BreezeMAX® Extreme

PRELIMINARY

System Manual

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P/N

Document History

Topic	Description	Date Issued
Preliminary Release for Early Field Trials	New System Manual	March 2009
Preliminary Release for Beta	New System Manual	June 2009
First Release for GA	New System Manual	June 2009
3.65 GHz band	A new radio band	August 2009
MAC Access Lists	A new feature in BTS Configuration	September 2009
PPPoE	Added a new Service Type	September 2009
Multiple Service Flows	Added support for Ethernet CS services. New Classifier types (VLAN ID, VLAN Priority)	September 2009
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Integral 5 GHz Antenna	Updated specifications of 5 GHz Integral antenna (Table 1-7)	October 2009
External 5 GHz Antennas	Added 8 dBi OMNI (Table 1-8)	October 2009
4.9 GHz FCC Band	Added a note on Tx Power limitations: Sections 1.4.13, 4.7.2.2.1.6	October 2009
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Radio Frequency Interference Statement

The Base Transceiver Station (BTS) equipment has been tested and found to comply with the limits for a class A 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 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. Operation of this equipment in a residential area is

likely to cause harmful interference in which case the user will be required to correct the interference at the user's own expense.

FCC Radiation Hazard Warning

To comply with FCC RF exposure requirements in Section 1.1307 and 2.1091 of FCC Rules, the antenna used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 2 meters from all persons.

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.

Grounding

BTS chassis, Power Feeders and Outdoor Units are required to be bonded to protective grounding using the bonding stud or screw provided with each unit.

Safety Considerations - DC Powered Equipment

CAUTION	ATTENTION
Risk of electric shock and energy hazard.	Risque de décharge électrique et d'electrocution.

Restricted Access Area: The DC powered equipment should only be installed in a Restricted Access Area.

Installation Codes: The equipment must be installed according to the latest edition of the country national electrical codes. For North America, equipment must be installed in accordance with the US National Electrical Code and the Canadian Electrical Code.

Overcurrent Protection: A readily accessible Listed branch circuit overcurrent protective device, rated 60A for the BTS or 20A for the Power Feeder, must be incorporated in the building wiring.

CAUTION: This equipment is designed to permit connection between the earthed conductor of the DC supply circuit and the grounding conductor at the equipment. See installation instructions.

■ The equipment must be connected directly to the DC Supply System grounding electrode conductor.

■ All equipment in the immediate vicinity must be grounded in the same way, and not be grounded elsewhere.

■ The DC supply system is to be local, i.e. within the same premises as the equipment.

■ There shall be no disconnect device between the grounded circuit conductor of the DC source (return) and the point of connection of the grounding electrode conductor.

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.

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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.

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About This Manual

This manual describes the BreezeMAX Extreme solution, and details how to install, operate and manage the BTS system components.

This manual is intended for technicians responsible for installing, setting and operating the BreezeMAX Extreme BTS equipment, and for system administrators responsible for managing the system.

This manual contains the following chapters and appendices:

- **Chapter 1 - System description:** Describes the BreezeMAX Extreme BTS and its components.

- **Chapter 2 - Installation:** Describes how to install the BTS components.

- **Chapter 3 - Commissioning:** Describes how to configure basic parameters and validate units' operation.

- **Chapter 4 - Operation and Administration Using the CLI:** Describes how to use the Command Line Interface (CLI) for configuring parameters, checking system status and monitoring performance.

- **Glossary:** A listing of commonly used terms.

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Chapter 2 - Installation

Chapter 1

System Description

In This Chapter:

1.1   About WiMAX

Emanating from the broadband world and using all-IP architecture, mobile WiMAX is the leading technology for implementing personal broadband services. With huge market potential and affordable deployment costs, mobile WiMAX is on the verge of a major breakthrough. No other technology offers a full set of chargeable and differentiated voice, data, and premium video services in a variety of wireless fashions - fixed, portable and mobile - that increase revenue and reduce subscriber churn.

WiMAX technology is the solution for many types of high-bandwidth applications at the same time across long distances and will enable service carriers to converge the all-IP-based network for triple-play services data, voice, and video.

WiMAX with its QoS support, longer reach, and high data capacity is positioned for fixed broadband access applications in rural areas, particularly when distance is too large for DSL and cable, as well as in urban/suburban areas of developing countries. Among applications for residential are high speed Internet, Voice Over IP telephony and streaming video/online gaming with additional applications for enterprise such as Video conferencing, Video surveillance and secured Virtual Private Network (with need for high security). WiMAX technology allows covering applications with media content requesting more bandwidth.

WiMAX allows portable and mobile access applications, with incorporation in notebook computers and PDAs, allowing for urban areas and cities to become "metro zones" for portable and mobile outdoor broadband wireless access. As such WiMAX is the natural complement to 3G networks by offering higher bandwidth and to Wi-Fi networks by offering broadband connectivity in larger areas.

The WiMAX Forum is an organization of leading operators and communications component and equipment companies. The WiMAX Forum's charter is to promote and certify the compatibility and interoperability of broadband wireless access equipment that conforms to the Institute for Electrical and Electronics Engineers (IEEE) 802.16 and ETSI HiperMAN standards. The ultimate goal of the WiMAX Forum is to accelerate the introduction of cost-effective broadband wireless access services into the marketplace. Standards-based, interoperable solutions enable economies of scale that, in turn, drive price and performance levels unachievable by proprietary approaches, making WiMAX Forum Certified products.

1.2   WiMAX Network Architecture

1.2.1   The WiMAX Network Reference Model

Figure 1-1 shows the basic mobile WiMAX network architecture as defined by the WiMAX Forum NWG.
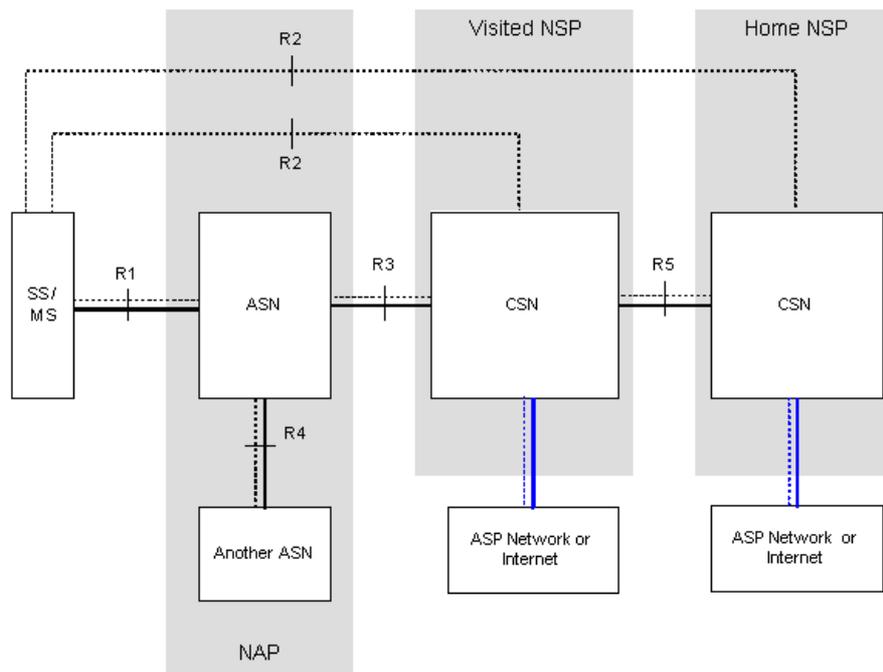
Figure 1-1: Mobile WiMAX Network Reference Model

Figure 1-2 shows the ASN-GW architecture for networks with multiple ASN-GWs (distributed network architecture).
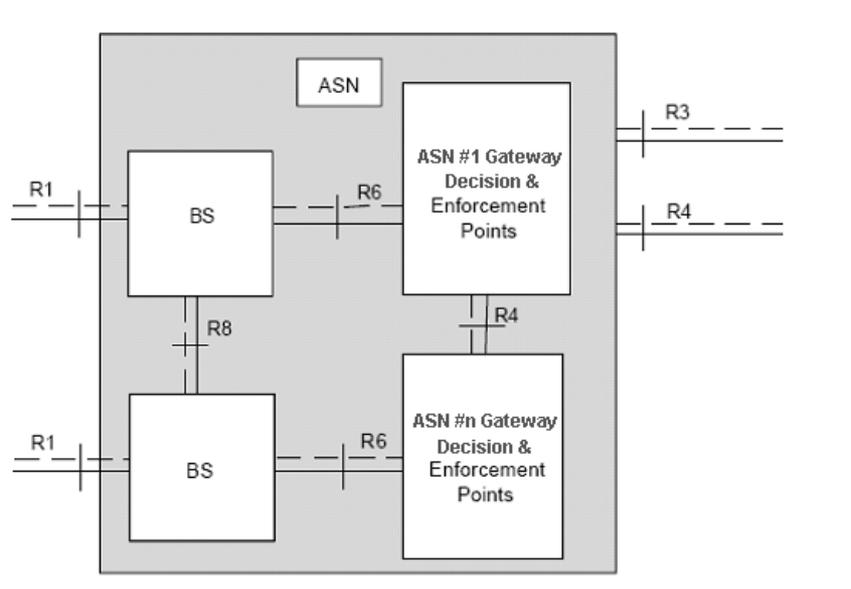
Figure 1-2: ASN Reference Model containing Multiple ASN-GWs

The various components and entities involved in the networking architecture are described in the following sections:

1.2.2   Access Service Network (ASN)

An ASN is defined as a complete set of network functions needed to provide radio access to a WiMAX subscriber. The ASN provides the following mandatory functions:

- WiMAX Layer-2 (L2) connectivity with WiMAX mobile station (MS)

- Transfer of AAA messages to the WiMAX subscriber's home network service provider (H-NSP) for authentication, authorization and session accounting for subscriber sessions

- Network discovery and selection of the WiMAX subscriber's preferred NSP

- Relay functionality for establishing Layer-3 (L3) connectivity with a WiMAX MS (i.e. IP address allocation)

- Radio resource management

- ASN-CSN tunneling

■ ASN anchored mobility

An ASN is comprised of network elements such as one or more base transceiver stations and one or more ASN gateways. An ASN may be shared by more than one connectivity service network (CSN).

1.2.3 Connectivity Service Network (CSN)

A CSN is defined as a set of network functions that provide IP connectivity services to WiMAX subscribers. A CSN may offer the following functions:

■ MS IP address and endpoint parameter allocation for user sessions

■ Internet access

■ AAA proxy or server

■ Policy and admission control based on user subscription profiles

■ ASN-CSN tunneling support

■ WiMAX subscriber billing and inter-operator settlement

■ WiMAX services such as location-based services, connectivity for peer-to-peer services, provisioning, authorization and/or connectivity to IP multimedia services, and facilities to support lawful intercept services such as those compliant with Communications Assistance Law Enforcement Act (CALEA) procedures

A CSN is comprised of network elements such as routers, proxy/servers, user databases, and inter-working gateway devices.

1.2.4 Network Access Provider (NAP)

An NAP is a business entity that provides WiMAX radio access infrastructure to one or more WiMAX network service providers (NSPs). A NAP implements this infrastructure using one or more ASNs.

1.2.5 Network Service Provider (NSP)

An NSP is a business entity that provides IP connectivity and WiMAX services to WiMAX subscribers compliant with the established service level agreement. The NSP concept is an extension of the Internet service provider (ISP) concept, providing network services beyond Internet access. To provide these services, an

NSP establishes contractual agreements with one or more NAPs. An NSP may also establish roaming agreements with other NSPs and contractual agreements with third-party application providers (e.g. ASP, ISP) for the delivery of WiMAX services to subscribers. From a WiMAX subscriber standpoint, an NSP may be classified as a home or visited NSP.

1.2.6 Base Station (BS)

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.

The basic functionality of the BS includes:

- IEEE 802.16e OFDMA PHY/MAC entity

- R6 and R8 functionality according to NWG definitions

- Extensible Authentication Protocol (EAP) relay

- Control message authentication

- User traffic authentication and encryption

- Handover management

- QoS service flow management entity

1.2.7 ASN Gateway (ASN-GW)

The ASN-GW is a network entity that acts as a gateway between the ASN and CSN. The ASN functions hosted in an ASN-GW may be viewed as consisting of two groups - the decision point (DP) and enforcement point (EP). The EP provides bearer plane functions, and the DP provides non-bearer plane functions.

The basic DP functionality of the ASN-GW includes:

- Implementation of EAP Authenticator and AAA client

- Termination of RADIUS protocol against the selected CSN AAA server (home or visited AAA server) for MS authentication and per-MS policy profile retrieval

- Storage of the MS policy profile

■ Generation of authentication key material

■ QoS service flow authorization entity

■ AAA accounting client

The basic EP functionality of the ASN-GW includes:

■ Classification of downlink data into generic routing encapsulation (GRE) tunnels

■ Packet header suppression functionality

■ DHCP functionality

■ Handover functionality

The WIMAX Forum NWG has adopted two different approaches for ASN architecture - centralized and distributed: In the centralized approach there is at least one central ASN-GW, and the BTS operates in transparent mode, as shown in Figure 1-3.
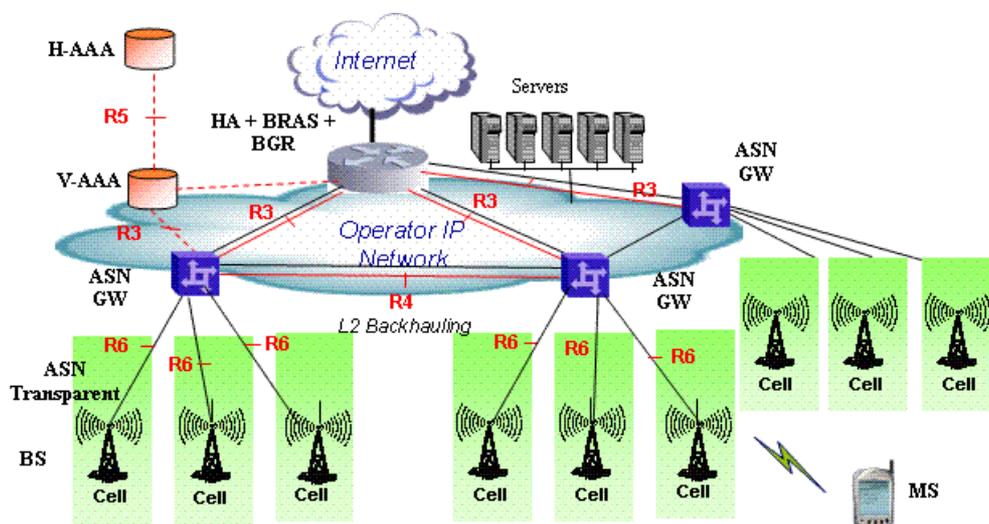
Figure 1-3: Centralized Network Reference Model

In the distributed approach, the BTS operates in ASN-GW mode, as shown in Figure 1-4.
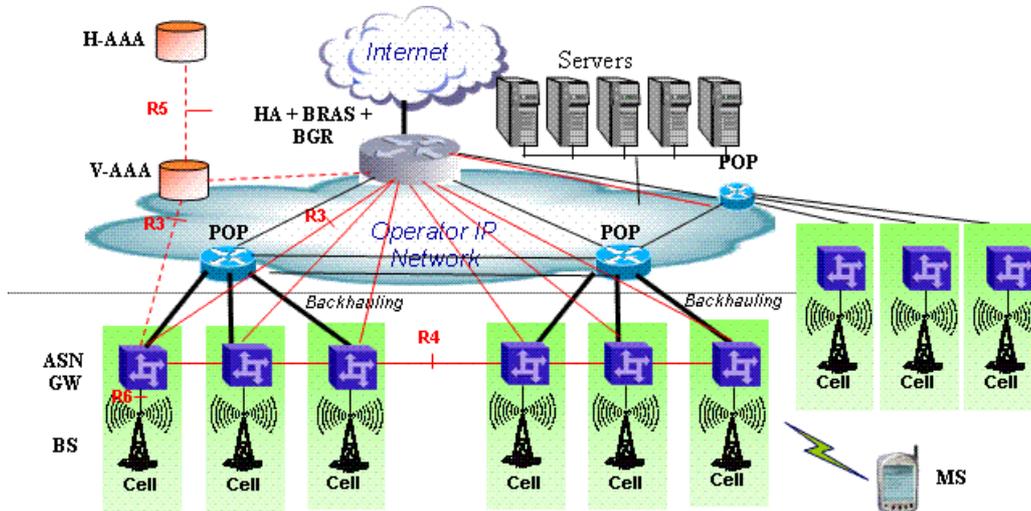
Figure 1-4: Distributed Network Reference Model

Alvarion believes in providing operators with the flexibility to select the mobile WiMAX network topology that best suits their needs and existing network architecture. Therefore, BreezeMAX Extreme is designed to support both distributed and centralized topology approaches according to WiMAX Forum NWG profile C.

1.2.8 Reference Points

- **Reference point R1** consists of the protocols and procedures between the MS and ASN as per the air-interface (PHY and MAC) specifications (IEEE 802.16e).

- **Reference point R2** consists of protocols and procedures between the MS and CSN associated with authentication, services authorization and IP host configuration management. This reference point is logical in that it does not reflect a direct protocol interface between the MS and CSN. The authentication part of reference point R2 runs between the MS and CSN operated by the home NSP, however, the ASN and CSN operated by the visited NSP may partially process the aforementioned procedures and mechanisms. Reference point R2 might support IP host configuration management running between the MS and CSN (operated by either the home NSP or visited NSP).

- ■ **Reference point R3** consists of the set of control plane protocols between the ASN and CSN to support AAA, policy enforcement and mobility management capabilities. It also encompasses the bearer plane methods (e.g. tunneling) to transfer user data between the ASN and CSN.

- ■ **Reference point R4** consists of the set of control and bearer plane protocols originating/terminating in various functional entities of an ASN that coordinate MS mobility between ASNs and ASN-GWs. R4 is the only interoperable reference point between similar or heterogeneous ASNs.

- ■ **Reference point R5** consists of the set of control plane and bearer plane protocols for internet working between the CSN operated by the home NSP and that operated by a visited NSP.

- ■ **Reference point R6** consists of the set of control and bearer plane protocols for communication between the BS and ASN-GW. The bearer plane consists of an intra-ASN data path between the BS and ASN gateway. The control plane includes protocols for data path establishment, modification and release control in accordance with the MS mobility events.

- ■ **Reference point R8** consists of the set of control plane message flows and optional bearer plane data flows between the base stations to ensure a fast and seamless handover. The bearer plane consists of protocols that allow data transfer between base stations involved in the handover of a certain MS.

It is important to note that all reference points are logical and do not necessarily imply a physical or even direct connection. For instance, the R4 reference point between ASN-GWs might be implemented across the NAP internal transport IP network, in which case R4 traffic might traverse several routers from the source to the destination ASN-GW.

1.3 BreezeMAX Extreme

1.3.1 General

BreezeMAX Extreme is a full-outdoor, all-in-one small WiMAX Base Transceiver Station. With a range of configuration options for rural, urban and suburban deployments, and all the benefits of Alvarion's Open WiMAX Ecosystem, the BreezeMAX Extreme system present an exceptionally attractive cost/performance ratio for various needs, improving operational costs and reducing complexity.

The system is currently available in the following frequency bands:

- 3.x GHz band: Offering optimal solutions for capacity limited scenarios and rural areas or highly price sensitive situations. Co-existence with the 4Motion Macro BTS supports expansion of Macro deployments providing optimization of both initial and final investment. Currently available units operate in the 3.400-3.600 GHz (3.5 GHz) and 3.650-3.700 GHz (3.65 GHz) bands.

- 5 GHz band units: Offering all the advantages of WiMAX, providing carrier class QoS with superior radio technology and leveraging the benefits of mass market ecosystem (low price CPEs). Co-existence with the mature BreezeACCESS VL product line. Currently available units operate in the 4.900-5.350 GHz (4.9 GHz) band and 5.470-5.950 GHz (5.4 GHz) band. Actually available frequencies and other operational capabilities depend on the applicable local regulations.

BreezeMAX Extreme supports different working modes:

- Embedded Distributed ASN-GW Authenticated: The ASN-GW functionality resides in the BTS (distributed architecture). MS authentication and services provisioning are managed by an external AAA server.

- Embedded Distributed ASN-GW Not Authenticated: The ASN-GW functionality resides in the BTS (distributed architecture). MS authentication and services provisioning are managed by the ASN-GW using local configuration (AAA server not needed).

- External ASN-GW: The ASN-GW is a separate entity (centralized architecture) that communicates with the BTS over R6 interface. MS authentication and services provisioning are managed by a AAA server.

The BTS can simultaneously serve up to 40 CPEs, with optional upgrades to support up to 150 or 250 CPEs.

The following figure describes the end-to-end BreezeMAX Extreme based WiMAX network:
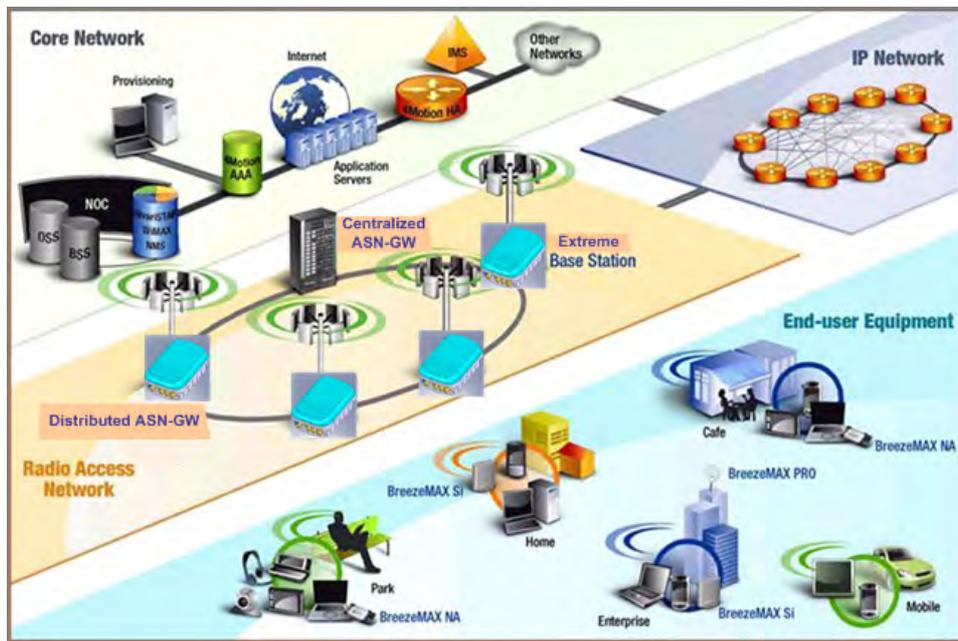
Figure 1-5: BreezeMAX Extreme System Architecture

1.3.2   System Components

The BreezeMAX Extreme system consists of the following elements:

- BreezeMAX Extreme Base Transceiver Station (BTS) and associated accessories such as GPS antenna, indoor power supply and, (if applicable) external antennas.

- External ASN-GW for centralized architecture and optional Embedded ASN-GW for distributed architecture.

- Optional AAA server for central authentication, authorization and accounting services.

- Outdoor and indoor CPEs supporting VoIP, Data, Switching, Bridging, tagging and marking functionality.

- AlvariSTAR central management system allowing multiple elements management and performance monitoring.

