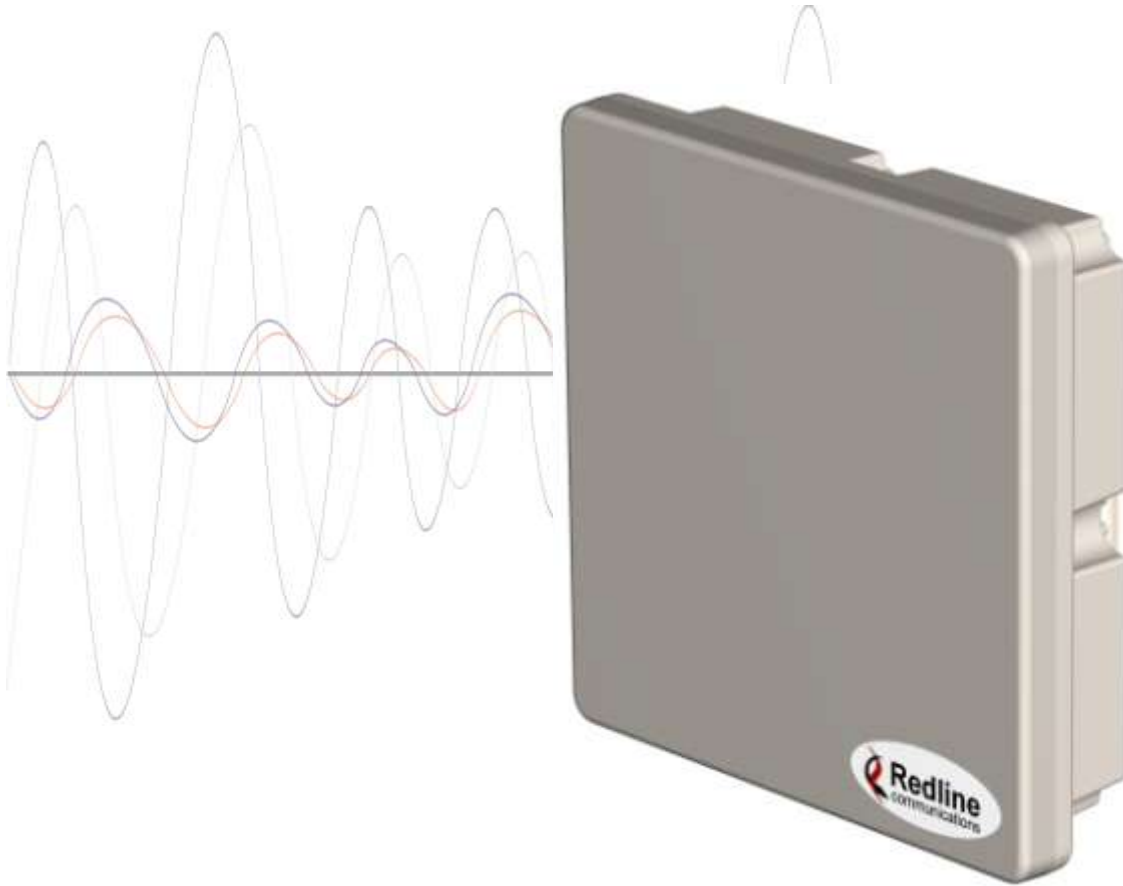




RedMAX 4c™



Outdoor Wireless Access Subscriber Modem REM Series User Manual

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Document Control: 70-00121-01-00-4C_SS_Outdoor_REM_UserManual-20090914a.doc

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1 Important Safety Notices

1.1 Safety Recommendations

WARNING

It is strongly recommended that end-users of the equipment observe all warnings and cautions during operation, installation, and maintenance of the system.

Failure to comply with these warnings and cautions, or with specific warnings and cautions elsewhere in the manuals, or displayed directly on system equipment, violates the safety standards incorporated into the design, manufacture, and intended use of the system equipment.

Redline Communications assumes no liability for the customer's failure to comply with these requirements.

1.2 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



Important Safety Notice



High Voltage


1.3 RF Exposure Warnings



WARNING

To satisfy RF exposure requirements (EN 50385) for RF transmitting devices, where an externally mounted antenna is employed in point-to-multipoint applications, each antenna must be separated from all persons by a distance of at least 50 centimeters. To ensure compliance, operations 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.

1.4 Safety Advisories

1.  **WARNING** Read this manual and follow all operating and safety instructions.
2. Installation of the system must be contracted to a professional installer.
3. Read this user manual and follow all operating and safety instructions.
4. PoE (Power over Ethernet) power adaptor caution:

PoE Power Adapter Caution

Warning to Service Personnel: 48 VDC

Standard Ethernet equipment may be damaged if connected directly to the 'Data + Power Output' port of a PoE power adaptor.

5. The power requirements are indicated on the product-marking label. Do not exceed the described limits.
6. Disconnect the power before cleaning.
7. Disconnect power when unit is stored for long periods.
8. The outdoor unit must not be located near power lines or other electrical power circuits.
9. The system must be properly grounded to protect against power surges and accumulated static electricity. It is the user's responsibility to install this device in accordance with the local electrical codes: correct installation procedures for grounding of the outdoor unit, mast, lead-in wire and discharge unit, location of discharge unit, size of grounding conductors and connection requirements for grounding electrodes.
10. Keep all product information for future reference.

1.5 Electrical Safety



 **WARNING**

1. To minimize shock hazard, the equipment chassis and enclosure must be connected to an electrical ground. All power outlets and plugs must meet International Electrotechnical Commission (IEC) safety standards.
2. Do not operate the system equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.
3. Only qualified maintenance personnel may remove equipment covers to replace internal subassemblies, components, or perform internal adjustments.

1.6 FCC Interference Statement

Important: The following statements apply only to the **REM2500M** 2.5 GHz model.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the Federal Communication Commission (FCC) Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



IMPORTANT NOTE: Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance **40** cm between the radiator & your body.

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

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user.

