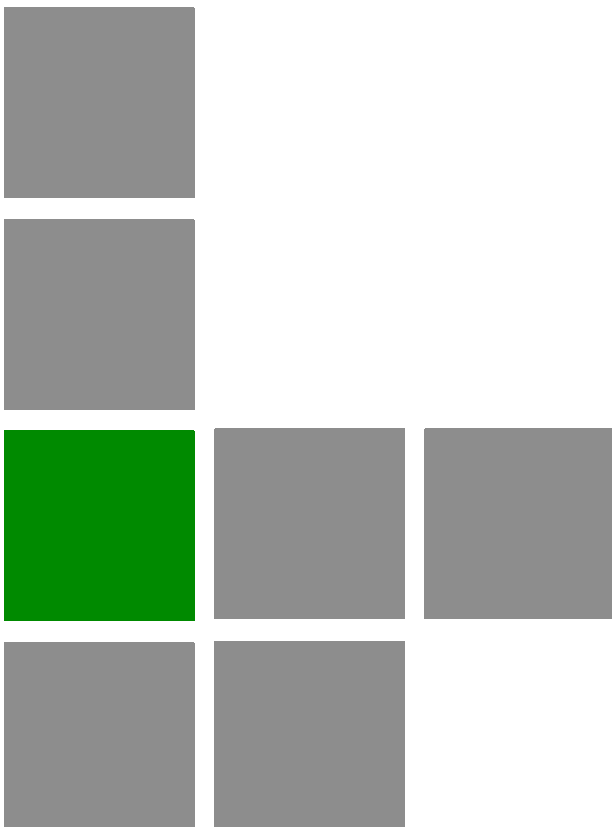# BreezeMAX® PRO 5000 CPE

Product Manual

Software Version 1.5
April 2010
P/N 215643

Document History

Topic	Description	Date Issued
First Release	New Product Manual	SW Version 4.6, July 2009
Ethernet CS display	Updated the Service Parameters page	SW Version x.x, September 2009
New IDU power supply unit XTRM-SU-IDU-1D	Added specifications and information	SW Version 1.2, October 2009
"Service Parameters" on page 79	Removed the Modify option	SW Version 1.2, October 2009
"User Registration" on page 60	Added EAP-AKA to the screen	SW Version 1.2, October 2009
"Radio Parameters" on page 67	Added "ATPC Parameters" on page 72	SW Version 1.2, October 2009
"User Registration" on page 60	Added default username and password.	SW Version 1.5, January 2010
"ATPC Parameters" on page 72	■ Added a note that the DHCP Client can be set to disable only in ETH-CS service. ■ The upload procedure of a country codes file (country_codes.xml) was added: The country codes file can be uploaded to the CPE using the Configuration Control menu. ■ A new field was added to the Show parameters: Current Country Code Data ■ Country codes changed	SW Version 1.5, January 2010
"Unit Control Parameters" on page 47	Added a new page: "Licences" on page 56	SW Version 1.5, January 2010
DHCP Client Configuration page	Moved the DHCP Client Configuration page from Radio Parameters to Management Parameters.	SW Version 1.5, January 2010
"Parameters Summary" on page 85	Updated latest parameters: Registration default username and password, Licences and AM&TM	SW Version 1.5, January 2010
General	■ Added information on models with external antennas. ■ Replaced all screenshots	SW Version 1.5, March 2010

Topic	Description	Date Issued
5 GHz Integral Antenna in Table 1-1	15°AZ x 15°EL instead of 20°	SW Version 1.5, March 2010
Table 1-5	■ Allocation of IP parameters: Removed LAN-Configurable, added options 66, 67 ■ Configuration Upload/Download: added TFTP ■ Authentication: Removed TLS	SW Version 1.5, March 2010
TM/PM Files Control	Removed	SW Version 1.5, March 2010
"Aligning the PRO CPE's External Antenna" on page 39	New section	SW Version 1.5, March 2010
Integratiion Time	Removed	SW Version 1.5, March 2010
"Configuration Control" on page 53	New functions	SW Version 1.5, March 2010
"Licences" on page 56	New section	SW Version 1.5, March 2010
"User Registration" on page 60	Revised	SW Version 1.5, March 2010
"BST/AU Parameters" on page 63	Revised	SW Version 1.5, March 2010
"ATPC" on page 73	Added section "Country Codes" on page 73	SW Version 1.5, March 2010

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Radio Frequency Interference Statement

The **Subscriber Unit** equipment has been tested and found to comply with the limits for a class B digital device, pursuant to ETSI EN 301 489-1 rules and Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment notwithstanding use in commercial, business and industrial environments. 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.

FCC Radiation Hazard Warning

Indoor CPE - To comply with FCC RF exposure requirements in Section 1.1307and 2.1091 of FCC Rules, the antenna used for this transmitter must be kept at a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Outdoor CPE - To comply with FCC RF exposure requirements in Section 1.1307 and 2.1091 of FCC Rules, the antenna be used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 2m from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

R&TTE Compliance Statement

This equipment complies with the appropriate essential requirements of Article 3 of the R&TTE Directive 1999/5/EC.

Safety Considerations - General

For the following safety considerations, "Instrument" means the BreezeMAX units' components and their cables.

Caution

To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

Line Voltage

Before connecting this instrument to the power line, make sure that the voltage of the power source matches the requirements of the instrument.

Radio

The instrument transmits radio energy during normal operation. To avoid possible harmful exposure to this energy, do not stand or work for extended periods of time in front of its antenna. The long-term characteristics or the possible physiological effects of radio frequency electromagnetic fields have not been yet fully investigated.

Outdoor Units and Antennas Installation and Grounding

Ensure that outdoor units, antennas and supporting structures are properly installed to eliminate any physical hazard to either people or property. Make sure that the installation of the outdoor unit, antenna and cables is performed in accordance with all relevant national and local building and safety codes. Even where grounding is not mandatory according to applicable regulation and national codes, it is highly recommended to ensure that the outdoor unit and the antenna mast (when using external antenna) are grounded and suitable lightning protection devices are used so as to provide protection against voltage surges and

static charges. In any event, Alvarion is not liable for any injury, damage or regulation violations associated with or caused by installation, grounding or lightning protection.

Disposal of Electronic and Electrical Waste

Disposal of Electronic and Electrical Waste

Pursuant to the WEEE EU Directive electronic and electrical waste must not be disposed of with unsorted waste. Please contact your local recycling authority for disposal of this product.

《电子信息产品污染控制管理办法》
(第39号)
(又名中国RoHS)

产品内含危害物质揭露表

零部件名称	危害物质项目					
	铅	镉	汞	六价铬	PBB	PBDE
	(Pb)	(Cd)	(Hg)	(Cr^{6+})	(多溴联苯)	(多溴二苯乙醚)
含铜线材	×	○	○	○	○	○
连接器	×	○	○	○	○	○
变压器	×	○	○	○	○	○
陶瓷电容	×	○	○	○	○	○
高温锡材	×	○	○	○	○	○

○：表示此部件使用的所有同类材料中此种有毒或有害物质的含量均低于 SJ/T11363-2006 规定的限制要求。
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About This Manual

This document describes and explains how to install and manage the BreezeMAX PRO 5000 CPE units.

This document contains the following chapters:

- Chapter 1 - Product description: Describes the PRO 5000 CPE, and its specifications.

- Chapter 2 - Installation: Describes how to install the PRO 5000 CPE.

- Chapter 3 - Commissioning: Describes how to configure basic parameters, align the antenna and validate unit operation.

- Chapter 4 - Operation and Administration: Describes how to use the web interface application for configuring parameters, checking system status and monitoring performance.

- Appendix A - Provides troubleshooting guidelines for CPE.

- Glossary - A listing of commonly used terms.

Contents

Figures

Tables

Chapter 1

Product Description

In This Chapter:

1.1 Introducing BreezeMAX PRO 5000 CPEs

1.1.1 General

The WiMAX-compatible BreezeMAX PRO 5000 CPE Subscriber Units (SUs) are powered by Sequans chipset.

BreezeMAX PRO 5000 CPE is currently available in the 5 GHz frequency band, 1 Data.

Differentiation between models of this product is based on its description: XTRM-SU-OD-1D-4.9-<c>-<a>

■ <c> - indicates capacity limitation – 2, 6, UL

■ <a> - indicates antenna configuration – A for attached integrated antenna, E for external antenna

For example: XTRM-SU-OD-1D-4.9-6-E

The units support the TR-069 CPE WAN Management Protocol (CWMP), allowing efficient management by an Auto Configuration Server (ACS).

In addition, configuration and performance monitoring of a single unit can be performed using the following options:

■ Using a PC/Notebook with an HTTP browser to access the built-in web configuration server.

■ Using TFTP to upload/download a Configuration File.

1.1.2 Hardware Description

The PRO CPE comprises an Outdoor Unit (ODU) and an Indoor Unit (IDU).

The ODU includes the modem, radio, data processing and management components of the SU. It also includes an integral high-gain flat antenna or a connection to two external antennas. The ODU connects to the IDU and to the user's equipment through a 10/100BaseT Ethernet port.

Figure 1-1: CPE Outdoor Units

The indoor unit is powered from the mains and connects to the ODU via a Category 5E Ethernet cable carrying the Ethernet data between the two units, as well as power (-54 VDC) and control signals to the ODU and status indications from the ODU.

Figure 1-2: Indoor Units

A miniature SU Alignment Unit (SAU), that includes signal strength and status indicators, is also available to support easy and convenient antenna alignment and status verification.

Figure 1-3: SU Alignment Unit (SAU)

1.2   Specifications

1.2.1   Radio

Table 1-1: Radio Specifications

Item	Details	
Frequency	Band	Frequencies (MHz)
	5 GHz	4900-5950
Operation Mode	■ TDD, Half Duplex	
Channel Bandwidth	■ 5 MHz ■ 10 MHz	
Central Frequency Resolution	0.125 MHz	
5 GHz Integral Antenna	Embedded dual polarization antenna, 16dBi, 15°AZ x 15°EL	
Antenna Port (units with external antenna)	N-Type, 50 Ohm	
5 GHz Detached Antennas[a]	■ UNI-23-9: 23 dBi, 5.150-5.875 GHz, 9° horizontal x 9° vertical, vertical polarization, compliant with ETSI EN 302 326-3 V1.2.1 (2007-01) ■ UNI-28-4: 28 dBi, 5.150-5.875 GHz, 4.5° horizontal x 4.5° vertical, vertical polarization, compliant with ETSI EN 302 326-3 V1.2.1 (2007-01) ■ Omni antenna (AN1435, 4.9-5.875 GHz, BS, Omni, 9.5dBi)	
Max. Input Power (at antenna port)	-20 dBm before saturation 0 dBm before damage	
Output Power (at antenna port)	Up to 21dBm ±1dB Maximum	
Modulation	OFDM modulation, 1024/512 FFT points: QPSK, QAM16, QAM64	
Access Method	OFDMA	
FEC	Convolutional Coding: 1/2, 2/3, 3/4, 5/6	

a. In 5.4 GHz units with a detached antenna, if the gain of the antenna (as inserted into Antenna gain field) is higher than 30 dBm, then the Maximum EIRP can vary by more than ±3 dB. As regulations in most countries limit the EIRP of units operating in the 5.4 GHz band, it is recommended to use detached antennas up to and including 28 dBi.

1.2.2   Sensitivity

Table 1-2: Sensitivity

Modulation & Coding	Sensitivity (dBm) @ 5 MHz BW	Sensitivity (dBm) @ 10 MHz BW
QPSK 1/2	-96	-93
QPSK 3/4	-93	-90
16QAM 1/2	-89	-86
16QAM 3/4	-86	-83
64QAM 2/3	-81	-78
64QAM 3/4	-80	-77
64QAM 5/6	-79	-76

1.2.3   IDU/ODU Communication

Table 1-3: ODU/ODU Communication

Item	Details
Cable Type	Category 5E, Outdoor Data Cable, Double Jacket, 4x2x24# FTP
Maximum Length	90 meter

1.2.4   Data Communication (Ethernet Port)

Table 1-4: Data Communication (Ethernet Port)

Item	Details
Standard Compliance	IEEE 802.3 CSMA/CD
Maximum Frame Size (including 4 CRC bytes)	1522 Bytes
Speed	10/100 Mbps, Half/Full Duplex with Auto Negotiation

1.2.5   Configuration and Management

Table 1-5: Configuration and Management

Item	Description
Management options	■ Web-based (HTTP/HTTPS) ■ TR-069 ■ TFTP
Management access	From Wired LAN, Wireless Link
Management access protection	Access Password
Allocation of IP parameters	WAN - DHCP, options 43, 60, 66, 67
Software upgrade	HTTP/TFTP
Configuration Upload/Download	HTTP/TFTP
Authentication	TTLS

1.2.6   Environmental

1.2.6.1   IDU

Table 1-6: Environmental Specifications

Item	Details
Operating Temperature	■ CPE IDU-1D: -5ºC to 45ºC ■ XTRM-SU-IDU-1D: 0°C to 40°C
Storage Temperature	■ CPE IDU-1D: -40 to 75 °C ■ XTRM-SU-IDU-1D: -30°C to 85°C
Humidity	Maximum 95%, non-condensing.

1.2.6.2   ODU

Table 1-7: Environmental Specifications

Item	Details
Operating Temperature	-40ºC to 55ºC
Storage Temperature	-40 to 70 °C
Humidity	Maximum 95%, non-condensing.
Rain	IEC 67

Table 1-7: Environmental Specifications (Continued)

Item	Details
Random Vibration	IEC 68-2-64
Shock	IEC-68-2-29
Salt Fog	IEC-68-2-11
Ice Loading	25mm radial ice density 7kN/m3
Solar Radiation	IEC-68-2-5, MIL-STD-810D
Wind Speed	160Km/Hr required for antenna stability under operation

1.2.7   Standards Compliance, General

Table 1-8: Standard Compliance Specifications

Type	Standard
EMC	■ FCC Part 15B Class B ■ EN 55022 Class B ■ EN 301 489-1/4
Safety	■ UL 60950-1/-22 ■ IEC/EN 60950-1/-22
Telecom	■ ITU-T K21
Standards	■ EN 302 326 ■ EN 302 085, V1.2.2 (2003-08) Range 1 ■ EN 301 893 v1.5.1 ■ FCC Part 15 C and E ■ IEEE 802.3-2005 10BASE-T and 100BASE-TX ■ FCC-06-96A1
WiMAX Radio Signal Certification	■ IEEE 802.16e-2005 WAVE 1 and WAVE 2

1.2.8 Physical and Electrical

1.2.8.1 Mechanical

Table 1-9: Mechanical Specifications

Unit	Dimensions (mm)	Weight (kg)
CPE-IDU	156mm (L) X 60mm (W) X 33mm (T) or 95mm(L) X 57mm (W) X 32mm (T)	0.3 0.2
CPE-ODU-PRO-SA	230mm (H) X 230mm (W) X 63mm (T)	2
CPE-ODU-PRO-SE	230mm (H) X 260mm (W) X 73mm (T)	2

1.2.8.2 Electrical

Table 1-10: Electrical Specifications

Item	Details
Power Consumption	16.5W
CPE-IDU Power Input	100-240 VAC, 47-63 Hz
CPE-ODU-PRO Power Input	54 VDC (or 48VDC) from the IDU over the indoor-outdoor Ethernet cable

1.2.8.3 Connectors

Table 1-11: Connectors

Unit	Connector	Details
CPE-IDU-1D	ETHERNET/LAN	10/100Base-T (RJ-45).Cable connection to a PC: Straight cable Connection to a hub: Crossed
	RADIO/LAN+DC	10/100Base-T (RJ-45)
	AC IN	3 pin AC power plug
CPE-ODU-PRO-SA	IDU COM	10/100Base-T (RJ-45)
	SAU	Special mini USB
CPE-ODU-PRO-SE	IDU COM	10/100Base-T (RJ-45)
	SAU	Special mini USB
	2x ANT (SE model)	N-Type jack, 50 Ohm, lightning protected
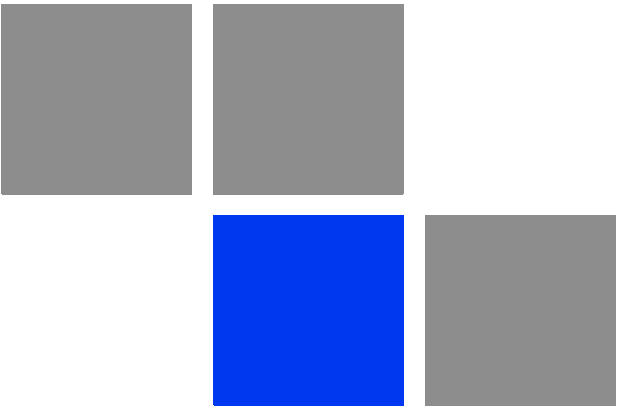
Chapter **2**

Installation

In This Chapter:

2.1   Installing the ODU of the CPE

The following sections describe how to install the outdoor unit (ODU) of the PRO CPE. CPE operation is exclusive for point to point and requires professional installation.