- StarACS – Automatic Configuration Server for TR-069 based management and monitoring of CPEs.

- AlvariCRAFT element management system allowing a single element management for BTS installation/maintenance.

1.3.3 System Configurations

In the current release the following BTS configurations are available:

1.3.3.1 Single Sector, Second Order Diversity Configurations

Single Sector Second Order Diversity (1DIV models) units include a BS connected to two internal radios with either an integral dual-slant antenna or two RF connections to external antenna(s). 1DIV model units support Single Sector Single BS with Diversity operation mode providing a bandwidth of up to 10 MHz per sector. A dual-slant antenna (internal or external) or two external antennas support second order diversity with MIMO in the downlink and MRC in the uplink.
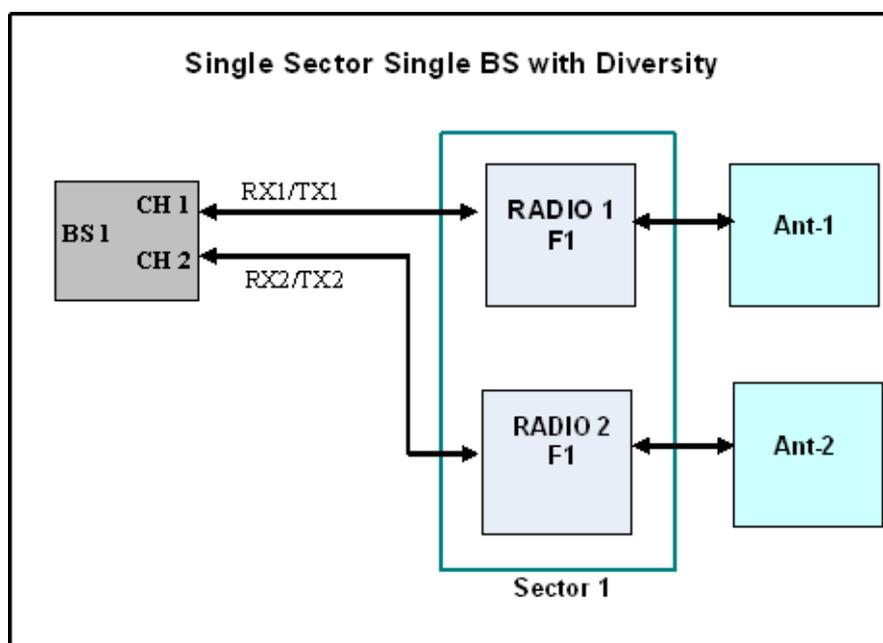
Figure 1-6: Single Sector Single BS with Diversity Operation Mode

1.3.3.2   Single Sector, No Diversity Configurations

Single Sector No Diversity (1SIS model) units include a BS connected to an internal radio with either an RF connection to an external antenna or (in 4.9/5.4 GHz units only) an integral dual slant antenna using the same slant as the PRO 5100 series CPEs. 1SIS model units support the Single Sector Single BS without Diversity operation mode providing a bandwidth of up to 10 MHz per sector.
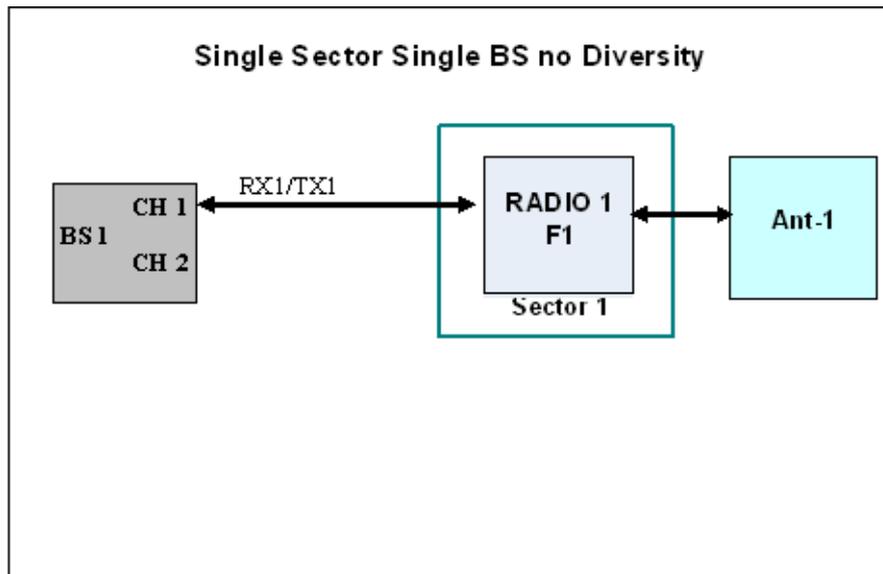
Figure 1-7: Single Sector Single BS without Diversity Operation Mode

1.3.4   Power Supply

The BTS is powered from a 48V DC power source. Alvarion offers a range of indoor AC/DC power supplies to support the different power requirements of the various BTS units:

■   A high power AC/DC power supply that may be used to provide power to all BTS types.

■   A low power PoE AC/DC power supply that can supply DC power over the Ethernet connection to 5 GHz BTS units.

1.3.5   Radio Antennas

According to radio band and configuration, BTS units are supplied with either integral antenna(s) or with connection(s) to external antenna(s). Alvarion offers a range of external antennas to support various deployment and coverage needs.

1.3.6 GPS Antenna

GPS is used to synchronize the air link frames of Intra-site and Inter-site located sectors to ensure that in all sectors the air frame will start at the same time, and that all sectors will switch from transmit (downlink) to receive (uplink) at the same time. This synchronization is necessary to prevent Intra-site and Inter-site sectors interference and saturation (assuming that all neighboring sectors are operating with the same DL/UL ratio).

The BTS includes an internal GPS receiver with hold over mechanism in case GPS is lost or satellites synchronization was not reached. The GPS clock required is 1PPS with accuracy of 10^{-11} and maximum jitter of 100ns. These GPS clock requirements can be reached by a GPS receiver when it receives at least 4 satellites. After initial synchronization, at least two satellites should be received to maintain sufficient synchronization.

Alvarion offers two types of GPS antennas:

■ Active high-gain antenna that can be installed at a distance of up to 25m from the BTS.

■ Basic miniature antennas that can be installed at a distance of up to 3m from the BTS.

1.4   Specifications

1.4.1   General Modem & Radio

Table 1-1: General Modem & Radio Specifications

Item	Description
Operation Mode	TDD
Modulation	OFDM modulation, 1024/512 FFT points; QPSK, QAM16, QAM64
Access Method	OFDMA
FEC	Convolutional Turbo Coding: 1/2, 2/3, 3/4, 5/6

1.4.2   3.x GHz BTS

Table 1-2: 3.x GHz BTS Specifications

Item	Description
Frequency	3.5 GHz: 3400-3600 MHz
	3.65 GHz: 3650-3700 MHz
Supported Bandwidth	5 MHz, 10MHz
Central Frequency Resolution	125 KHz
Tx Power Range	3.5 GHz: 21-30 dBm
	3.65 GHz: 17-30 dBm
Tx Power Accuracy	+/- 1 dB
Max. Input Power (at antenna port)	-50 dBm before saturation
	-10 dBm before damage
Dimensions (H x W x D)	510 x 280 x 147 mm
Weight (kg)	10.7
Power Source	40 to 60 VDC
Power Consumption	Single Radio: 59W maximum
	Two Radios: 92W maximum

1.4.3   5 GHz BTS

Table 1-3: 5 GHz BTS Specifications

Item	Description
Frequency* (see note below)	■ 4.9 GHz Band: 4900-5350 MHz ■ 5.4 GHz Band: 5470-5950 MHz
Supported Bandwidth	5 MHz, 10MHz
Central Frequency Resolution	■ 2.5 MHz @ 5 MHz bandwidth ■ 5 MHz @ 10 MHz bandwidth
Tx Power Range* (see note below)	0-21 dBm, in 1 dBm steps
Tx Power Accuracy	+/- 1 dB
Max. Input Power (at antenna port)	-50 dBm before saturation -10 dBm before damage
Dimensions (H x W x D)	510 x 280 x 147mm
Weight (kg)	10.7
Power Source	40 to 60 VDC
Power Consumpltion	Single Radio: 41.5W maximum Two Radios: 57W maximum

NOTE

Actual supported frequencies and Tx power range depend on relevant regulations according to the Frequency Band being used.

Maximum supported Tx Power depend also on the configured antenna gain and in some cases also on the bandwidth, according to the maximum allowed EIRP and spectral density specified in the relevant regulation for the selected Band Name. See also the Notes on Maximum Tx Power Limitations for 5 GHz Units at the end of the Specifications section.

1.4.4   Sensitivity

Table 1-4: Sensitivity, AWGN @ PER=1%, UL Fade Margin=2dB

Modulation & Coding	Sensitivity (dBm), 5 MHz Bandwidth		Sensitivity (dBm), 10 MHz Bandwidth	
	No Diversity	With Diversity	No Diversity	With Diversity
QPSK 1/2	-95	-98	-92	-95
QPSK 3/4	-92	-95	-89	-92
16QAM 1/2	-89	-92	-86	-89
16QAM 3/4	-85	-88	-82	-85
64QAM1/2	-83	-86	-80	-83
64QAM2/3	-80	-83	-77	-80
64QAM3/4	-79	-82	-76	-79
64QAM5/6	-76	-79	-73	-76

1.4.5   3.x GHz Antennas

1.4.5.1   Integral 3.x GHz Antennas

Table 1-5: Integral 3.x GHz Antennas Specifications

Item	Description
90° Dual Slant	2 x 13 dBi in the 3.3-3.8 GHz band, 90°AZ x 13°EL sector antenna, dual slant +/- 45° polarization, RoHS compliant.

1.4.5.2   External 3.x GHz Antennas (Optional)

Table 1-6: External 3.x GHz Antennas Specifications

Item	Description
BS ANT 60V/3.3-3.8	16.5 dBi minimum in the 3.3-3.8 GHz band, 60° AZ x 7° EL, vertical polarization, compliant with ESTI EN 302 326-3 V1.2.1 (2007-01). 76.6 x 15 x 8.7 cm, 2.2 kg. Mounting kit: 2" to 4.5" pole.
BS ANT 90V/3.3-3.8	14.5 dBi minimum in the 3.3-3.8 GHz band, 90° AZ x 7° EL, vertical polarization, compliant with ESTI EN 302 326-3 V1.2.1 (2007-01). 76.6 x 15 x 8.6 cm, 2.2 kg. Mounting kit: 2" to 4.5" pole.

Table 1-6: External 3.x GHz Antennas Specifications

Item	Description
BS ANT 65/3.5 DP	2 x 16.5 dBi minimum in the 3.3-3.8 GHz band, 65°AZ x 7°EL sector antenna, dual slant +/- 45° polarization, compliance with ETSI EN 302 326-3 V1.2.1 (2007-01) and RoHS. 85.1 x 16 x 6.1 cm, 2 kg. Mounting kit: 4 to 12 cm pole.
BS ANT 90/3.5 DP	2 x 15.5 dBi minimum in the 3.3-3.8 GHz band, 90°AZ x 7°EL sector antenna, dual slant +/- 45° polarization, compliance with ETSI EN 302 326-3 V1.2.1 (2007-01) and RoHS. 85.1 x 16 x 6.1 cm, 2 kg. Mounting kit: 4 to 12 cm pole.
Omni ANT 3.4-3.6	10 dBi typical in the 3.4-3.6 GHz band, 360° AZ x 9° EL, vertical polarization. 67.5 tubular, 8 diameter, 0.29 kg, Mounting bracket: up to 50 mm pole.
Omni ANT 3.6-3.8	10 dBi typical in the 3.6-3.8 GHz band, 360° AZ x 9° EL, vertical polarization. 67.5 tubular, 8 diameter, 0.29 kg, Mounting bracket: up to 50 mm pole.

1.4.6   5 GHz Antennas

1.4.6.1   Integral 5 GHz Antennas

Table 1-7: Integral 5 GHz Antennas Specifications

Item	Description
ANT BS, 90° Dual Slant	2x14.5dBi in the 4.9-5.1 GHz band, 2x15dBi in the 5.15-5.875 GHz band, 90°AZ x 8°EL sector antenna, dual slant +/- 45° polarization, RoHS compliant. * In the 90V model only a single slant is used

1.4.6.2   External 5 GHz Antennas (Optional)

Table 1-8: 5 GHz Antennas Specifications

Item	Description
5.15-5.875GHz BS 60° 16dBi.	16 dBi typical in the 5.150-5.875 GHz band (15.5 dBi in the 4.900-5.150 GHz band). 60° AZ x 10° EL sector antenna, vertical polarization, compliant with ETSI EN 302 326-3 V1.2.1 (2007-01). 43.6 x 25 x 1.0 cm, 2.2kg, 2"-3.5" pole mountable.
5.15-5.875GHz BS 90° 17dBi.	17 dBi typical in the 5.150-5.875 GHz band (16.5 dBi in the 4.900-5.150 GHz band). 90° AZ x 6° EL sector antenna, vertical polarization, compliant with ETSI EN 302 326-3 V1.2.1 (2007-01). 55 x 25 x 1.1 cm, 1.5kg, 2"-3.5" pole mountable.

Table 1-8: 5 GHz Antennas Specifications

Item	Description
5.15-5.875GHz BS 120° 15dBi	15 dBi typical in the 5.150-5.875 GHz band (14.5 dBi in the 4.900-5.150 GHz band). 120° AZ x 6° EL sector antenna, vertical polarization, compliant with ETSI EN 302 326-3 V1.2.1 (2007-01). 55.3 x 26 x 1.1 cm, 2.5kg, 2"-3.5" pole mountable.
ANT-BST-15-120	15 dBi typical in the 4.900-5.100 GHz band. 120° AZ x 6.5° EL sector antenna, vertical polarization, compliant with ETSI EN 302 326-3 V1.2.1 (2007-01). 55 x 25 x 1.7 cm, 1.5 kg, 2"-4" pole mountable.
ANT,BS,4.9-5.875G,V9.5dBi, OMNI	9.5 dBi typical in the 4.900-5.875 GHz band. 360° AZ x 7° EL, vertical polarization. 46.4 cm high, 2.8 cm base diameter, 0.7 kg, 1.5"-3" pole mountable.
ANT,BS,5.15-5.875G,V8dBi,OMNI	8dBi in the 5.15-5.875 GHz band 360° AZ x 4.5° EL, vertical polarization, 70 cm high, 6cm diameter, 1.5Kg; 2.5"-4.5" pole mountable

1.4.7   Power Supply

1.4.7.1   High-Power AC/DC Power Supply

Table 1-9: High-Power AC/DC Power Supply Specifications

Item	Description
Input Volage	90 ~ 132 / 180 ~ 264 VAC (selection by switch), 47 ~ 63 Hz.
Input AC Current (typical)	8A/115 VAC, 3.2A/230VAC
Efficiency	89% typical
Output Voltage	54 VDC
Output Current	Up to 10A
Dimensions (H x W x D)	110 x 303 x 240 mm
Weight	4.75 kg

1.4.7.2 PoE AC/DC Power Supply for 5 GHz BTS

Table 1-10: PoE AC/DC Power Supply for 5 GHz BTS Specifications

Item	Description
Input Volage	90 ~ 264 VAC, 47 ~ 63 Hz
Input AC Current	1.8A max. at 90 VAC
Efficiency	83% minimum
Output Voltage	55 VDC
Output Current	Up to 1.27A
Dimensions (H x W x D)	33.5 x 63.5 x 160 mm
Weight	375 g

1.4.8 GPS Antennas

Table 1-11: GPS Antennas Specifications

Item	Description
High Gain	66.2 mm high, 77.5 mm diameter, 170 g, 1"-14 thread, ROHS compliant, IP 67. 35 dB gain, power consumption 30 mA max. @ 3.3 VDC. Cable length (RG-6) up to 25m. Operating Temperature: -40°C to +85°C.
Basic	21 mm high, 60 mm diameter, 50 g, ¾" thru-hole or bracket mount, ROHS compliant, IP 67. 28 dB gain, power consumption 15 mA max. @ 3.3 VDC. Cable length (RG-6) up to 3m. Operating Temperature: -40°C to +85°C.

1.4.9 Data Communication (Ethernet Port)

Table 1-12: Data Communication (Ethernet Port)

Item	Description
Standards Compliance	IEEE 802.3 CSMA/CD, IEEE 803.3u
Maximum Packet Size (including 4 CRC bytes and 4 VLAN tag bytes)	1550 bytes
Speed	10/100 Mbps, Half/Full Duplex with Auto Negotiation

1.4.10 Configuration and Management

Table 1-13: Configuration and Management

Item	Description
Management via Data Port	■ SNMP ■ Telnet
SNMP Agents	SNMP ver 1 client MIB II (RFC 1213), RFC2233, RFC2618, RFC2620, Private MIBs
Software upgrade	Using TFTP
Configuration upload/download	Using TFTP

1.4.11 Environmental

Table 1-14: Environmental Specifications

Type	Unit	Details
Operating temperature	BTS	-40°C to +60°C
	AC/DC Power Supplyt	-20°C to +70°C
Operating humidity	BTS	5%-95% non condensing
	AC/DC Power Supply	20%-90% non condensing
Rain and Dust Ingress Protection	BTS	IP 67

1.4.12 BTS Standards Compliance, General

Table 1-15: BTS Standards Compliance, General

Type	Standard
EMC	■ ETSI EN 301 489-1/4 ■ ETSI EN55022 Class B ■ FCC Part 15 Class B
Safety	■ EN 60950-1/22 ■ UL 60 950-1/22 ■ AS/NZS 3260 (Australia / New Zealand)
Environmental	ETSI 300 019-2-4 V2.2.2 Class T4.1E

Table 1-15: BTS Standards Compliance, General

Type	Standard
3.5 GHz Radio	■ ETSI EN 302 326 ■ ETSI EN 302 623 ■ ETSI EN 301 390 ■ CEPT/ERC Recommendation 74-01E
3.65 GHz Radio	■ FCC Part 90 ■ FCC Part 2
5 GHz Radio	■ ETSI EN 302 326 ■ ETSI EN 301 390 ■ ETSI EN 302 502 v1.2.1 ■ ETSI EN 301 893 v1.5.1 ■ FCC Part 15.247 ■ FCC Part 15.407 ■ FCC Part 90 Subpart Y ■ FCC Part 15 Subpart B ■ FCC-06-96A1 ■ UK VNS 2107 ■ UK IR200 ■ CEPT/ERC Recommendation 74-01E
Lightning Protection	■ ITU-T - K.20 ■ EN-61000-4-5
Ethernet	■ IEEE 802.3 CSMA/CD ■ IEEE 803.3u
Power Supply Interface (DC)	ETSI EN 300 132-2
WiMAX	■ IEEE 802.16-2004 ■ IEEE-802.16e-2005

1.4.13 Notes on Maximum Tx Power Limitations for 5 GHz Units:

According to the Band Name being used the maximum allowed Tx Power depends on the gain of antenna(s) and in some cases also on the bandwidth for ensuring compliance with the maximum allowed EIRP and spectral density specified in the relevant regulations.

For units operating in the **FCC 4.9 GHz** band the Maximum Tx Power at the antenna port is 19dBm, regardless of BW and number of sectors.

The following tables show the calculated maximum transmitter power level according to relevant FCC regulations for 5.4 and 5.8 GHz bands.

Table 1-16: Maximum Tx Power @ Antenna Connector, FCC 5.4 GHz

Antenna Type	RF Chains/BW	Maximum Tx Power (dbm)
Sector, 17dbi	1 RF chain /5MHz	7.7
Sector, 17dbi	2 RF chains/5MHz	4.7
Sector, 17dbi	1 RF chain /10MHz	10.7
Sector, 17dbi	2 RF chains/10MHz	7.7
Internal, 15.5dbi	1 RF chain /5MHz	8.5
Internal, 15.5dbi	2 RF chains/5MHz	8.5
Internal, 15.5dbi	1 RF chain /10MHz	11.5
Internal, 15.5dbi	2 RF chains/10MHz	11.5
Omni, 8dbi	1 RF chain /5MHz	16.7
Omni, 8dbi	2 RF chains/5MHz	13.7
Omni, 8dbi	1 RF chain /10MHz	19.7
Omni, 8dbi	2 RF chains/10MHz	16.7

Table 1-17: Maximum Tx Power @ Antenna Connector, FCC 5.8 GHz

Antenna Type and Gain	Maximum Tx Power (dbm)
Internal , dual slant 15.5dbi	20.5
Omni, 9.5dbi	24.2
Sector, 17dbi	19.7

The required calculations are performed automatically by the BTS. Actual values also take into account the maximum Tx power that can be supported by the

hardware (21 dBm) and supported resolution (calculated values are rounded down to nearest integer).
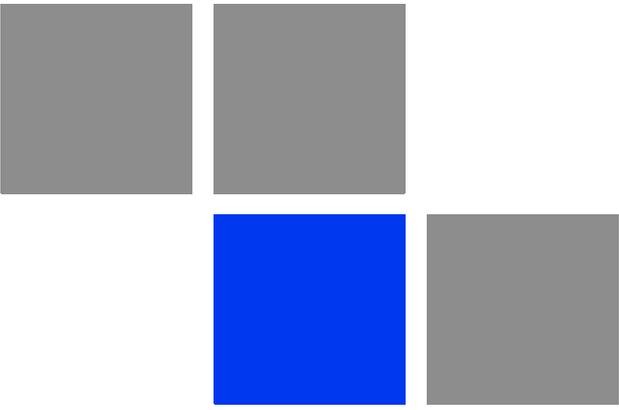
Chapter 2
Installation

In This Chapter:

2.1   BTS 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 BreezeMAX Extreme 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.

The BTS can be installed on straight or angled poles (±45° from upward position) and on a flat surface, such as walls. GPS and external antenna should be installed above the BTS. Make sure to allow access to all components and consider the location of power source.

All the installations options include a tilt bracket which supports:

- Rotation: ±45°

- Tilt: +7.5° to -10°

2.1.1   Installation Requirements

2.1.1.1   Packing List

- BTS (weight: 10.7 Kg.)

- Mounting kit (for 1.5"-4" poles) including the tilt bracket and carriage

- Sealing Gland Fastening Tool

2.1.1.2   Optional Components

Kit including 4 metal bands for mounting on poles larger than 4"

2.1.1.3   Additional Installation Requirements

The following items are also required to install the BTS:

- Ethernet cable*. Not applicable for 5 GHz units using PoE power supply option. Available in various lengths.

■ Power Supply:

» PoE Power Supply and Data and Power (indoor-outdoor) CAT5 cable*
(applicable only for 5 GHz units, available in various lengths), or:

» High power AC/DC Power Supply unit and DC power cable* (available in
various lengths).

■ Antenna(s)* and RF cable(s)* for connecting the antenna(s) to the BTS.
(applicable for units without integral antennas).

■ Grounding cable with an appropriate termination.

■ One of the following GPS options (see "GPS Installation" on page 39):

» High-Gain GPS Antenna with mounting kit, 25m cable and two lightning
arrestors. Or:

» Basic GPS Antenna kit including mounting kit, 3m cable and one lightning
arrestor.

■ Installation tools and materials.

■ For wall mount installation - four suitable dowels and screws.