Due to the essential high output power natural of WiMAX device, use of this device with other transmitter at the same time may exceed the FCC RF exposure limit and such usage must be prohibited (unless such co-transmission has been approved by FCC in the future).

1.7 Europe – EU Declaration of Conformity

This device complies with the essential requirements of the R&TTE Directive 1999/5/EC. The following test methods have been applied in order to prove presumption of conformity with the essential requirements of the R&TTE Directive 1999/5/EC:

IEC 60950-1: 2001 (1st edition)

Safety of Information Technology Equipment

EN50385

Product standard to demonstrate the compliance of radio base stations and fixed terminal stations for wireless telecommunication systems with the basic restrictions or the reference levels related to human exposure to radio frequency electromagnetic fields (110 MHz - 40 GHz) - General public

EN 301 489-1

Electromagnetic compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements

EN 301 489-4

Electromagnetic compatibility and radio spectrum matters (ERM); Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 4: Specific conditions for fixed radio links and ancillary equipment and services

EN 302 544-1 (REM2500M 2.5 GHz Systems Only)

Broadband Data Transmission Systems operating in the 2 500 MHz to 2 690 MHz frequency band; Part 1: TDD Base Stations; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive

EN 302 326-2 (REM3500M 3.5 GHz systems Only)

Fixed Radio Systems; Multipoint Equipment and Antennas; Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive for Digital Multipoint Radio Equipment



Table 1: Notices - R&TTE Community Language CE Declarations






Country	Notice
 Český [Czech]	<i>[Jméno výrobce]</i> tímto prohlašuje, že tento <i>[typ zařízení]</i> je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
 Dansk [Danish]	Undertegnede <i>[fabrikantens navn]</i> erklærer herved, at følgende udstyr <i>[udstyrets typebetegnelse]</i> overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
 Deutsch [German]	Hiermit erkläre <i>[Name des Herstellers]</i> , dass sich das Gerät <i>[Gerätetyp]</i> in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
 Eesti [Estonian]	Käesolevaga kinnitab <i>[tootja nimi = name of manufacturer]</i> seadme <i>[seadme tüüp = type of equipment]</i> vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
 English	Hereby, <i>[name of manufacturer]</i> , declares that this <i>[type of equipment]</i> is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Table 1: Notices - R&TTE Community Language CE Declarations

Country	Notice
[es] Español [Spanish]	Por medio de la presente [<i>nombre del fabricante</i>] declara que el [<i>clase de equipo</i>] cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
[el] Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ [<i>name of manufacturer</i>] ΔΗΛΩΝΕΙ ΟΤΙ [<i>type of equipment</i>] ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
[fr] Français [French]	Par la présente [<i>nom du fabricant</i>] déclare que l'appareil [<i>type d'appareil</i>] est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
[it] Italiano [Italian]	Con la presente [<i>nome del costruttore</i>] dichiara che questo [<i>tipo di apparecchio</i>] è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski [Latvian]	Ar šo [<i>name of manufacturer / izgatavotāja nosaukums</i>] deklarē, ka [<i>type of equipment / iekārtas tips</i>] atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių [Lithuanian]	Šiuo [<i>manufacturer name</i>] deklaruoją, kad šis [<i>equipment type</i>] atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
[nl] Nederlands [Dutch]	Hierbij verklaart [<i>naam van de fabrikant</i>] dat het toestel [<i>type van toestel</i>] in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
[mt] Malti [Maltese]	Hawnhekk, [<i>isem tal-manifattur</i>], jiddikjara li dan [<i>il-mudel tal-prodott</i>] jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn rilevanti li hemm fid-Dirrettiva 1999/5/EC.
[hu] Magyar [Hungarian]	Alulírott, [<i>gyártó neve</i>] nyilatkozom, hogy a [<i>... típus</i>] megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak.
[pl] Polski [Polish]	Niniejszym [<i>nazwa producenta</i>] oświadczam, że [<i>nazwa wyrobu</i>] jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
[pt] Português [Portuguese]	[<i>Nome do fabricante</i>] declara que este [<i>tipo de equipamento</i>] está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
[sl] Slovensko [Slovenian]	[<i>Ime proizvajalca</i>] izjavlja, da je ta [<i>tip opreme</i>] v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Slovensky [Slovak]	[<i>Meno výrobcu</i>] týmto vyhlasuje, že [<i>typ zariadenia</i>] spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
[fi] Suomi [Finnish]	[<i>Valmistaja = manufacturer</i>] vakuuttaa täten että [<i>type of equipment = laitteen tyyppimerkintä</i>] tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
[sv] Svenska [Swedish]	Härmed intygar [<i>företag</i>] att denna [<i>utrustningstyp</i>] står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

1.8 Security Features

Redline Communications wireless systems and provide security setting that can be adjusted by the operator to meet specific applications. Redline recommends these parameters be set according to industry recognized security practices. Considerations include confidentiality, integrity, and availability of information. Implementation of these recommendations and the final responsibility for the system security is the responsibility of the system administrator and operators.

1.9 WEEE Product Return Process

In EU countries, dispose of equipment 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. In non-EU countries, dispose of equipment in accordance with national and regional regulations.



2 Overview

Congratulations on your purchase of the Redline Communications 802.16e Wave 2 outdoor (REM2500M 2.5 GHz or REM3500M 3.5 GHz) wireless broadband personal modem. Redline Communications is a world leader in design and production of wireless broadband systems. The RedMAX 4C subscriber is a complete Mobile WiMAX (IEEE 802.16e-2005) compliant broadband wireless subscriber.

2.1 IEEE 802.16e / WiMAX Compliance

The RedMAX 4C subscriber supports Certification Wave II Mobile WiMAX System Profiles:

REM2500M: WiMAX Certification Wave 2: Profile 3A: 2.5-2.7 GHz, 5/10 MHz, TDD

REM3500M: WiMAX Certification Wave 2: Profile 5A: 3.4-3.6 GHz, 5/7/10 MHz, TDD

2.2 PHY Specification

The subscriber design is based on the WirelessMAN-OFDMA PHY definition in the IEEE 802.16e-2005 specifications.