CAUTION

ONLY experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities should install outdoor units and antennas.

Failure to do so may void the product warranty and may expose the end user or Service Provider to legal and financial liabilities. Alvarion and its resellers or distributors are not liable for injury, damage or regulation violations associated with the installation of Outdoor Units or antennas.

2.1.1   CPE Installation Requirements

2.1.1.1   Packing List

The PRO CPE includes the following components:

- ODU Package:

    » CPE ODU unit of chosen model

    » Mounting kit

    » Quick Installation Guide

    » Optional software utilities and User Guide CD

- IDU Package:

    » CPE IDU unit, comprising of AC power adapter and internal gateway

- Power Cable Package:

    » AC/DC power cable

2.1.1.2   Additional Installation Requirements

The following items are also required to install the ODU:

- Double shielded Cat.5E outdoor ethernet cable with two RJ-45 connectors* (90m) (see Section 2.1.3 for details on approved cables and maximum length), and an RJ-45 connectors crimping tool.

- For units that connect to external antenna: Antenna(s)* and RF cable* for connecting the antenna to the ODU.

- SAU* (SU Alignment Unit) for antenna alignment and status verification.

- Grounding cable with an appropriate termination.

- Installation tools and materials, including appropriate means (e.g. a 1" to 4" pole) for installing the ODU (and antenna where applicable).

2.1.1.3   Optional Items

- Tilt Pole Mounting kit*.

> **NOTE**
>
> Items marked with an asterisk (*) are available from Alvarion.

2.1.2   Guidelines for Positioning the ODU

This section provides key guidelines for selecting the optimal installation locations for the ODU.

Select the optimal locations for the equipment using the following guidelines:

- The ODU should be mounted on a 1"-4" pole. Its location should enable easy access to the unit and its connectors for installation and testing.

- The higher the placement of the ODU/antenna, the better the achievable link quality.

- The ODU/antenna should be installed to provide a direct, or near line of sight with the BTS antenna(s). The ODU/antenna should be aligned to face the general direction of the BTS.

- In some cases it might be necessary to up/down-tilt the antenna. An optional Tilt accessory for the ODU providing a tilt range of ±15° is available. The tilt option may be necessary to either improve the link conditions or, if the SU is too close to the BTS, to reduce the receive signals strength. As a rule of thumb, if the SU is located at a distance of less than 300 meters from the BTS, it is recommended to up-tilt the antenna by approximately 10° to 15° (especially in line-of-sight conditions) to avoid saturation of the receivers by too strong signals.

- Outdoor units with a connection to an external antenna should be installed as close as possible to the antenna.

- The equipment is designed for fixed, point-to-point operation. That is, in the same time, the same CPE cannot connect to multiple BTSs; It is the responsibility of the operator and the installer to take into account that - at least in the 5725-5850 MHz band - the equipment excludes the use of point-to multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information.

2.1.3   IDU-ODU Cables

NOTE

The length of the Indoor-to-Outdoor cable should not exceed 90 meters. The length of the Indoor-to-Outdoor cable, together with the length of the Ethernet cable connecting the CPE-IDU-1D to the data equipment, should not exceed 100 meters.

Use only Category 5E Ethernet cables from either Alvarion or any of the approved manufacturers, listed in Table 2-1. Consult with Alvarion's specialists on the suitability of other cables.

Table 2-1: Approved Category 5E Ethernet Cables

Manufacturer	Part Number
Superior Cables Ltd. www.superior-cables.com	612098
HES Cabling Systems www.hescs.com	H5E-00481
Teldor www.teldor.com	8393204101

Table 2-1: Approved Category 5E Ethernet Cables

Manufacturer	Part Number
Southbay Holdings Limited 11th Fl., 15, Lane 347, Jong Jeng Rd. Shin Juang City, Taipei County Taiwan, R.O.C. Attn: Eva Lin Tel. 886-2-2832 3339 Fax. 886-2-2206 0081 E-mail: eva@south-bay.com.tw	TSM2404A0D
GU-Tech., LLC . - A Member of OVIS GroupTel/Fax : 732 918 8221 Mobile: 718 909 4093 www.OVIS.COM.TW www.GU-TECH.COM	

In case of missing information in the manufacturer's WEB site (product specifications, ordering issues, etc.), it is highly recommended to contact the manufacturer's sales representative directly.

2.1.4 Pole Mounting the ODU

The ODU can be mounted on a 1" to 4" pole using one of the following options:

■ A pole mounting kit is supplied with each unit. The kit includes a special clamp and a pair of threaded rods, flat washers, spring washers and nuts. There are two pairs of threaded holes on the back of the unit, enabling to use the mounting kit for installing the unit using either vertical or horizontal polarization. The clamp enables installing the unit on diverse pole diameters from 1" to 4".

■ A Tilt Pole Mounting kit, providing a tilt range of ±15° is available. The Tilt kit can be attached to the ODU and be mounted on a 1" to 4" pole using two 9/16" wide metal bands.

2.1.4.1 Pole Mounting the ODU Using the Clamp

Figure 2-1 and Figure 2-2 illustrate how to mount an ODU on a pole, using the clamp and threaded rods.

NOTE

■ There is a groove on one end of the threaded rod. Insert the rods with the grooves pointing outward, and fasten them to the unit using a screwdriver. Install the unit with the bottom panel, which includes the connectors, facing downward.

■ You can install the ODU with the arrow on the back of the unit facing upwards or rightwards. Match the polarity of the transmission antenna to the polarity of the receiver antenna.

■ Make sure that the connectors are facing downwards.

Grounding screw
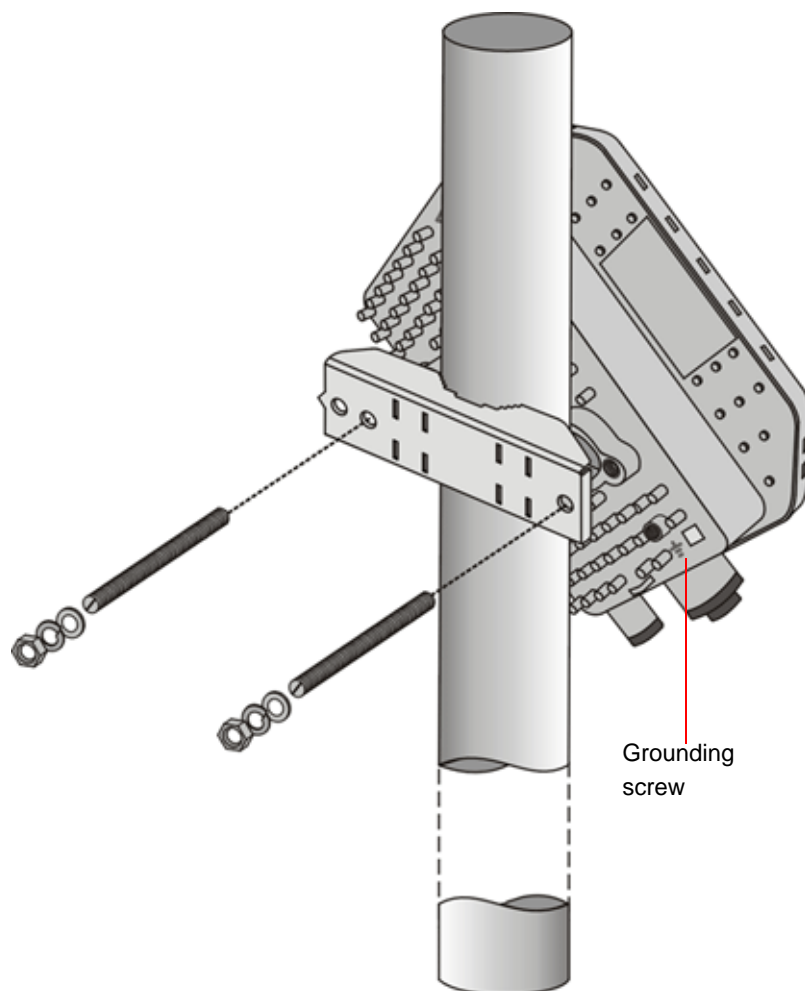
Figure 2-1: ODU Pole Installation Using the Special Clamp, Arrow Facing Upwards
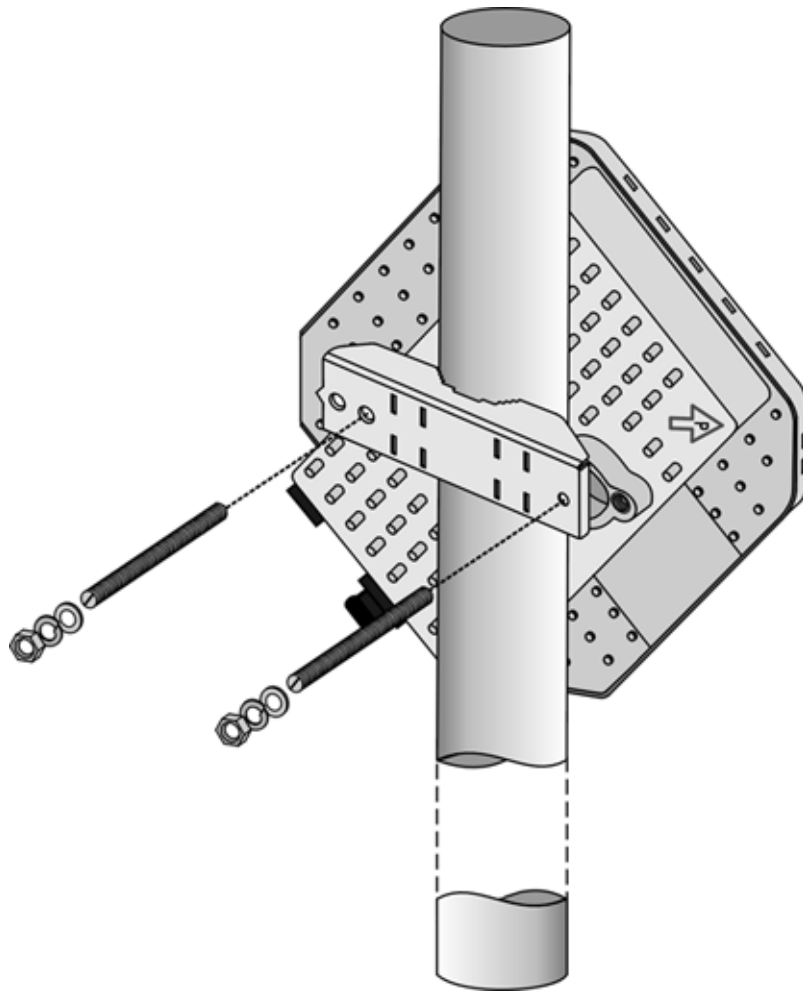
Figure 2-2: ODU Pole Installation Using the Special Clamp, Arrow Facing Rightwards

2.1.4.2   Pole Mounting the ODU with the Tilt Accessory
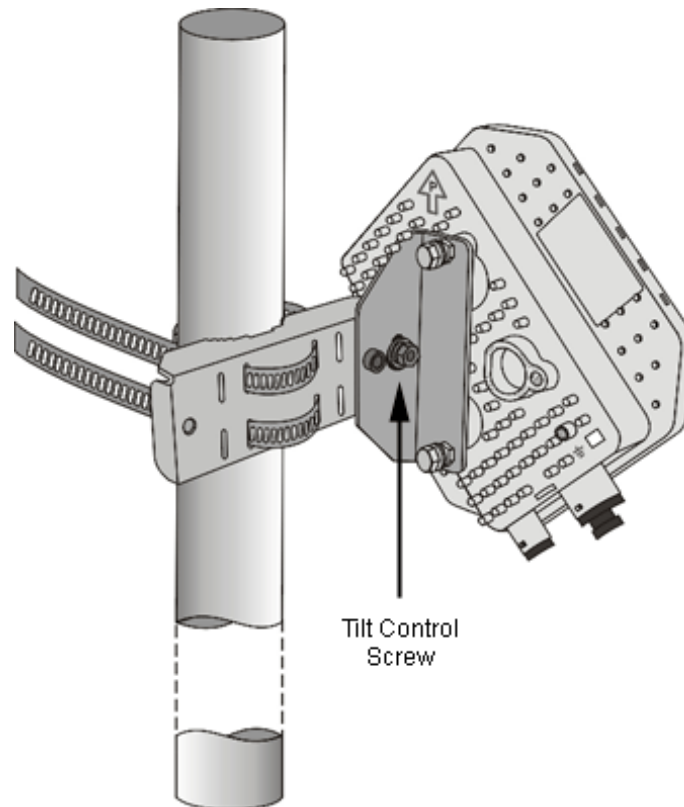
Figure 2-3: ODU Pole Installation Using the Tilt Accessory, Vertical Polarization

➤ **To mount the ODU on a pole using the Tilt accessory:**

1 Attach the Tilt accessory to the ODU using the two pairs of flat washers, spring washers and nuts supplied in the Tilt kit.