NOTE

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

2.1.1.4   Pole Mounting Kit

■ Carriage

■ Tilt bracket

■ Two Heavy duty metal clamps

■ 4 x Threaded rods

■ 10 x M8X20 screws

■ 18 x M8 flat washers

- 8 x M8 nuts

- 14 x M8 spring washers

For poles larger than 4" - additional kit containing 4 metal bands

NOTE

The lightning arrestors supplied within the GPS kit are not included in the warranty cover provided for the GPS unit.

Additional lightning arrestors can be ordered separately

2.1.2   Assembling the Tilt Bracket on the BTS

The tilt bracket is attached and fastened to the BTS and then hung on the carriage. After hanging the BTS on the carriage, tilt and rotate the BTS as required before fastening the screws. The Tilt Bracket supports +7.5°/-10° tilting and ±45° vertical plane rotation. The BTS has to be vertical to the ground.

NOTE

Install the unit with the bottom panel, including the LEDs, facing downward. Note the direction arrows (UP) on the sides of the BTS.

CAUTION

The weight of BTS is 10.7 Kg and the weight of the Pole Mounting Kit is approximately 5 kg. Be sure to plan the installation accordingly. It is recommended to use a harness to lift the units.

Install the unit using the supplied kit only.

To assemble the bracket on the BTS:

Place the tilt bracket on the BTS and fasten its M8 screws (see Figure 2-1 and Figure 2-2). Apply torque of 80 [Lib*In] = 9 [N*m]

BTS

Carrying
grooves

Tilt bracket

M8X20 screws
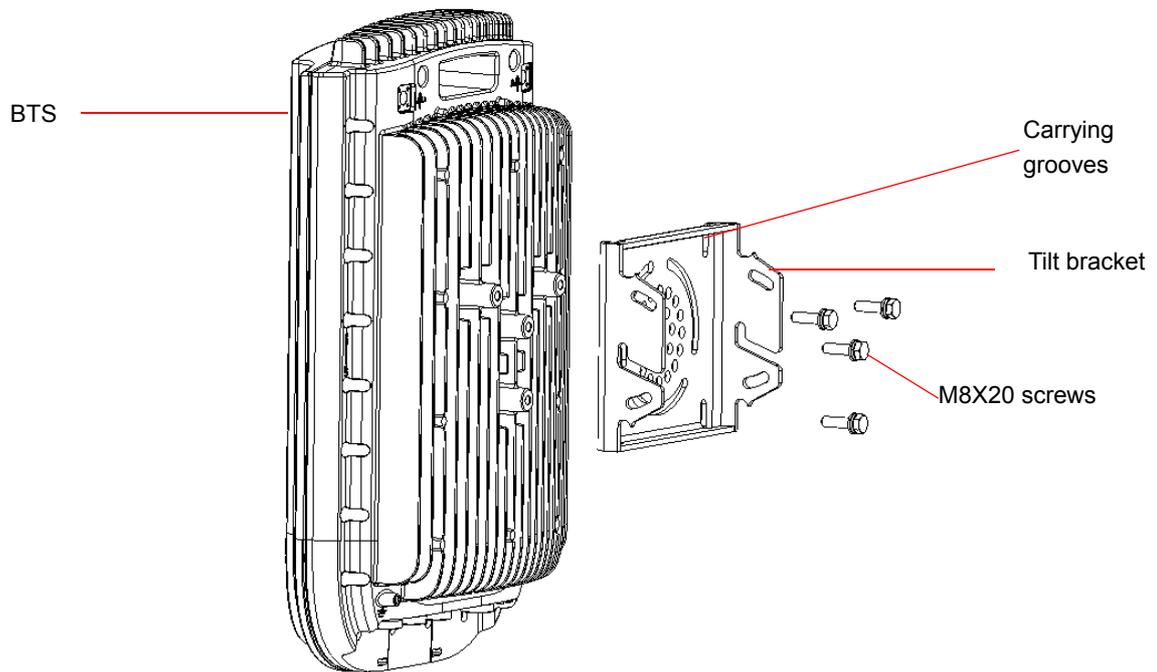
Figure 2-1: Assembling the Tilt Bracket on the BTS
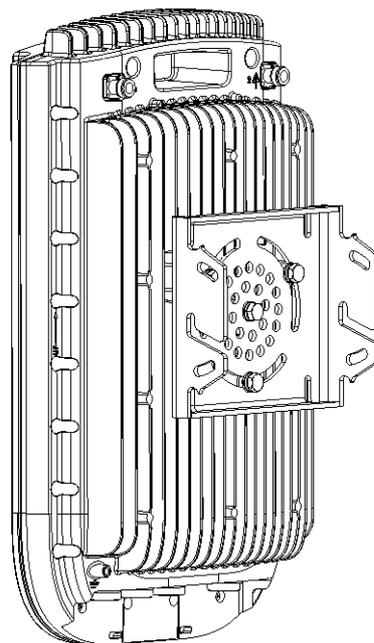
Figure 2-2: Tilt Bracket Installed on BTS

2.1.3 Installing a Lightning Arrestor for the High-Gain GPS Antenna

If you use a High-Gain GPS antenna with a cable longer than 3m, a lightning arrestor must be installed near the BTS.

1   Install the lightning arrestor (part of the GPS Kit, see "GPS Installation" on page 39) at the designated location at the bottom of the carriage (see Figure 2-3).

2   Connect one end of the 0.5 m cable to the lightning arrestor and the other end to the GPS ANT connector on the BTS.
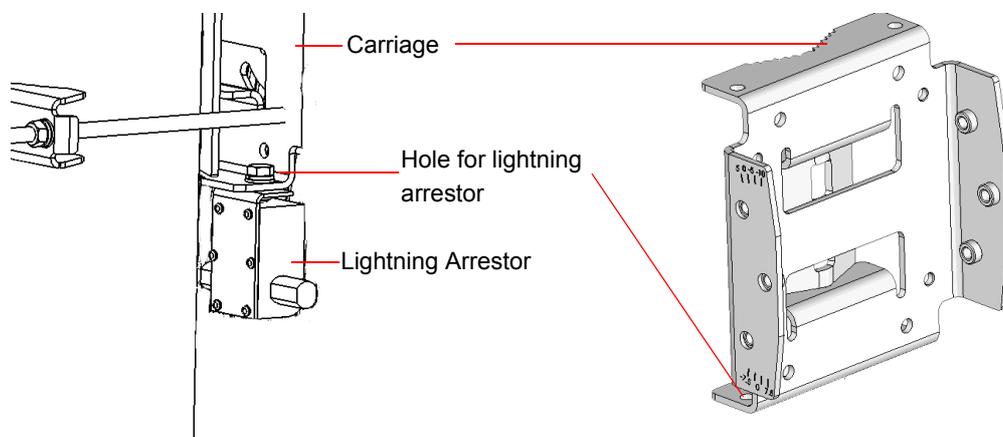
Figure 2-3: Installing the Lightning Arrestor on the Carriage

NOTE

■   Some units are supplied with a separate pole-mounting bracket for the lightning arrestor. Instead of attaching the lightning arrestor to the carriage, install this bracket on the pole as close to the BTS as possible, allowing connecting the lightning arrestor to the BTS's GPS connector.

■   The lightning arrestors supplied within the GPS kit are not included in the warranty cover provided for the GPS unit. Additional lightning arrestors can be ordered separately

2.1.4 Installing the BTS on a Pole

The BTS can be installed on poles of various sizes, using the supplied carriage (see Figure 2-4). For poles of 1.5''-4'' in diameter, use the supplied metal clamps. For poles larger than 4'' use metal bands.

Holes for wall
mounting screws (x4)

Groove for
metal bands

Tilt control
screws (x2)

Holes for fastening
screws (x4)

Holes for pole
mounting rods (x4)

Holes for lightning
arrestor (x4)
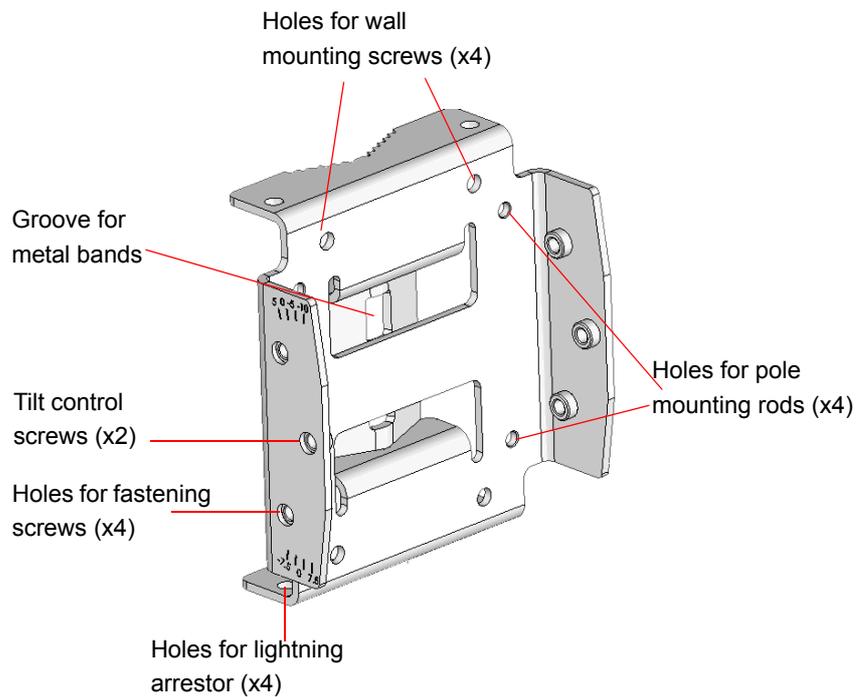
Figure 2-4: BreezeMAX Extreme Pole Mount Carriage

To install the Carriage on a 1.5"-4" pole:

1   Assemble the tilt bracket on the BTS and fasten its four screws (see
    "Assembling the Tilt Bracket on the BTS" on page 30).

2   If you use a High-Gain GPS antenna with a cable longer than 3m, install a
    lightning arrestor on the carriage as described in "Installing a Lightning
    Arrestor for the High-Gain GPS Antenna" on page 32.

3   Thread the four rods through the carriage.

4   Attach the carriage and the clamps to the pole and tighten on both sides using
    the supplied washers, spring washers and nuts. Apply torque of
    80 [Lib*In] = 9 [N*m].

5   Insert the tilt control screws into the middle-side hole of the carriage on both
    sides.
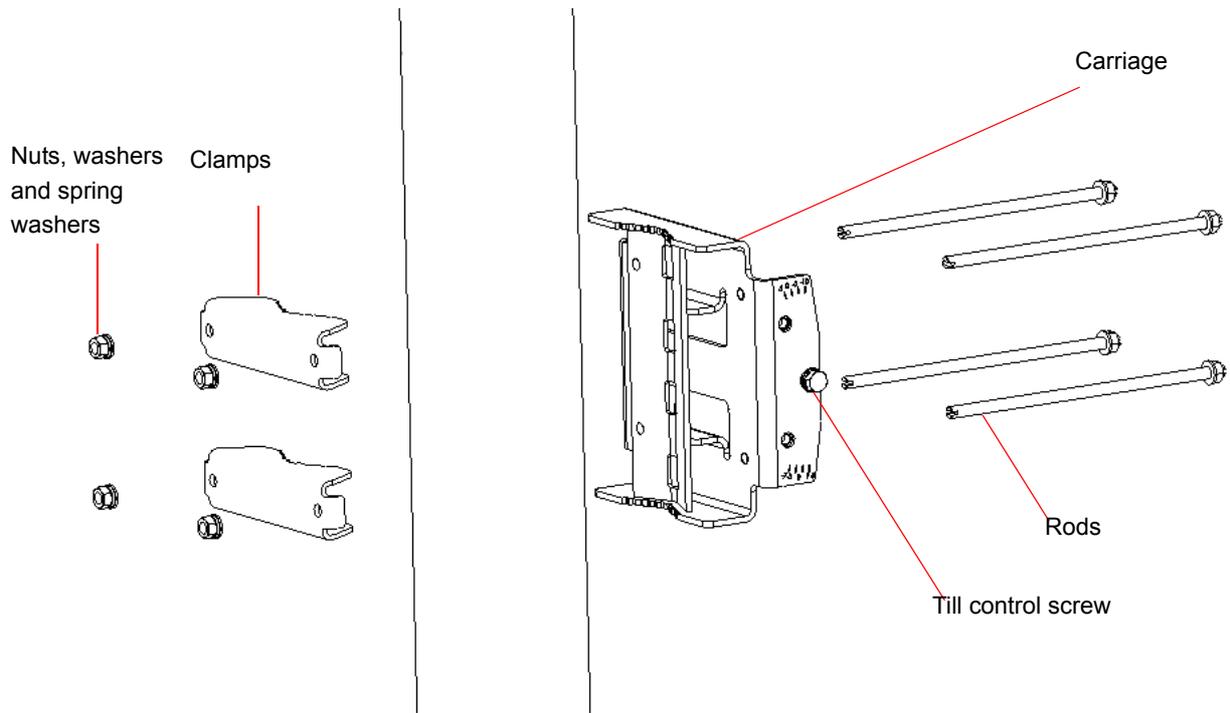
Figure 2-5: Assembling BTS Carriage and Clamps
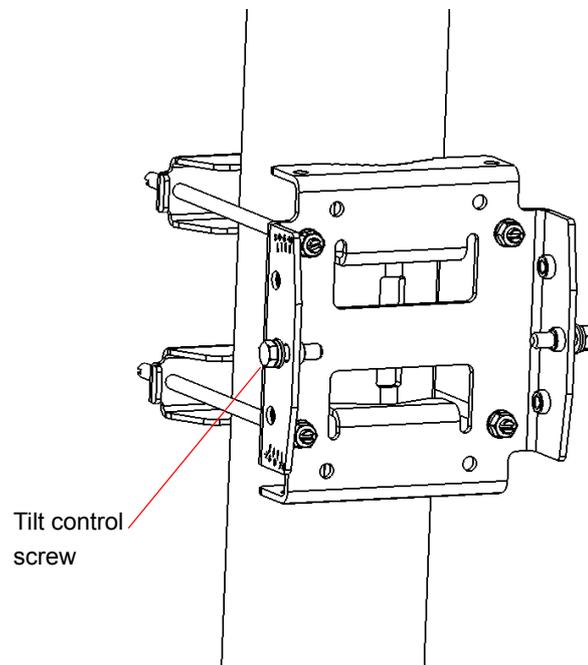
Figure 2-6: BTS Carriage and Clamps Installed

> **To install the Carriage on a pole larger than 4":**

1   Assemble the tilt bracket on the BTS and fasten its four screws (see "Assembling the Tilt Bracket on the BTS" on page 30).

2   Thread the four metal bands through the grooves on the BTS carriage and fasten them (see Figure 2-7).

3   Attach the carriage to the pole and fasten the metal bands (see Figure 2-7).

4   Insert the tilt control screws into the middle-side hole of the carriage on both sides (Figure 2-7).
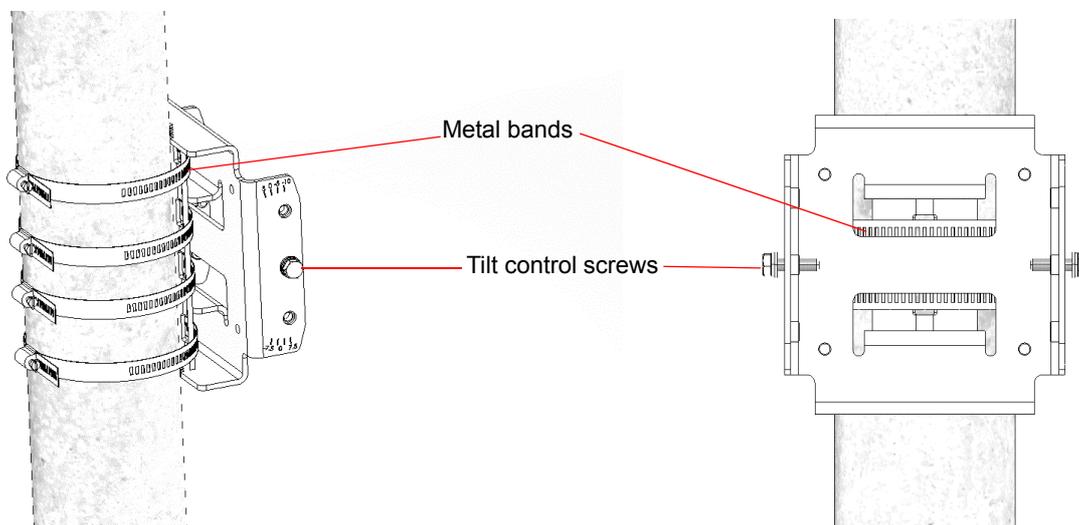
Figure 2-7: Installed Carriage with Metal Bands

2.1.5   Mounting the BTS on the Carriage

At this stage, after mounting the BTS on the carriage, use the Tilt bracket to tilt and rotate the BTS as required.

CAUTION

The weight of BTS is 10.7 Kg and the weight of the Pole Mounting Kit is approximately 5 kg. Be sure to plan the installation accordingly. It is recommended to use a harness to lift the units.

Install the unit using the supplied kit only.

To mount the BTS on the carriage:

1   Hang the BTS with the tilt bracket on the tilt control screws of the BTS carriage.

2   Attach and fasten all the screws at both sides of the BTS carriage . Do not over tighten.
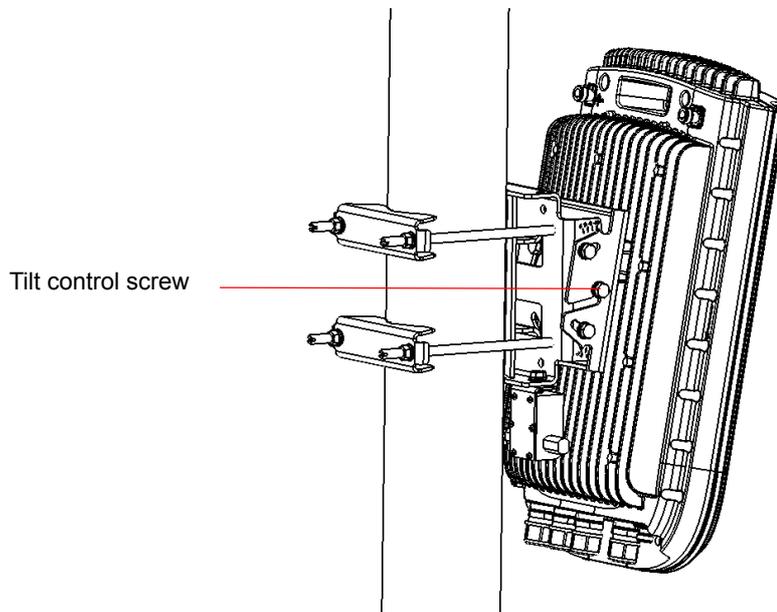
Tilt control screw

Figure 2-8: BTS Mounted on a 1.5"-4" Pole (with Clamps)
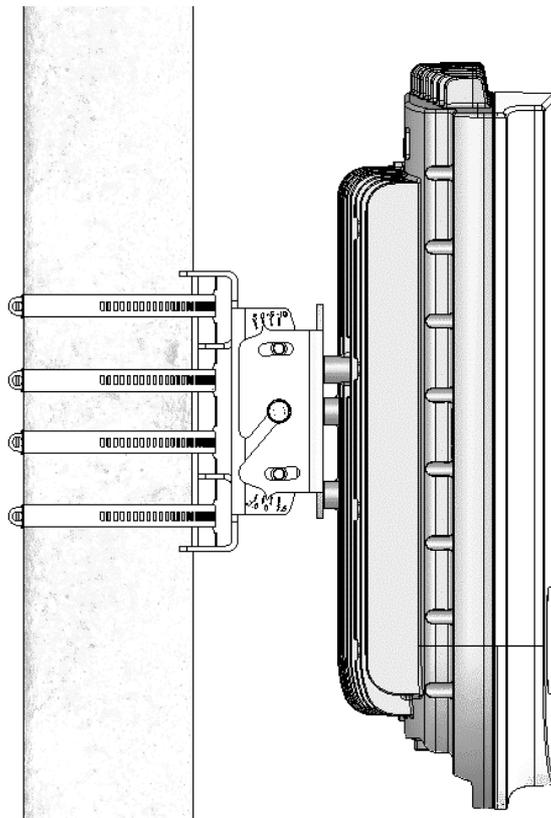
Figure 2-9: BTS Mounted on a Pole Larger than 4" (with Metal Bands)

3   If required, slightly release the tilt bracket screws to enable rotation, and the tilt control screws to enable tilting; Adjust the BTS position and tighten the screws. Apply torques of 45 [Lib*In.] = 5 [N*m] to the M6 Tilt-control screws, and 80 [Lib*In] = 9 [N*m] to the M8 screws.

2.1.6   Wall Mount Installation

The BreezeMAX Extreme BTS can be installed on walls or any flat surface. This requires attaching and fastening the carriage with the BTS to the wall using suitable securing means (not supplied) and then tilting and rotating the BTS as required. The location of the screws should be planned with maximum precision.

To install the BTS on a wall:

1   Assemble the tilt bracket on the BTS and fasten its four screws (see).

2   If you use a High-Gain GPS antenna with a cable longer than 3m, install a
     lightning arrestor on the carriage as described in "Installing a Lightning
     Arrestor for the High-Gain GPS Antenna" on page 32.

3   Place the carriage on the wall and mark the exact location of the holes to drill.

4   Drill the holes, and use four metal dowels and screws to affix the carriage to
     the wall.

5   Insert the tilt control screws into the middle-side hole of the carriage on both
     sides (see Figure 2-10).
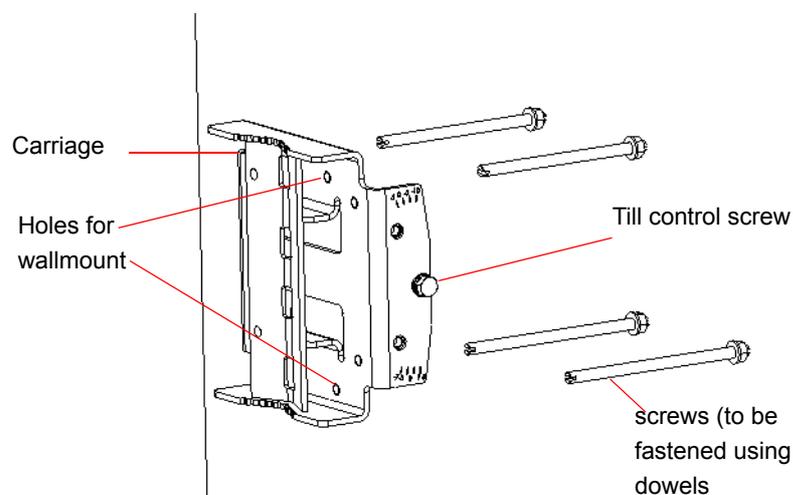
Figure 2-10: Mounting the Carriage on the Wall

6   Hang the BTS with the tilt bracket on the tilt control screws of the BTS
     carriage.

7   Attach and fasten all the screws at both sides of the carriage (see Figure 2-10).
     Do not over tighten.

8   If required, slightly release the tilt bracket screws to enable rotation, and the
     tilt control screws to enable tilting; Adjust the BTS position and tighten the
     screws.

2.2   GPS Installation

Alvarion offers two types of GPS antenna (basic and high-gain) that can be installed at a distance of up to 25m (high-gain) or 3m (basic) from the BTS (with the required mounting kit and connecting cable). Refer to "GPS Antennas" on page 21 in the Specifications section for more information.