2.3 OFDMA

Orthogonal Frequency Division Multiple Access (OFDMA) is a multi-user version of the OFDM digital modulation scheme. Multiple access is achieved in OFDMA by assigning subsets of subcarriers to individual users - allowing simultaneous transmission from several users. OFDMA uses the Fast Fourier Transform (FFT) algorithm to implement modulation and demodulation functions. Using adequate channel coding and bit-interleaving, OFDMA can perform very well in severe multipath environments, mitigate frequency selective fading and provide high spectral efficiency.

2.4 Convolutional Turbo Codes and Coding Rates

Turbo codes are used for error correction. These techniques can improve the information transfer rate over a noisy channel. As part of the error correction technique, each burst of data transmitted over the wireless interface is padded with redundant information, making it more resistant to potential over-the-air errors. The coding rate is the ratio of user data to the total data transmitted including the redundant error correction data.

2.5 Privacy

The CPE implements IEEE 802.16e-2005 Privacy Sublayer.

EAP-based authorization

- Privacy and Key Management Protocol Version 2 (PKMv2) to manages all security, authentication and encryption schemes over the air interface.
- PKMv2 manages Authorization Key (AK) security using PKM messaging between the base station and subscriber.
- User & device authentication using EAP authentication schemes.
 - Cryptographic suites: CCM-Mode 128-bit AES
 - TEK encryption: 128-bit AES

2.6 Time Division Duplexing (TDD)

The base station uses time division duplexing (TDD) to transmit and receive on the same RF channel. These are both non contention-based methods for providing an efficient and predictable two-way PMP cell deployment. All uplink and downlink transmission scheduling is managed by the base station. The base station sends data traffic to subscribers, polls for grant requests, and sends grant acknowledgements based on the total traffic to all subscribers.

2.7 Modulation

The modulation technique specifies how the data is coded within the OFDMA carriers. The subscriber supports the following modulations: QPSK, 16 QAM, and 64 QAM.

2.8 Channelization

The subscriber is a frequency-specific system, with the frequency band defined by the transceiver unit. The subscriber divides the available frequency band into channels. Allocation of channels during deployment is dependent on spectrum availability in the licensed FWA band and local licensing requirements and conditions. Channel selection allows planners to obtain the maximum geographic coverage, while avoiding frequency contention in adjacent sectors.

2.9 Service Flows

A Service Flow represents a unidirectional data flow with 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.

Table 2: Overview - Subscriber Service Class Types		
Service Class		Description
UGS	Unsolicited Grant Service	Provides the most stringent scheduling, maintaining guarantees on throughput, latency, and jitter to the levels necessary for Time Division Multiplexed (TDM) services.
RT-VR	Real Time –Variable Rate Service	Provides guarantees on throughput and latency, but greater tolerance on latency. Applicable for VoIP and video conferencing applications.
ERT-VR	Extended Real Time – Variable Rate Service	Provides services as RT-VR, except that committed maximum rate can be changed on the fly as requested by subscriber signaling.
NRT-VR	Non-Real Time – Variable Rate Service	Guarantees throughput only. Applicable to mission critical data applications that are not latency-dependent.
BE	Best Effort	No guaranteed minimum throughput. Does allow setting a maximum data rate.

3 Unit Features

The subscriber is a fully integrated WiMAX Forum compliant subscriber device incorporating a wireless modem interface to a remote WiMAX base station, and an Ethernet interface for connection to the local network. The subscriber is a fully integrated unit with a built-in Multiple Input/Multiple Output (MIMO) antenna system. Power is supplied by Power Over Ethernet (PoE). The subscriber electronics are housed in a weatherproof aluminum alloy case.

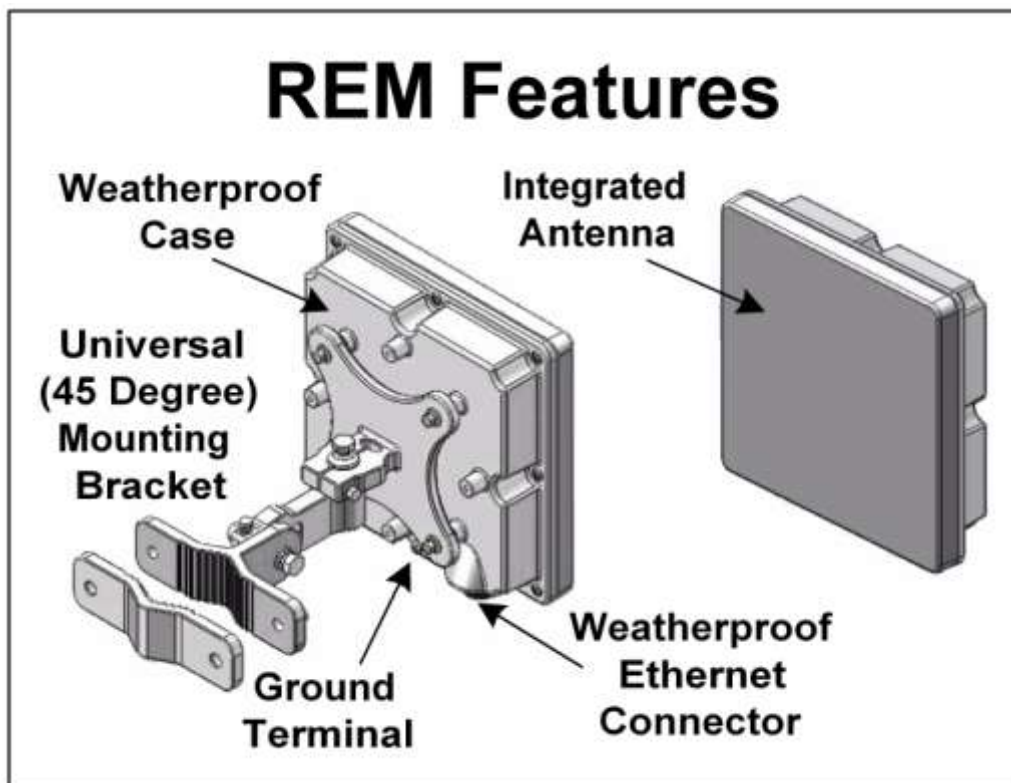


Figure 1: Subscriber System Features

Table 3: Subscriber Installation Parts	
Included with system	Items sold separately
<ol style="list-style-type: none"> Subscriber with integrated antenna. Power-over-Ethernet (PoE) power adaptor. Universal mounting bracket (assembly required). 	<ol style="list-style-type: none"> PoE power adapter AC power cord (NA, UK, or EU). Outdoor (ruggedized) Ethernet cable. Lightning/surge protection.