2 Mount the Tilt accessory on a 1" to 4" pole using two 9/16" metal bands.

3 Release slightly the Tilt Control Screw, tilt the ODU downward/upward as required, and re-tighten the screw.

2.1.5   Connectors
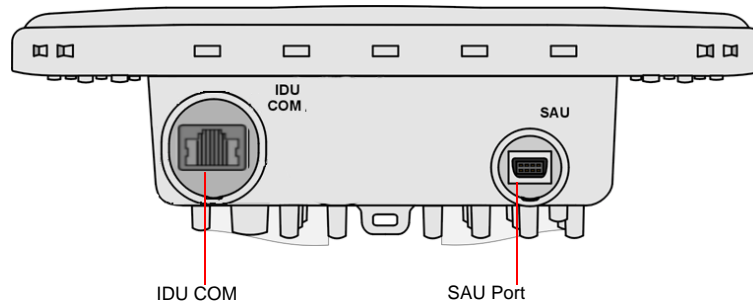
Figure 2-4: Bottom Panel of the ODU (SA/SE model without sealing covers)
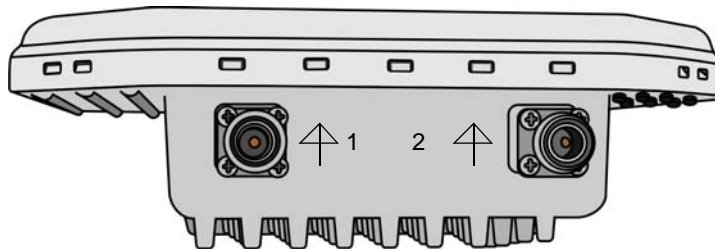
Figure 2-5: Top Panel of the ODU (SE model)

Table 2-2: CPE-ODU-PRO Connectors

Name	Connector	Functionality
IDU COM	10/100Base-T (RJ-45)	Connection to the IDU
SAU	Special mini USB	Connection to SAU
⟰ (ANT, only in SE model) x2	N-Type jack, 50 Ohm	Connection to an external antenna

2.1.6   Connecting the Cables

2.1.6.1   Connecting the Grounding Cable

The Grounding screw (marked ⏚) is located on the back panel of the ODU (see Figure 2-1).

To connect the grounding cable:

1   Connect one end of a grounding cable to the grounding screw and tighten the grounding screw firmly.

2 Connect the other end of the grounding cable to a good ground (earth) connection.

2.1.6.2   Connecting the IDU-ODU Cable

CAUTION

Use only Category 5E 4x2x24# FTP outdoor cables from an approved manufacturer. See list of approved cables in Table 2-1.The length of the Indoor-to-Outdoor cable should not exceed 90 meters. The length of the Indoor-to-Outdoor cable, together with the length of the Ethernet cable connecting the CPE-IDU-1D to the data equipment, should not exceed 100 meters.

To prepare the IDU-ODU cable:

Use a crimp tool for RJ-45 connectors to prepare the wires. Insert them into the appropriate pins and use the tool to crimp the connector. Make sure to do the following:

■ Remove as small a length as possible of the external jacket. Verify that the external jacket is well inside the sealing cover when connected to the unit, to ensure good sealing.

■ Pull back the shield drain wire before inserting the cable into the RJ-45 connector, to ensure a good connection with the connector's shield after crimping.

The IDU-ODU cable provides pin-to-pin connection on both ends.

The following figure shows the required wire pair connections.
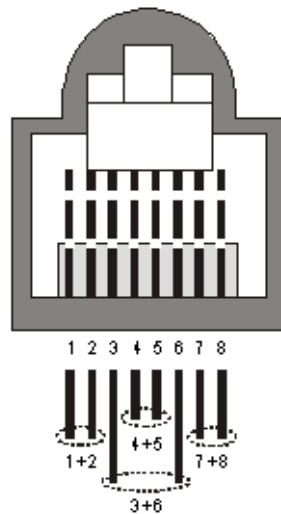
Figure 2-6: Ethernet Connector Pin Assignments

Data pairs are 1&2, 3&6.

Power pair (proprietary solution) is 4&5.

The color codes used in standard cables supplied by Alvarion are as listed in the following table:

Table 2-3: Cable Color Codes

Wire color	Pin
Blue	1
Blue/white	2
Orange	3
Orange/white	6
Brown	4
Brown/white	5
Green	7
Green/white	8

➤ **To connect the IDU-ODU cable:**

1   The seal has a special groove allowing to insert an ethernet cable with an already assembled RJ-45 connector. Strip the cable sheath and crimp the RJ-45 plug.

2 Insert the cable with the assembled connector through the sealing nut.

3 To expose the groove, lightly squeeze the seal. Carefully insert the cable through the groove.

4 Insert the cable through the housing and insert the seal at the back end of the housing.

5 Tighten the sealing nut onto the housing.

6 Stricken the gasket on the front end of the housing.
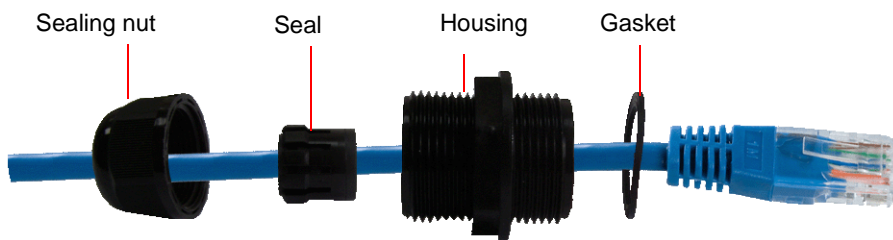
Figure 2-7: Inserting the IDU COM Cable into the Sealing Cap

7 Connect the Ethernet cable to the IDU COM RJ-45 connector and tighten the sealing cap.

8 Route the cable to the location selected for the indoor equipment.

9 Assemble an RJ-45 connector with a protective cover on the indoor end of the IDU-ODU cable. Refer to the pin assignment and color codes in standard cables described above.

2.1.6.3   Connecting the Antenna Cable (units with external antenna)

To connect the RF cable:

1 Mount the antenna as close as possible to the ODU.

2 Connect one end of the coaxial RF cable to the RF connector (marked) located at the top panel of the unit (see Figure 2-5).

3 Connect the other end of the RF cable to the antenna.

4 The RF connectors should be properly sealed to protect against rain and moisture.

2.2   Installing the IDU-1D Indoor Unit of the CPE

2.2.1   Installation Requirements

2.2.1.1   Packing List

■ BMAX-CPE-IDU-1D or XTRM-SU-IDU-1D

■ Wall mounting kit

2.2.1.2   Additional Installation Requirements

■ Ethernet cable(s): a crossed cable if connecting to a hub/switch and a straight cable if connecting directly to a PC Network Interface Card (NIC).

> **NOTE**
>
> The length of the Ethernet cable connecting CPE-IDU-1D to the user's equipment, together with the length of the IDU-ODU cable, should not exceed 100 meters.

■ Mains power cord

■ Mains plug adapter or termination plug (if the power plug on the supplied AC power cord does not fit local power outlets).

■ For configuring parameters: a Portable PC/Notebook and a straight Ethernet cable for configuring parameters using a web browser.

■ Other installation tools and materials (a drill for wall-mounting the unit, means for securing cables to walls, etc.)

2.2.2   Location

The unit can be placed on a desktop or a shelf. Alternatively, it can be wall-mounted using the mounting kit and guidelines supplied with the unit.

2.2.3   IDU Connectors and LEDs

2.2.3.1   CPE IDU-1D Connectors and LEDs
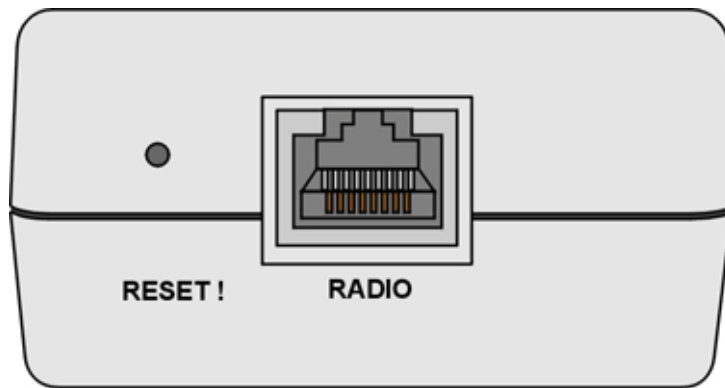
Figure 2-8: CPE-IDU-1D Front Panel
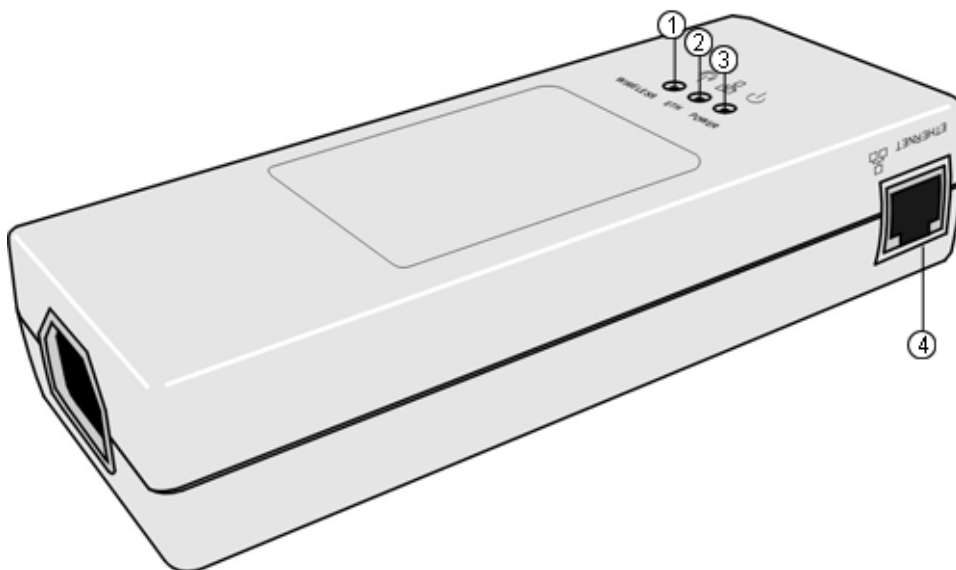
Figure 2-9: CPE-IDU-1D 3D View

Table 2-4: CPE-IDU-1D Connectors

Name	Connector	Functionality
ETHERNET (4) (on the side panel)	10/100Base-T (RJ-45) with 2 embedded LEDs	Connection to the user's LAN/PC Cable connection to a hub/switch/router: Crossed Cable connection to a PC: Straight

Table 2-4: CPE-IDU-1D Connectors

Name	Connector	Functionality
RADIO (on the front panel)	10/100Base-T (RJ-45)	Connection to the ODU
POWER (on the bottom panel)	3-pin AC	Mains power connection

Table 2-5: CPE-IDU-1D LEDs

Name	Description	Functionality
POWER (3)	Power Indication	■ Off - IDU is not powered or power failed ■ Green - IDU power is OK
ETH (2)	Ethernet link status (Ethernet integrity)	■ Off - No Ethernet connectivity has been detected between the outdoor unit and the device connected to the indoor unit's data port ■ Green - Ethernet connectivity has been detected between the outdoor unit and the device connected to the indoor unit's data port
WIRELESS (1)	Wireless link status	■ Off - SU is not associated with a BS ■ Green - SU is connected with a BS (network entry completed) ■ Blinking Green - Authentication failed

* After power-up, the WIRELESS LED illuminates until self-test is finished.

The CPE IDU-1D includes a recessed RESET button located on the front panel of the unit. When pressed, power to the ODU is disconnected (hard reset).

2.2.3.2   XTRM-SU-IDU-1D Connectors and LEDs

Figure 2-10: XTRM-SU-IDU-1D

Table 2-6: XTRM-SU-IDU-1D Connectors

Name	Connector	Functionality
LAN	10/100Base-T (RJ-45) with 2 embedded LEDs	Connection to the user's LAN/PC Cable connection to a hub/switch/router: Crossed Cable connection to a PC: Straight
LAN+DC	10/100Base-T (RJ-45)	Connection to the ODU
POWER	3-pin AC	Mains power connection

Table 2-7: XTRM-SU-IDU-1D LED

Name	Description	Functionality
POWER	Power Indication	■ Off - IDU is not powered or power failed ■ Green - IDU power is OK

2.2.4   IDU Installation

To install the IDU:

1   It is assumed that the IDU-ODU cable is already connected to the ODU. Assemble an RJ-45 connector with a protective cover on the indoor end of the IDU-ODU cable. Refer to Section 2.1.6.2 for instructions on preparing the cable.

2 Connect the IDU-ODU cable to the RADIO/LAN+DC connector (See Figure 2-8 and Figure 2-10).

CAUTION

Do not connect the data equipment to the RADIO/LAN+DC port. The RADIO/LAN+DC port supplies DC power to the ODU, and this may harm other equipment connected to it.

3 Connect the power cord to the unit's AC socket, located on the rear panel. Connect the other end of the power cord to the AC mains after verifying that the unit is rated for the voltage in the country of use; the AC range is indicated on the back side of the CPE-IDU-1D.

NOTE

The color codes of the power cable are as follows:

Brown	Phase	~
Blue	Neutral	0
Yellow/Green	Ground	⏚

4 To comply with safety regulations, the shield of the ODU-IDU outdoor-rated Ethernet cable must be connected to protective ground (earth). The grounding point can be either inside the building, or immediately at the entry point to the building, depending on where a protective ground is available. See "Grounding the ODU-IDU Cable" on page 28.

CAUTION

Grounding the ODU-IDU Ethernet cable must be performed by a professional installer in conformance with local safety regulations.

5 Verify that the POWER LED located on the front panel is lit, indicating that the unit is supplying power to the radio port.

6 Configure the basic parameters and align the antenna as described in the applicable sections of Chapter 3.

7 Connect the 10/100 Base-T ETHERNET connector(s) to the data equipment. The cable connection should be a crossed Ethernet if connecting to a hub/switch and a straight cable if connecting directly to a PC Network Interface Card (NIC).

NOTE

The length of the Ethernet cable connecting CPE-IDU-1D to the user's equipment, together with the length of the IDU-ODU cable, should not exceed 100 meters.

8 Verify proper operation as described in the applicable section of Chapter 3.

2.2.5   Grounding the ODU-IDU Cable

Follow the instructions below to ground the ODU-IDU cable. The following paragraphs describe one method for grounding the outdoor-rated Category 5E Ethernet cable through its drain wire. The actual connection method employed is left to the professional installer.