2.2.1   Installation Requirements

■ The High-gain GPS antenna is installed using a specially designed bracket and a 25m cable. A second lightning arrestor is required with this configuration in addition to the lightning arrestor already assembled on the BTS carriage (see "Installing a Lightning Arrestor for the High-Gain GPS Antenna" on page 32).

■ The Basic GPS antenna is installed using a specially designed bracket and a 3m cable. No lightning arrestor is required with this configuration in addition to the lightning arrestor already assembled on the BTS carriage.

2.2.2   Packing List

GPS Mounting Kit: One of the following options:

■ Basic GPS Antenna

» Basic antenna

» 3m cable

» Pole mount bracket

» Two metal bands

» One Lightning Arrestor with 0.5m cable, including screws, washer, and spring washer (UNC10-32)

■ High gain GPS Antenna

» High gain antenna

» 25m cable

» Pole mount bracket

» Two metal bands

» Carriage mounting bracket

» Two Lightning Arrestors with 0.5m cables, including screws, washers, and spring washers (2 x UNC10-32)

NOTE

The lightning arrestors supplied within the GPS kit are not included in the warranty cover provided for the GPS unit.

Additional lightning arrestors can be ordered separately.

2.2.3   Installing the GPS

To install the basic GPS antenna:

1   Place the bracket on a flat surface and thread the GPS antenna through the hole at the top of the bracket. Hand-tighten the fastening nut.

2   Assemble the lightning arrestor on the bracket, with the screws facing the bracket. Connect one end of the 0.5 m cable to the lightning arrestor and the other end to the GPS antenna.

3   Connect one end of the GPS 3m cable to the lightning arrestor, and the other end to the GPS ANT connector on the BTS.
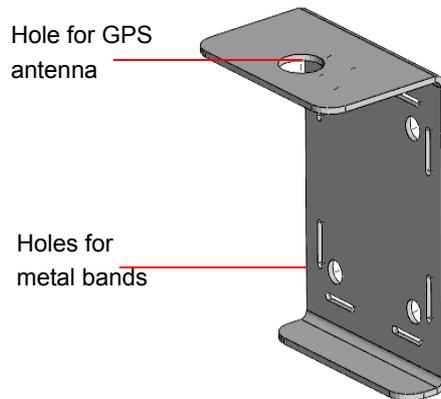
Figure 2-11: Bracket for Basic GPS

4   Use the supplied metal bands to assemble the bracket on a pole.

5   Fix the cable onto the pole using plastic strips.

To install the high-gain GPS antenna:

NOTE

Do not over-tighten or use a tool for tightening the cables, to avoid stripping the connectors.

1   Place the bracket on a flat surface and thread the GPS antenna through the 3/4" hole of the bracket. Hand-tighten the fastening nut.

2   Assemble the lightning arrestor on the bracket, with the screws facing the bracket.

3   Connect one end of the 0.5 m cable to the lightning arrestor and the other end to the GPS antenna.

Hole for
High-gain
GPS antenna

Lightning
arrestor

Holes for
metal bands
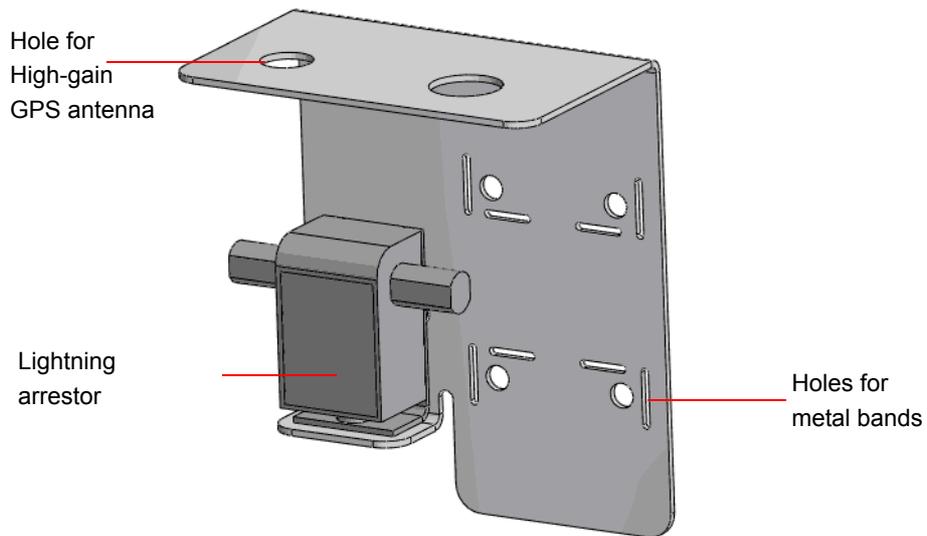
Figure 2-12: Bracket for High-Gain GPS

4   Use the 25m GPS cable to connect the lightning arrestor on the GPS bracket to the second lightning arrestor installed near the BTS (see "Installing a Lightning Arrestor for the High-Gain GPS Antenna" on page 32). Connect this second lightning arrestor to the GPS ANT connector on the BTS.

5   Hand-tighten the connector on the interface cable using the locking ring for securing the connection.

6   Use the supplied metal bands to assemble the bracket on a pole.

7   Fix the cable onto the pole using a plastic strip.

2.3   Indoor Power Supply Installation

The BTS is powered from a 48V DC power source. Alvarion offers a range of indoor AC/DC power supplies to support the different power requirements of the various BTS units:

- A PoE AC/DC power supply that can supply DC power over the Ethernet connection to 5 GHz BTS units.

- A high power AC/DC power supply - to be used with all BTS types (see "High Power AC/DC Power Supply Unit" on page 44).

CAUTION

Do not connect two power sources (PoE and DC input) simultaneously.

2.3.1   PoE AC/DC Power Supply

A Universal Indoor Unit AC Power Adapter is used to supply DC power over the Ethernet connection to 5 GHz BTS units. This is an AC to DC power transfer device, which can provide a 70W single DC output with constant voltage source.

This unit can be wall mounted or placed on the desktop.

For cable connection, refer to "Cable Connection" on page 47

Figure 2-13: PoE AC/DC Power Supply

2.3.2   High Power AC/DC Power Supply Unit
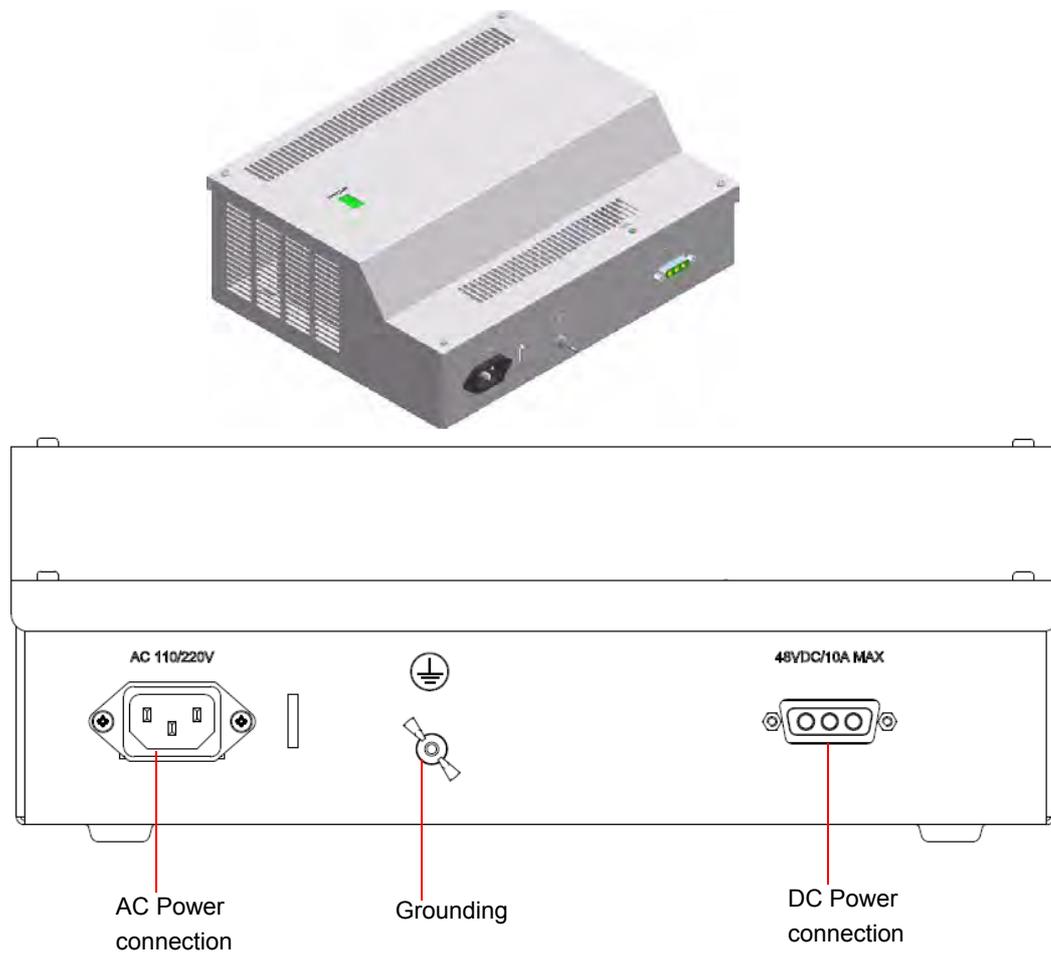
Figure 2-14: Indoor High Power AC/DC Power Supply Unit

➤   **To install the indoor high power supply unit:**

1   Place the Power Supply on a table/shelf or use 4 screws to mount the unit to the wall.

2   For cable connection, refer to "Cable Connection" on page 47.

2.4   Cable Connections

The BreezeMAX Extreme is provided with sealing glands on all the cable connectors. The DATA/DC IN/OUT, and GPS IN/OUT cables are to be connected to the BTS by inserting the cable connector through the sealing gland. The DC power cable is supplied with a sealing gland that should replace the existing sealing gland provided with the BTS.

A dedicated tool is supplied for fastening the sealing glands (see Figure 2-16).

For LED indication refer to "Operation Verification" on page 55.
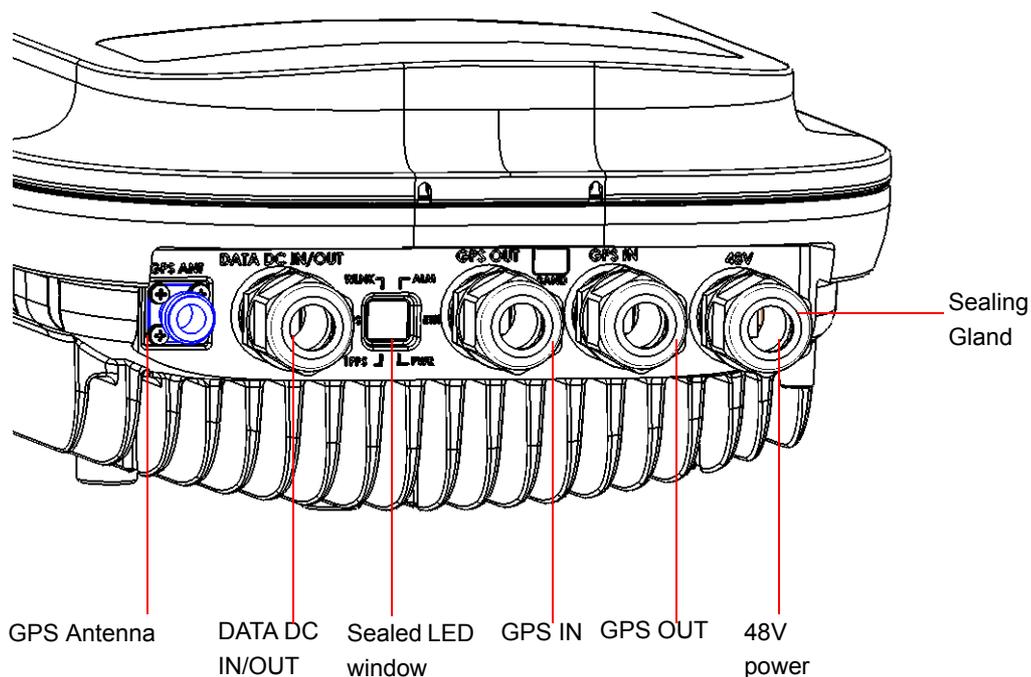
Figure 2-15: BTS with Sealing Glands
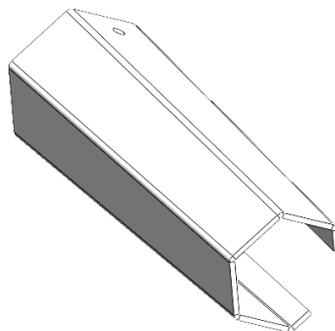
Figure 2-16: Sealing Gland Fastening Tool
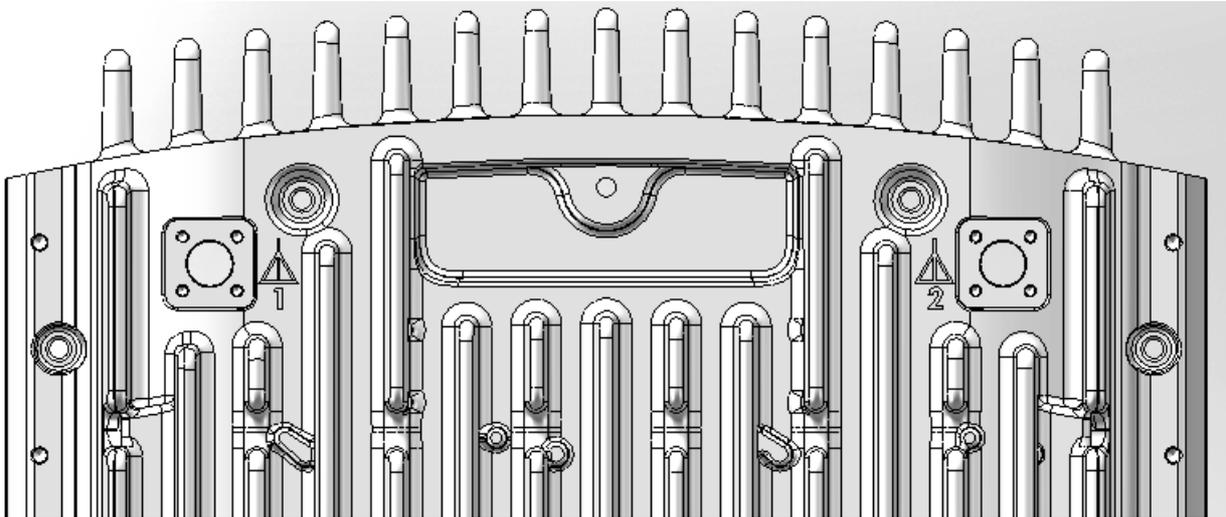
Figure 2-17: BTS Rear View - External Antenna Connections

Table 2-1: External Connectors

Connection	Connector Type	Functionality
DATA DC IN/OUT	RJ-45	10/100BASE-T connectivity Supports MDI/MDIX PoE In/Out
GPS Antenna	TNC jack	Connection to GPS antenna (via lightning arrestor(s))
GPS In	RJ-45	GPS signalling from another BTS. Not applicable in current release
GPS Out	RJ-45	GPS signalling to another BTS. Not applicable in current release
DC source	4-pin Mini Fit High Current Molex 39-29-1048	DC Power
⊤ (GND)	Grounding screw	Connection to ground (earth)
Y ANT (1/2)	N-Type jack, 50 Ohm	Connection to external antenna(s) (not applicable if integral)

CAUTION

Do not connect two power sources (PoE and DC input) simultaneously.

2.4.1   Cable Connection

2.4.1.1   Grounding Cable Connection

When grounding the unit, use the GND (ground) screw on the unit as a grounding point. The Grounding screw (marked ⏚) is located on the rear panel of the unit.

To connect the grounding cable:

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

2   Connect the opposite end of the grounding cable to a ground connection.

2.4.1.2   Data/PoE Cable Connection

For all units, use Category 5E Ethernet cables with two shielded RJ-45 connectors from either Alvarion or any of the approved manufacturers, listed in Table 2-2. The provided cables are crimped.

Consult with Alvarion's specialists on the suitability of other cables.

For 5 GHz units, if you use a PoE indoor power supply (see "Indoor Power Supply Installation" on page 43), the data port cable is used as a power source cable. In this case, use a Power over Ethernet (PoE) cable for connecting PoE to the BreezeMAX Extreme unit.

NOTE

The length of the Data/PoE cable, together with the length of the Ethernet cable should not exceed 100 meters.

For 5 GHz units using two radios (diversity) the maximum length of the PoE cable should not exceed 70m.

CAUTION

As PoE cable conducts power as well, there is a risk of electric shock and energy hazard.

Table 2-2: 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
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

NOTE

In case of missing information (product specifications, ordering information, etc.) regarding these products on the manufacturer's web site, it is highly recommended to contact the manufacturer's sales representative directly.

To connect the data cable (with an assembled sealing gland)

1   Remove the DATA DC IN/OUT sealing gland from the BTS.

2   Open the gland and thread the cable through the gland's nut.

3   Carefully insert the cable with the already assembled RJ-45 connector through the gland.

4   Connect the cable to the DATA connection on the BTS.

5   Return the gland. Use the dedicated tool to fasten it.

6   Use the dedicated tool to fasten the sealing gland's nut on the gland body.

7   Connect the other end of the cable to one of the following:

   »   If you are not using PoE - to the backhauling equipment.

   »   If you are using PoE (for 5 GHz units only) - to the PoE AC/DC power supply RJ-45 connector (labeled as Radio). Connect the Ethernet port of

the PoE PS to the backhauling equipment using a standard Ethernet cable. Connect the PoE PS to the 110/220 VAC mains.

NOTE

The combined lengths of the Ethernet cables should not exceed 100m.

2.4.1.3   DC Power Cable Connection (not applicable if using PoE)

The power cable is supplied with a specially designed sealing gland that should replace the existing gland provided with the BreezeMAX Extreme BTS.

Cables are available either open ended at the Power Supply side or with a crimped D-Type connector.

To connect the power cable:

1   Remove the existing gland from the 48V connection on the BTS.

2   Attach the DC power cable with the already assembled gland to the 48V connection on the BTS.

3   Separate the sealing gland nut from the gland body.

4   Use the dedicated tool to fasten the gland to the BTS.

5   Use the dedicated tool to fasten the sealing gland's nut on the gland body.

6   Connect the other end of the power cable to the high power AC/DC power supply.Use a standard power cable to connect to 48V DC power source.

2.5 External Antennas Connection

Two N-type connectors are used for optional external antenna connection (see Figure 2-17). The connectors should have an impedance 50Ω and should be protected against lightning.

To connect the RF cable (units with external antenna):

1 Connect one end of the coaxial RF cable to the connector (marked ![Y]) located on the rear panel of the unit.

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

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

NOTE

The recommended minimum distance between any two antennas in neighboring sectors is 0.5 meters.

The minimum distance between any two antennas in the same sector (space diversity configuration) is 10 lambda (λ), where λ=C/Frequency (Hz). C is the speed of light in centimeters per second which is equal to 29,979,245,800.

The minimum distance between any two antenna in the same sector (space diversity configuration) is 1.3 meters.
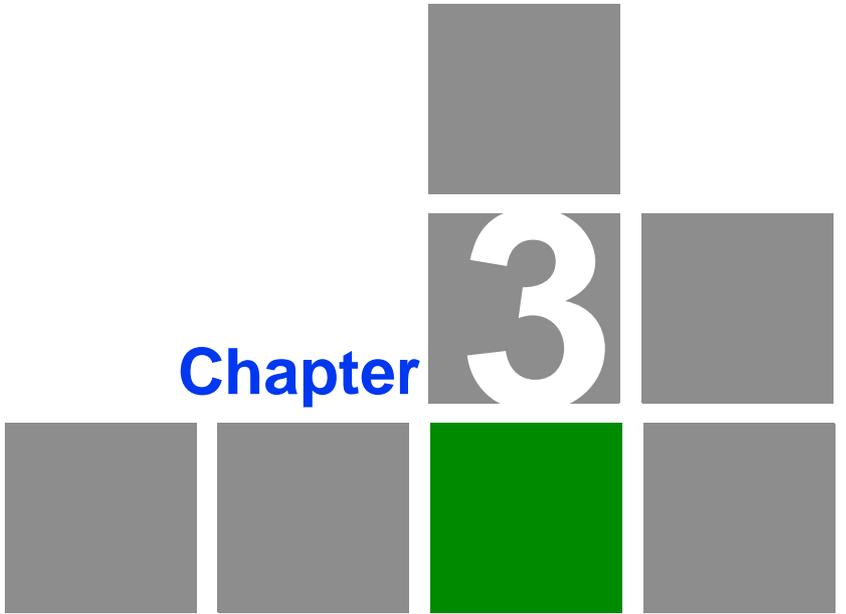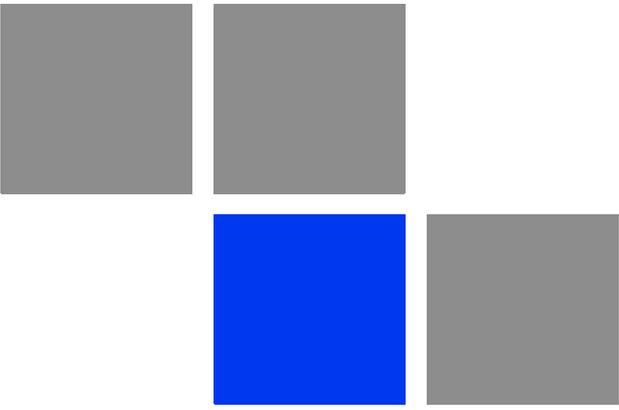
Chapter **3**

Commissioning

In This Chapter:

3.1   Configuring Parameters Required for Remote Management

After completing the installation process, as described in the preceding chapter, some parameters must be configured using either Telnet (the Monitor application) or AlvariCRAFT. These parameters are necessary to enable remote management of the BTS.

NOTE

AlvariCRAFT can be used only if the Authorized Managers list in the BTS is either empty (default) or includes the IP address of the AlvariCRAFT station.

Refer to Chapter 4 for information on how to access the Monitor application and how to use it. Refer to the AlvariCRAFT User Manual for information on how to use it.

The basic parameters are listed in Table 3-1. Refer to Chapter 4 for detailed information on the applicable parameters.

Table 3-1: Basic BTS Parameters

Management Option	Parameters
BTS-Connectivity	■ IP address ■ Subnet Mask ■ Default Gateway ■ VLAN ID ■ VLAN Priority
Authorized Managers (per manager)	■ IP Address ■ Read Community ■ Write Community ■ Traps Distribution Enabled

NOTE

If no Authorized Manager is defined in the device, it can be managed using SNMP by any station. If at least one Authorized Manager is defined, the device can be managed only by a station whose parameters match a defined Authorized Manager.

After the basic parameters have been configured, the BTS can be managed remotely using either Telnet or SNMP-based management.

3.2   Operation Verification

To verify the correct operation of the BTS (including the GPS), examine the LED indicators located on the bottom panel of the unit.

The following tables list the provided LEDs and their associated indications.