REM Outdoor Subscriber



Figure 2: 90 Degree Universal Mounting Bracket

3.1.1 Ethernet Port (and Cable)

The auto-sensing 10/100Base-T Ethernet port connects through the outdoor Ethernet cable to a PoE power adaptor/CO switch. The REM receives DC power and exchanges data with the network through this port (straight-through connection).

The REM cable access entrance is equipped with a weatherproof seal. The outdoor end of the Redline supplied outdoor (hardened) CAT-5 Ethernet cable is terminated with an environmentally sealed RJ-45 connector for connection to the subscriber. The minimum diameter to pass this connector through a conduit or hole is 26 mm (1 in).

Important: The PoE device is a passive Ethernet device and does not amplify or repeat signal. The maximum total length of the Ethernet cable is 100 m (328 ft). For example, 98 m from the REM to the PoE and 2 m from the PoE to the connected network equipment.

The indoor end of the Redline supplied outdoor (hardened) CAT-5 Ethernet cable is terminated with a standard indoor RJ-45 connector for connection to a PoE power adaptor/CO switch. The minimum diameter to pass this connector through a conduit or hole is 18 mm (11/16 in).

Important -- Warranty Information -- Ethernet Cable

Redline does not endorse or support the use of outdoor cable assemblies: i) not supplied by Redline, ii) third-party products that do not meet Redline's cable and connector assembly specifications, or iii) cables not installed and weatherproofed as specified in the Installation Guidelines manual (70-00068-01-XX). Refer to the Redline Limited Standard Warranty and RedCare service agreements.



Figure 3: Outdoor Ethernet Cable - Cable Connection

REM Outdoor Subscriber

3.1.2 Grounding Connection

A ground terminal is located on the rear of the subscriber. Use this screw to terminate the ground wires. Correct grounding is very important for safe operation of wireless equipment. Ensure that all grounding connections are in accordance with local and national standards.

3.1.3 PoE (Power over Ethernet) Power Adaptor

The REM may be powered using a stand-alone PoE power adaptor, or by a central office switch equipped with RJ-45 sockets that provide PoE power and data to the REM device. All PoE devices must have metal-lined RJ-45 sockets that provide a protective ground connection to the Ethernet cable shield. The PoE power adaptor may be supplied by Redline as a stand-alone AC powered device.

Important -- PoE Equipment

The Ethernet outdoor cable is supplying a protective ground connection for the Ethernet cable. Customer supplied PoE devices (e.g., central office switches equipped with RJ-45 sockets that provide PoE power and data) must have metal-lined RJ-45 sockets providing a protective ground connection to the cable shield.

Redline Supplied PoE Power Adaptor

The Redline supplied PoE power adaptor source is auto-sensing 110-240 (nominal) VAC. The PoE power adaptor provides two Ethernet interfaces:

Table 4: System - PoE Ports	
Port	Description
DATA IN	The auto-sensing 10/100Base-T Ethernet port (RJ-45 socket) for connection to the network equipment.
DATA & POWER OUT	The auto-sensing 10/100Base-T Ethernet port (RJ-45 socket) port is used to carry signals and source power to the outdoor subscriber outdoor unit.



Figure 4: Optional Redline-Supplied PoE Power Adaptor

Table 5: System - Ethernet Data Port Link/Act LEDs		
LED	Port	Power Output
Solid	Connected	Power is active
Blink	Not connected	Out of range

4 CLI Commands

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

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

4.1 Local Ethernet Port IP

All factory-shipped subscriber systems have the following IP addresses assigned to the local Ethernet port:

Fixed: 192.168.101.1 (can not be modified)

4.2 Telnet Access

4.2.1 Login

Type 'telnet' followed by the IP address of the subscriber system, depress ENTER, and enter the account and password when prompted.

Username: admin

Password: admin

4.2.2 Logout

Exit from a CLI session by typing:

logout <ENTER>

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

Note: 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)

4.3 Modes and Commands

The subscriber CLI interface supports several modes of operation. The system defaults to root mode when you login to the subscriber. From root mode you can display a list of all user modes and commands, reboot the subscriber system, and logout from the Telnet session. From all modes, you can directly display and modify (if applicable) each of the parameters. Enter 'exit' or CTRL-Z to return to root mode. All commands are case-sensitive.

Table 6: CLI - Generic 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 ? set rFC ? set rfConfig RxGain ?
tab	Use the tab character to auto-complete partially typed commands.
CTRL-Z	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>For example:</i> <i>help <ENTER> Help for all functions/fields.</i> <i>help command <ENTER></i> <i>help command parameter <ENTER></i>

Table 7: CLI - Modes and Commands

Command	Description
bsidtable	Access the Management Base Station ID table
buzzer	Audible alignment tool (if hardware equipped).
collectradio	Display radio statistics.
ethtag	Display/modify the Ethernet Tagging
eventlog	System event log.
interface	Configure Ethernet and wireless interfaces.
loadimage	Download and run a new software image
logout	Exit the current Telnet session.
realm	May be used by the ASN to select the AAA server.
reboot	Reset the system (confirmation required).
rfconfig	Display /modify the RF configuration
statistics	Statistics for authentication (EAP), Ethernet, and wireless interface.
status	Access the Management Status data structure
system	System software version settings
tr069	Communication between CPE and Auto Configuration Servers (ACS).