To ground the ODU-IDU Ethernet cable, follow these steps:

1 Strip back about a one inch (2.4 cm) section of the Ethernet cable jacket to expose the drain wire.
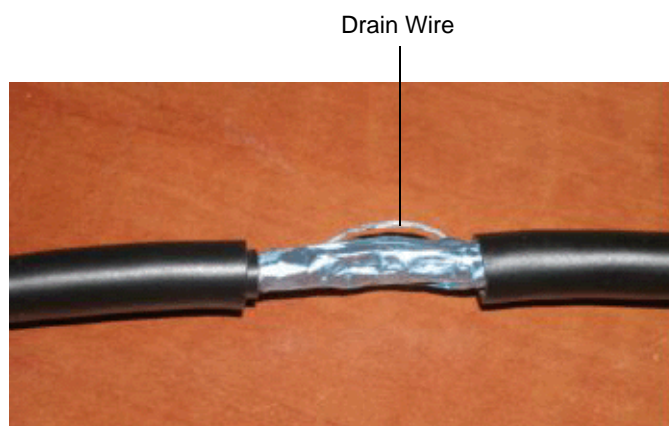
Drain Wire

Figure 2-11: Exposing the Drain Wire

2 Attach a grounding cable to the drain wire and then connect it to protective earth.

3 Use weatherproof tape to cover and seal the attachment area on the Ethernet cable.
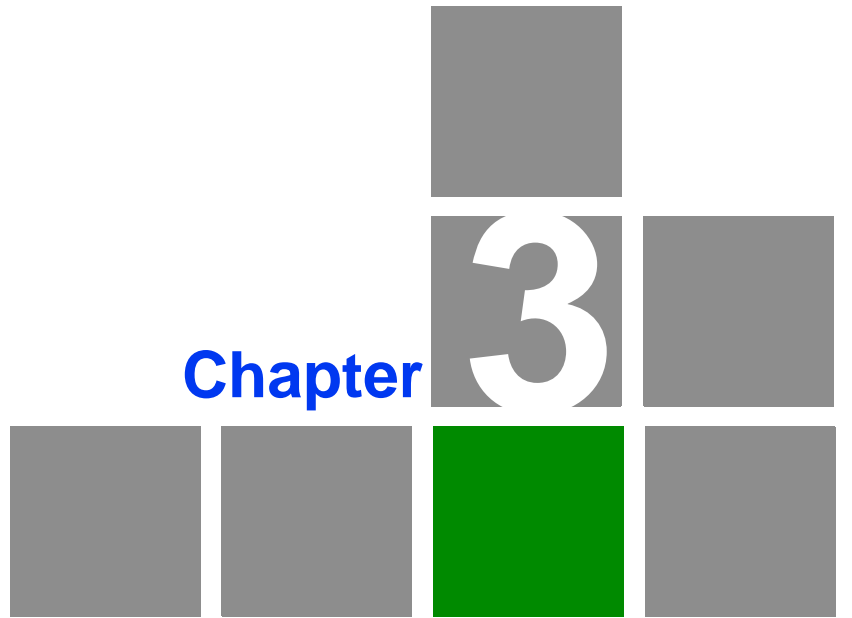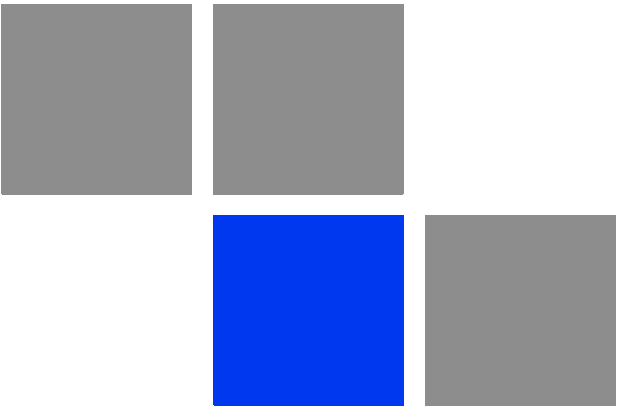
Chapter **3**

Commissioning

In This Chapter:

3.1   Commissioning Steps

After completing the installation process, as described in the preceding chapter, several actions should be performed to ensure connectivity with a BTS and provisioning of services. After the CPE is connected with a BTS, it can be fully managed via the wireless link:

1   The basic parameters must be configured to ensure that the unit operates correctly and can communicate with a BTS.

2   The antenna must be aligned to ensure optimal performance of the wireless link.

3   Proper operation should be verified, including data connectivity.

3.2   Configuring Basic Parameters

3.2.1   The Basic Parameters

Table 3-1: CPE Basic Parameters

Parameter	Default Value	Comment
Country Code		Must be set in accordance to designated country and deployment scenario
Ethernet Port auto Negotiation Enable/Disable	Enabled	
Ethernet Port Speed and Duplex		Applicable only if Ethernet Auto Negotiation Enable/Disable is set to Disable
User Name	CPEMACaddress@WiMax.com	Should be supplied by system administrator/operator
User Password	Empty	Should be supplied by system administrator/operator
Organization	Empty	
Address	Empty	
Country	Empty	
BST/AU ID	0.0.0.0.0.0	
BST/AU ID Mask	0.0.0.0.0.0	
Preferred BST/AU ID	0.0.0.0.0.0	
Preferred BST/AU ID Mask	0.0.0.0.0.0	
Bandwidth	Auto (5/10 MHz)	
Start Rx Frequency (KHz)	Depends on Radio Band and Bandwidth	
End Rx Frequency (KHz)	Depends on Radio Band and Bandwidth	
Scanning Main Step	2.5 MHz	
Discrete Scanning Frequencies	Null (empty list)	

NOTE

Most parameters are changed to their new values only after reset (refer to Section 4.14 for more details). Once the basic parameters are configured, the unit should be reset in order to activate the new configuration.

3.2.2   Configuration Tools

The CPEs include a Web Configuration Server, providing a web-based GUI for local configuration and monitoring. The Web Configuration Server can be accessed using a PC/Notebook with a web browser.

The CPE may be delivered with the operator's default settings already configured in the FLASH memory. The only parameters that should be configured (if necessary) are the end user's credentials (User Name and User Password).

3.2.3   Using the Web Configuration Server

To configure basic parameters:

1   Connect a PC/Notebook with a web browser to the Ethernet port of the CPE, using a straight Ethernet cable.

2   Configure the PC's IP parameters to enable connectivity with the unit. The IP address of the CPE for local management access is 192.168.254.251. The Subnet Mask is 255.255.255.0. The recommended IP address for the PC is 192.168.254.250, as this is also the default TFTP Sever IP Address (required for downloading SW versions and for downloading/uploading configuration files).

3   Open a web browser, and connect to http://192.168.254.251. The "Enter the Password" prompt is displayed. Enter the password and press the Enter key.

NOTE

The default password is "installer".

Please Enter Password
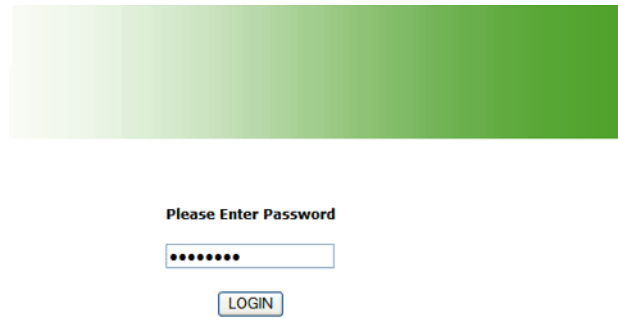
Figure 3-1: Login Window

4   The Main window of the Web Configuration Server is displayed, enabling access to the required parameters configuration and performance monitoring options. Refer to Chapter 4 for instructions on using the Web Configuration Server and detailed information on the various parameters and other features supported.

5   Configure the basic parameters listed in Table 3-1.

6   Reset the unit to apply the new settings and enable synchronization with a BS.

3.3   Aligning the PRO CPE's Internal Antenna

3.3.1   SU Alignment Unit (SAU)

The miniature SU Alignment Unit can be used during installation and testing to support an easy process of antenna alignment and provide the ODU's status indications.

To connect the SAU to the ODU:

1   Remove the sealing cap of the ODU's SAU connector.

2   Connect the cable attached to the SAU to the SAU connector.

3   After completing the installation, disconnect the cable and replace the cap.

Use appropriate sealing material to protect the connection against moisture and humidity. Use removable sealing material, such as a tar seal, to enable future access to the connector.
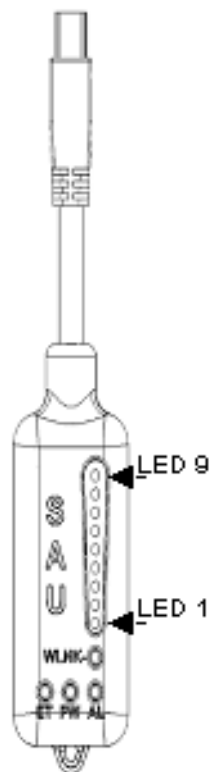
Figure 3-2: SAU

Table 3-2: SAU LEDs

Name	Description	Functionality
AL	Alarm indication	■ Off - ODU is OK, diagnostic test passed ■ Red - ODU failure
PW	Power indication	■ Off - ODU is not powered or 3.3 VDC failure ■ Green - ODU power to SAU is OK
ET	Ethernet link status indication (Ethernet integrity)	■ Off - No Ethernet connectivity has been detected between the outdoor unit and the device connected to the indoor unit's Ethernet port ■ Green- Ethernet connectivity has been detected between the outdoor unit and the device connected to the indoor unit's Ethernet port
WLNK	Wireless link status indication	■ Off - The SU is not connected with a BS ■ Orange on - The SU is connected with and receives services from the BS (Network Entry completed). Link Quality is indicated by LEDs 1-9 as described in Table 3-3. below. ■ Blinking orange - Authentication failed (LEDs 6, 7 and 8 on)

* After power-up of the ODU, all LEDs illuminate until self-test has completed.

Table 3-3: SAU LINK QUALITY LEDs Functionality

Bar LEDs	SNR
LED 1 (green) is On	Wireless link is established.
LED 2 (green) is On	5dB ≤ SNR < 9dB
LEDs 2-3 (green) are On	10dB ≤ SNR < 14dB
LEDs 2-4 (green) are On	15dB ≤ SNR < 19dB
LEDs 2-5 (green) are On	20dB ≤ SNR < 23dB
LEDs 2-6 (green) are On	SNR ≥ 24dB and RSSI < -72dBm
LEDs 2-7 (green) are On	SNR ≥ 24dB and RSSI ≥ -72dBm
LEDs 2-8 (green) are On	SNR ≥ 24dB and RSSI ≥ -69dBm
LEDs 2-9 (green) are On	SNR ≥ 24dB and RSSI ≥ -60dBm

Table 3-3: SAU LINK QUALITY LEDs Functionality (Continued)

Bar LEDs	SNR
LEDs 2-10 (green) and 9 (red) are On	RSSI $\geq$ -21dBm (saturation)
LEDs 2-10 Blinking one after the other	During full frequency scan
LEDs 2-10 Blinking as follows: LED 6 lights, after 200ms LEDs 7 & 5 light, after 200ms LEDs 8 & 4 light, after 200ms LEDs 9 & 3 light, after 200ms LEDs 10 & 2 light, after 200ms all the LEDs are extinguished and then the sequence is repeated.	During Best AU selection process or short scan

3.3.2   Using SAU for Aligning the PRO CPE's Antenna

The LINK QUALITY bar display on the SAU comprises 9 LEDs:

■ The WLNK LED indicates that the wireless link is active, and is lit when the CPE has completed the Network Entry process.

■ LEDs 1 to 8 (green) and 9 (red) indicate the quality of the received signal. The higher the number of LEDs illuminating, the better the quality of the received signal.

■ If all LEDs, including LED 9 (red) are on, the received signal strength is too high. This must be avoided, preferably by up-tilting the antenna. As a rule of thumb, if the CPE is located at a distance of less than 300 meters from the BTS, it is recommended to up-tilt the antenna by approximately 10° to 15°.

To align the internal antenna using SAU:

1 Point the antenna toward the general direction of the BTS.

2 Connect the SAU to the ODU.

3 Verify that the PWR (power) indication on the SAU is on.

4 Verify that the WLNK LED indicator is on, indicating that the unit is synchronized with a BS. If the CPE is not synchronized with a BS, ensure that all parameters are configured properly. If the unit is still not synchronized with a BS, improve the quality of the link by changing the direction of the antenna or by placing the antenna at a higher point or in an alternate location.

5 Rotate (and/or tilt if applicable) the ODU until the maximum link quality reading is achieved. If you encounter prolonged difficulty in achieving the expected link quality, try to improve the reception quality by placing the ODU at a higher point or in an alternate location.

NOTE

Ensure that the front of the antenna is always facing the BTS. However, in certain conditions, such as when the line of sight to the BTS is hampered, better reception may be achieved using a reflected signal. In this case, the antenna is not necessarily directed toward the BTS.

6 Secure the ODU firmly to the pole.

3.4 Aligning the PRO CPE's External Antenna

In order to achieve better link quality in units with external antenna, use the following steps to align the external antenna rather than the CPE itself.

To align the external antenna:

1   Verify that the the unit is synchronized with a Base Station and ensure that all parameters are configured properly. If the unit is still not synchronized with a Base Station, improve the quality of the link by changing the direction of the antenna or by placing the antenna at a higher or in an alternate location.

2   Rotate (and/or tilt if applicable) the ODU/antenna until the maximum link quality (SNR and RSSI) reading is achieved. If you encounter prolonged difficulty in achieving the expected link quality, try to improve the reception quality by placing the antenna at a higher point or in an alternate location.

NOTE

Ensure that the front of the antenna is always facing the Base Station. However, in certain conditions, such as when the line of sight to the Base Station is hampered, better reception may be achieved using a reflected signal. In this case, the antenna is not necessarily directed toward the Base Station.

3   Secure the ODU/antenna firmly to the pole.

CAUTION

In some cases, the antenna may need to be tilted to ensure that the level at which the CPE receives transmissions from the BTS (and vice versa) is not too high. When the RSSI reading is higher than -20 dBm, the received signal level is too high (saturation). This must be avoided, preferably by up-tilting the antenna. As a rule of thumb, if the CPE is located at a distance of less than 300 meters from the BTS, it is recommended to up-tilt the antenna by approximately 10° to 15°.

3.5   Operation Verification

To verify proper operation of the PRO CPE, examine the LED indicators on the IDU (see Table 2-5) and the SAU (see Table 3-2).
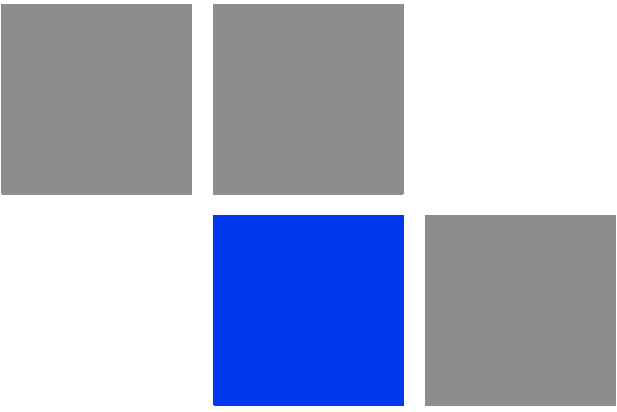
NOTE

Verifying the correct operation of the ODU using the SAU LEDs is meaningful only after the configuration and alignment processes are completed, and the unit is synchronized with a BS.

To verify proper connection to the end-user's data equipment, examine the Ethernet Integrity and Ethernet Activity LEDs of the Ethernet connectors.

To verify data connectivity, from the end-user's PC or from a portable PC connected to the unit, ping a known device in the network, or connect to the Internet.

Chapter 4

Operation

In This Chapter:

4.1   Introduction to CPE Management

The units support the TR-069 CPE WAN Management Protocol (CWMP), allowing efficient management by an Auto Configuration Server (ACS).

In addition, configuration and performance monitoring of a single unit can be performed either locally (via the Ethernet port) or remotely using any of the following options:

■ Using a PC/Notebook with an http browser to access the built-in web configuration server.

■ Using TFTP to upload/download a Configuration File.

For local management, the management IP address is 192.168.254.251 with subnet mask 255.255.255.0.

Remote (over the air) management is done using a WAN management IP address acquired from a DHCP server as a part of the Network Entry process. The DHCP server should supply also the IP address of the ACS management station. In the uplink, the DSCP value of management packets sent by the unit can be configured only by the remote management system using TR-069 (the default value is 6).

The Web Configuration Server enables the configuration of all CPE parameters using a Notebook/PC with a web browser. It also enables downloading of SW files, control of the running SW version, and downloading/uploading of the configuration file, enabling simplified and faster configuration process.