Table 3-2: BTS LEDs

Name	Description	Functionality
PWR	Power indication	▪ Off - Power failure ▪ Green - Power to ODU is OK, internal 3.3 VDC power supply is OK.
ALM	IDU-ODU communication and synthesizer status indication	▪ Off -Built-in-test passed successfully. ▪ Red - Critical failure.
ETH	Ethernet link status	▪ Off - No Ethernet connection ▪ Green - Lights when the backhaul Ethernet is connected and blinks 500ms on and 500ms off when data traffic appears on the Ethernet link.
WLNK	Wireless link status	▪ Off - No wireless link (no MS is registered) ▪ Green - Blinking when the wireless link is working (transmitting), indicating that there is at least one registered MS being served by the unit.
GPS	GPS synchronization status	▪ Off - GPS is not synchronized (see below) or not installed. ▪ Green - On once the GPS is reporting on reception of at least 4 satellites (initial synchronization). ▪ Blinking Green - (0.5 Sec on, 0.5 Sec off) the number of received satellites decreased from 4 (or more) to 3 or 2 satellites.

Table 3-2: BTS LEDs

Name	Description	Functionality
1PPS	1PPS clock status	Master Unit ■ Off - GPS is not installed. ■ Green - 1PPS clock is supplied by GPS. Slave Unit (not applicable in current release): ■ Off - External 1PPS is not supplied. ■ Blinking Green - blinking at the 1PPS rate when external 1PPS clock is supplied.

* All LEDs are turned on upon power up and turn off after successful completion of the built-in-test.
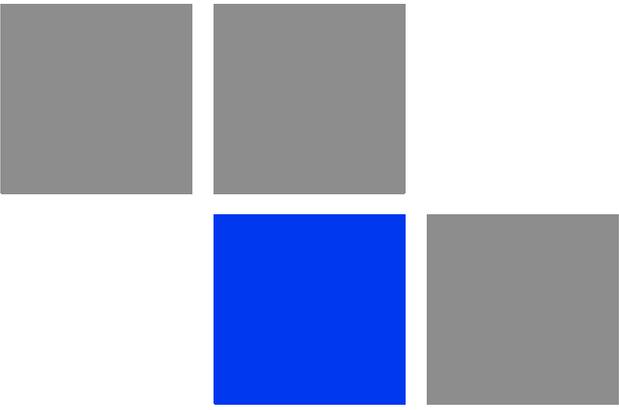
Chapter 4

Operation and Administration

In This Chapter:

4.1   BreezeMAX Extreme System Management

BreezeMAX Extreme can be managed using any of the following options:

- SNMP based management using AlvariSTAR/AlvariCRAFT (or another network management system customized to support management of BreezeMAX Extreme).

- Using Telnet to access the embedded Monitor application via the Ethernet port.

NOTE

It is not possible to manage the BreezeMAX Extreme Base Transceiver Station via the wireless link (from the MS's side).

This chapter describes how to manage the system using the Monitor application. For information on managing the system using AlvariSTAR/AlvariCRAFT refer to the applicable documentation.

4.2 The Monitor Program

4.2.1 Accessing the Monitor Program

To access the Monitor program using Telnet:

1 The PC used for accessing the Monitor program should be configured according to the BTS Management Connectivity parameters (see "Connectivity" on page 71).

2 Run the Telnet program connecting to the IP address of the connected port.

3 Select the access level according to your access rights.

4 The Enter the password message is displayed. Enter the password and press the Enter key to get to the Main menu. The default passwords are:

Table 4-1: Default Passwords

Access Level	Default Password
Administrator	admin
Installer	installer
Monitor	monitor

NOTE

Following three unsuccessful login attempts (using incorrect passwords), access to the monitor program will be blocked for 5 minutes.

If you forgot the Installer or Monitor password, the Administrator can login (with the Administrator password) and define a new password for Installer and/or Monitor access level.

If you forgot the Administrator password, type "help" to receive a challenge string consisting of 24 characters. Contact Alvarion's Customer Service and provide the challenge string (after user identification) to receive a temporary password. You can use this password only once to enter the program. The password must be changed during the session to a different "permanent" password. The system administrator should be notified of this new password. Five consecutive errors in entering the temporary password will invalidate it. In this case, repeat this procedure to receive a new challenge string for a new temporary password.

4.2.2 Using the Monitor Program

This section describes the Monitor program structure and navigation rules.

- There are three access levels to the Monitor program. The available actions depend on the access level (password) used for accessing the program:

  - » **Administrator**: Read/Write permissions for all parameters. The default password is admin.

  - » **Installer**: Read/Write permissions for all options excluding the Change Password option. The default password is installer.

  - » **Monitor**: Read-only permissions for all parameters. The default password is monitor.

- Each menu or submenu specifies the unit type (BreezeMAX Extreme/BTS), the Management IP address, the running SW version and a description of the menu.

- Each menu or submenu displays a list of numbered options. To access an option, enter the number of the required option at the > prompt.

- At any point in the program, you can use the **Esc** key to return to the previous menu (one level up) without applying any change.

- The first selectable item in most menus is the Show option, enabling to view the current configuration of the applicable parameters. For some menus some additional status information is displayed.

- For certain parameters, an updated value is applied only after reset or after entering a specific command. For these parameters, both Configured and Current values are displayed in relevant Show menus.

- The Update/Add options will display all applicable parameters line by line, allowing to conveniently edit all of them. The availability and/or value range of certain parameters may change according to the value selected for a previous parameter belonging to the same group. The current value is displayed for each parameter. To keep the current value - press **Enter**. To change it - enter a new value and press **Enter**. The new/modified configuration will take effect only after completing the configuration process for the all relevant parameters.

- Press the **Tab** key for context sensitive help text (where applicable).

- If an erroneous value was entered - the reason of the error or help text will be displayed, and the parameter entry text will be displayed again.

■ Many menus include a Select By option, enabling to get a sub-menu for a selected entity according to the selection criteria.

■ If the Monitor program is not used for the period of time defined by the Monitor Inactivity Time-out (see "Monitor Inactivity Timeout" on page 88), the session will be terminated automatically.

■ Select the Exit option in the Main menu to exit the program and terminate the session.

4.3 IP Addresses Configuration

4.3.1 IP Address Configuration Restrictions

1 The following IP addresses should not be used and will be rejected:

■ 0.0.0.0

■ 224.0.0.0 - 255.255.255.255 (Multicasts, RFC 3171 D, RFC 1700 E)

2 Note that the following IP addresses are reserved for specific applications:

■ 10.0.0.0 - 10.255.255.255 (Private IP addresses, RFC 1918 A)

■ 127.0.0.0 - 127.255.255.255 (Localhost Loopback Address, RFC 1700 A)

■ 169.254.0.0 - 169.254.255.255 (Zeroconf / APIPA, RFC 3330 B)

■ 172.16.0.0 - 172.31.255.255 (Private IP addresses, RFC 1918 B)

■ 192.0.2.0 - 192.0.2.255 (Documentation and Examples, RFC 3330 C)

■ 192.88.99.0 - 192.88.99.255 (IPv6 to IPv4 relay Anycast, RFC 3068 C)

■ 192.168.0.0 - 192.168.255.255 (Private IP addresses, RFC 1918 C)

■ 198.18.0.0 - 198.19.255.255 (Network Device Benchmark, RFC 2544 C)

4.3.2 IP Subnets

In a binary representation (32 bits) a Subnet Mask string must comprise a series of contiguous binary '1's starting from the MSB, followed by a series of contiguous binary '0's.

Subnet Masks 0.0.0.0 (all zeros, meaning "nothing") and 255.255.255.255 (all ones, meaning "this address only") are illegal and will be rejected.

4.4   The Main Menu

The Main menu of the Monitor program includes the following options:

1 - BTS (see "BTS Menu" on page 65)

2 - ASN-GW (see "ASN-GW Menu" on page 97)

3 - Sector (see "Sector Menu" on page 124)

4 - BS (see "BS Menu" on page 137)

5 - Radio Channel (see "Radio Channel Menu" on page 157)

6 - Antenna (see "Antenna Menu" on page 159)

7 - GPS (see "GPS Menu" on page 162)

8 - MS (see "MS Menu" on page 169)

X - Exit (select to exit the Monitor program and terminate the Telnet session)

4.5   BTS Menu

The BTS menu includes the following options:

■ Show Summary

■ Show Properties

■ Configuration

■ Unit Control

■ Fault Management

■ Performance Counters

4.5.1   Show Summary

Select this option to view the current and (where applicable) configured values of all configurable BTS parameters and options:

General:

■ BTS Number

■ BTS Name

■ BTS Location

■ BTS Contact

BTS Working Mode:

■ Current BTS Working Mode

■ Configured BTS Working Mode

Management Connectivity:

■ Current IP Address

■ Configured IP Address

- Current Subnet mask

- Configured Subnet mask

- Current Default Gateway

- Configured Default Gateway

- Current VLAN ID

- Configured VLAN ID

- Current VLAN Priority

- Configured VLAN Priority

Ethernet Interface

Speed and Duplex After Negotiation (Mbps)

Authorized Managers (for each defined manager):

- Authorized Managers Index

- Manager IP Address

- Read Community

- Write Community

- Trap Distribution Enabled

General Radio:

- Current Operator ID

- Configured Operator ID

- Operator Name

- Current Service Zone ID

- Configured Service Zone ID

■ Service Zone Name

Unit Operation Mode:

■ Current Operation Mode

■ Configured Operation Mode

ATPC Mode:

■ ATPC Mode: Open Loop. It is assumed that Open Loop Transmit Power Control is used by the MSs, meaning that each MS calculates the link loss considering the BS Tx power and preamble RSSI and determines its Tx power taking into account the estimated link loss, the number of sub-channels used and the SNR required for the relevant rate.

UL/DL Ratio:

■ Current UL / DL Ratio

■ Configured UL / DL Ratio

DFS:

■ Current DFS Type

■ Configured DFS Type

■ Current Frequencies Management Level

■ Configured Frequencies Management Level

4.5.2   Show Properties

Select this option to view the general hardware and software properties of the device:

■ Product Type

■ Operational SW File Name

■ Operational SW Version

- Shadow SW File Name

- Shadow SW Version

- Running From (Operational or Shadow)

- Operational Boot SW Version

- Frequency File Name

- Frequency File Version

- Digital Board Assembly Version

- Digital Board HW Version

- Radio 1 HW version

- Radio 2 HW version

- Radio 1 HPA Version

- Radio 2 HPA Version

- Product HW Type: A string defining the HW configuration of the device.

- FPGA Version

- Serial Number

- BTS MAC Address

- Cumulative Power On Time (minutes): The cumulative power-on time of the device since first power-up.

- Cumulative Life Time (minutes): The cumulative life time of the device since first power-up.

- Measured Temperature (degrees Celsius)

- Supported Frequency Band Name

4.5.3   Configuration

The Configuration menu includes the following options:

■   General Parameters

■   BTS Working Mode

■   Connectivity

■   Authorized Managers

■   Radio

■   MAC Access Lists

4.5.3.1   General Parameters

The BTS General Parameters submenu enables viewing the current values and updating the general BTS parameters. The General Parameters include the following:

■   BTS Number

■   BTS Name

■   BTS Location

■   BTS Contact

4.5.3.1.1   BTS Number

A BTS identifier for management purposes. Should be unique in the managed network.

The range is from 1 to 999999.

The default is 0. A different number (unique in the managed network) must be configured.

4.5.3.1.2   BTS Name

An optional descriptive parameter. A string of up to 32 printable characters.

The default is null (an empty string).

4.5.3.1.3   BTS Location

An optional descriptive parameter. A string of up to 64 printable characters.

The default is null (an empty string).

4.5.3.1.4   BTS Contact

An optional descriptive parameter. A string of up to 64 printable characters.

The default is null (an empty string).

4.5.3.2   BTS Working Mode

The BTS Working Mode defines the network ASN-GW architecture and the method of MS authentication and service provisioning for embedded ASN-GW.

The available options are:

■ Embedded Distributed ASN-GW Authenticated: The ASN-GW functionality resides in the BTS (distributed architecture). MS authentication and services provisioning are managed by a AAA server: MSs (see "MS Menu" on page 169) cannot be added or deleted, and MS Services (see "MSs Services" on page 108) are not configurable locally (read-only).

■ Embedded Distributed ASN-GW Not Authenticated: The ASN-GW functionality resides in the BTS (distributed architecture). MS authentication and services provisioning are managed by the ASN-GW using local configuration. The AAA menu (see "AAA" on page 97) is not applicable.

■ External ASN-GW: The ASN-GW is a separate entity (centralized architecture) that communicates with the BTS over R6 interface. MS authentication and services provisioning are managed by a AAA server. MSs (see "MS Menu" on page 169) cannot be added or deleted. All Services configuration (see "Services Menu" on page 107) are managed by the external ASN-GW and are not available to the user. The AAA menu (see "AAA" on page 97) is not applicable.

When changing the BTS Working Mode from Embedded Distributed ASN-GW Not Authenticated to another mode where provisioning is managed by a AAA server, and vice versa, MSs and MS-Services tables records are erased and all connections are deleted.

When changing the BTS Working Mode from any Embedded Distributed ASN-GW mode to External ASN-GW mode all Services tables (see "Services Menu" on page 107) and AAA servers (see "AAA" on page 97) are erased.

The default BTS Working Mode is Embedded Distributed ASN-GW Authenticated.

4.5.3.3   Connectivity

The Connectivity parameters enable viewing the current and configured values and updating the parameters of the management interface. The Connectivity parameters include the following:

■ IP Address

■ Subnet mask

■ Default Gateway

■ VLAN ID

■ VLAN Priority

4.5.3.3.1   IP Address

The IP address of the Management interface.

The default is 1.1.1.23.

Refer to the limitations described in "IP Addresses Configuration" on page 63.

4.5.3.3.2   Subnet mask

The Subnet Mask of the Management interface.

The default is 255.255.255.0.

Refer to the limitations described in "IP Addresses Configuration" on page 63.

4.5.3.3.3   Default Gateway

The Gateway IP address of the Management interface.

The default is 0.0.0.0 (meaning no default gateway).

The Default Gateway must be in the subnet of the IP Address. Refer to the limitations described in "IP Addresses Configuration" on page 63.

4.5.3.3.4   VLAN ID

The VLAN ID to be used with management messages.

Available values are from 1 to 4094, or 4096 for No VLAN (untagged).

The default is 4096 (No VLAN).

4.5.3.3.5   VLAN Priority

The Management VLAN Priority value. Applicable only if VLAN ID is other than 4096 (No VLAN).

Available values are from 0 to 7. The default is No VLAN Priority.

4.5.3.4   Authorized Managers

The Authorized Managers submenu enables defining the properties of management stations that are allowed to manage the BTS using SNMP.

NOTE

If no Authorized Manager is defined in the device, it can be managed using SNMP by any station, with the default Read (public) and Write (private) Communities. If at least one Authorized Manager is defined, the device can be managed only by a station whose parameters match a defined Authorized Manager.

The Authorized Manager submenu includes the following options:

■ Show Summary

■ Select

■ Add

4.5.3.4.1   Show Summary

Select this option to view the details of all currently defined authorized managers.

4.5.3.4.2   Select

This option enables selecting an existing authorized manager for viewing or updating its properties or for deleting it from the database. The selection is based on the authorized manager's IP address.

The Selected Manager submenu includes the following options:

■ **Show:** For viewing the details of the selected Manager.

■ **Update:** For updating the properties of the selected Manager, except to its IP Address. Refer to the following Add section for details on the configurable parameters.

■ **Delete:** For deleting the selected Manager from the database.

4.5.3.4.3   Add

Select this option to add a new authorized manager. Up to 5 Authorized Managers can be defined. The following parameters can be configured:

- Manager IP Address

- Read Community

- Write Community

- Traps Distribution Enabled

4.5.3.4.3.1   Manager IP Address

The IP address of the Authorized Manager. Refer to the limitations described in "IP Addresses Configuration" on page 63.

The IP Address of an existing Manager cannot be updated (to change it you must first delete the Manager).

4.5.3.4.3.2   Read Community

The SNMP Read Community to be used by the Authorized Manager. A null Read Community means that the read (get) operation can only be performed using the Write Community.

Valid Community strings: 1 to 32 printable characters, case sensitive.

The default is public.

4.5.3.4.3.3   Write Community

The SNMP Write Community to be used by the Authorized Manager. A null Write Community means that the Authorized Manager has Read only access rights.

Valid Community strings: 1 to 32 printable characters, case sensitive.

The default is private.

4.5.3.4.3.4   Traps Distribution Enabled

The Traps Distribution Enabled parameters whether to enable or disable sending of traps to the Authorized Manager.

The default is Enable.

4.5.3.5   Radio

The Radio submenu includes two options:

■ **Show**: Enables viewing the current values of the Radio parameters. For parameters that are applied only after reset, the configured values are also displayed:

» General Radio

◊ Current Operator ID

◊ Configured Operator ID

◊ Operator Name

◊ Current Service Zone ID

◊ Configured Service Zone ID

◊ Service Zone Name

» Unit Operation Mode

◊ Current Operation Mode

◊ Configured Operation Mode

» ATPC Mode

◊ ATPC Mode: Open Loop. It is assumed that Open Loop Transmit Power Control is used by the MSs, meaning that each MS calculates the link loss considering the BS Tx power and preamble RSSI and determines

its Tx power taking into account the estimated link loss, the number of sub-channels used and the SNR required for the relevant rate.

» UL / DL Ratio

◊ Current UL / DL Ratio

◊ Configured UL / DL Ratio

» Band Name

◊ Current Band Name

◊ Configured Band Name

» DFS (if applicable)

◊ DFS Type: Read-only, according to the current Band Name. The options are ETSI, FCC, Normal ETSI, Normal FCC.

◊ Current Frequencies Management Level

◊ Configured Frequencies Management Level

■ **Update**: Enables updating the configured values of Radio parameters.

The configurable Radio Parameters include the following:

■ Operator ID

■ Operator Name

■ Service Zone ID

■ Service Zone Name

■ Operation Mode

■ DL / UL Ratio

■ Band Name

■ DFS

4.5.3.5.1   Operator ID

The Operator ID is a unique identifier of the radio network. The same Operator ID must be used by all devices belonging to the same wireless access network.

The Operator ID is presented as x.y.z, where x, y, z are in the range 0 to 255.

The default Operator ID is 0.0.0. The BTS will not start transmitting until a different Operator ID is defined.

4.5.3.5.2   Operator Name

An optional descriptive parameter. A string of up to 32 printable characters.

The default is null (an empty string).

4.5.3.5.3   Service Zone ID

The Service Zone ID form a part of the BS ID (see BS ID in Section 4.8.1). Each Service Zone may include up to a total of 32 cells, with a maximum of 18 cells with 4 sectors per cell.

The value range is from 0 to 2047.

The default value 0. The BTS will not start transmitting until a different Service Zone ID is defined.

4.5.3.5.4   Service Zone Name

An optional descriptive parameter. A string of up to 32 printable characters.

The default is null (an empty string).

4.5.3.5.5   Operation Mode

The following operation modes are supported in current release:

■ Single Sector Single BS no Diversity:
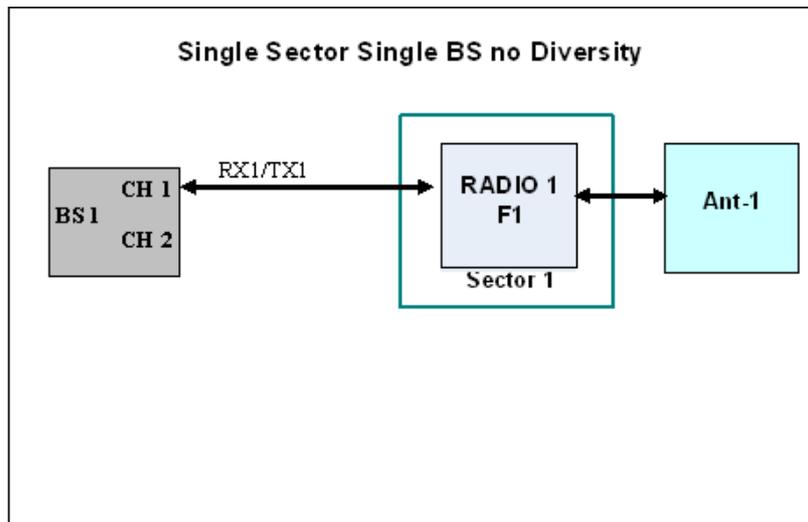
■ Single Sector Single BS with Diversity:
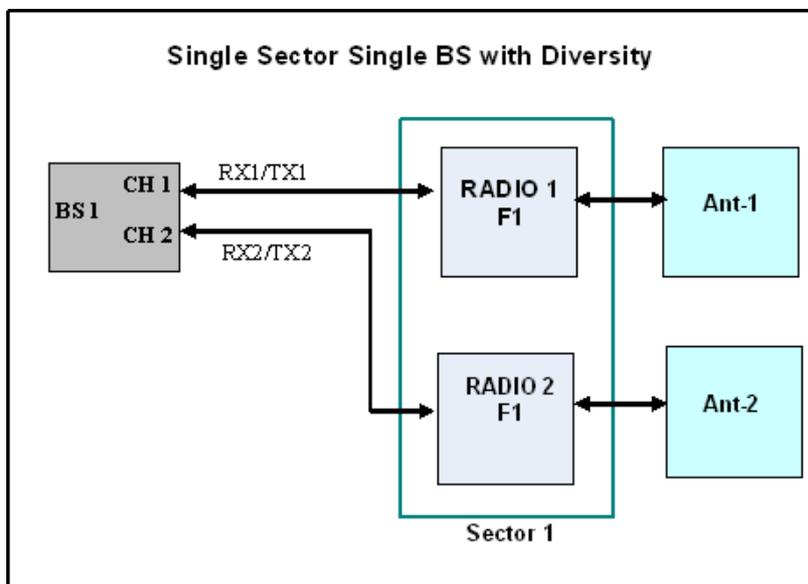
NOTE

PRO 1000 and Si 1000 CPEs can operate only with MIMO A diversity. To support these CPEs by units with a single radio, it is possible to set the Operation Mode of such a unit to Single Sector Single BS with Diversity, although actual operation is with a single radio, single antenna and a single Rx/Tx radio channel.

The available operation modes depend on the supplied configuration and installed license options.

4.5.3.5.6 DL / UL Ratio

The DL/UL Ratio defines the ratio of transmit (downlink) time to receive (uplink) time, in percents.

NOTE

In the current release only ratio of DL = 60% : UL = 40% with compliance to DL/UL slots ratio of 29, 18 is supported. Other options described below will be supported by future releases.

The available values are:

- DL = 70%: UL = 30% - applicable only for BWs 7MHz and 3.5MHz. (complies with DL/UL slots ratio of 24, 9)

- DL = 65%: UL = 35% - applicable only for BWs 10MHz and 5MHz. (complies with DL/UL slots ratio of 32, 15)

- DL = 60%: UL = 40% - applicable for BWs 10, 7, 5 and 3.5MHz. (complies with DL/UL slots ratio of 29, 18 and 21, 12)

- DL = 55%: UL = 45% - applicable for BWs 10, 7, 5 and 3.5MHz. (complies with DL/UL slots ratio of 26, 21 and 18,15 or SQN initiated as 53%-47%)

- DL = 50%: UL = 50% - applicable only for BWs 10MHz and 5MHz. (complies with DL/UL slots ratio of 23, 24 or SQN initiated as 47%-53%)

- DL = 45%: UL = 55% - applicable only for BWs 7MHz and 3.5MHz. (complies with DL/UL slots ratio of 15, 18 or SQN initiated as 44%-56%)

- DL = 35%: UL = 65% - applicable only for BWs 7MHz and 3.5MHz. (complies with DL/UL slots ratio of 12, 21)

The default is DL = 60%: UL = 40%. In the current release only this option is supported, with compliance to DL/UL slots ratio of 29, 18.