4.3.1 bsidtable - Base Station ID Table

The bsidTable stores the MAC addresses of up to sixteen base stations. When one or more MAC addresses are registered in the table, the subscriber is authorized to register only with the listed base stations. When there are no entries in the bsidTable table the subscriber can register with any base station.

Table 8: CLI - bsidTable - Base Station ID Table Commands

bsidtable <add> <delete> <show>

add <bsid> <priority> <0-15>

Add or replace a base station ID entry. If the table position value is not specified, the new entry is inserted after the last valid entry. The table is filled from the beginning (position 0) and positions are adjusted forward when 'empty' entries are not permitted. The count value is adjusted to the current number of entries.

bsid <aa:bb:cc:dd:ee:ff>

Enter base station MAC address.

priority <<0-7>

Enter priority for this base station. When multiple base stations are detected, the CPE will attempt to register entry having the highest priority (7).

<0-15>

Entry position in the table (optional).

Example: Use the following command to register a base station with priority 2 in the fourth position in the table:

CPE(bsId ->)# add 00:09:02:00:a3:5d priority 2 3 <Enter>

delete <entrynumber> <all | yestoall>

Delete a base station ID entry. If the table position value is not specified, the last entry in the table is deleted. The count value is adjusted to reflect the current number of entries. Confirmation is required.

<0-15>

Identify the specific entry position in the table (first entry is zero).

Example: Enter the following command to delete the 3rd entry in the table:

CPE(bsId ->)# delete 2 <Enter>

Are you sure ? Enter Y to delete this entry

all

Delete all entries in the table. Operator confirmation is required.

yestoall

Delete all entries in the table. Confirmation is not required.

show <0-15>

Display the base station ID table entries.

<0-15>

Identify the specific entry position in the table. If the table position is not specified, all entries in the table are displayed.

count

Display only the number of active entries in the table.

bsidentrie

Display only the base station ID values and associated priorities.

Note: The following actions are taken when the bsidtable is modified:

1. A 'Detected BS table reset' log message is generated.
2. An 'Add/Delete detected BS...' log message is generated if a new entry has been added.
3. A frequency scan is initiated.

4.3.2 buzzer - Antenna alignment Tool

Audible alignment tool (if hardware equipped).

Table 9: CLI - buzzer - Antenna Alignment Tool Commands

buzzer <set> <show>

Enable and disable audible alignment tool and show current status. This feature is supported only on outdoors models.

set <0 | 1>

Enable and disable audible alignment tool.

0 - Disable buzzer.

1 - Enable buzzer

show

Display status of audible alignment tool.

Buzzer is turned off.

Buzzer is turned on.

Buzzer is not present on this platform.

4.3.3 collectradio - Radio Statistics

Collect and display information about the radio.

Important: This command produces machine-readable output only.

Table 10: CLI - collectradio - Radio Statistics

collectradio <get> <time>

Specify radio collection parameters.

get

Displays the radio statistics (no parameters).

For example:

CPE(collectRadio ->)#>get

Press any key to exit ...

▼0.0⊙▼0.0⊙⊙0▼-79.0♦⊙0▼0.0⊙▼0.0⊙⊙0 ...

End of collecting data

time <50 - 10000>

Change or display the current data output rate (ms).

4.3.4 ethtag - Ethernet Tagging

Use 802.1Q VLAN tags to identify data traffic through the subscriber.

Table 11: CLI - ethTag - Ethernet Tagging Commands

ethertag <reset> <set> <show>

View and adjust the VLAN tag settings.

reset <yes>

Set all tagging parameters to factory default values (Active=Priority=Value=0). Requires operator confirmation if 'yes' is not specified.

yes - Do not ask operator for confirmation.

set <active> <priority> <value>

Change Ethernet VLAN tagging parameters.

active <0- | 1>

Set the tagging mode.

0: Disabled - All tagging 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 forwarded over the wireless interface to the base station.

priority <0-7>

Default priority for VLAN tagged packets.

value <VLAN ID>

This is the VLAN tag added to all uplink packets (when tagging is enabled).

show <active> <priority> <value> <monitor>

Display the current settings.

active

Display the active/inactive state for the tagging feature.

priority

Display the priority assigned to added VLAN tagged packets.

value

Display the VLAN ID.

monitor

Continuously display the mode (active), priority, and VLAN ID (value) fields. Press any key to stop updates.

4.3.5 interface - Ethernet Port and Wireless Settings

Use the *interface* command to view and configure the Ethernet ports.

Table 12: CLI - interface - Ethernet and Wireless Configuration Commands

<p>interface <eth0> <wman0> Ethernet port settings.</p> <p>eth0 <set> <show> set <ip> <port> View and adjust the Ethernet port speed, duplex, and IP settings.</p> <p>ip <address> <mask> <yes> View/modify the Ethernet (management) IP address.</p> <p>address <aaa.bbb.ccc.ddd> Set CPE IP address. Requires operator confirmation.</p> <p>mask <aaa.bbb.ccc.ddd> Set CPE network mask for CPE. Requires operator confirmation.</p> <p>yes Enter 'yes' to override request for operator confirmation. <i>Example: Use the following command to set a static IP address and mask and not ask for confirmation:</i> CPE# interfaces eth0 CPE(itf:eth0)# set ip address 192.168.20.33 mask 255.255.255.0 yes</p> <p>port <auto> <duplex> <speed> Ethernet port settings.</p> <p>auto <0 1> Set negotiation mode. 0: Disable auto-detect speed and duplex. See speed and duplex. 1: Enable auto-detect speed and duplex. Ignore speed and duplex.</p> <p>duplex <0 1> Set Ethernet port duplex. 0: Operate at half duplex mode only. 1: Operate at full duplex mode only.</p> <p>speed <0 1> Set Ethernet port speed. 0: Operate at 10Base-T only. 1: Operate at 100Base-T only.</p> <p>show <ip> <port> Display current settings. <i>Example: Enter the following command to display the Ethernet port ip settings:</i> CPE# interface ethernet show ip Settings --- <<SS IP Address Data>> Address= 10.1.1.254 Mask= 255.255.255.0</p> <p>wman0 <set> <show> Wireless interface settings. Changes to these values are effective only following a reboot.</p> <p>set <configcapabilities> <csublayer> <phy> View and modify the wireless interface settings. The subscriber uses a 5 ms frame duration only with a cyclic prefix of 1/8. Bandwidth setting determines the FFT size.</p> <p>configcapabilities <authpolicysupport> <openloopsupport> View and modify the wireless interface authentication settings.</p> <p>authpolicysupport <0 1></p>
--

Table 12: CLI - interface - Ethernet and Wireless Configuration Commands

Set Authorization Policy mode.