The Web Configuration Server also provides a selection of performance monitoring capabilities, allowing installers and technicians to view information on link quality and traffic counters. These monitoring capabilities enable performance verification and problems identification.

To further support local testing, the program also enables temporary control of the ATPC mechanism.

4.2   Accessing the Web Configuration Server

To configure parameters using the Web Configuration Server, connect a PC/Notebook with a web browser to the Ethernet port of the IDU, using a straight Ethernet cable.

1   Configure the PC's IP parameters to enable connectivity with the unit. The IP address of the CPE for local management access is 192.168.254.251. The Subnet Mask is 255.255.255.0. The recommended IP address for the PC is 192.168.254.250, as this is also the default TFTP Sever IP Address (required for downloading SW versions and for downloading/uploading configuration files).

2   Open a web browser, and connect to http://192.168.254.251. The Enter Network Password window is displayed. Enter the Username and password and click OK.

NOTE

The default password is "installer".

3   The Main window of the Web Configuration Server is displayed, enabling access to the required parameters configuration and performance monitoring options.
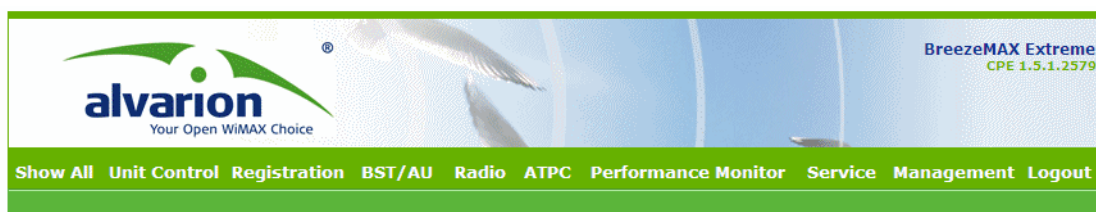
Figure 4-1: Web Configuration Server - Main Window

4.3   Using the Web Configuration Server

The Web Configuration Server view when using a Notebook/PC consists of a number of menu links (to the left). Clicking on each of them will display the configuration/status page for the selected menu item, with the applicable content (configurable parameters/options or status information) in the main area.

Several pages include a page selection bar at the top of the page, enabling selection between several pages related to the same menu item.

Several pages include a Current Parameters area and a Configured Parameters area. The Current Parameters area displays the current unit's settings. To change the settings of the parameters, enter the new settings in the configuration field and click the Update/Apply button. The change will appear in the Configured Parameters area and will take effect after performing reset to the unit.

The Web Configuration Server includes the following Menus:

■ "Show All" on page 46

■ "Unit Control Parameters" on page 47

■ "Registration Parameters" on page 59

■ "BST/AU Parameters" on page 63

■ "Radio Parameters" on page 67

■ "ATPC Parameters" on page 72

■ "Performance Monitor" on page 76

■ "Service Parameters" on page 79

■ "Management Parameters" on page 82

■ "Logout" on page 84

4.4   Show All

The Show All page enables viewing all the configurable parameters of the unit. In addition, the displayed information includes the general hardware and software properties of the units and relevant status details.

The display includes all the items available upon selecting the Show option for specific groups of parameters.

4.5   Unit Control Parameters

The Unit Control menu includes the following options:

■ Show

■ Reset Unit

■ Change Password

■ SW Versions Control

■ Configuration Control

■ Ethernet Operation (Op) Mode

4.5.1   Show

Select this option to view the current values/selected option of applicable parameters as well as general status information, as follows:

■ HW Details

» CPE Type: CPE Pro SQ

» CPE Family: Describes the primary chipset of the CPE: Sequans

» Serial Number: Describes the serial number of the CPE unit. This number can be used to determine the identity of the subscriber unit by the BTS operator.

» MAC Address: This is the unit's LAN MAC address. The WAN MAC address is the displayed address +1.

» MAC Address Control Number (a number computed from the MAC Address that can be used for verification purposes)

» Radio Band: Describes the radio band in use (currently only 5 GHz).

» HW Version: The version of the digital module

» HW Configuration

» RF Version: The version of the radio module.

» CPE Interface Type: 1D (one data port)

» Radio Type: the receive (Rx) and transmit (Tx) capacity of the radio. 1R/1T
- one receive (Rx) and one transmit (Tx).

» Antenna Type: Dual slant antenna (embedded)

■ Ethernet Port Operation Mode parameters and status:

» Ethernet Port Auto Negotiation Mode: Enable/Disable

» Ethernet Port Speed and Duplex

» Ethernet Down Timeout: Duration (in seconds) after which the system is
up again.

■ Operation Mode:

» IP CS - transparent delivery of IPv4 packets

» ETH CS transparent delivery of tagged 802.3 packets over Ethernet

■ Unit Status: the connectivity status of the unit. Possible statuses are:

» Searching for Base Station

» Base station found

» Not Authorized

» Not Registered

» Registered

■ SW Versions:

» SW Boot Version

» Main SW File Name

» Main SW Version

» Shadow SW File Name

» Shadow SW Version

» Running from: Main or Shadow

■ Upload/Download Parameters:

» Local TFTP Server IP address: the IP address of the TFTP server from the LAN side used for SW File/Configuration File download.

» Remote TFTP Server IP address: the IP address of the TFTP server from the WAN side used for SW File/Configuration File download.

» SW File Name: the name in the TFTP server of the SW version to be downloaded to the unit.

» Configuration File Upload Name: the name of the configuration file to be uploaded.

» Configuration File Download Name: the name of the configuration file to be downloaded.

4.5.2 Reset Unit
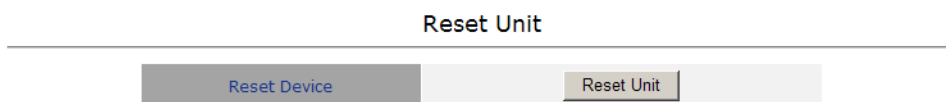
Figure 4-2: Reset Unit Page

The Reset Unit page enables to reset the unit. Click **Reset Unit**. To avoid unintentional reset, you will be prompted to confirm the reset request. Changes to most of the configurable parameters are applied only after reset. Refer to Section 4.14 for information on which parameters are changeable in run time and which changes are applied only after reset.

4.5.3   Change Password

Change Password

Old Password:	
New Password:	
Confirm New Password:	

Save New Password

Refresh

Figure 4-3: Change Password Page

The Change Password page enables to change the login password. Enter the old password, the new password and re-enter the new password for confirmation. Then click **Save New Password**.

Click **Refresh** to clear the fields.

NOTE

Notify the administrator of the new password!

Valid passwords: 1 to 20 printable characters, case sensitive.

Default password: installer

4.5.4   SW Versions Control

Figure 4-4: SW Versions Control Page

The CPE can contain two SW versions:

■ Main: Normally, each time the CPE resets it will reboot using the version defined as Main.

■ Shadow: Normally the Shadow version is the backup version. Each time a new SW File is downloaded to the CPE, it will be stored as a Shadow version, replacing the previous Shadow Version.

The typical process of upgrading to a new SW version includes the following steps:

1   Download the new SW file to the CPE. It will be stored as the Shadow version.

2   Reset and run the unit from its Shadow version. Note that if the new SW file was loaded from StarACS, the Run from Shadow operation will be performed automatically.

3   If the unit succeeded to complete network entry, the Shadow and Main versions will be swapped automatically: The currently running version will be defined as Main and will be used each time the unit reboots. The previous version is defined now as Shadow.

The CPE functions as a TFTP client, enabling the loading of SW files from a TFTP server.

The SW Versions Control submenu includes the following fields:

■ Main SW File Name: the name of the Main software file.

■ Main SW Version: the version of the Main software.

■ Shadow SW File Name: the name of the software file in the shadow.

■ Shadow SW Version: the version of the software in the shadow.

■ Running From: indicates whether the unit is currently running the Main or the Shadow version.

■ Local TFTP Server IP address: the IP address of the TFTP server from the LAN side used for SW version download. The default TFTP Server IP address is 192.168.254.250. You can enter a new TFTP Server IP address.

NOTE

The same TFTP Server IP Address parameter is used in the SW Download, Configuration File Download, Country Codes File Upload and Configuration File Upload processes.

■ Remote TFTP Server IP address: the IP address of the WAN TFTP server used for SW version download.

■ SW File Name: the name in the TFTP server of the SW version file to be downloaded to the unit.

The SW Versions Control submenu includes the following control buttons:

■ SW Download: click to execute the SW download operation. To avoid unintentional actions you will be prompted to confirm the request. To perform the SW download:

  1 The required SW file should be available in the TFTP Server directory in a PC connected to the unit.

  2 Typically it is recommended to configure the IP address of the PC to 192.168.154.250, which is the default TFTP Server IP address of the unit.

If a different IP address is configured in the PC with the TFTP, configure the TFTP Server IP Address to the same address.

3 Enter the name of the SW file (as called in the TFTP server) as the SW File Name.

4 Select Perform SW Download and confirm the download request. Wait to receive a success/failure message.

5 Following a successful download, the loaded SW version becomes the Shadow version in the unit.

■ Reset and Run from Shadow: select this option to reset the unit and run the Shadow version after power up. To avoid unintentional actions you will be prompted to confirm the request.

■ Set Running Version as Main: when the unit is running the Shadow version (after selecting Reset and Run from Shadow) without succeeding to complete network entry, the versions will not be swapped and the unit will boot from the Main version after the next reset. Select this option if you want to swap versions so that the running version will become the Main version and will be the version to be used after reset. To avoid unintentional actions you will be prompted to confirm the request.

■ Refresh: select this option to clear the fields.

4.5.5   Configuration Control

Figure 4-5: Configuration Control Page

The Configuration Control submenu enables to define parameters related to uploading/downloading of configuration files to/from the CPE, and to initiate the upload/download operation. This submenu also enables downloading of a country codes file (always named *country_codes.xml*). The Configuration Control page includes the following fields:

■ Configuration Upload File Name: enter the name in the TFTP server directory of the configuration file or country code file to be uploaded. A Configuration File Upload name consists of up to 50 characters. The default Configuration File Upload name is *SU_UPLOAD_CFG*. The country code file name is *country_codes.xml*. See also .

■ Configuration Download File Name: enter the name in the TFTP server of the required configuration file. A Configuration File Download Name consists of up to 50 characters. The default Configuration File Download Name is *SU_DOWNLOAD_CFG*.

■ Local TFTP Server IP Address: enter the IP address of the LAN TFTP server. The default TFTP Server IP address is 192.168.254.250.

NOTE

The same TFTP Server IP Address parameter is used in the SW Download, Configuration File Download and Configuration File Upload processes.

■ Remote TFTP Server IP Address: enter the IP address of the WAN TFTP server. The default TFTP Server IP address is 192.168.254.250.

■ Choose Upload/Download Action: select the action to perform, either upload or download.

To perform configuration file or country code upload:

1 Typically it is recommended to configure the IP address of the PC to 192.168.254.250, which is the default TFTP Server IP address of the unit. If a different IP address is configured in the PC with the TFTP server, configure the TFTP Server IP address to the same address.

2 Enter the name of the configuration/country code file (as will appear in the TFTP server) in the Configuration File Upload Name.

3 Select Upload in the Choose Upload/Download Action field.

4 Click Perform Action. Confirm the upload request and wait to receive a success/failure message.

To perform configuration or country code file download:

1 Check that the required file is available in the TFTP Server directory in a PC connected to the unit.

2 Typically it is recommended to configure the IP address of the PC to 192.168.154.250, which is the default TFTP Server IP address of the unit. If a different IP address is configured in the PC with the TFTP server, configure the TFTP Server IP address to the same address.

3 Enter the name of the configuration file (as called in the TFTP server), or country code file (as provided by 4Motion) as the Configuration File Download Name.

4 Select Download in the Choose Upload/Download Action field.

5 Click Perform Action. Confirm the download request and wait to receive a success/failure message.

6 Following a successful download, reset the unit to apply the new configuration.

The Configuration Control page includes the following control buttons:

■ Perform Action: executes the upload/download action.

■ Refresh: clears the screen.

■ Set Factory Defaults: click to reset the unit and revert to the default configuration. To avoid unintentional actions you will be prompted to confirm the request. All parameters except the Password will revert to the factory default values.

4.5.6   Licences

Figure 4-6: License Control Page

Licence control enables loading licence files and view the license parameters.

By default the CPEs are limited from factory to 2 Mb capacity. You can increase the capacity to 6 Mb or to Unlimited by purchasing a license.

Following are the available licenses:

■ From 2 to Unlimited

■ From 2 to 6

■ From 6 to Unlimited

The License Control page includes the following fields/buttons:

■ License Download File Name - the name of the currently used *.*lic* file.

■ Local TFTP Server IP Address: enter the local TFTP server IP address from which to upload the license file.

■ Remote TFTP Server IP Address

■ Download Licence File: click to initiate the download procedure

■ License Files: list of the valid license files that are loaded to the unit

■ License Parameters: the Bandwidth accepted for the unit. In case of UNLIMITED the value is 0.

The license files can also be uploaded using the TR069 option. The license can be downloaded to the CPE just by using the SW Upgrade procedure, only that the file pointed at is a *.*lic* file. Refer to "SW Versions Control" on page 51.

4.5.7   Ethernet Operation (Op) Mode

The Ethernet Port control parameter enables viewing and defining the operation mode of the Ethernet port.

Ethernet Operational Mode Parameters and Status

Auto Negotiation Current	Enable
Speed & Duplex Current	100 Mbps Full duplex
Auto Negotiation Configured	○ Disable ◉ Enable
Speed & Duplex Configured	10 Mbps Half duplex ▾
Ethernet Down Timeout	3

Apply

Figure 4-7: Ethernet Operation Mode Page

The Ethernet Operation Mode page includes the following fields. The read-only fields display the current configured parameters. The configurable fields enable to set a different value for these parameters.

■ Auto Negotiation: enable/disable Auto Negotiation.

The default is Enable.

■ Speed and Duplex: If Auto Negotiation is set to Enable, this field is greyed out. If set to Disable, this parameters allows selecting one of the following options:

    » 10Mbps Half-Duplex

    » 10Mbps Full-Duplex

    » 100Mbps Half-Duplex

» 100Mbps Full-Duplex

■ Ethernet Down Timeout (applicable only in IP CS): Enables to configure Ethernet downtime, after which it will be up again. The range is from 3 seconds up to 100 seconds.

■ Click Apply to save the changes.

4.6   Registration Parameters

The Registration menu includes the following sub-menus:

■ Show

■ User Registration

4.6.1   Show

Select this submenu to view the registration parameters (excluding the User Password that is not shown for security reasons).

Show All parameters, Registration parameters

Configured User Name	0010E7415723@WiMax.com
Current User Name	0010E7415723@WiMax.com
Organization	
Address	
Country	
Authentication Type	EAP TTLS
Authentication Status	Not Operational

Refresh

Figure 4-8: Registration Show Page

■ User Name (Configured and Current): the name of the unit, to be used for service provisioning. Changes to the User Name parameter are applied only after reset. Therefore, the actual value may differ from the configured value. Both the actual and configured values are displayed.

■ Organization

■ Address

■ Country

■ Authentication Type: the method of authentication being used to secure the WiMAX connection.

■ Authentication Status: the status of the authentication:

» Rejected: the CPE's authentication request was rejected.

» Authenticated: the CPE is connected to the BTS.

» Not Operational: no BTS is found.