A change in the configured DL/UL Ratio is applied only after reset.

> **CAUTION**
>
> The DL/UL Ratio of all BTSs in the same coverage area (neighboring cells) must be set to the same value to ensure optimal performance and avoid uplink saturation.

4.5.3.5.7 Band Name

The Band Name to be used. In all units operating in the licensed 2.x or 3.x GHz bands only a single Band Name is applicable, according to the unit's HW properties. In 5GHz units several Band Name options are available to support different local regulations.

> **CAUTION**
>
> In 5 GHz units, it is the responsibility of the Administrator to verify that the selected Band Name is in accordance with relevant local regulations.

The default for 4.9 GHz units is 4.9 GHz Universal.

The default for 5.4 GHz units is 5.4 GHz Universal.

The parameters that are affected by the selected Band Name are:

■ Supported frequency range. For details refer to "Frequency" on page 128.

■ Maximum EIRP allowed by regulations. This parameter affects the allowed range for Tx Power. For more details refer to "Tx Power" on page 129.

■ Required DFS algorithm. For more details refer to "DFS" on page 80.

Table 4-2: Band Name's Dependent Parameters, 4.9 GHz Units

Band Name	Frequency Range (MHz)	Maximum EIRP (dBm)		Supported DFS
		5 MHz BW	10 MHz BW	
4.9 GHz Universal	4900-5350	No Limit	No Limit	None
4.9 GHz FCC	4940-4990	No Limit	No Limit	None
4.9 GHz Japan A	4900-5000	34	34	None
4.9 GHz Japan B	5030-5091	34	34	None
5.3 GHz ETSI	5250-5350	20	23	ETSI
5.2 GHz ETSI	5150-5250	20	23	None
5.2 GHz FCC	5150-5250	27	30	None

Table 4-2: Band Name's Dependent Parameters, 4.9 GHz Units

Band Name	Frequency Range (MHz)	Maximum EIRP (dBm)		Supported DFS
		5 MHz BW	10 MHz BW	
5.3 GHz FCC	5250-5350	27	30	FCC
5.1 GHz FAA	5090-5150	No Limit	No Limit	None

Table 4-3: Band Name's Dependent Parameters, 5.4 GHz Units

Band Name	Frequency Range (MHz)	Maximum EIRP (dBm)		Supported DFS
		5 MHz BW	10 MHz BW	
5.4 GHz Universal	5470-5900*	No Limit	No Limit	None
5.9 GHz Universal	5900-5950	No Limit	No Limit	None
5.4 GHz ETSI	5470-5725	27	30	ETSI
5.8 GHz ETSI	5725-5875	30	33	ETSI
5.4 GHz FCC	5470-5725	27	30	FCC
5.8 GHz FCC	5725-5875	36	36	None
5.4 GHz Australia A	5490-5585	24	27	Normal FCC
5.4 GHz Australia B	5655-5725	24	27	Normal FCC
5.8 GHz Australia	5730-5840	33	36	None
5.8 GHz UK	5725-5845	30	33	Normal ETSI

* The frequency 5725 MHz is illegal and cannot be used.

4.5.3.5.8   DFS

The DFS option is applicable only for units operating in the 5 GHz frequency bands using a Band Name specifying that DFS should be used. The DFS feature is managed separately for each sector (see). The BTS level DFS parameters are common to both sectors (if applicable) and it includes the following parameters:

- DFS Type

- Frequencies Management Level

4.5.3.5.8.1   DFS Type

The DFS Type parameter defines the DFS algorithm to be used. This read-only parameter is set according to the DFS type specified in the selected Band Name.

The available DFS algorithm (according to the selected Band Name) are:

- ETSI/FCC: The algorithm searches (passive listening) for radar signals according to relevant ETSI or FCC regulations. To increase the probability of radar detection for compliance with the relevant regulations, additional silence zone is added to the uplink at the expense of slightly reduced throughput in the downlink. This means that although the specified DL-UL Ratio is 60-40, the actual DL-UL Ratio is 40-60 in ETSI and 45-55 in FCC (where the additional UL bandwidth is dedicated to "silence" zone).

- Normal ETSI/Normal FCC: The algorithm searches for radars according to relevant ETSI or FCC regulations. However, the DL/UL ratio is not affected (probability of detection is lower than required by the relevant regulations).

Table 4-4: Supported DFS, 4.9 GHz Units

Band Name	Supported DFS
4.9 GHz Universal	None
4.9 GHz FCC	None
4.9 GHz Japan A	None
4.9 GHz Japan A	None
5.3 GHz ETSI	ETSI
5.2 GHz ETSI	None
5.2 GHz FCC	None
5.3 GHz FCC	FCC
5.1 GHz FAA	None

Table 4-5: Supported DFS, 5.4 GHz Units

Band Name	Supported DFS
5.4 GHz Universal	None
5.9 GHz Universal	None
5.4 GHz ETSI	ETSI
5.8 GHz ETSI	ETSI
5.4 GHz FCC	FCC
5.8 GHz FCC	None
5.4 GHz Australia A	Normal FCC
5.4 GHz Australia B	Normal FCC

Table 4-5: Supported DFS, 5.4 GHz Units

Band Name	Supported DFS
5.8 GHz Australia	None
5.8 GHz UK	Normal ETSI

4.5.3.5.8.2 Frequencies Management Level

The Frequencies Management Level defines the method of handling the DFS Frequencies Table (see "Update" on page 158) when two sectors use DFS. When set to Sector Level, the Frequencies Table of each sector is managed independently. When set to BTS Level, each sector uses information about frequencies (Radar Detected/Clear Channel) from the other one.

The default is Sector Level.

4.5.3.6 MAC Access Lists

The MAC Address List menu enables viewing and managing the Denied list. The Denied list can include up to 256 MAC addresses. An MS whose MAC address is included in this list will not receive any services. To Add or Remove a MAC address to/from the list use the format xx-xx-xx-xx-xx-xx.

4.5.4 Unit Control

The Unit Control menu of the enables changing the access Passwords, resetting the BTS, reverting to the factory default configuration, managing the SW versions of the BTS and uploading/downloading configuration backup files.

The Unit Control menu includes the following options:

- Change Password

- Reset BTS

- Reset to BTS Factory Defaults

- SW Version Control

- Configuration File Control

- Monitor Inactivity Timeout

4.5.4.1   Change Password

For security and control reasons, the Change Password option is available only for users with Administration access rights. The Change Password option enables defining the passwords for each of the three different access levels: Administrator, Installer and Monitor. After changing the password for a selected access level, you will be prompted to re-enter the new password for confirmation.

NOTE

For security reasons, the passwords do not change after performing the Set Factory Defaults operation.

Valid passwords: 1 to 16 printable characters, case sensitive.

The default passwords are:

Table 4-6: Default Passwords

Access Level	Default Password
Administrator	admin
Installer	installer
Monitor	monitor

4.5.4.2   Reset BTS

Select this option to reset the BTS. To avoid unintentional reset, you will be prompted to confirm the reset request. Changes to some of the configurable parameters are applied only after reset.

Refer to "Parameters Summary" on page 174 for information on which parameters are changeable in run time and which changes are applied only after reset.

4.5.4.3   Reset to BTS Factory Defaults

Select this option to set the BTS parameters to their factory default values. All parameters, excluding the access Passwords, BTS General parameters and BTS Connectivity parameters (required to enable remote management of the BTS) will revert to their default values after the next reset. Note that AAA servers and Authorized Managers will be deleted. Services (if applicable) are not deleted.

Refer to "Parameters Summary" on page 174 for information on the factory default values of all parameters.

4.5.4.4   SW Version Control

The BTS can contain two SW versions:

■   Operational: Each time the BTS resets it will reboot using the version defined as Operational.

■   Shadow: Normally the Shadow version is the backup version. Each time a new SW File is downloaded to the BTS, 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 BTS. It will be stored as the Shadow version.

2   Reset and run the BTS from its Shadow version. Note that at this stage, if a reset were to occur, the BTS will return to the previous Operational version.

3   If you want to continue using the new version, swap the Shadow and Operational versions. The new (currently running) version is now defined as Operational, and will be used each time the BTS reboots. The previous version is defined now as Shadow.

Each SW version includes two identifiers:

■   SW File, which is the name of the downloaded SW file. This name does not necessarily include clear identification of the SW version number.

■   SW Version, which provides the SW version number.

The SW Version Control submenu includes the following options:

■   Show Versions

■   Show Activation and Status Parameters

■   Load to Shadow

■   Reset and Run from Shadow

■   Set Running Version as Operational

4.5.4.4.1   Show Versions

Select this option to view the current available versions and the running version:

■ Operational SW File

■ Operational SW Version

■ Shadow SW File

■ Shadow SW Version

■ Running From: Operational or Shadow

■ Operational Boot SW Version

4.5.4.4.2   Show Activation and Status Parameters

Select this option to view details on the last requested Load to Shadow or Load Boot SW operation. The displayed details include:

■ **Process Initiator IP Address**: The IP address of the station that initiated the process.

■ **Process Status:** The status/results of the last SW loading process. The status can be None, In Progress, Completed Successfully, or Failed. For a failed process the reason is also provided. A process may fail due to various reasons including TFTP problem, the SW file may already exist in the device, there is not sufficient memory space or a CRC error.

4.5.4.4.3   Load to Shadow

The Load to Shadow option enables initiating a process of loading a new SW file to the BTS. The loaded SW file will be stored as the new Shadow file.

The following parameters should be configured each time you want to initiate a Load to Shadow operation:

■ **TFTP Server IP Address**: The IP address of the TFTP Server holding the SW file to be loaded.

■ **File Name**: The path to and file name of the SW file to be loaded. A string comprising 1 to 80 characters.

4.5.4.4.4   Reset and Run from Shadow

Select the Reset and Run from Shadow option to reset the BTS and run the Shadow version after power up. To avoid unintentional actions you will be prompted to confirm the request.

4.5.4.4.5 Set Running Version as Operational

When the BTS is running the Shadow version (after selecting Reset and Run from Shadow), it will boot from the Operational version after the next reset. Select the Set as Operational option if you want to swap versions so that the running version will become the Operational version and will be the version to be used after reset. To avoid unintentional actions you will be prompted to confirm the request.

4.5.4.5 Configuration File Control

The Configuration File Control submenu enables creating backup files of the BTS configuration and uploading/downloading a configuration file from/to the BTS. It also enables creating and uploading an Event Log file from the BTS.

The Configuration File Control menu also enables downloading a Frequency Bands File to the BTS. A Frequency Bands File includes all relevant parameters of the frequency band supported by the device such as frequency range, resolution, allowed Tx Power range, etc. The option to download a Frequency Bands File enables loading an updated version of the file (if necessary) without the need to replace the SW version.

The Configuration File Control menu includes the following menu options:

■ Upload Configuration File From The Unit

■ Download Configuration File To The Unit

■ Show Activation and Status Parameters

4.5.4.5.1 Upload Configuration File From The Unit

The Upload Configuration File menu includes the following options:

■ Create Full Configuration File

■ Create Services (SP & MSF) File

■ Create Event Log File

■ Activate Upload Operation

4.5.4.5.1.1 Create Full Configuration File

The Create Full Configuration File option enables creating an updated configuration file that contains all the configurable parameters of the device.

4.5.4.5.1.2 Create Services (SP & MSF) File

The Create Services (SP & MSF) File option enables creating an updated configuration file that contains all the Services related parameters. This includes the Service Profiles and Multiple Service Flows with all the relevant components (QoS Profiles, Service Rules, Classifiers, Service Groups, Service Interfaces and Forwarding Rules). This option is not applicable for External ASN-GW working mode.

4.5.4.5.1.3 Create Event Log File

The Create Event Log File option enables creating an updated file that contains all the events in the device's event log.

4.5.4.5.1.4 Activate Upload Operation

The Activate Upload Operation option enables initiating a process of uploading a configuration file to an external TFTP server.

The following parameters should be configured each time you want to initiate a configuration file upload operation:

- **File Type**: Full Configuration, Services (SP & MSF) File or Event Log File. Note that the Services (SP & MSF) File option is not applicable for External ASN-GW working mode.

- **TFTP Server IP Address**: The IP address of the TFTP Server to which the file should be loaded.

- **File Path and Name**: The path to and file name to be assigned to the uploaded file in the TFTP server. A string comprising 1 to 80 characters.

    The default file names are:

    » Full Configuration: backup.res

    » Services: profiles_srvc.res

    » Event Log: traps_logs.res

4.5.4.5.2 Download Configuration File To The Unit

The Download Configuration File option enables initiating a process of downloading a file from an external TFTP server.

To initiate a new download operation, configure the following parameters and reset the unit:

■ **File Type**: Full Configuration, Services (SP & MSF) File, or Frequency File.Note that the Services (SP & MSF) File option is not applicable for External ASN-GW working mode.

■ **TFTP Server IP Address**: The IP address of the TFTP Server from which the file should be loaded.

■ **File Path and Name**: The path to and file name of the file to be downloaded. A string comprising 1 to 80 characters.

The default file names are:

» Full Configuration: backup.res

» Services: profiles_srvc.res

» Frequency File: Rfu.db

NOTE

To avoid loss of connectivity behind a router, the Management Connectivity parameters are not changed when loading a Full backup file to the BTS. The values of these parameters configured in the target BTS before the loading process, are maintained.

4.5.4.5.3 Show Activation and Status Parameters

Select this option to view details on the last requested upload/download operation.

4.5.4.6 Monitor Inactivity Timeout

The Monitor Inactivity Timeout (min) parameter determines the amount of inactive time following which the unit automatically exits the Monitor program.

The time out duration can range from 0 to 60 minutes. 0 means no inactivity timeout.

The default value is 10 minutes.

4.5.5 Fault Management

The Fault Management menu includes the following options:

■ Trap Configuration

■ Show Active Alarm Log Table

■ Event Log Selection Criteria

■ Show Event Log Table By Selection Criteria

■ Show All Event Log Table

4.5.5.1   Trap Configuration

The Trap Configuration menu enables viewing current parameters of all traps and updating the parameters of a selected trap. It also enables viewing traps with modified parameters (different from the default) and restoring the configuration of all modified traps to their default values.

The available options are:

■ Show

■ Distribution Enabled

■ Alarm Severity

■ Suppression Interval

4.5.5.1.1   Show

Select this option to view a list of all traps and their parameters. For each trap, the following details are displayed:

■ Trap ID

■ Name

■ Distribution Enabled (the default for all traps is Enabled)

■ Suppression Interval (in seconds. The default is 0, which means no suppression).

■ Default Severity*

■ Current Severity*

* The Severity parameter is applicable only for Alarm traps. It is not applicable to other trap categories (System Event, Configuration Change Event).

4.5.5.1.2   Distribution Enabled

The Distribution Enabled submenu includes the following options:

- **Show Distribution Disabled Traps**: Displays all traps with Distribution Enabled parameter set to Disable (the default for all traps is Enable).

- **Update**: Enables modifying the Distribution Enabled parameter of a selected trap.

- **Restore Distribution Enabled Defaults**: Enables restoring the Distribution Enabled parameter of all traps to the default value (Enable).

4.5.5.1.3   Alarm Severity

The Alarm Severity option is applicable only for Alarm traps.

The Alarm Severity submenu includes the following options:

- **Show Modified Traps (Severity Changed)**: Displays the current and default Severity for all Alarm traps with modified Severity (different from the default).

- **Update**: Enables modifying the Severity parameter of a selected Alarm trap. The available options are Indeterminate, Critical, Major, Minor, Warning.

- **Restore Severity Defaults**: Enables restoring the default Severity parameter of all traps to the default value.

4.5.5.1.4   Suppression Interval

The Suppression Interval submenu includes the following options:

- **Show Modified Traps (Suppression Interval Changed)**: Displays all traps with a modified Suppression Interval (the default for all traps is 0).

- **Update**: Enables modifying the Suppression Interval parameter of a selected trap. The available range is from 0 to 86,400 (seconds). The default is 0, which means no suppression.

- **Restore Suppression Interval Defaults**: Enables restoring the Suppression Interval parameter of all traps to the default value (0, meaning no suppression).

4.5.5.2   Show Active Alarm Log Table

Select to view the currently active alarms. For each active alarm, the following details are displayed:

■ Seq#: The sequential identification number of the event (trap).

■ Time: The Date and Time at which the alarm was generated.

■ MO Type & Instance: The Type and Instance (ID number) of the applicable Managed Object. The possible MO Types are BTS, ASN GW, AAA, Sector, BS, Radio Channel, GPS, Antenna, MS, and MS Service.

■ Event Type: The type of event (first level of event description).

■ Probable Cause: The probable cause of the event (second level of event description).

■ Specific Problem: The specific problem that caused the event (third level of event description).

■ Alarm Severity: The defined severity of the Alarm.

■ Object Severity: The combined events severity for the Managed Object at the time the alarm was generated.

For more details on alarms, refer to the Traps and Alarms document.

4.5.5.3   Event Log Selection Criteria

This submenu enables Select to view/update the filtering criteria for the Show Event Log Table By Selection Criteria display (see "Show Event Log Table By Selection Criteria" on page 92). For more details on events refer to the Traps and Alarms document. The configurable filtering criteria are:

■ Minimum Severity

■ Last Days

■ Managed Object Type

■ Specific Event Category

4.5.5.3.1   Minimum Severity

The Minimum Severity parameter enables defining the minimum severity filter. Traps whose severity is below the defined severity will not be displayed.

The available options are Clear, Indeterminate, Critical, Major, Minor, Warning.

The default is Clear severity, which means that all the traps in the log will be displayed, including traps indicating that a problem has been resolved (cleared).

4.5.5.3.2   Last Days

The Days parameter enables defining the period for which traps will be displayed.

The available options are from 1 to 31 days. Only traps that occurred within the last N days, where N is the value selected for this parameter, will be displayed.

The default is 1 day.

4.5.5.3.3   Managed Object Type

The Managed Object Type parameter enable limiting the display to traps associated with a specific Managed Object type.

The available options are All, BTS, ASN GW, Sector, BS, Radio Channel, GPS, Antenna, MS and MS Service.

The default is All.

4.5.5.3.4   Specific Event Category

The Specific Event Category parameter enables limiting the display to traps of a certain category.

The available options are All, Alarm, State Change, Configuration Change, System Event.

The default is All.

4.5.5.4   Show Event Log Table By Selection Criteria

Select this option to display details of all events that meet the defined filtering criteria (see "Event Log Selection Criteria" on page 91). For each event, the following details are displayed:

- ■ Seq#: The sequential identification number of the event (trap).

- ■ Time: The Date and Time at which the event was generated.

- ■ MO Type & Instance: The Type and Instance (ID number) of the applicable Managed Object.

■ Event Type: The type of event (first level of event description).

■ Probable Cause: The probable cause of the event (second level of event description).

■ Specific Problem: The specific problem that caused the event (third level of event description).

■ Event Severity: The defined severity of the Event.

■ Object Severity: The combined events severity for the Managed Object at the time at which the event was generated.

■ Group OID: Applicable only for Configuration Change event. Indication of the changed parameter or the group of parameters where a change occurred.

■ Event Description: Description of the event.

■ Specific Data: Additional details on the event.

4.5.5.5   Show All Event Log Table

Select this option to display all events logged in the device without any filtering. The displayed details are the same as for "Show Event Log Table By Selection Criteria" on page 92.

4.5.6   Performance Counters

The Performance Counters menu enables viewing and resetting the Traffic counters of the Data Ethernet interface and of the Data Path. The displayed information and counters include:

4.5.6.1   Ethernet

General Interface Details

■ MTU: The size of the largest packet which can be sent/received on the interface, specified in octets.

■ Speed: The speed of the interface in bits per second.

■ BTS MAC Address: The MAC address of the interface.

- Operational Status: The current operational state of the interface (Up/Down/Testing). The Testing state indicates that no operational packets can be passed.

Ethernet Interface Counters:

- Received Bytes: The number of octets in valid MAC frames received on this interface, including the MAC header and FCS.

- Received Unicast Packets: The number of packets received on this interface, which were not addressed to a multicast or broadcast address.

- Received And Discarded Packets: The number of received packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffer space.

- Received Multicast Packets: The number of packets received on this interface, which were addressed to a multicast address.

- Received Broadcast Packets: The number of packets received on this interface, which were addressed to the broadcast address.

- Transmitted Bytes: The number of octets transmitted in MAC frames on this interface, including the MAC header and FCS.

- Transmitted Unicast Packets: The number of packets transmitted on this interface, which were not addressed to a multicast or broadcast address.

- Packets Discarded On Tx: The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being transmitted. One possible reason for discarding such a packet could be to free up buffer space.

- Transmitted Multicast Packets: The number of packets transmitted on this interface, which were addressed to a multicast address.

- Transmitted Broadcast Packets: The number of packets transmitted on this interface, which were addressed to the broadcast address.

- Report Flag (ifPromiscuousMode): This object has a value of false(2) if this interface only accepts packets/frames that are addressed to this station. This

object has a value of true(1) when the station accepts all packets/frames transmitted on the media. The value does not affect the reception of broadcast and multicast packets/frames by the interface.

4.5.6.2   Data Path

The Data Path counters provides information on data path (customer services) traffic. The data path counters are:

■ Received Bytes: The number of received data path octets.

■ Received Unicast Packets: The number of received data path unicast packets.

■ Received And Discarded Packets: The number of received data path packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffer space.

■ Received Multicast Packets: The number of received data path multicast packets.

■ Received Broadcast Packets: The number of received data path broadcast packets.

■ Total Received Packets: The total number of received data path packets.

■ Packet Dropped from Input Queue: The number of packets that were dropped from the queue of packets forwarded by the Ethernet interface.

■ Transmitted Bytes: The number of transmitted data path octets.

■ Transmitted Unicast Packets: The number of transmitted data path unicast packets.

■ Packets Discarded On Tx: The number of outbound data path packets which were chosen to be discarded even though no errors had been detected to prevent their being transmitted. One possible reason for discarding such a packet could be to free up buffer space.

■ Transmitted Multicast Packets: The number of transmitted data path multicast packets.

- ■ Transmitted Broadcast Packets: The number of transmitted data path broadcast packets.

4.6   ASN-GW Menu

The ASN-GW menu includes the following options:

■ AAA

■ Services Menu

4.6.1   AAA

4.6.1.1   Working with RADIUS Servers

Managing a large number of users creates the need for significant administrative support together with careful attention to security, authorization and accounting. The use of RADIUS (Remote Authentication Dial In User Service) enables operators to manage a single database of users, supporting authentication (verifying user name and password) as well as configuration information detailing the type of service to deliver to the user and the traffic that the user transmitted and received, for billing proposes.

RADIUS is a protocol for carrying authentication, authorization, and configuration information between a Network Access Server (NAS), which desires to authenticate its links, and a shared Authentication server. A Network Access Server operates as a client of RADIUS. The client is responsible for passing user information to designated RADIUS server(s), and then acting on the response. RADIUS servers are responsible for receiving user connection requests, authenticating the user, and then returning all configuration information necessary for the client to deliver service to the user.