0 - Disabled: No authentication.

1 - Enabled: Authentication is required.

openloopssupport <0 | 1>

Subscriber terminal adjusts transmission level based on the signal strength measured on the preamble received from the base station.

0 - Disabled: Subscriber does not use open loop control.

1 - Enabled: Open loop control is active.

csublayer <0-2>

View and modify the wireless interface convergence sublayer settings.

0 - IPCS+NAT

1 - EthernetCS

2 - IPCS

phy <bandwidth> <framesize >

View and modify the wireless interface physical layer settings.

bandwidth <5000 | 7000 | 8750 | 10000>

Channel size (Hz).

5000 - 5 MHZ

7000 - 7 MHZ*

8750 - 8.75 MHZ*

10000 - 10 MHZ

framesize <5000 | 10000>

Frame duration (microseconds).

5000 - 5,000 us

10000 - 10,000 us

Show <configCapabilities> <csublayer> <phy>

Display the wireless configuration.

For example:

```
CPE(itf:wman0)# show phy
```

```
Settings -- <<SS Mmgt PHY Configuration Parameter>>
```

```
Bandwidth=7000 kHz
```

```
FftSize=          1024
```

```
CyclicPrefix=     8 PS
```

```
FrameSize=        5000 us
```

Note: The bandwidth setting controls the FFT size and cyclic prefix.

* Not supported by 1.8 GHz CPE.

4.3.6 loadImage - Download and Activate Software Image

Use the loadImage command to update the subscriber over-the-air or using the local Ethernet connection. The following items must be addressed before beginning software upgrades:

1. All software upgrades use an FTP server.
2. The FTP server must have a user account with the following settings:

Username: **target**

Password: **secret**

3. The subscriber binary file must be copied to the default file location for this user account on the FTP server.

Table 13: CLI - loadImage - Upgrade CPE Software Commands

loadImage

Load new subscriber software image. This command does not accept any parameters. The command will prompt for the following information:

ServerIP

IP address of FTP server.

Filename

Name of the binary file. Must be located in the FTP default directory.

Example:

```
CPE#> loadImage
Server IP Address: 192.168.100.100
File Name: REM-18-M-001-02-02-005.bin
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.
CPE#><enter reboot command to load new software>
```

4.3.7 realm - Domain Reference for Locating AAA Server

May be used by the ASN to select the AAA server.

Table 14: CLI - realm - For Locating AAA Server Commands

realm <set> <show>

Set parameters to factory default values. If no parameter is specified.

configuration <backup> <restore>

Use an FTP server to save and restore the subscriber configuration.

set <domain.name>

Enter a new realm domain.

Example:

```
CPE# realm tier1.com
```

show

Display current realm.

4.3.8 rfConfig - Configure RF Settings

The rfConfig mode allows you to view and modify the subscriber RF settings.

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

Table 15: CLI - rfConfig - RF Configuration Commands

rfConfig <reset> <set> <show>

View and modify the subscriber RF settings.

reset <yes>

Reset all RF parameters to factory default values. Requires confirmation.

yes

Append yes to command to override operator confirmation.

set <param₁><value₁> ... <param_n><value_n>

View and modify the RF parameters.

freqpriority_n <0-9>

Priority for this frequency interval (n=1-16).

hirffreq_n <1800 - 1830 >

High frequency (KHz) for this frequency interval (n=1-16).

Example:

CPE# rfconfig set hirffreq1 1810000

lorffreq_n <1800 - 1830>

High frequency (KHz) for this frequency interval (n=1-16).

maxrngretries <1 - 5000>

Max number of retries for initial ranging.

maxtxpower <value>

Maximum Tx power (dBm). Refer to specifications.

nomadic <0 | 1>

Set the nomadic mode.

0 -- Disable

1 -- Enable

rxagc <0 | 1>

Receive automatic gain control (AGC).

0 - Disable AGC.

1 - Enable AGC.

rxgain <-19.00 to 80.00>

Enter the Rx Gain value (dB). This may be a decimal number.

stickinesstimer <1-120>

Time (seconds) to attempt re-connection to the same base station.

txactualpower <value>

Actual Tx power (dB). Refer to specifications.

txfixedgain <0|1>

Tx power scan during network entry.

0 - Enable

1 - Disable

txfixedpower <value>

Transmitter gain value (dB). This may be a decimal number.

Table 15: CLI - rfConfig - RF Configuration Commands

show <parameter₁> ... <parameter_n>

Show the current parameter settings. Displays the set commands above and the following:

rxfreq

Current receiver frequency (KHz).

rftemp

Radio temperature (Celsius).

rxfrssi

Received RSSI.

rxlock

Receiver lock mode.

0 - Disabled.

1 - Enabled.

txlock

Transmitter lock mode.

0 - Disabled.

1 - Enabled.

Notes:

1. When specifying a single channel, enter the RF frequency in the 'hirffreq_n' setting and then enter the identical value in the 'lorffreq_n' setting.
2. Scanning ranges must not intersect or overlap.
3. When changing settings, the order of data entry must ensure the 'hirffreq_n' setting is always greater than the 'lorffreq_n' setting. For example, when changing from the default setting (hirffreq_n=lorffreq_n=0) you must enter the hirffreq_n setting first.