■ Click Refresh to update the information.

4.6.2   User Registration

Figure 4-9: User Registration Page

The Registration page enables to set the following parameters. After setting the parameters, click Apply. The changes are saved, and the Registration - Show page is displayed. A message that informs about rebooting the unit is also, so that the changes made will take effect.

■ User Name: consists of 1 to 32 printable characters, case sensitive.

The default User Name is<CPEMACaddress>@WiMax.com, where <CPEMACaddress> is the actual MAC of the unit. This is a mandatory parameter; the User Name must be defined during the installation process for proper authentication and service provisioning.

The new user name is applied only after rebooting the unit.

■ Password: the user password (for registration) consists of 1 up to 32 printable characters, case sensitive. The default password is "quickynikynyoky".

The new password is applied only after rebooting the unit.

■ Password Confirmation: re-enter the new password when defining one.

■ Organization: enter the name of the organization (customer) using the unit. This parameter is optional, and is intended for optional use by the Network Management System.

The Organization Name can include up to 32 printable characters.

■ Address: use this field to enter the location of the unit. This parameter is optional, and is intended for optional use by the Network Management System.

The Address can include up to 32 printable characters.

■ Country: use this field to enter the name of the country where the unit is located. This parameter is optional, and is intended for optional use by the Network Management System.

The Country name can include up to 12 printable characters.

■ Authentication: A security supplicant incorporated into the device supports Single EAP-TTLSv0 with MSCHAPv2 method according to RFC2759. The Authentication Mode allows enabling/disabling authentication using the security supplicant. The available options are:

   » Not Authenticated

   » EAP-TTLS

When EAP-TTLS is configured the CPE will use the configured User Name/Password with EAP-TTLS protocol for CPE Authentication by AAA. Over the air data is encrypted using AES-CCM128 as defined in IEEE.802.16-2005.

When Not Authenticated, the CPE will not execute the EAP-TTLS protocol and will be associated to the ASN GW in non authenticated mode. Over the air data will not be encrypted.

If the SBC negotiation shows that the connected BS is working in Not Authenticated mode, the CPE will change automatically to Not Authenticated

mode and will complete the network entry without EAP-TTLS authentication process.

The default is EAP-TTLS.

4.7   BST/AU Parameters

The quest for load sharing together with the desire to create best throughput conditions for the CPE created the need for the Best BS feature, to enable an CPE to connect to the best BS in its neighborhood.

The CPE scans a set of frequencies (see "Radio Parameters" on page 67) searching for BSs it can communicate with. Each BS in the network is configured with a unique BS ID. The BS ID parameters in the CPE define a set of BS IDs, and the CPE is allowed to communicate only with BSs whose BS ID is included in the BS IDs range defined by the applicable parameters. Each of the BSs with which the CPE can communicate (perform initial phase of network entry) is given a quality mark based on the quality of the signal at which it is received by the CPE. At the end of the scanning period, the CPE reaches a Best BS decision according to the information gathered. The BS with the highest quality mark is selected as the Best BS, and the CPE will immediately try to associate with it at the relevant frequency/bandwidth.

The range used for scanning is defined by the BS ID and BS ID Mask parameters. The initial range can be limited by defining a preferred range of BSs, and selecting the best BS in the preferred range. If no device is found in the preferred range, the CPE will scan the entire range.

A Mobility Mode parameter enables supporting optimal performance after loosing connectivity to the BS according to the expected mobility of the CPE: A Mobile CPE is expected to move among different BSs, while a Nomadic CPE is typically stationary although it may also be moved to the coverage area of a different BS.

If a Nomadic CPE loses communication with the selected BS, it will continue searching for it for 4 minutes. If not found within 4 minutes, the CPE will scan the frequencies from the discrete frequencies list and if it finds a preferred BS within these frequencies it will associate with it. If the CPE does not find any BS at this stage or cannot associate with any of the BSs found, it will move on to the Full Scan.

The same process will be executed also for a Mobile CPE.

The same process will be executed following a reset of the CPE, with the exception that the CPE retries connecting to the last connected BS for 2 minutes in case of reset in the following situations:

» BS is preferred

» Preferred mask is not set

In case of loosing the link connection, the CPE will:

» Wait 4 minutes if BS is preferred, or preferred mask is not set

» Go directly to scanning if BS is not preferred and mask is set

Figure 4-10: BST/AU Page

The BST/AU page includes the following parameters:

■ Best BST/AU Parameters and Best BST/AU Table:

» Configured Best BS ID: the configured Preferred BST/AU ID. Together with the BS ID Mask, it is used to define the range of BSs that can communicate with the unit.

The BS ID comprises 6 octets of up to 3 digits each, where the range of each group is 0 to 255.

The default BS ID is 0.0.0.0.0.0

» Current Best BS ID

» Selected Best BS ID

» Preferred Best BS ID

» Current Preferred BS ID

If a BS ID is set on the preferred BS and the mask is 255.255.255.255.255.255 and the CPE finds it in the discrete frequency list or in the full range, it will immediately connect to it.

■ Selected BST/AU Parameters:

» Selected BST/AU ID: The BST/AU ID to which the CPE is currently connected.

» Selected Rx Frequency: The Rx Frequency of the BTS to which the CPE is currently connected.

» Selected Best BS RSSI: The Rx RSSI of the BTS to which the CPE is currently connected.

» Selected Best BS SNR (dB): The Rx SNR of the BTS to which the CPE is currently connected.

» Selected BW: The bandwidth of the BTS to which the CPE is currently connected.

■ Best BST/AU Table: displays the following details for each of the BS(s) found during the scanning process:

» BS ID

» Rx Frequency (KHz)

» SNR (dB)

» RSSI (dBm)

» Bandwidth

■ BST/AU and Preferred BST/AU Parameters

» BST/AU ID

» BST/AU ID Mask

» Preferred BST/AU ID

» Preferred BST/AU ID Mask

» Mobility Mode: enables defining the expected mobility of the CPE: Nomadic or Mobile.

The default is Nomadic.

After configuring the parameters, click Apply to save your changes.

■ Preferred BS Loss - Timeout before trying to connect to a preferred BS. This value should vary between 30 minutes and 6 hours increasing dynamically by 30 minutes every time the timer expires, until reaching 6 hours.

» Min. Re-scan Timeout (min): (default 30)

» Max. Re-scan Timeout (min): (default 360)

After configuring the parameters, click Apply to save your changes.

4.8   Radio Parameters

The Radio Parameters page includes the following options:

■ Show

■ Frequency Scanning

■ Antenna Selection

4.8.1   Show

The Show page displays the Frequency and Bandwidth selected by the scanning mechanism.

Show All parameters, Radio parameters

Configured Bandwidth	5MHz (Auto)
Configured TX Antenna Selection	N/A
Configured RX Antenna Selection	N/A
Configured Rx Attenuator parameters	N/A
Current Bandwidth	5MHz (Auto)
Current TX Antenna Selection	N/A
Current RX Antenna Selection	N/A
Current Rx Attenuator parameters	N/A

Figure 4-11: Radio - Show Page

4.8.2   Frequency Scanning

The Frequency Scanning page enables viewing and updating the set of frequencies to be used during the scanning process. The list of frequencies that participate in the scanning process includes a set of frequencies belonging to the scanning range and/or a set of up to 10 discrete frequencies.

The scanning range is defined by Start Rx Frequency, End Rx Frequency, Scanning Main Step and Intermediate Steps. The set of frequencies to be scanned is defined as follows:

The "Main Frequencies" are defined by the Start Frequency and Main Step, using the formula $F(N) =$ Start Frequency $+ N*$Main Step;
$F(1) =$ Start Frequency $+$ Main Step, $F(2) =$ Start Frequency $+2*$Main Step,...
End Frequency is the upper limit.

The Intermediate Steps can be used to define additional frequencies using a finer resolution. The intermediate steps are defined as follows:

NOTE

In the current version, intermediate steps are disabled.

Table 4-1: Intermediate Steps

Step	Effect on scanned frequencies set when Step is Enabled
B0	Scan Start Frequency: Start Frequency is added to the set of "Main Frequencies"
B1	Intermediate Step=125 KHz: All intermediate frequencies defined by "Main Frequency" + 125 KHz are added to the scanning set
B2	Intermediate Step=250 KHz: All intermediate frequencies defined by "Main Frequency" + 250 KHz are added to the scanning set
B3	Intermediate Step=375 KHz: All intermediate frequencies defined by "Main Frequency" + 375 KHz are added to the scanning set
B4	Intermediate Step=500 KHz: All intermediate frequencies defined by "Main Frequency" + 500 KHz are added to the scanning set
B5	Intermediate Step=625 KHz: All intermediate frequencies defined by "Main Frequency" + 625 KHz are added to the scanning set
B6	Intermediate Step=750 KHz: All intermediate frequencies defined by "Main Frequency" + 750 KHz are added to the scanning set
B7	Intermediate Step=875/1250 KHz: All intermediate frequencies defined by "Main Frequency" + 1250 KHz are added to the scanning set.

For example, if steps B0, B1 and B4 are enabled and all other steps are disabled, the scanned frequencies are: Start Frequency, Start Frequency + 125 KHz, Start Frequency + 500 KHz, Start Frequency +N*Main Step, Start Frequency +N*Main Step + 125 KHz, Start Frequency +N*Main Step + 500 KHz (N=1, 2,...). End Frequency is the upper limit for the scanned frequencies.

In addition, the Discrete Frequencies option enables defining up to 10 discrete frequencies to be used in the scanning process in addition to the frequencies defined by the Frequency Scanning parameters.

Figure 4-12: Frequency Scanning Page

The Frequency Scanning menu includes the following fields:

◼ Scanning Table: displays the list of all current frequencies that participate in the full scanning process. Following the Full Scanning Table, the Best BS Scanning Table displays all the frequencies associated with BSs that are included in the current Best BS Table.

■ Start Rx Frequency (KHz): the lowest frequency in the range of frequencies to be scanned (in KHz).

The available values depend on the radio band of the unit.

■ End Rx Frequency (KHz): the highest frequency in the range of frequencies to be scanned (in KHz).

The available values depend on the radio band of the unit.

■ Scanning Main Step (MHz): the Main Scanning Step that together with the Intermediate Scanning Steps define the frequencies to be scanned between the Start and End Rx Frequencies.

The main steps can be 2.5 MHz or 5 MHz. The default is 2.5 MHz.

■ Scanning Intermediate Steps (KHz): the Intermediate Scanning Steps that together with the Main Scanning Step define the frequencies to be scanned between the Start and End Rx Frequencies.

The Intermediate Scanning Steps include 8 Steps that define the intermediate scanning steps as described above. The default is Enable for the B0 Start Frequency Scan.

NOTE

In the current version, intermediate steps are disabled.

■ Bandwidth: enables to select either a specific bandwidth (according to the options supported by the unit) or scan all supported bandwidths (Auto).

The default is Auto mode.

To change the bandwidth, select the required bandwidth from the list and click Apply.

■ Discrete Frequencies: enables editing the list of discrete frequencies that will be included in the Frequency Scanning Table. If no discrete frequency has been added, N/A will be displayed. To delete a discrete frequency from the list, first selecting the frequency to be deleted and click Delete select. The Delete select button is available only if at least one discrete frequency is added.

■ Delete All Discrete Frequencies: to delete all discrete frequencies, click on Delete All.

■ Discrete Scanning Frequencies: enables to enter discrete frequencies, as follows:

» Update List of Discrete Frequencies: Enter a list of up to 10 discrete frequencies in steps of 2.5MHz, separated by commas (no space). This list will replace the current list of discrete frequencies.

» Add One Discrete Frequency: Enter one frequency to be added to the current list of discrete frequencies.

■ Update Scanning Table: select this option to update the frequency scanning table in run time (without resetting the unit).

■ Clear Best BS Table: select this option to clear the current Best BS Table. Typically this should be done prior to initiating a full scanning process (see below).

■ Force Full Scanning: select this option to initiate a full scanning process. The BS table is cleared automatically.

4.8.3   Antenna Selection

Figure 4-13: Antenna Selection Page

The Antenna Selection page enables viewing the parameters of the integrated and external antennas. The following parameters are displayed:

■ Radio Status

■ Antenna Gain: enables configuration of the external antenna gain (shown only if the CPE is configured with an external antenna). Enter the gain value for the external antenna and click Apply. The message "Antenna Param Set, done!" is displayed. This operation requires a CPE reboot in order for the change to take effect.

4.9   ATPC Parameters

In regular operation, the level of the signal transmitted by the CPE is controlled by the Adaptive Transmission Power Control (ATPC) mechanism of the serving BS. The ATPC page enable temporary control of the signal transmitted by the CPE. It is intended for test purposes only.

These settings will not be saved and will automatically return to original values as received from the BS when the unit resets or upon closing the web interface.

The ATPC menu includes the following sub-menus:

■ Show

■ ATPC

4.9.1   Show

Select this option to view the current Multirate and ATPC parameters:

■ Last Tx Rate: the last detected transmission rate

■ Optimal Rx Rate: the transmission rate best suited to the connection

■ ATPC: The current status (Enabled/Disabled) of the ATPC mechanism

■ Tx Power: the transmission power level

■ Current Country Code Data: the country code that is currently used.

Show All parameters, ATPC

Last Tx Rate	qpsk-cc-1/2
Optimal Rx Rate	qpsk-cc-1/2
ATPC	Enable
Tx Power	0
Current Country Code Data	4.9 GHz Universal range=4900000-5900000, Max Power=21dBm(TX)

Figure 4-14: ATPC Show Page

4.9.2   ATPC

Figure 4-15: Multi rate and ATPC Parameters Page

From the ATPC page, you can enable/disable the ATPC mechanism and select your country code.

4.9.2.1   ATPC

To enable/disable the ATPC mechanism:

1   Select Disable to temporarily disable ATPC for testing purposes. You will be prompted to enter the requested Tx Power. The available range depends on unit type/radio band.

IMPORTANT

The maximum Tx power may vary depending on the country code applied and on applicable regulations.

The default Tx Power is the last power level used before the ATPC algorithm was disabled.

2   Click Apply.

3   Upon completing the test, enable ATPC to resume normal operation. If not enabled manually, ATPC will be enabled automatically after the next reset or when closing the web interface.

4.9.2.2   Country Codes

The country codes can be configured using two methods:

■ Selecting from a set of default country codes that appear in the ATPC window as described below.

■ Uploading a country codes file as described in the Configuration Control (see .

The Current Country Code Data field displays the country code that is currently used. After performing reset to the unit, the configured country code becomes the current country code.

The following are the available country codes:

Table 4-2: Country Codes

Country Code	Frequency Range (MHz)
4.9 GHz Universal	4900-5350
4.9 GHz FCC	4940-4990
4.9 GHz Japan A	4900-5000
4.9 GHz Japan B	5030-5091
5.3 GHz ETSI	5150-5350
5.2 GHz ETSI	5150-5350
5.2 GHz FCC	5150-5350
5.3 GHz FCC	5250-5350
5.1-5.3 GHz FCC	5150-5350
5.1 GHz FAA	5090-5150
5.4 GHz Universal	5470-5900
5.9 GHz Universal	5900-5950
5.4 GHz ETSI	5470-5725
5.8 GHz ETSI	5725-5875
5.4 GHz FCC	5470-5725
5.8 GHz FCC	5725-5875
5.4 GHz Australia A	5490-5585
5.4 GHz Australia B	5655-5725
5.8 GHz Australia	5730-5840
5.8 GHz UK	5725-5845

To select a country code:

IMPORTANT
The selected Country Code must comply with applicable local radio regulations.
The selected Country Code may affect the maximum Tx power and also the system performance.

