF Id: XXXX]	subscriber has attempted to acknowledge a DSA transaction unsuccessfully more than the maximum number of times.

Table 34: Troubleshooting - Event Log Messages	
Log Message	Description
DSA Rejected - Service Flow exists [SF Id: XXXX]	The service flow ID assigned base station already exists locally in subscriber
DSC abort by DSC-ACK [SF Id: XXXX]	A DSC transaction has been aborted due to an acknowledgement message not being received by the subscriber.
DSC Err - DSC-ACK send retries exhausts [SF Id: XXXX]	subscriber has attempted to acknowledge a DSC transaction unsuccessfully more than the maximum number of times.
DSC Err - DSC-RSP send retries exhausts [SF Id: XXXX]	subscriber has attempted to acknowledge a DSC-RSP transaction message unsuccessfully more than the maximum number of times.
DSC Err - SF or CLS rejected [SF Id: XXXX]	DSC transaction has been rejected by base station.
DSC Success [SF Id: XXXX]	DSC transaction has been successful.
DSC-DSD Reject - SF ID not found	base station has requested the deletion of a SFID which does not exist.
DSD Success [SF Id: XXXX]	DSD transaction has successfully completed.
DSx Action [error]	There has been an error in the creation of a service flow. The particular failure is detailed in the message text.
DSx Add Reject [reason]	This message signifies that the addition of a service flow has been rejected by the subscriber. The reason for the failure is included in the message text.
Failed to acquire the time-of-day	Communication with a ToD (RFC-868) server has not been successful. The correct time of day has not been acquired. According to standard, the subscriber must now perform a MAC reboot and begin network entry again.
Initial Ranging at Maximum Power [Adj.: +nn]	subscriber has begun initial ranging with a base station, and has reached its maximum Tx power while attempting to establish communication.
Initial Ranging at Minimum Power [Adj.: +nn]	subscriber has begun initial ranging with a base station, and has reached its minimum Tx power while attempting to establish communication.
Initial Ranging Backoff	A contention was encountered with another subscriber while attempting to perform initial ranging. The subscriber will wait and try again after the backoff interval.
Initial Ranging Parameters Adjusted [TLV Map: XXXXXXXX]	This message displays the parameter adjustments as requested by the base station.
Initial Ranging Success [TLV Map: XXXXXXXX]	Initial ranging has been completed successfully.
Invalid MAC address	This message is displayed when the MAC of the subscriber does not belong the Redline. The system will not function in this state.
Large Time Adjustment Received	An excessively large timing correction has been sent by the base station. This correction has not been applied, though it has been acknowledged.

Table 34: Troubleshooting - Event Log Messages	
Log Message	Description
Lost DL-MAP	The time since the last valid DL MAP was received by the subscriber has exceeded the timeout. The subscriber will now begin the ranging process in an attempt to re-establish wireless synchronization.
Lost UL-MAP	The time since the last valid UL MAP was received by the subscriber has exceeded the timeout. The subscriber will now begin the ranging process in an attempt to re-establish wireless synchronization.
MAC Initialized	The MAC processor has completed initialization.
MAC Reset: Configuration Change	The MAC has required a reset to apply a configuration change that was made by the user.
MAC Reset: SC Request (RES-CMD)	The base station has requested that the subscriber reset its MAC.
MAC Reset: SC Request (RES-CMD)	base station has requested that subscriber should reset its MAC.
MAC Started	The MAC processor has been started.
New Cls for SF with CID XXXX	A new classifier has been added to the specified service flow.
No Maintenance Data Grant Slot T4	IF subscriber has nothing to send, the base station should grant unsolicited bandwidth. subscriber should respond with padding. This message indicates that the base station has not granted this data for 35 seconds.
REG Failure - Retries Exhausted	The timer above (T6) has been hit 3 times in a row. The subscriber will now reboot and begin scanning for a base station again.
REG Success [TLV Map: XXXXXXXX]	The subscriber has successfully registered.
REG Wait Timeout T6 [nn retries]	The subscriber has not received a response to its registration request within 3 seconds.
REG_REQ authentication failure - HMAC [CC: nn]	With privacy enabled, authentication failed.
REG-REQ not sent - no bw granted	The subscriber has not been able to send a registration request message to the base station, since the base station has not granted it bandwidth to do so. It cannot request bandwidth, because it is not yet registered.
Reset [reason]	The subscriber has reset itself. The reason for the reset is included in the message text.
Rf Rx Calibration Error	Rx Calibration data located in the subscriber's EEPROM has failed CRC
Rf Tx Calibration Error	Tx calibration data located in the subscriber's EEPROM has failed CRC
Rng Maintenance Correction Anomaly [TLV Map: XXXXXXXX]	An adjustment requested by the base station has failed. Not a fatal error.
Rng Maintenance Correction Success [TLV Map: XXXXXXXX]	An adjustment requested by the base station has been successfully applied.