Frequency Scanning

Frequency scanning is performed in 250 KHz steps, monitoring each step for approximately four seconds. The subscriber will always complete the entire scan for all non-zero ranges. If all ranges are zero, the subscriber will scan the entire range of the radio. During the scan, the subscriber compiles a table of detected base stations (filtered by the bsidtable entries) and orders the results based on priority and then signal level (CINR). Once the scan is completed, the table is saved in non-volatile RAM (preserved through subscriber reboot/power-cycle).

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

1. The RF parameters are modified.
2. The bsidtable (allowed base station list) is modified.
3. There are no base stations in the scanning results table.

Following any of the events listed above, the subscriber attempts to register with the first base station in the scanning results table. If the subscriber is unable to register with a base station, that entry is removed from the scanning results table. Once registered, the subscriber remains connected to that base station. If the connection to the base station is lost while the subscriber is online (e.g., base station rebooted), that base station is removed from the scanning results table, and the subscriber attempts to register with the next base station in the scanning results table. If the scanning results table becomes empty, the scanning process is restarted.

4.3.9 statistics - Display Statistics

The statistics mode allows you to view subscriber operational statistics.

Table 16: CLI - statistics - Statistics Commands

statistics <eap> <interface> <packetFlows>

Subscriber operational statistics.

eap <reset><show>

Display EAP-based statistics.

reset

Reset all counters to zero.

show

Display current statistics values.

CPE#>statistics eap show

```

inPackets = 0
outPackets = 0
eapStart = 0
eapIdRequest = 0
eapIdReply = 0
eapSuccess = 0
eapFail = 0
ineapTlsPackets = 0
outeapTlsPackets = 0
outeapAuthKeys = 0
badeapAuthKeys = 0
eaplastidxReq = 0
    
```

forwarder <show>

Packet forwarder statistics.

show

Display packet forwarder statistics.

CPE#>statistics forwarder show

FORWARDER SYNTHESIS

```

=====
Interface | Packets  Loss (unit=packet)
=====TO INTERFACE=====
RF-RX   |    0
-----
Local-RX | 2567
-----
Etm-RX  | 2597
=====FROM INTERFACE=====
RF-TX   |    0
-----
Local-TX | 2581
-----
Etm-TX  | 2581 Dropped=30
    
```

interface <eth0> <wman>

Display Ethernet or wireless statistics.

eth0 <clear><show>

Ethernet statistics.

clear

Reset all counters to zero.

REM Outdoor Subscriber

Table 16: CLI - statistics - Statistics Commands

show

Display current statistics values.

```
CPE #>statistics interface eth0 show
Settings --- <<Ethernet Statistics>>
InPacket=          2500
InBytes=           0
OutPacket=         2461
OutBytes=           0
```

wman0 <show>

Wireless interface statistics.

clear

Reset all counters to zero.

show

Display current statistics values.

```
CPE#>statistics interface wman0 show
Settings --- <<Wman statistics>>
InPacket=          0
InBytes=           0
OutPacket=         0
OutBytes=           0
```

packetflows <show>

Packet-based statistics.

show

Display current statistics values.

```
CPE#>statistics packetflows show
PACKET FLOW SYNTHESIS
```

Module	Input	Output	Loss (unit=packet)
=====UPLINK=====			
ETM-RX	2649	2649	

DMC	0	0	
UQSS	0	0	
UMSS	0	0	
=====DOWNLINK=====			
RTM	0	0	

ETM-TX	2648	2648	

4.3.10 status - Display Status Information

Use status mode to view subscriber status information.

Table 17: CLI - status - Status Commands

status <show>	
display subscriber status information.	
show <parameter₁> ... <parameter_n>	
display specified parameter(s). if no parameters are specified, display all values.	
cinr	carrier/(interference + noise)
dcd	show downlink channel descriptor group of statistics
dcdchangecount	current downlink channel descriptor count used by the mac
dcdcrccount	downlink channel descriptor crc errors
dcderrcount	downlink channel descriptor semantic errors
dcdrxcount	downlink channel descriptor s parsed
dlbytecount	downlink data bytes received
dlcrrccount	downlink data crc errors
dlfpcount	downlink fps received (to frames)
dlfpcrccount	downlink fp semantic errors
dlfperrcount	downlink fp semantic errors
dlhrcrccount	downlink data hcrc errors
dlmapcount	downlink maps parsed
dlmapcrccount	downlink map crc errors
dlmaperrcount	downlink map semantic errors
dlmpducount	downlink MAC packet data units sent received
dl pducount	downlink MAC service data units received
downlink	show all fields of downlink group
frameduration	Frame duration in microseconds
freqoffset	frequency offset
linkstatus	0 -- non-registered, 1 -- registered
lostframes	logical frames lost
manage	show all fields of management group
mgmtcrccount	management message crc errors
mgmterrcount	management message semantic errors
mgmtrxcount	other management messages parsed
modemresets	modem reset due to errors
monitor	enter into monitor mode, press any key to exit
other	show all fields not belonging to a specific group
rfrssi	received signal strength indication (at phy)
rngtimecorrection	time correction resulting from RNG response
rssi	received signal strength indicator
snr	signal to noise ratio
tcnt	time count of the last received burst
totalbwreqcount	bandwidth requests sent
totalcrcerrors	payload crc errors
totalhcrcerrors	header crc errors
totalmgmsentcount	other management messages sent
totalpaddingcount	padding MAC packet data units sent
totalrngreqcount	ranging requests sent (including initial)
totaltxburstcount	bursts transmitted
txactualpower	transmit actual power

Table 17: CLI - status - Status Commands

ucd	show ucd group of statistics
ucdrcrcount	ucd crc errors
ucderrcount	ucd semantic errors
ucdrxcount	ucds parsed
ulbytecount	ul data bytes sent
ulmapcount	ulmaps parsed
ulmaprcrcount	ulmap crc errors
ulmaperrcount	ulmap semantic errors
ulmpducount	ul mpdus sent
ulsdccount	ul sdus sent
uplink	show uplink group of statistics

4.3.11 system - Subscriber General Configuration

Use the system commands to display the software versions stored in the subscriber non-volatile memory, download software updates, and switch the active versions.