Select the required country code from the list and reset the unit to apply the new country code.

4.10   Performance Monitor

The Performance Monitor Page enables viewing performance monitoring of link quality, and Ethernet counters, and enables to set the monitoring intervals. The CPE collects data on a regular basis and is able to deliver the data to the Access Control Server NMS (Network Management Station) upon request.

The Performance Monitor menu includes the following options:

■ Link Quality Counters Page

■ Ethernet Counters

4.10.1   Link Quality Counters Page

The Link Quality On-Line Display table displays read-only information related to the quality of the link between the CPE and the BTS. The display is updated every 2 seconds based on histograms/counters collected during this period.

Link Quality On-Line Display

Current Fec Code	qpsk-cc-1/2
CINR (dB)	0.00
CINRStd (dB)	0.00
CINR Reuse 1 (dB)	0.00
CINRStd Reuse 1 (dB)	0.00
CINR Reuse 3 (dB)	0.00
CINRStd Reuse 3 (dB)	0.00
RSSI (dBm)	0.00
RSSIStd (dB)	0.00
Last Tx power (dBm)	0.00
UL fec code	qpsk-cc-1/2

Figure 4-16: Link Quality On-line Display Page

The Link Quality Counters page displays the following counters:

■ Current Fec Code

■ CINR (dB): the average Carrier to Interference and Noise Ratio of the signal

■ CINRStd (dB)

■ CINR Reuse 1 (dB)

- CINRStd Reuse 1 (dB)

- CINR Reuse 3 (dB)

- CINRStd Reuse 3 (dB)

- RSSI

- RSSIStd

- Last Tx Power (dBm)

- UL Fec Code

4.10.2 Ethernet Counters

The Ethernet On-Line Counters page displays RX and Tx levels for the Ethernet connection.

Ethernet On-Line Counters

Rx LAN Port Bit Rate	0
Rx LAN Packet Rate	0
Tx LAN Port Bit Rate	0
Tx LAN Packet Rate	0
Rx LAN Port Total Bytes	97257
Rx LAN Port Total Packets	748
Tx LAN Port Total Bytes	445872
Tx LAN Port Total Packets	624
Rx WAN Port Bit Rate	0
Rx WAN Packet Rate	0
Tx WAN Port Bit Rate	0
Tx WAN Packet Rate	0

Figure 4-17: Ethernet Counters Page

The Ethernet On-Line Counters table displays a continuously updated list of the traffic counters. The display is updated every 2 seconds based on counters collected during this period. The displayed counters include the following for each port (LAN/WAN) and each direction (TX/RX):

- Bit Rate

- Packet Rate

■ Total Bytes

■ Total Packets

Rate counts are the average rate (Bytes/Packets per second) for the last measurement interval (2 seconds).

Total counts are the accumulated number of Bytes/Packets since the last unit reset or the last Counters Reset.

4.11   Service Parameters

The Service Parameters page enables viewing and setting the service related parameters configured via the BTS. To edit parameters, select the Change Service Parameters page.

Show All parameters, Service Parameters

Service Line Count	1
Operation Mode	IP CS
Access VLAN	4096

Service definition

Service ID	VLAN ID	VLAN Priority	DSCP Start Value	DSCP Stop Value	DSCP Marking	Access VLAN
1	Untagged	Untagged	0	63	Disable	4096

Refresh

Figure 4-18: Service Page - IP CS Mode (Show Parameters)

Change Service Parameters

Access VLAN	4096

Modify

Figure 4-19: Change Service Parameters - Ethernet CS Mode

> **NOTE**
>
> The Operation mode cannot be modified from the Change Service Parameters page.

The Service Parameters page displays the following:

For IP CS Mode:

■ Service Line Count: this is the number of configured services and corresponds to the number of service rules in the Service Definition table.

■ Operation Mode: displays the convergence sublayer (CS) in the wireless access network: IP CS (DSCP based classification) or Ethernet CS (VLAN based classification).

■ Service Definition table: displays the Service Rules to be used for handling the relevant classifiers (VLAN/DSCP) of packets processed by the units. For each service rule, the following parameters are displayed:

» Service ID: up to 8 non-overlapping Service Rules can be defined via the BTS.

» VLAN ID: from 0 to 4095

» VLAN Priority: from 0 to 7

» DSCP Start Value: from 0 to 63

» DSCP Stop Value: from 0 to 63

» DSCP Marking: Enabled/Disable:

» Access VLAN: From 0 to 4095 or 4096 (Transparent). Transparent is used to allow untagged packets.

When enabled, the DSCP value of a packet arriving from the Ethernet port must be 0 (otherwise it will be discarded). Before forwarding to the wireless port the 0 DSCP value will be replaced by the defined DSCP value and the VLAN tag will be removed. For packets with this DSCP value arriving from the wireless port, the defined VLAN tag will be added before forwarding it to the Ethernet port (without changing the DSCP value).

If DSCP Marking is disabled, a packet with the defined VLAN tag (VLAN ID and Priority) will be forwarded to the wireless port after removal of the VLAN tag. The DSCP value of these packets is the DSCP configured (the packet will be forwarded regardless of its DSCP value). For packets with the configured DSCP value arriving from the wireless port, the defined VLAN tag (VLAN ID and Priority) will be added before forwarding to the Ethernet port.

For Ethernet CS mode:

- ■ Access VLAN: From 0 to 4095 or 4096 (Transparent). Transparent is used to allow untagged packets. In the Change Service Parameters page, you can change the Access VLAN as required. Click Modify to apply the changes.

- ■ Operation Mode: displays the convergence sublayer (CS) in the wireless access network: IP CS (DSCP based classification) or Ethernet CS (VLAN based classification). The operation mode is detected automatically.

For additional information on service configuration, refer to the *BreezeMAX Extreme System Manual.*

4.12   Management Parameters

The Management Page enables viewing the parameters related to remote (over the air) management of the device, and configure the parameters of the DHCP client.

The Management Parameters menu includes the following options:

■   Management Parameters

■   DHCP Client Configuration

4.12.1 Management Parameters

Management Parameters

Factory Defaults DSCP Classifier	6
Actual used DSCP Classifier	6
Configured DSCP Classifier	6
Management IP address	10.11.12.13
eCPE Manager Server IP address	12.13.14.15
eCPE Manager Server connection status	Not Connected

Apply

Refresh

Figure 4-20: Management Page

The Management page enables viewing the parameters related to remote (over the air) management of the device and to set the DSCP classifier.

The following parameters are displayed:

■   Factory Defaults DSCP Classifier

■   Actual Used DSCP Classifier: the DSCP classifier used when the CPE is connected. When the CPE is not connected, the value is N/A.

■   Configured DSCP (to change, enter a value and click Apply). Range 0-63; Default 6

■   Management IP Address (acquired from a DHCP server during Network Entry)

■ eCPE Manager IP Address (acquired from a DHCP server, or Not Available)

■ eCPE Manager Connection Status (Up, Down or Not Connected)

4.12.2 DHCP Client Configuration

Dhcp Client	⦿ Enabled ○ Disabled
Client IP Address	10 . 11 . 12 . 13
Network Mask	255 . 0 . 0 . 0
Default Gateway IP Address	10 . 11 . 12 . 1
TR069 Server URL	http://AlvarionWiMAX-CPE

Apply

Refresh

Figure 4-21: Dhcp Client Configuration

The DHCP Client Configuration page enables viewing and updating the parameters of the DHCP client.

■ Dhcp Client

■ Client IP Address

■ Network Mask

■ Default Gateway IP Address

■ TR069 Server IP Address

By default, DHCP Client is enabled (IP address allocated by DHCP), therefore parameters cannot be modified.

To change the parameters in order to have static IP address for the CPE management, select the **Disable** option, modify the values and click **Apply**.

NOTE

The DHCP Client can be set to disable only in ETH-CS service

4.13   Logout

To log out, click on the Logout menu. The following window is displayed:
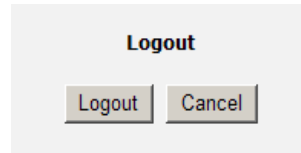
Figure 4-22: Logout Page

Click on the Logout button. The Login page is displayed.

4.14   Parameters Summary

Table 4-3: CPE Parameters Summary

Parameter	Range	Default	Run-Time Updated
Unit Control Parameters			
Password	Up to 20 printable characters, case sensitive	installer	No
Local TFTP Server IP Address	IP address	192.168.254.250	Yes
Configuration Upload File Name			
Configuration Download File Name			
Choose Upload/Download Action	■ Upload ■ Download	Upload	No
Licences	■ From 2 to Unlimited ■ From 2 to 6 ■ From 6 to Unlimited	Licence.lic	
SW File Name			Yes
Ethernet Port Auto Negotiation	■ Disable ■ Enable	Enable	No
Ethernet Port Speed and Duplex	■ 10Mbps Half-Duplex ■ 10Mbps Full-Duplex ■ 100Mbps Half-Duplex ■ 100Mbps Full-Duplex		No
Registration Parameters			
User Name	1 to 32 printable characters, case sensitive	<CPEMACaddress>@Wi Max.com	No
Password	1 to 32 printable characters, case sensitive	quickynikynyoky	No
Organization	Up to 32 printable characters		No
Address	Up to 32 printable characters		Yes

Table 4-3: CPE Parameters Summary

Parameter	Range	Default	Run-Time Updated
Country	Up to 12 printable characters		Yes
Authentication	■ Not Authenticated ■ EAP TTLS	EAP TTLS	Yes
BS ID Parameters			
BST/AU ID	6 octets of up to 3 digits each. Each group range is 0-255.	0.0.0.0.0.0	Yes
BST/AU ID Mask	6 octets of up to 3 digits each. Each group range is 0-255.	0.0.0.0.0.0	Yes
Preferred BST/AU ID	6 octets of up to 3 digits each. Each group range is 0-255.	0.0.0.0.0.0	Yes
Preferred BS ID Mask	6 octets of up to 3 digits each. Each group range is 0-255.	0.0.0.0.0.0	Yes
Mobility Mode	■ Nomadic ■ Mobile	Nomadic	Yes
Radio Parameters			
Start Rx Frequency (KHz)	Per country code Resolution for all bands is 0.125 MHz	Per country code	Yes (after Update Scanning Table)
End Rx Frequency (KHz)	Per country code Resolution for all bands is 0.125 MHz	Per country code	Yes (after Update Scanning Table)
Scanning Main Step (MHz)	■ 2.5 MHz ■ 5 MHz	2.5 MHz	Yes (after Update Scanning Table)
Set Bandwidth to Scan	■ 5 MHz ■ 10 MHz ■ Auto	Auto	Yes
Multirate and ATPC Parameters			
ATPC	■ Enable ■ Disable	Enable	Yes
Set Tx Power	-26 to 21	Last power used by ATPC	Yes

Table 4-3: CPE Parameters Summary

Parameter	Range	Default	Run-Time Updated
Management			
Configured DSCP Classifier	0-63	6	No
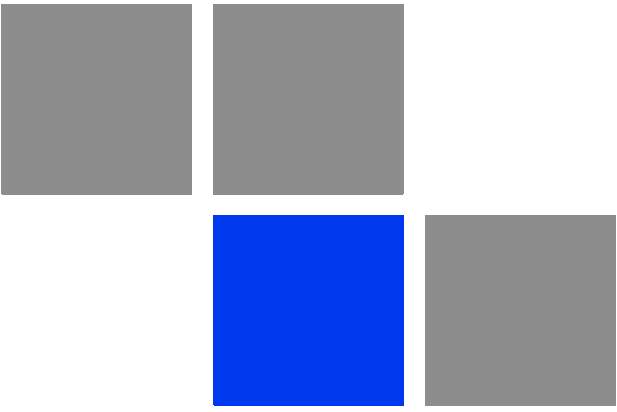
Troubleshooting

In This Appendix:

- ■ "CPE Troubleshooting" on page 90

A.1   CPE Troubleshooting

Refer to the BreezeMAX Troubleshooting Guide for additional information on troubleshooting.

Problem and Indication	Possible Cause	Corrective Action
Power Failure: None of the IDU LEDs illuminate after connecting to power	Mains power problem	Verify mains power availability on the power outlet to which the power supply is connected. Try using a different outlet.
	Mains power connection problem	Verify that the AC jack of the power cord is connected properly to the unit. Verify that the AC plug of the power cable is connected properly to the mains power outlet.
	Unit failure	Replace the IDU.
IDU-ODU connection problem: None of the SAU's indicators illuminate	IDU-ODU connection problem	Verify that the IDU-ODU cable is connected properly.
	Unit failure	Try replacing the IDU. If the problem persists, try replacing the IDU-ODU cable. If the problem persists, try replacing the ODU.
When connected to the data equipment, the Ethernet Integrity Indicator (green LED) is off, and/or the Ethernet Activity Indicator (yellow LED) does not blink when there should be traffic on the Ethernet port.	Wrong type of Ethernet cable or faulty cable.	If connected directly to PC-use a straight cable. Otherwise-use a crossed cable. If the problem persists, try replacing the cable. If a hub or switch is installed between the PC and the CPE, verify first the Ethernet connection integrity between the hub/switch and the PC by checking the Ethernet LEDs at the hub/switch and at the PC's NIC card. If not ok, try replacing the cable.
	IDU-ODU cable problem.	Verify that the IDU-ODU cable is in order and connected properly. Using SAU, verify that PWR LED is on and ALRM LED is off.
	Unit failure	Try replacing the IDU. If the problem persists, try replacing the IDU-ODU cable. If the problem persists, try replacing the ODU.

Problem and Indication	Possible Cause	Corrective Action
The Ethernet Activity and/or Integrity LEDs are on, but no management access using Telnet or web browser, and the unit does not respond to ping.	Wrong IP configuration	Make sure that the PC is on the same subnet as the unit. The unit's IP address for management purposes is 192.168.254.251, and the subnet mask is 255.255.255.0.
	Wrong Ethernet port operation mode	Make sure that the speed and duplex settings in the PC match the configuration in the unit. The default operation mode is Auto Negotiation, and supported speeds are 10/100 Mbps, Full or Half Duplex.
	ARP table in the PC contains a wrong MAC address for the 192.168.254.251 IP address (due to a recent connection to another CPE).	Perform arpV-d at the DOS command prompt to clear the ARP table, and retry the Telnet command to the unit.
	Bridging table in CPE is full (expected when Number of Supported Devices, configurable from the Base station's side, is set to a small number.	Reset the CPE to clear the table and retry the Telnet command to the unit.
Scanning failed and/or Base Station not found: None of the LINK QUALITY LEDs illuminate.	Configuration problem	Verify proper configuration of Frequency Scanning parameters. Verify proper configuration of BS ID parameters. If proper configuration parameters are not known, press the RESET button for more than 5 seconds to activate the factory default configuration
	Poor link quality	Try changing the location of the unit/antenna to improve link quality using the LINK QUALITY LEDs.
Signal is too strong:All LINK QUALITY LEDs, including the red LED are on	Signal is too strong-may cause saturation.	Change the location/direction of the unit/antenna to reduce signal strength using the LINK QUALITY LEDs.
Authentication Failure: LED 1 (orange) of the LINK QUALITY bar blinks.	Authentication problem	Enter User Name and User Password and reset the unit. If the problem persists, contact the operator.