Table 34: Troubleshooting - Event Log Messages	
Log Message	Description
SBC Failure - Retries Exhausted	T18 expired beyond the maximum number of allowed retries.
SBC Success [TLV Map: XXXXXXXX]	The subscriber has successfully negotiated its basic capabilities with the base station.
SBC Wait Timeout T18 [nn retries]	A SBC request response is not received within 50ms.
SBC-REQ not sent - no BW granted	base station has not allocated bandwidth to allow subscriber to do SBC and registration
Synchronization Completed	The subscriber has completed scanning for a downlink channel, and established synchronization with a base station. It will now begin its initial ranging process.
System startup [status]	The subscriber has begun the bootup sequence. The startup status will be included in the text of this message. Modes specify a possible reason for reboot.
TFTP - no response T26 [nn retries]	SMC setup has not completed within the allowed time.
TFTP Completed Successfully	This message confirms that SMC registration has completed. Communication with DHCP and ToD servers was successful.
TFTP Success	SMC IP, ToD, have been successfully obtained via DHCP.
TFTPC failed send	SMC has failed, and the subscriber will reset the MAC and begin registration process again.
Time-of-day acquired	Communication with a ToD (RFC-868) server has been successful. The correct time of day has been acquired.
UCD Receiving Timeout	5 uplink channel descriptors in a row have been expected and not received. The subscriber will now restart the ranging process in an attempt to re-establish wireless synchronization.
Unicast Initial Ranging No Response T3 [nn retries]	The base station has not responded to an initial ranging request sent by the subscriber within 200 ms.
Unicast Initial Ranging Retries Exhausted [nn retries]	The subscriber has attempted to perform initial ranging 16 times and has failed each time.
Unicast Initial Ranging Start [CID: XXXX]	The subscriber has received a unicast ranging opportunity
Unicast Ranging Abort	Indicates that the base station has sent the subscriber a ranging abort, telling it to halt the ranging process.
Uplink Channel Parameters Acquired	The subscriber has successfully obtained the uplink channel descriptor
Uplink SF nn changed	Changes have been successfully applied to the specified uplink service flow.
Uplink SF nn created [CID: XXXX, No.Cls: nn]	An uplink service flow has been successfully created.
Uplink SF nn not created (no space) [CID: XXXX]	The subscriber cannot create the specified UL service flow, as there is not enough remaining memory.

6.2 Upgrade Subscriber

6.2.1 Before Beginning the Upgrade

Use the following procedures to upgrade the subscriber.

The following items must be addressed before beginning the upgrade:

1. You must obtain the latest subscriber binary files.
2. The subscriber performs all software upgrades using an FTP server:
 - a) The FTP server must be located on the network connected to an active Ethernet port (Data or Mgmt) on the base station, or on the Ethernet port of the subscriber (i.e., laptop).
 - b) You must copy the binary files into the default file location for the FTP server. You can not specify a 'path' in the upgrade dialog.
 - c) The FTP server must have a user defined as follows:
 - username: target
 - password: secret

6.2.2 Update Software Procedure

1. Start a telnet session to the subscriber using the following settings:
 - Login:** admin
 - Password:** admin
2. Enter the 'loadImage' command. The subscriber will prompt you to enter the following information:
 - Server IP address:** [enter address of FTP server]
 - File Name:** [enter base station binary file name]

The subscriber performs FTP server authentication with user name 'target' and password 'secret' (these settings cannot be altered). The image will be uploaded to the subscriber and saved in the non-volatile memory (flash).
3. The subscriber must be reset to load the new software. Enter the 'reboot' command to reset the unit. The telnet session will be terminated.

Example Download Dialog with Subscriber
<pre> Login: admin Password: admin, welcome to the SS CLI. SUI#> loadImage Server IP Address: [enter ftp server IP address here] File Name: [enter binary file name here] Opening FTP connection.....Done Downloading image Done Programming update.....Done Erasing setup partition. Done. Writing setup partition. Done. Erasing boot block. Done Programming boot block. Done Flash programming complete. SUI#>reboot </pre>