Table 18: CLI - system - System Commands

<p>system <configuration> <reboot> <show> <software> <summary> Set parameters to factory default values. If no parameter is specified.</p> <p>configuration <backup> <restore> Use an FTP server to save and restore the subscriber configuration.</p> <p>backup <server> <file> Save the subscriber configuration on a TFTP server.</p> <p>server <IP Address> IP address of TFTP server.</p> <p>file <string> Name of the binary file. Must be located in the TFTP default directory.</p> <p>restore <server> <file> Restore the subscriber settings from a saved configuration file.</p> <p>server <IP Address> IP address of TFTP server.</p> <p>file <string> Name of the binary file. Must be located in the TFTP default directory.</p> <p>reboot <yes> Reboot the subscriber (confirmation required).</p> <p>yes Perform operation without operator confirmation. Example: <i>CPE#system reboot yes</i></p> <p>show <swver> Display system settings.</p> <p>swver Display current software version. Example: Enter the following command to display version: <i>CPE# system show swver</i> <i>Active Software Image= 2.2.5</i> <i>Passive Software Image= 2.2.4</i></p>

Table 18: CLI - system - System Commands

software <download> <switch> <switch_and_reboot>
 Download new software to the subscriber.

download <server> <file>
 Download subscriber software from TFTP server.

server <aaa.bbb.ccc.ddd>
 TFTP server IP address

file <filename.bin>
 Software binary file name.

switch <yes>
 Change to alternate software. Operator confirmation is required.

yes
 Perform operation without operator confirmation.

Example:
CPE#system switch yes

switch_and_reboot <yes>
 Change to alternate software and reboot CPE. Operator confirmation is required).

yes
 Perform operation without operator confirmation.

summary
 Display summary information.

CPE# system summary
Redline Communications Inc.
REM

Active Software Image= 2.2.5
Passive Software Image= 2.2.4

4.3.12 tr069 - Auto Configuration Servers Support

Communication between CPE and Auto Configuration Servers (ACS).

Table 19: CLI - tr069 - Auto Configuration Servers Support Commands

tr069 <set> <show>
 Set parameters to factory default values. If no parameter is specified.

configuration <backup> <restore>
 Use an FTP server to save and restore the subscriber configuration.

set <enable>
 Enable and disable tr069 mode.

enable <0 | 1>
 Set tr069 mode.
 0 - Disable tr069.
 1 - Enable tr069.

show
 Display current tr069mode.

5 Appendices

5.1 System Technical Specifications

Table 20: Specifications - Indoor Wireless Subscriber Modem	
System Models:	REM2500M: 2.496 - 2.69 GHz Mobile WiMAX modem compliant with WiMAX Certification Wave 2: Profile 3A: 2.5-2.7 GHz, 5/10 MHz, TDD REM3500M: 3.4 - 3.6 GHz Mobile WiMAX modem compliant with WiMAX Certification Wave 2: Profile 5A: 3.4-3.6 GHz, 5/7/10 MHz, TDD
Physical Layer:	Scalable OFDMA (512/1024 FFT) MIMO support (Matrix A/Space Time Coding and Matrix B/Spatial Multiplexing) Supports 2x2 downlink MIMO and Collaborative uplink MIMO operation
MAC Attributes:	Hybrid ARQ with convolutional turbo codes (CTC) QoS: Best Effort (BE), non Real Time Polling Service (nrtPS), Real Time Polling Service (rtPS), Extended Real Time Polling Service (ertPS), Unsolicited Grant Service (UGS)
Duplex Technique:	TDD (time division duplex)
Tx Power:	Up to 26.66 dBm
Rx Sensitivity:	3 dB better than MRCT
Network Attributes:	Transparent bridge 802.1p, 802.1Q VLAN port tagging, 802.1Q, TOS/DSCP and L2/L3 address, traffic classification
Modulation:	QPSK, 16 QAM, 64 QAM
Forward Error Correction:	Convolutional Turbo Coder/Decoder
Over the Air Encryption:	AES
Network Connections:	10/100 Ethernet (RJ-45)
System Configuration:	SNMP, FTP
Network Management:	SNMP, standard and proprietary MIBs. Full management by Redline Management Suite (RMS)
PoE Power Injector:	Standard IEEE 802.3af (15.4 W Max.) Input: Auto-sensing 110-250 VAC 50/60 Hz, 0.5 A Output: 48 V, 0.35A Dimensions: 5.5" x 2.25" x 1"
Compliance:	EMC: EN 301 489-1, EN 301 489-4, EN 550 24 EN 55022/CISPR 22 RF: EN 302 544 (2.496 - 2.69 GHz) EN 302 326 (3.4 - 3.6 GHz) Safety: IEC 60950-1, EN 60950-1 Enclosure Protection: IEC 60529 (IP 67)
Operating Temperature:	-40 C to 60 C (-40° to 140° F)
Storage:	5 - 70 C (40° - 160° F), 5 - 95% Humidity
Wind Loading:	Antenna: 220 Km/hr (137 mph)
Dimensions:	20 x 20 x 7.5 cm (8 x 8 x 2.5 in)
Weight:	1.8 Kg (4 lb) (does not include mounting bracket)
Antenna:	Two cross polarized integrated antennas (14 dBi gain)
Power Consumption:	5 W Maximum

5.2 Subscriber Upgrade Procedure

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 the subscriber Ethernet port, or be reachable over the air interface.
 - b) The FTP server must have a user account defined as follows:

username:	target
password:	secret
 - c) You must copy the subscriber binary file into the default file location for the FTP account (not able to specify a pathname in the upgrade dialog).

Update Software Procedure

Start a telnet session to the subscriber using the following settings:

Login: admin

Password: admin

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).

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

```

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
  
```



RedMAX 4c™
REM Outdoor Subscriber

User
Manual

302 Town Centre • Suite 100 • Markham, Ontario • Canada • L3R 0E8

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