Glossary

AAA	Authentication, Authorization, and Accounting (pronounced "triple a."). A system (or several systems) that controls what resources users have access to, and keeps track of the activity of users over the network.
ACS	Auto Configuration Server. A CPE management system supporting secure auto-configuration as well as other CPE management functions.
AES-CCM	Advanced Encryption Standard - Counter mode with Cipher-block chaining Message authentication code.

Counter mode with Cipher-block chaining Message authentication code (CCM) is an encryption protocol in the 802.11i standard. The CCM protocol (CCMP) is based upon the CCM mode of the AES encryption algorithm and utilizes 128-bit keys. |
APD	Automatic Platform Detection. A mechanism that dtects the wireless link protocol used by the Base Station, enabling automatic selection of the operation mode to be used Subscriber Unit.
ARP	Address Resolution Protocol. Internet protocol used to map an IP address to a MAC address. Defined in RFC 826
ATPC	Automatic Transmit Power Control
AWGN	Additive white Gaussian noise, also known as white noise, contains equal energy per frequency across the spectrum of the noise employed.
BPSK	Binary Phase-Shift Keying. A data transfer technique. BPSK transmits data using two phase modulation signals, one phase representing a binary one, and the other representing a binary zero. The signal is divided into bits; their status is determined by the preceding wave. If the wave changes, for example, the signal is reversed.
BS	Base Station. The WiMAX BS is an entity that implements the WiMAX MAC and PHY in compliance with the IEEE 802.16e standard. A BS operates on one frequency assignment, and incorporates scheduler functions for uplink and downlink resources.
BTS	Base Transceiver Station. A wireless network element that provides the radio interface of the network. The BTS comprises the radio transmission and reception devices, and also manages the signal processing related to the air interface.
BWA	Broadband Wireless Access
CF	Compact Flash. A popular memory card that uses flash memory to store data on a very small card.
CINR	Carrier-to-Interference plus Noise Ratio (expressed in dB)
CLI	Command Line Interface. A user interface where the user sees the command line on the monitor and a prompt that is waiting to accept instructions from the user. The user types in the command, the computer acts on that command and then issues a new prompt for the next instruction from the user.
CPE	Customer Premise Equipment. Communications equipment that resides on the customer's premises.
CPU	Central Processing Unit

CRC	Cyclical Redundancy Check. A common technique for detecting data transmission errors, in which the frame recipient calculates a remainder by dividing frame contents by a prime binary divisor and compares the calculated remainder to a value stored in the frame by the sending equipment.
CS	Convergence Sublayer. Particular protocols that are responsible for gathering and formatting higher layer information so it can be processed by the lower layers.
CSMA/CD	Carrier Sense Multiple Access with Collision Detection. Media-access mechanisms wherein devices ready to transmit data first check the channel for a carrier. If no carrier is sensed for a specific period of time, a device can transmit. If two devices transmit at once, a collision occurs and is detected by all colliding devices. This collision subsequently delays retransmissions from those devices for some random length of time. Ethernet and IEEE 802.3 use CSMA/CD access.
CW	Continuous Wave. An unmodulated RF signal.
CWMP	CPE WAN Management Protocol. See also TR-069.
DHCP	Dynamic Host Configuration Protocol. A protocol for dynamically assigning IP addresses from a pre-defined list to nodes on a network. Using DHCP to manage IP addresses simplifies client configuration and efficiently utilizes IP addresses.
DL	Down Link
DSCP	Differentiated Service Code Point, AKA DiffServ: An alternate use for the ToS byte in IP packets. Six bits of this byte are being reallocated for use as the DSCP field where each DSCP specifies a particular per-hop behavior that is applied to the packet.
EAP	Extensible Authentication Protocol, A protocol used between a user station and an authenticator or authentication server. It acts as a transport for authentication methods or types. It, in turn may be encapsulated in other protocols, such as 802.1x and RADIUS. EAP is defined by RFC 2284.
EAP-TTLS	Extensible Authentication Protocol-Tunneled Transport Layer Service. A type of mutual authentication protocol where just the server sends a digital certificate to identify itself to the clients.
EMC	Electro-Magnetic Compatibility. The capability of equipment or systems to be used in their intended environment within designed efficiency levels without causing or receiving degradation due to unintentional EMI (Electro Magnetic Interference). EMC generally encompasses all of the electromagnetic disciplines.
ETSI	European Telecommunications Standards Institute. A non-profit organization producing voluntary telecommunications standards used throughout Europe, some of which have been adopted by the EC as the technical base for Directives or Regulations.
FCC	Federal Communications Commission. A U.S. government agency that supervises, licenses, and controls electronic and electromagnetic transmission standards.
FEC	Forward Error Correction. A method of communicating data that can correct errors in transmission on the receiving end. Prior to transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.

FFT	Fast Fourier Transform. An algorithm for converting data from the time domain to the frequency domain; often used in signal processing.
FIPS	Federal Information Processing Standards. The Federal Information Processing Standard (FIPS) Publication 140-2 1, called Security Requirements for Cryptographic Modules, is a United States security standard used to certify cryptographic modules.
FTP	File Transfer Protocol. A protocol for exchanging files over the Internet. FTP uses the Internet's TCP/IP protocols to enable data transfer.
GUI	Graphical User Interface. In a GUI operating system, the user responds to graphic images on the screen instead of typing in commands in response to a prompt.
HTTP	HyperText Transfer Protocol. The protocol used to transmit and receive data over the World Wide Web.
IDU	Indoor Unit
IEEE	Institute of Electrical and Electronics Engineers. IEEE (pronounced I-triple-E) is an organization composed of engineers, scientists, and students. The IEEE is best known for developing standards for the computer and electronics industry. In particular, the IEEE 802 standards for local-area networks are widely followed.
IEEE 802.3	A Local Area Network protocol suite commonly known as Ethernet. Ethernet uses Carrier Sense Multiple Access bus with Collision Detection CSMA/CD. This method allows users to share the network cable. However, only one station can use the cable at a time. A variety of physical medium dependent protocols are supported.
IEEE 802.16	Also known as WIMAX. A group of broadband wireless communications standards for metropolitan area networks (MANs) developed by a working group of the IEEE.
IEEE 802.16e	802.16e, also known as 802.16-2005, is an IEEE standard addressing mobility of wireless broadband (WiMax). IEEE 802.16e is sometimes called Mobile WiMAX, after the WiMAX forum for interoperability. 802.16e, based on an existing WiMAX standard 802.16a, adds WiMAX mobility in the 2-to-6 GHz-licensed bands. 802.16e allows for fixed wireless and mobile Non Line of Sight (NLOS) applications primarily by enhancing the OFDMA (Orthogonal Frequency Division Multiple Access).
IP	Internet Protocol. The standard that defines how data is transmitted over the Internet. IP bundles data, including e-mail, faxes, voice calls and messages, and other types, into "packets", in order to transmit it over public and private networks.
LAN	Local Area Network. A computer network limited to a small geographical area, such as a single building. The network typically links PCs as well as shared resources such as printers.
LED	Light Emitting Diode.
MAC Address	Standardized data link layer address that is required for every port or device that connects to a LAN. Other devices in the network use these addresses to locate specific ports in the network and to create and update routing tables and data structures. MAC addresses are 6bytes long and are controlled by the IEEE.

MCS	Multipoint Communications Systems. Applications licensed at 2500 MHz in Canada. A wide variety of applications are possible including one-way and two-way transmission and a diversity of distribution capacities.
MMDS	Multichannel Multipoint Distribution Service. MMDS is a licensed wireless service that has the capability to provide broadband access. MMDS operates in several parts of the 2 GHz spectrum.
MSCHAP	Microsoft Challenge Handshake Authentication Protocol. an implementation of the CHAP protocol that Microsoft created to authenticate remote Windows workstations. In most respects, MS-CHAP is identical to CHAP, but there are a few differences. MS-CHAP is based on the encryption and hashing algorithms used by Windows networks, and the MS-CHAP response to a challenge is in a format optimized for compatibility with Windows operating systems.
MSS	Maximum Segment Size.
NA	Not Available or Not Applicable
NE	Network Entry
NIC	Network Interface Card. An expansion board you insert into a computer (or a built-in component) that enables the computer to connect to a network. Most NICs are designed for a particular type of network, protocol, and media, although some can serve multiple networks.
ODU	Outdoor Unit
OFDM	Orthogonal Frequency Division Multiplexing: A method for multiplexing signals, which divides the available bandwidth into a series of frequencies known as tones. Orthogonal tones do not interfere with each other when the peak of one tone corresponds with the null. The rapid switching, frequency-hopping technique is intended to allow more robust data service.
OFDMA	Orthogonal Frequency Division Multiple Access. It's a logical extension of OFDM and a modulation/multiple access technique. OFDMA divides a signal into sub-channels (i.e. groups of carriers), with each sub-channel (or several sub-channels) being allocated to a different subscriber.
PER	Packet Error Rate. In a digital transmission, PER is the percentage of packets with errors divided by the total number of packets that have been transmitted, received or processed over a given time period.
PHY	PHYsical Layer. The physical, or lowest, layer of the OSI Network Model. In a wireless network, the PHY defines parameters such as data rates, modulation method, signaling parameters, transmitter/receiver synchronization, etc. Within an actual radio implementation, the PHY corresponds to the radio front end and baseband signal processing sections.

PPPoE	Point-to-Point Protocol over Ethernet. PPPoE relies on two widely accepted standards: PPP and Ethernet. PPPoE is a specification for connecting the users on an Ethernet to the Internet through a common broadband medium, such as a single DSL line, wireless device or cable modem. All the users over the Ethernet share a common connection, so the Ethernet principles supporting multiple users in a LAN combines with the principles of PPP, which apply to serial connections.
QAM	Quadrature Amplitude Modulation. A technique used in wireless applications to double the available bandwidth by combining two amplitude-modulated signals. The two combined signals differ in phase by 90 degrees; this technique doubles the bandwidth by combining the two signals at the source before transmission, transmitting digital data at a rate of 4 bits per signal change.
QPSK	Quadrature Phase Shift Keying. A data transfer technique used in coaxial cable networks that sends data using modulating signals. Four different phases represent data, with each signal's information determined by the signal before it. For example, if a phase stays the same from one signal to the other, the information has not changed.
RADIUS	Remote Authentication Dial-In User Service, an authentication and accounting system used by many Internet Service Providers (ISPs). When you connect to the system you must enter your username and password. This information is passed to a RADIUS server, which checks that the information is correct, and then authorizes access to the system.
RF	Radio frequency. An AC signal of high enough frequency to be used for wireless communications.
RSSI	Received Signal Strength Indicator. A signal or circuit that indicates the strength of the incoming (received) signal in a receiver.
R&TTE	Radio & Telecommunications Terminal Equipment. The R&TTE Directive 1999/5/EC governs the marketing and use of R&TTE equipment. With the exception of a few categories of equipment, the Directive covers all equipment, which uses the radio frequency spectrum. It also covers all terminal equipment attached to public telecommunication networks.
Rx	Receive
SAU	SU Alignment Unit
SDARS	Satellite Digital Audio Radio Service. A satellite-based direct-broadcast radio service in which digitally encoded audio entertainment material is broadcast to earth-based receivers from an orbiting satellite, either directly or via a repeater station.
SIP	Session Initiation Protocol. An application-layer control IETF protocol that can establish, modify, and terminate multimedia sessions such as Internet telephony calls (VoIP). SIP can also invite participants to already existing sessions, such as multicast conferences. Media can be added to (and removed from) an existing session. SIP transparently supports name mapping and redirection services, which supports personal mobility - users can maintain a single externally visible identifier regardless of their network location.

SNMP	Simple Network Management Protocol. A network management protocol that provides a means to monitor and control network devices, and to manage configurations, statistics collection, performance, and security. SNMP works by sending messages, called protocol data units (PDUs), to different parts of a network. SNMP-compliant devices, called agents, store data about themselves in Management Information Bases (MIBs) and return this data to the SNMP requesters.
SNR	Signal to Noise Ratio. The ratio of the amplitude of a desired analog or digital data signal to the amplitude of noise in a transmission channel at a specific point in time. SNR is typically expressed logarithmically in decibels (dB). SNR measures the quality of a transmission channel or a signal over a network channel. The greater the ratio, the easier it is to identify and subsequently isolate and eliminate the effects of noise. SNR also is abbreviated as S/N.
SU	Subscriber Unit
TCP	Transmission Control Protocol. Connection-oriented transport layer protocol that provides reliable full-duplex data transmission. TCP is the part of the TCP/IP suite of protocols that is responsible for forming data connections between nodes that are reliable, as opposed to IP, which is connectionless and unreliable.
TCP/IP	Transmission Control Protocol/Internet Protocol. A set of protocols developed by the U.S. Department of Defense to allow communication between dissimilar networks and systems over long distances. TCP/IP is the de facto standard for data transmission over networks, including the Internet.
TDD	Time Division Duplex is a duplexing technique dividing a radio channel in time to allow downlink operation during part of the frame period and uplink operation in the remainder of the frame period.
TFTP	Trivial File Transfer Protocol. Simplified version of FTP that allows files to be transferred from one computer to another over a network, usually without the use of client authentication.
TR-069	TR-069 CPE WAN Management Protocol (CWMP) was created by the DSL Forum to standardize management of CPEs over the Wide Area Network (WAN) . The TR-069 protocol specifically defines a common method for CPE devices to communicate with an Auto Configuration Server (ACS).
Tx	Transmit
UDP	User Datagram Protocol. Connectionless transport layer protocol in the TCP/IP protocol stack. UDP is a simple protocol that exchanges datagrams without acknowledgments or guaranteed delivery, requiring that error processing and retransmission be handled by other protocols. UDP is defined in RFC 768.
UL	Up Link
VLAN	Virtual Local Area Network. A group of devices on one or more LANs that are configured with the same VLAN ID so that they can communicate as if they were attached to the same wire, when in fact they are located on a number of different LAN segments. Used also to create separation between different user groups.

VoIP
Voice over Internet Protocol. Provides an advanced digital communications network that bypasses the traditional public switched telephone system and uses the Internet to transmit voice communication. VoIP enables people to use the Internet as the transmission medium for telephone calls by sending voice data in packets using IP rather than by traditional circuit switched transmissions of the PSTN.

WAN
Wide Area Network. A computer network that spans a relatively large geographical area. Wide area networks can be made up of interconnected smaller networks spread throughout a building, a state, or the entire globe.

WCS
Wireless Communications Services. The variety of services available using frequencies in the 2.3 GHz band for general fixed wireless use.

WEEE
Waste Electronic and Electrical Equipment. The purpose of Directive 2002/96/EC on waste electrical and electronic equipment (WEEE) is, as a first priority, the prevention of waste electrical and electronic equipment (WEEE), and in addition, the reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste. It also seeks to improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment, e.g. producers, distributors and consumers and in particular those operators directly involved in the treatment of waste electrical and electronic equipment.

WL (or W/L)
Wireless LAN

WIMAX
The name commonly given to the IEEE 802.16 standard. Specifications for fixed broadband wireless metropolitan access networks (MANs) that use a point-to-multipoint architecture. WIMAX supports very high bit rates in both uploading to and downloading from a base station up to a distance of 30 miles.