In BreezeMAX Extreme systems, a RADIUS NAS is implemented in each BTS. MS authentication and service provisioning are managed by a RADIUS Authentication server if the BTS working mode is Embedded Distributed ASN-GW Authenticated (If the BTS working mode is Embedded Distributed ASN-GW Not Authenticated MS authentication and service provisioning are managed by the embedded ASN-GW using local configuration. In External ASN-GW working mode the entire ASN-GW functionality resides outside the BTS).

Transactions between the client and RADIUS server are authenticated using Password Authentication Protocol (PAP) through encryption based on RSA Message Digest Algorithm MD5 and a Shared Secret, which is never sent over the network.

The Access-Request is submitted to the RADIUS server via the network. If no response is returned within a length of time, the request is re-sent a number of times. Once the RADIUS server receives the request, it validates the sending client. A request from a client for which the RADIUS server does not have a shared secret must be silently discarded. If the client is valid, the RADIUS server consults a database of users to find the user whose User Name matches the request. The user entry in the database contains the User Password that must be verified.

The MS authentication and service provisioning process when the BTS Working Mode is Embedded Distributed ASN-GW Authenticated is:

1 User Name and Password should be configured in the MS.

2 All required Service Profiles and Multiple Service Flows, including their components, should be configured in the BTS.

3 The RADIUS Authentication server(s) should be configured with the relevant MS's details (User Name and Password) and their corresponding services, including the relevant service parameters (references to Service Profiles and Multiple Service Flows).

4 When an MS attempt registering at the BTS, the BTS searches within its local database. The details of each MS (and the provisioned Services) are maintained in the database for about 20 minutes after being disconnected. If this MS will reconnect within 20 minutes, they will be provisioned with the same service(s) without re-authentication.

5 The RADIUS server searches for the corresponding service(s) defined for the MS (based on the User Name and Password).

  » If it finds the applicable service(s) the RADIUS server replies to the ASN-GW with an access-accept message that includes the relevant Service(s) parameters.

  » If the RADIUS server does not find matching MS's credentials or defined service(s), it replies to the ASN-GW with a reject message.

6 According to the response from the RADIUS server, the ASN-GW either authenticates the MS and provides the appropriate service(s) or rejects the MS.

7 Part of the information sent from the RADIUS server can include the Authentication Time Out. Before the end of this time the ASN-GW should re-authenticate the MS with the RADIUS server. This allows the operator to stop service for a customer even if the MS was not reset and the network entry process was not re-started.

A RADIUS server can be used for authentication purposes only, for accounting purposes only, or for both authentication and accounting purposes. In the current release one server of each type can be defined.

The AAA menu includes the following options:

■ Show Summary

■ Configuration

4.6.1.2 Show Summary

Select the Show Summary option to view the configuration and status details for the general AAA Client parameters and for each of the defined Authentication and/or Accounting Servers. For more details on these parameters refer to the relevant sections in the AAA Configuration menu below.

4.6.1.3 Configuration

The AAA Configuration menu includes the following options:

■ AAA Client

■ Authentication Server

■ Accounting

4.6.1.3.1 AAA Client

The AAA Client menu enables viewing and updating general parameters that affect the communication with all RADIUS servers. These parameters include:

■ Retry Interval (sec)

■ Maximum Number of Retries

■ Keep Alive Timeout (sec)

4.6.1.3.1.1 Retry Interval (sec)

The Retry Interval parameter defines the time in seconds to wait before retransmitting a RADIUS message if no response is received.

The range is 1-30 (seconds).

The default value is 5 (seconds).

4.6.1.3.1.2 Maximum Number of Retries

The Maximum Number of Retries parameter defines the maximum number of retransmission attempts, before a decision is taken to revert to another server if configured (not applicable for current release where only one server of each type can be defined), or give up.

The range is 1-10 (retries).

The default value is 3 (retries).

4.6.1.3.1.3 Keep Alive Timeout (sec)

The NPU maintains a keep alive mechanism with all defined servers. The Keep Alive Timeout defines the time in seconds between keep alive messages.

The range is 60-180 (seconds).

The default value is 60 (seconds).

> **NOTE**
>
> When the BTS sends keep alive message to the server, it uses it's own default User Name and User Password.
>
> These User Name and User Password must be configured in the users list (the same list used for the MSs) of the server, otherwise the server will response with a reject message as "User name not found", and the BTS will process these rejects as a proper answer, and keep the AAA status as "up". This means that even if "KeepAliveUserNameAndPassword" is not defined, the keepalive mechanism will still works.
>
> The default User Name of the BTS is KeepAliveUserNameAndPassword.
>
> The default User Password of the BTS is KeepAliveUserNameAndPassword.
>
> The default User Name and User Password of the BTS are not configurable.

4.6.1.3.2 Authentication Server

The Authentication Server menu enables viewing the status and parameters of a defined Authentication server, adding a new server (in the current release one server can be defined), updating the parameters of a selected server, or deleting a server from the database.

The Authentication menu includes the following options:

■ Show Summary

■ Select

■ Add

4.6.1.3.2.1   Show Summary

Select this option to view the current configuration parameters and status details of a defined Authentication server. The following details are displayed:

- **Server Address**

- **Server Alias**

- **UDP Port Number**

- **Operation Status**: Up or Down (according to the keep alive mechanism)

4.6.1.3.2.2   Select

This option enables selecting an existing Authentication Server for viewing its status and parameters, updating its parameters, deleting it from the database or viewing its Statistics counters. The selection is based on the server's IP address.

The available options for a selected server are:

- **Show**: Displays current status and parameters. For information on displayed details refer to Section 4.6.1.3.2.1).

- **Update**: to update the parameters of the server. For details on the configurable parameters refer to Section 4.6.1.3.2.3. The Server Address of an existing server cannot be modified.

- **Delete:** To delete the server from the database.

■ **Performance Counters**: To display or reset the Performance Counters for this server. The Performance Counters display traffic information according to the standard RFC 2618 "RADIUS Authentication Client MIB", as follows:

» **Round Trip Time**: The time interval (in hundredths of a second) between the most recent Access-Reply/Access-Challenge and the Access-Request that matched it from this server.

» **Access Requests**: The number of RADIUS Access-Request packets sent to this server. This does not include retransmissions.

» **Access Retransmissions**: The number of RADIUS Access-Request packets retransmitted to this server.

» **Access Accepts**: The number of RADIUS Access-Accept packets (valid or invalid) received from this server.

» **Access Rejects**: The number of RADIUS Access-Reject packets (valid or invalid) received from this server.

» **Access Challenges**: The number of RADIUS Access-Challenge packets (valid or invalid) received from this server.

» **Malformed Access Responses***: The number of malformed RADIUS Access-Response (Access-Accept, Access-Challenge or Access-Reject) packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or Signature attributes or unknown types are not included.

» **Bad Authenticators**: The number of RADIUS Access-Response packets containing invalid authenticators or Signature attributes received from this server.

» **Pending Requests**: The number of RADIUS Access-Request packets destined for this server that have not yet timed out or received a response. This counter is incremented when an Access-Request is sent and decremented due to receipt of an Access-Accept, Access-Reject or Access-Challenge, a timeout or retransmission.

» **Timeouts**: The number of authentication timeouts to this server. After a timeout the client may retry to the same server, send to a different server (not applicable in the current release), or give up. A retry to the same server

is counted as a retransmit as well as a timeout. A send to a different server is counted as a Request as well as a timeout.

» **Unknown Types**: The number of RADIUS packets of unknown type which were received from this server on the authentication port.

» **Packets Dropped**: The number of RADIUS packets which were received from this server on the authentication port and dropped for any reason.

* Malformed Access Responses counter is not supported in the current release.

4.6.1.3.2.3   Add

Select this option to define a new Authentication server. In the current release one Authentication server can be defined. You will be prompted to configure the following parameters:

4.6.1.3.2.3.1 Server Address

The IP address of the Authentication server.

The default is null (IP address must be defined).

The IP Address of an existing server cannot be modified (to change it you must first delete the server).

4.6.1.3.2.3.2 Server Alias

An reference name for the server.

A string of 1 to 32 printable characters.

The default is null (an alias must be defined).

4.6.1.3.2.3.3 Shared Secret

Shared Secret is the key used for encrypting the User name and Password transmitted to the RADIUS server(s).

For security and control reasons, the Shared Secret option is available only for users with Administration access rights, using the Administrator Password to access the program. For the same security reasons, the Shared Secret is displayed as a series of asterisks, and when defining it for the first time or updating it, the user is prompted to re-enter the new Shared Secret for confirmation.

Valid Shared Secret: 1 to 16 printable characters, case sensitive.

The default Shared Secret is null (Shared Secret must be defined).

4.6.1.3.2.3.4 UDP Port Number

Specifies the UDP port number used by the RADIUS server for authentication transactions.

Valid values: 1 to 65535.

The default value is 1812 (RFC 2865 requirement).

The UDP Port Number of an existing server cannot be modified (to change it you must first delete the server).

4.6.1.3.3 Accounting

The Accounting menu enables viewing the status and parameters of a defined Accounting server, adding a new server (in the current release one server can be defined), updating the parameters of an existing server, or deleting a server from the database.

The Accounting menu includes the following options:

- Show Summary

- Select

- Add

4.6.1.3.3.1 Show Summary

Select this option to view the current status and parameters of a defined Accounting server. The following details are displayed:

- **Server Address**

- **Server Alias**

- **UDP Port Number**

- **Operation Status**: Up or Down (according to the keep alive mechanism)

4.6.1.3.3.2 Select

This option enables selecting an existing Accounting Server for viewing its status and parameters, updating its parameters, deleting it from the database or viewing its Statistics counters. The selection is based on the server's IP address.

The available options for a selected server are:

- **Show**: Displays current status and parameters. For information on displayed details refer to Section 4.6.1.3.3.1).

- **Update**: to update the parameters of the server. For details on the configurable parameters refer to Section 4.6.1.3.3.3. The Server IP Address of an existing server cannot be modified)

- **Delete:** To delete the server from the database.

- **Performance Counters**: To display or reset the Performance Counters for this server. The Performance Counters display traffic information according to the standard RFC 2620 "RADIUS Accounting Client MIB", as follows:

  » **Round Trip Time**: The time interval (in hundredths of a second) between the most recent Accounting-Response and the Accounting-Request that matched it from this server.

  » **Requests**: The number of RADIUS Accounting-Request packets sent to this server. This does not include retransmissions.

  » **Retransmissions**: The number of RADIUS Accounting-Request packets retransmitted to this server. Retransmissions include retries where the Identifier and Acct-Delay have been updated, as well as those in which they remain the same.

  » **Responses**: The number of RADIUS packets received on the accounting port from this server.

  » **Malformed Responses**: The number of malformed RADIUS Accounting-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or unknown types are not included.

  » **Bad Authenticators**: The number of RADIUS Accounting-Response packets containing invalid authenticators received from this server.

  » **Pending Requests**: The number of RADIUS Accounting-Request packets sent to this server that have not yet timed out or received a response. This counter is incremented when an Accounting-Request is sent and decremented due to receipt of an Accounting-Response, a timeout or retransmission.

  » **Timeouts**: The number of accounting timeouts to this server. After a timeout the client may retry the same server, send to a different server (not

applicable in the current release), or give up. A retry to the same server is counted as a retransmit as well as a timeout. A send to a different server is counted as an Accounting- Request as well as a timeout.

» **Unknown Types**: The number of RADIUS packets of unknown type which were received from this server on the accounting port.

» **Packets Dropped**: The number of RADIUS packets which were received from this server on the accounting port and dropped for any reason.

* Malformed Responses counter is not supported in the current release.

4.6.1.3.3.3 Add

Select this option to define a new Accounting server. In the current release one Accounting server can be defined. You will be prompted to configure the following parameters:

4.6.1.3.3.3.1 Server IP Address

The IP address of the Accounting server.

The default is null (IP address must be defined).

4.6.1.3.3.3.2 Server Alias

An optional reference name for the server.

A string of 1 to 32 printable characters.

The default is null (an empty string).

4.6.1.3.3.3.3 Shared Secret

Shared Secret is the key used for encrypting the User name and Password transmitted to the RADIUS server(s).

For security and control reasons, the Shared Secret option is available only for users with Administration access rights, using the Administrator Password to access the program. The Shared Secret cannot be changed using SNMP. For the same security reasons, the Shared Secret is displayed as a series of asterisks, and when defining it for the first time or updating it, the user is prompted to re-enter the new Shared Secret for confirmation.

Valid Shared Secret: 1 to 16 printable characters, case sensitive.

The default Shared Secret is null (Shared Secret must be defined).

4.6.1.3.3.3.4 UDP Port Number

Specifies the UDP port number used by the RADIUS server for accounting transactions.

Valid values: 1 to 65535.

The default value is 1813 (RFC 2866 requirement).

The UDP Port Number of an existing server cannot be modified (to change it you must first delete the server).

4.6.2   Services Menu

4.6.2.1   Common Operations in Services Menus

The menu options available in the Services menu enable viewing, editing, deleting and adding applicable entities, such as Service Profiles, QoS Profiles, etc.

Some or all of the following options are available in the Services menus:

- **Show Summary**: Select this option to see the current details of all entities in the applicable menu.

- **Select From List**: Select this option to view all defined entities in the applicable menu sorted by the entity ID. The entity ID is an identifier attached automatically to each new entity. You can select a specific entity by its ID. This will open the Selected Entity menu with the Show, Update and Delete options described above.

- **Select By...**(or Select From a specific list): This option enables selecting an entity by a specific identifier such as Name or ID. Select this option and enter the appropriate parameter's value to access the menu for a selected entity. This will typically enable you to choose from the following options:

  » **Show**: Select this option to view the details of the selected entity.

  » **Update**: Select this option to edit the details of the selected entity.

  » **Delete**: Select this option to remove the selected entity from the database.

- **Add**: Select this option to add a new entity to the database.

The Services menu includes the following options:

- MSs Services

- Service Profiles

- Multiple Service Flows

- Service Groups

- Service Interfaces

- Forwarding Rules

4.6.2.2   MSs Services

The MSs Services menu enables managing the provisioning of Services to MSs. MSs Services can be created or updated only in Embedded Distributed ASN-GW Not Authenticated working mode.

The MS services table connects between a single Service Profile and a single Multiple Service Flow. Up to 3 MS services can be created, to allow different services.

The number of QoS Profiles assigned to the selected Service Profile must be identical to the number of Service Rules assigned to the selected Multiple Service Flow.

The MS Service parameters are:

- MS MAC Address

- Service Number

- Admin Status

- Multiple Service Flow Name

- Service Profile Name

The menu for a selected MS Service enables also viewing the Service Counters for the selected MS Service.

4.6.2.2.1   MS MAC Address

The MAC Address of the MS to which the Service is provisioned.

IMPORTANT

The MAC Address must be one that exists in the database. Refer to ""MS Menu" on page 169 for details on manually adding MSs to the database.

4.6.2.2.2 Service Number

The Number of the Service. Each MS can be provisioned with up to 3 Services, with Numbers from 1 to 3.

4.6.2.2.3 Admin Status

The Admin Status of the Service: Enable or Disable. A disabled Service will not be available to the end-user, but its properties are maintained in the database allowing quick renewal of the Service.

4.6.2.2.4 Multiple Service Flow Name

The name of the Multiple Service Flow associated with the Service. Must be a name of a previously defined Multiple Service Flow that exists in the database.

4.6.2.2.5 Service Profile Name

The name of the Service Profile associated with the Service. Must be a name of a previously defined Service Profile that exists in the database.

A Management Service Profile must be associated with each MS. Up to two additional Service Profiles can be associated with each MS (all combinations are allowed, including two Service Profiles of the same type).

4.6.2.2.6 MS Service Counters

The Service Counters for a selected MS Service include the following counters for each existing Service Rule:

■ Service Rule Number

■ UL Total Received Bytes

■ UL Total Received Packets

■ UL Total Lost Packets

■ UL HARQ ACK Bursts

■ UL HARQ NACK Bursts

■ UL HARQ Dropped Bursts

■ DL Total Transmitted Bytes

■ DL Total Transmitted Packets

■ DL Total Lost Packets

■ DL HARQ ACK Bursts

■ DL HARQ NACK Bursts

■ DL HARQ Dropped Bursts

4.6.2.3   Service Profiles

The Service Profiles menu enables managing Service Profiles, including the QoS Profile(s) associated with each Service Profile. The menu for a selected Service Profile (after the basic parameters are defined) enables access to the QoS Profiles submenu. At least one QoS Profile must be assigned to each Service Profile, up to a maximum of four QoS Profiles per Service Profile. For details refer to QoS Profiles (Section 4.6.2.4) below.

The Service Profile basic parameters are:

■ Service Profile ID

■ Service Profile Name

■ Service Profile Type

■ HARQ Repetitions

4.6.2.3.1   Service Profile ID

This is an auto-sequential number from 1 to a maximum of 64, generated automatically during creation of a new Service Profile.

4.6.2.3.2   Service Profile Name

The Name of the Service Profile. A unique string of 1 to 32 characters.

4.6.2.3.3   Service Profile Type

The type of a service using the Service Profile. The options available in the current release are Data, VoIP, PPPoE and Management.

4.6.2.3.4   HARQ Repetitions

HARQ (Hybrid-ARQ) is an ARQ (Automatic Repeat reQuest) mechanism that is implemented at the physical layer together with FEC, providing improved link performance over traditional ARQ at the cost of increased implementation complexity. HARQ uses a combination of FEC and ARQ, where blocks of data, along with a CRC code, are encoded using a FEC coder before transmission; retransmission is requested if the decoder is unable to correctly decode the received block. When a retransmitted coded block is received, it is combined with

the previously detected coded block and fed to the input of the FEC decoder. Combining the two or more received versions of the code block improves the chances of correctly decoding.

The WiMAX standard supports this by combining an N-channel stop and wait ARQ along with a variety of supported FEC codes. Doing multiple parallel channels of HARQ at a time can improve the throughput, since when one HARQ process is waiting for an acknowledgment, another process can use the channel to send some more data. WiMAX supports signaling mechanisms to allow asynchronous operation of HARQ and supports a dedicated acknowledgment channel in the uplink for ACK/NACK signaling. Asynchronous operations allow variable delay between retransmissions, which provides greater flexibility for the scheduler.

In the current release HARQ is not configurable: It is enabled by default for Data, PPPoE and Management Services Profiles (4 repetitions) and disabled (1 repetitions) for VoIP Service Profiles.

4.6.2.4   QoS Profiles

The QoS Profile submenu option for a selected Service Profile enables managing the QoS Profiles assigned to the Service Profile. At least one QoS Profile must be assigned to each Service Profile, up to a maximum of four QoS Profiles per Service Profile.

NOTE

In the current release only BE and NRT QoS Types are supported. For BE QoS Profiles only a a value of 0 is supported for the CP parameters. For NRT QoS Profiles only values of 1 or 2 are supported for the CP parameter.

Each QoS Profile includes the following components:

- QoS Profile ID

- Uplink QoS Type

- Uplink CP

- Uplink QoS Parameter(s) - according to Uplink QoS Type

- Downlink QoS Type

- Downlink CP

■ Downlink QoS Parameter(s)- according to Downlink QoS Type

4.6.2.4.1 QoS Profile ID

This is an auto-sequential number from 1 to a maximum of 4, generated automatically during creation of a new QoS Profile for the specific Service Profile.

4.6.2.4.2 Uplink/Downlink QoS Type

The type of QoS mechanism in the uplink/downlink when the QoS Profile is used. In the current release the available options are BE (Best Effort) and NRT (Non Real Time).

BE (Best Effort) service is designed to support data streams, such as Web browsing, that do not require a minimum service-level guarantee.

NRT (Non Real Time) is designed to support delay-tolerant data streams, such as an FTP, that require variable-size data grants at a minimum guaranteed rate.

4.6.2.4.3 Uplink/Downlink CP

The Committed Priority in the uplink/downlink.

In the current release, only a value of 0 is supported for BE QoS Profiles. For NRT QoS Profiles the supported range is from 1 (the default) to 2.

The CP parameter affects the Committed Time (CT) for BE and NRT QoS Profiles:

Table 4-7: Committed Time for BE and NRT QoS

CP (Committed Priority)	CT (Committed Time)
0	200ms
1	100ms
2	50ms

The maximum tolerated jitter for BE and NRT QoS is 10ms.

4.6.2.4.4 Uplink/Downlink QoS Parameters

The availability of specific QoS parameters depend on the selected QoS Type as follows:

Table 4-8: QoS Parameters

QoS Type	QoS Parameters
BE	MIR
NRT	CIR, MIR

4.6.2.4.4.1   CIR

CIR is the minimum information transfer rate that the system is committed to transfer under normal conditions (minimum reserved traffic rate). The rate is averaged over a minimum increment of time, which is defined by the CT parameter.

The range is from 32 to 54,000 Kbps.

CIR is applicable for NRT QoS.

4.6.2.4.4.2   MIR

MIR is the maximum information rate that the system will allow for the connection (maximum sustained traffic rate). The rate is averaged over a minimum increment of time, which is defined by the CT parameter.

The range is from 32 to 54,000 Kbps.

MIR is applicable for BE and NRT QoS. MIR cannot be lower than CIR.

4.6.2.5   Multiple Service Flows

The Multiple Service Flows menu enables managing Multiple Service Flows, including the Service Rule(s) associated with each Multiple Service Flow. The menu for a selected Multiple Service Flow (after the basic parameters are defined) enables access to the Service Rules submenu. At least one Service Rule must be assigned to each Multiple Service Flow, up to a maximum of four Service Rules per Multiple Service Flow. For details refer to Service Rules (Section 4.6.2.6) below.

The Multiple Service Flow basic parameters are:

■   Multiple Service Flow ID

■   Multiple Service Flow Name

■   Service Group Name

4.6.2.5.1   Multiple Service Flow ID

This is an auto-sequential number from 1 to a maximum of 1030, generated automatically during creation of a new Multiple Service Flow.

4.6.2.5.2   Multiple Service Flow Name

The Name of the Multiple Service Flow. A unique string of 1 to 32 characters.

4.6.2.5.3   Service Group Name

The name of the Service Group associated with the Multiple Service Flow. Must be a name of a previously defined Service Group that exists in the database.

4.6.2.5.4   Service Operation Mode

The Service Operation Mode parameter defines whether NAT routing is used by the MS or behind the MS (Router mode) or not (Bridge mode).

In Bridge mode, the ASN-GW learns the IP address assigned to the MS, and associate with this IP address the VLAN ID defined in the Service Interface specified in the Service Rule that matches the connection used for DHCP.

In Router mode, the ASN-GW checks all the Router mode Multiple Service Flows assigned to the same MS that use the same Service Group as the relevant connection, and associate with the IP address all VLAN IDs defined in relevant Service Interfaces. Router mode is applicable only for IP CS services.

If the MS functions as a NAT router, all its Services will operate in Router mode. If there is a router behind the MS, the Management Service will operate in Bridge mode and other Services will operate in Router mode.

4.6.2.6   Service Rules

The Service Rules menu enables managing Service Rules, including the Classifier(s) associated with each Service Rule. The menu for a selected Service Rule (after the basic parameters are defined) enables access to the Classifiers submenu. At least one Classifier must be assigned to each Service Rule, up to a maximum of five Classifiers per Service Rule. For details refer to Classifiers (Section 4.6.2.7) below.

When either defining a new Service Rule and its components or updating an existing one, note that a Multiple Service Flow can include a maximum of one Service Rule with a Classifier of type Any.

The Service Rule basic parameters are:

■ Service Rule ID

■ Service Interface Name

4.6.2.6.1   Service Rule ID

This is an auto-sequential number from 1 to a maximum of 4, generated automatically during creation of a new Service Rule for a specific Multiple Service Flow.

4.6.2.6.2 Service Interface Name

The Name of the Service Interface associated with the Service Rule. Must be one of the previously defined Service Interfaces that exists in the database. An Ethernet CS Service Interface can be associated only to a Multiple Service Flow with a Bridge Service Operation Mode.

4.6.2.7 Classifiers

The Classifiers submenu option for a selected Service Rule enables managing the Classifier(s) assigned to the Service Rule. At least one Classifier must be assigned to each Service Rule, up to a maximum of five Classifiers per Service Rule.

Note the following rules when either defining a new Classifier or updating an existing one:

■ A maximum of one Classifier of type Any for a certain direction can be associated with each MS. This means:

» A Service Rule can include a maximum of one Classifier of type Any for a certain direction.

» A Multiple Service Flow can include a maximum of one Service Rule with a Classifier of type Any for a certain direction.

» An MS can have a maximum of one Service associated with a Multiple Service Flow with a Service Rule with a Classifier of type Any for a certain direction.

■ Overlapping of range values is not allowed. This is applicable for:

» The Service Rule level: The range values defined for any Classifier of a certain Type for a certain direction assigned to a Service Rule should not overlap with the range values of other Classifiers of the same Type for the same direction assigned to the same Service Rule.

» The Multiple Service Flow level: The range values defined for any Classifier of a certain Type for a certain direction assigned to a Service Rule of a certain Multiple Service Flow, should not overlap with the range values of any Classifiers of the same Type for the same direction assigned to other Service Rules assigned to the same Multiple Service Flow.

» The MS level: The range values defined for any Classifier of a certain Type for a certain direction assigned to a Service Rule of any Multiple Service Flow assigned to any Service for a certain MS, should not overlap with the

range values of any Classifiers of the same Type for the same direction assigned to any of the Service Rules assigned to other Multiple Service Flows that are assigned to other Services for the same MS.

Each Classifier includes the following components:

Table 4-9: Classifier Parameters

Uplink/Downlink Classifier Type	Uplink/Downlink Classifier Parameter 1	Uplink/Downlink Classifier Parameter 2
Any	-	-
DSCP	Lowest DSCP Value	Highest DSCP Value
VLAN ID	Lowest VLAN ID Value	Highest VLAN ID Value
VLAN Priority	Lowest VLAN Priority Value	Highest VLAN Priority Value

4.6.2.7.1 Uplink/Downlink Classifier Type

This parameter defines the type of classifier to be used in the applicable direction. Different classifier types may be defined for the uplink and downlink directions. The available options are None, DSCP, VLAN ID and VLAN Priority. If the CS Type of the Service Interface assigned to the Service Rule is IP CS, then only None and DSCP types are supported.

For a Classifier Type Any there are no other parameters.

4.6.2.7.2 Uplink/Downlink Classifier Parameter 1 and 2

Each Classifier of any type other than None can define a range of value to be used for classification. These parameters defines the lowest and highest values in the range. The applicable range values are:

Table 4-10: Uplink/Downlink Classifier Parameters Range Values

Uplink/Downlink Classifier Type	Uplink/Downlink Classifier Parameter 1 and 2
DSCP	0-63
VLAN ID	1-4094
VLAN Priority	0-7

The value configured for Parameter 2 for a certain direction cannot be lower than the value configured for Parameter 1 for the same direction.

Note that the value configured for any of these parameters cannot be within the ranges defined for other Classifiers of the same Type and Direction assigned to

either the same Service Rule, or to other Service Rules assigned to the same Multiple Service Flow.

4.6.2.8   Service Groups

A Service Group defines the DHCP mode to be used for acquiring IP address configuration for the MS provisioned with the relevant Service and, if applicable, for other devices behind the MS. It also defines additional parameters that affect the communication between the ASN-GW and an external DHCP server, if applicable. The Service Group's parameters includes also the Attributes to be used for communication with a RADIUS Accounting server.

Up to 10 different Service Groups can be defined.

NOTE

In the current release only Transparent DHCP is supported. Other DHCP Types and their components are not supported in the current release.

Each Service Group includes the following parameters:

4.6.2.8.1   Service Group ID

This is an auto-sequential number from 1 to a maximum of 10, generated automatically during creation of a new Service Group.

4.6.2.8.2   Service Group Name

The Name of the Service Group. A unique string of 1 to 32 characters.

4.6.2.8.3   DHCP Type

In the current release only Transparent mode is supported.

4.6.2.8.4   Nomadic Mode

The Nomadic Mode parameter ia applicable only in Transparent DHCP operation mode. It defines whether nomadic operation of the MS should be supported by the provisioning and accounting mechanism. When disabled, the provisioned services should be supported only when the MS is served by a specific BTS. When enabled, provisioned services should not be restricted to a specific BTS.

The default is Disable.

4.6.2.8.5   Attribute 31

The Attribute 31 parameter is applicable for all DHCP operation modes, defining information that should be used by the embedded RADIUS client.

Attribute 31 specifies the Calling Station ID information to be included in RADIUS Access-Request and Accounting-Request messages. This feature enables service providers to provide more information about the call originator to the RADIUS

server(s). The information provided by this feature can also be used for additional security checks.

In RADIUS Access-Request messages Attribute 31 is set by default to CPE MAC Address. The configurable Attribute 31 parameter is applicable only for RADIUS accounting messages.

The available options are None, CPE MAC Address and CPE Fully Qualified Domain Name.

The default option is CPE MAC Address.

4.6.2.8.6 Attribute 32

The Attribute 32 parameter is applicable for all DHCP operation modes, defining information that should be used by the embedded RADIUS client.

Attribute 32 specifies the NAS Identifier information to be included in RADIUS Access-Request and Accounting-Request messages. This feature enables service providers to provide more information about the device serving the call originator to the RADIUS server(s). The information provided by this feature can also be used for additional security checks.

In RADIUS Access-Request messages Attribute 32 is set by default to BTS ID. The configurable Attribute 32 parameter is applicable only for RADIUS accounting messages.

The available options are None, BTS MAC Address, GIADDR, Service Interface VLAN, Management IP Address, BS ID, BTS Name, Free Text. If the Free Text option is selected, a unique string of 1 to 32 characters should be specified.

The default option is None.

4.6.2.8.7 Attribute 32 Free Text

Applicable only if the selected option for Attribute 32 is Free Text. A string of 1 to 32 characters to be used as a unique NAS ID in relevant RADIUS accounting messages.

The default is an empty string (must be configured to a valid value if Free Text is the selected option for Attribute 32).

4.6.2.9 Service Interfaces

The Service Interface menu enables managing the parameters of the interface used by the NPU on the network side for a service using a specific Service Interface. Up to 1024 different Service Interfaces can be defined.

NOTE

In the current release only IP CS Service Interfaces are supported. The references to Ethernet CS Service Interface in the following sections are not relevant in the current release.

Each Service Interface includes the following parameters:

4.6.2.9.1 Service Interface ID

This is an auto-sequential number from 1 to a maximum of 1024, generated automatically during creation of a new Service Interface.

4.6.2.9.2 Service Interface Name

The Name of the Service Interface. A unique string of 1 to 32 characters.

4.6.2.9.3 Forwarding Rule Name

The Name of the Forwarding Rule used by the Service Interface. Must be one of the previously defined Forwarding Rules that exists in the database.

4.6.2.9.4 CS Type

The Convergence Sublayer Type: Ethernet CS or IP CS.

The default is IP CS.

4.6.2.9.5 VLAN Interface

The VLAN Interface parameter defines how VLAN tags in packets forwarded on the interface are handled:

The VLAN Interface parameter is applicable only in IP CS. In Ethernet CS it is always set to Enable.

If VLAN Interface is set to Disable: Untagged packets are forwarded without any change. In the downlink, the VLAN tag of packets received with a VLAN tag is removed before forwarding to the wireless link.

If VLAN Interface is set to Enable: In the downlink, packets received with a VLAN tag are discarded. For IP CS Service Interface, in the uplink a VLAN tag is added, using the values defined by the VLAN ID and VLAN Priority parameters. If the VLAN ID is set to None (untagged), this is practically the same as setting the VLAN Interface to Disable.

NOTE

Only one Service Interface without VLAN is allowed. A Service Interface without VLAN is either one with VLAN Interface set to Disable or one with Service Interface set to Enable and VLAN ID set to None.

4.6.2.9.6   VLAN Transparency

Applicable only in Ethernet CS (with VLAN Interface enabled). In IP CS it is always set to Disable.

If set to Enable: Uplink and downlink packets whose VLAN IDs are included in the VLAN List (see below) will be forwarded transparently without any changes in the value of the VLAN ID. All other packets will be discarded. The VLAN Priority of uplink packets may be changed, depending on the configured VLAN Priority Marking parameter.

If set to Disable: In the uplink packets will be forwarded with a VLAN tag with the values defined by the VLAN ID and VLAN Priority parameters (replacing original VLAN tag or added to untagged packets). If the VLAN ID is set to None (untagged), all uplink packets will be forwarded untagged. In the downlink a reverse process will take place according to the what was learned in the uplink.

4.6.2.9.7   VLAN ID

In IP CS the VLAN ID parameter is applicable only if VLAN Interface is set to Enable. In Ethernet CS applicable only if VLAN Transparency is set to Disable. This is the VLAN ID to be inserted in packets forwarded to the network (uplink).

The available range is 1-4094 or 4096 for untagged. To set the value to 4096 (none) you can also click Enter with an empty (null) string.

4.6.2.9.8   VLAN Priority Marking

Applicable only in Ethernet CS when VLAN Transparency is set to Enable. If VLAN Priority Marking is set to Disable, the VLAN Priority of forwarded packets will not change. If set to Enable, the VLAN Priority of all forwarded tagged packets will be replaced by the value configured for the VLAN Priority parameter.

4.6.2.9.9   VLAN Priority

In IP CS the VLAN Priority parameter is applicable only if VLAN ID is other than None (untagged). The VLAN Priority to be inserted in packets forwarded to the network (uplink).

In Ethernet CS, if VLAN Transparency is set to Disable and VLAN ID is other than None, this is the VLAN Priority to be used in the uplink. If VLAN Transparency is set to Enable and VLAN Priority Marking is set to Enable, the VLAN Priority of all forwarded tagged packets will be replaced by this value.

The available range is from 0 to 7.

4.6.2.9.10   VLAN List

Applicable only in Ethernet CS when VLAN Transparency is set to Enable. A list of up to 16 VLAN IDs (including None for untagged). Only packets with a VLAN ID included in the list will be forwarded. An empty list means that all VLAN IDs

(including None) are included in the list. Only one Service Interface will "All" VLAN List can be defined.

4.6.2.9.11 Inner DSCP Marking

The Inner DSCP Marking parameter defines whether to replace in the uplink the original DSCP value in IP packets with a new value specified by the Inner DSCP parameter.

The options are Disable (no change in DSCP values) or Enable.

4.6.2.9.12 Inner DSCP

The Inner DSCP parameter is applicable only if Inner DSCP Marking is set to Enable. It specifies the DSCP value that will replace in IP packets the original value in the uplink.

The range is from 0 to 63.

> **NOTE**
>
> Any VLAN ID (including None for untagged) can be defined only in a single Service Interface: This includes the values configured for the VLAN ID parameter and values in VLAN Lists. The Management VLAN cannot be configured.

4.6.2.10 Forwarding Rules

The Forwarding Rule includes the features that affect the wireless broadcast domain.

The Forwarding Rule menu enables viewing all Forwarding Rules in the database, defining new Forwarding Rules, editing details of existing Forwarding Rules and removing Forwarding Rules from the database.

Up to 10 different Forwarding Rules can be defined.

Each Forwarding Rule includes the following parameters:

4.6.2.10.1 Forwarding Rule ID

This is an auto-sequential number from 1 to a maximum of 10, generated automatically during creation of a new Forwarding Rule.

4.6.2.10.2 Forwarding Rule Name

The Name of the Forwarding Rule. A unique string of 1 to 32 characters.

4.6.2.10.3 Relay Mode

The Relay Mode parameter determines whether the unit performs relaying of messages in the wireless link. When the Relay Mode parameter is enabled, packets originating from devices on the wireless link are transmitted by the unit back to the wireless link to other relevant device(s) that use the same Forwarding

Rule, as well as to the backbone. If disabled, these packets are sent only to the backbone and are not sent back to the wireless link.

4.6.2.10.4   Unknown Address Forwarding Mode

The Unknown Address Forwarding Mode parameter determines the mode of controlling the flow of information from the backbone to the wireless media. Select from the following options:

1 - Forward: Enables the transmission of all packets, except unicast packets sent to addresses that the unit recognizes as being on its wired backbone side.

2 - Discard: The unit will transmit unicast packets only to those addresses that it knows to exist on the wireless link side.

4.6.2.10.5   QoS Type

The QoS Type parameter determines the QoS type to be used for multicast and broadcast messages.

NOTE

In the current release only BE and NRT QoS Types are supported. For BE QoS Profiles only a a value of 0 is supported for the CP parameters. For NRT QoS Profiles only values of 1 or 2 are supported for the CP parameter.

The availability/range of the following parameters depend on the selected QoS Type:

4.6.2.10.6   CP

The Committed Priority.

In the current release, only a value of 0 is supported for BE QoS Profiles. For NRT QoS Profiles the supported range is from 1 (the default) to 2.

The CP parameter affects the Committed Time (CT) for BE and NRT QoS Profiles:

Table 4-11: Committed Time for BE and NRT QoS

CP (Committed Priority)	CT (Committed Time)
0	200ms
1	100ms
2	50ms

The maximum tolerated jitter for BE and NRT QoS is set to 10ms.

4.6.2.10.7   QoS Parameters

The availability of specific QoS parameters depend on the selected QoS Type as follows:

Table 4-12: QoS Parameters

QoS Type	QoS Parameters
BE	MIR
NRT	CIR, MIR

4.6.2.10.7.1   CIR

CIR is the minimum information transfer rate that the system is committed to transfer under normal conditions (minimum reserved traffic rate). The rate is averaged over a minimum increment of time, which is defined by the CT parameter.

The range is from 32 to 54,000 Kbps.

CIR is applicable for NRT QoS.

4.6.2.10.7.2   MIR

MIR is the maximum information rate that the system will allow for the connection (maximum sustained traffic rate). The rate is averaged over a minimum increment of time, which is defined by the CT parameter.

The range is from 32 to 54,000 Kbps.

MIR is applicable for BE and NRT QoS. In NRT QoS MIR cannot be lower than CIR.

4.7 Sector Menu

According to the capabilities supported by the hardware and (if applicable) the selected Operation Mode, the unit supports one or two sectors. The Sector menu enables viewing the current and configured parameters of each sector supported by the unit and modifying these parameters.

The Sector menu includes the following options:

■ Show Summary: Select this option to view all relevant parameters of the supported Sector(s).

■ Select: Use this option to select the viewing and configuration mode for a specific Sector.

> **NOTE**
>
> In the current release only configurations with a single Sector (Sector 1) are supported.

4.7.1 Show Summary

Select this option to view all relevant parameters of the supported Sector(s). For each of the supported Sectors the following details are displayed:

■ BTS Operation Mode (for more details see "Operation Mode" on page 77)

■ Sector ID (In the current release only Sector 1 is applicable)

Sector General Parameters (for more details see Section 4.7.2.2 below)

■ Sector Name

■ Sector Location

■ Sector Heading (degrees)

■ Current Bandwidth (MHz)

■ Configured Bandwidth (MHz)

■ Current Frequency (MHz)

■ Configured Frequency (MHz)

■ Current TX Power (dBm)

■ Configured TX Power (dBm)

Sector Antenna's Associations

According to the Operation Mode, the Sector can be associated with either one or two Antennas. The details displayed for each Antenna associated with the Sector are:

■ Antenna ID

■ Antenna Gain (dBi)

■ Beam Width (degrees)

■ Antenna Polarization

■ Antenna Type

Sector BS's & Radio Channel's Association

The number of associated BSs/Radio Channels depend on the Operation Mode.

NOTE

In the current release the Sector is associated with one BS (BS1) and one or two Radio Channels.

The details displayed for each Radio Channel associated with the Sector are:

■ BS Index

■ Radio Channel ID

■ BS ID

■ BS Name

Supported Frequency Range (according to the details in the Frequency File for the Frequency Band supported by the unit):

■ Frequency Band ID

■ Frequency Band Name

■ Downlink Start Frequency (MHz)

■ Downlink Stop Frequency (MHz)

■ Frequency Resolution (KHz)

■ Low Tx Power (dBm)

■ High Tx Power (dBm)

DFS General Parameters (if applicable)

■ DFS Type

■ Current DFS Support

■ Configured DFS Support

■ Current Channel Availability Check Time (sec)

■ Configured Channel Availability Check Time (sec)

■ Current Channel Non Occupancy Period (min)

■ Configured Channel Non Occupancy Period (min)

■ Current Startup Test Valid Period (hours)

■ Configured Startup Test Valid Period (hours)

■ Current Radar Detection Threshold (dBm)

■ Current Radar Detection Threshold (dBm)

The DFS Parameters are applicable only for units operating in the 5 GHz bands using a Band Name where DFS is required. For details on these parameters refer to .

Usable Frequencies (if applicable)

A list of frequencies for the DFS algorithm. Applicable only for units operating in the 5 GHz bands using a Band Name where DFS is supported. For details refer to "Usable Frequencies" on page 135.

4.7.2 Select

Use this option to select the viewing and configuration mode for a specific Sector. The following options are available for the selected Sector:

4.7.2.1 Show

Select this option to view the relevant parameters. The displayed information is the same as described in Show Summary (Section 4.7.1) above.

4.7.2.2 Configuration

The Configuration menu includes the following options:

■ General Parameters

■ DFS

4.7.2.2.1 General Parameters

The General Parameters menu enables configuration of the following parameters:

4.7.2.2.1.1 Sector Name

An optional descriptive parameter. A string of up to 32 printable characters.

The default is null.

4.7.2.2.1.2 Sector Location

An optional descriptive parameter. A string of up to 64 printable characters.

The default is null (an empty string).

4.7.2.2.1.3 Sector Heading (degrees)

A descriptive parameter indicating the sector's heading in degrees. A number from 0 to 359.

The default is 0.

4.7.2.2.1.4 Bandwidth

The bandwidth of the sector in MHz.

In the current release the supported options are 5* MHz and 10 MHz.

The default Bandwidth is 10 MHz.

4.7.2.2.1.5   Frequency

The central frequency of the sector in MHz. The available range and default depend on the frequency band supported by the hardware and the selected Band Name (5 GHz units) and the selected bandwidth.

The configurable frequencies are from the Minimum Frequency + 1/2 Bandwidth up to a maximum of the Maximum Frequency - 1/2 Bandwidth.

The resolution for 3.x GHz units is 0.125 MHz.

In 5 GHz units, the frequency resolution is half the selected bandwidth: 2.5 MHz for a bandwidth of 5 MHz, 5 MHz for a bandwidth of 10 MHz.

In the current release the available bandwidths, ranges and defaults are:

Table 4-13: Frequency Configuration, 3.x GHz Units

Band Name	Frequency Range	Default Frequency
3.5 GHz	3400-3600 MHz	3405 MHz
3.65 GHz	3650-3700	3655 MHz

Table 4-14: Frequency Configuration, 4.9 GHz Units

Band Name	Frequency Range	Default Frequency
4.9 GHz Universal	4900-5350 MHz	4905 MHz
4.9 GHz FCC	4940-4990 MHz	4945 MHz
4.9 GHz Japan A	4920-5000 MHz	4905 MHz
4.9 GHz Japan B	5030-5091 MHz	5035 MHz
5.3 GHz ETSI	5250-5350 MHz	5255 MHz
5.2 GHz ETSI	5150-5250 MHz	5155 MHz
5.2 GHz FCC	5150-5250 MHz	5155 MHz
5.3 GHz FCC	5250-5350 MHz	5255 MHz
5.1 GHz FAA	5090-5150 MHz	5095 MHz

Table 4-15: Frequency Configuration, 5.4 GHz Units

Band Name	Frequency Range	Default Frequency
5.4 GHz Universal	5470-5900 MHz*	5475 MHz
5.9 GHz Universal	5900-5950 MHz	5905 MHz
5.4 GHz ETSI	5470-5725 MHz	5475 MHz
5.8 GHz ETSI	5725-5875 MHz	5730 MHz
5.4 GHz FCC	5470-5725 MHz	5475 MHz
5.8 GHz FCC	5725-5875 MHz	5730 MHz
5.4 GHz Australia A	5490-5585 MHz	5500 MHz
5.4 GHz Australia B	5655-5725 MHz	5660 MHz
5.8 GHz Australia	5730-5840 MHz	5735 MHz
5.8 GHz UK	5725-5845 MHz	5730 MHz

* The frequency 5725 MHz is illegal and cannot be used.

4.7.2.2.1.6 Tx Power

The sector's Tx Power in dBm. The configuration range is from 0 to 50 dBm using a 1 dB resolution. In 3.x GHz units the actually available range (using 1 dB resolution) and default are:

Table 4-16: Sector Tx Power, 3.x GHz Units

Band	Tx Power Range (dBm)	Default (dBm)
3.5 GHz	21-30	30
3.65 GHz	17-30	30

The system administrator/installer is responsible for verifying compliance of the power emitted from the antenna(s) with local regulations and license conditions, if applicable.

In 4.9 GHz and 5.4 GHz units the HW supports a Tx Power range of 0 to 21* dBm (* in the current release, in units using 5.9 GHz Universal Band Name the maximum supported Tx Power is 20 dBm). However, in units using certain Band Names the actually available Tx Power range depends also on the maximum allowed EIRP according to relevant regulations and on the configured Bandwidth and Antenna Gain:

Table 4-17: Maximum Allowed EIRP, 4.9 GHz Units

Band Name	Maximum EIRP (dBm)	
	5 MHz BW	**10 MHz BW**
4.9 GHz Universal	No Limit	No Limit
4.9 GHz FCC	No Limit	No Limit
4.9 GHz Japan A	34	34
4.9 GHz Japan B	34	34
5.3 GHz ETSI	20	23
5.2 GHz ETSI	20	23
5.2 GHz FCC	27	30
5.3 GHz FCC	27	30
5.1 GHz FAA	No Limit	No Limit

Table 4-18: Maximum Allowed EIRP, 5.4 GHz Units

Band Name	Maximum EIRP (dBm)	
	5 MHz BW	**10 MHz BW**
5.4 GHz Universal	No Limit	No Limit
5.9 GHz Universal	No Limit	No Limit
5.4 GHz ETSI	27	30
5.8 GHz ETSI	30	33
5.4 GHz FCC	27	30
5.8 GHz FCC	36	36
5.4 GHz Australia A	24	27
5.4 GHz Australia B	24	27
5.8 GHz Australia	33	36
5.8 GHz UK	30	33

In 4.9 GHz and 5.4 GHz units, the actual maximum Tx Power is the lower of the following values:

■ The maximum supported by the HW (21 dBm)

■ Maximum Allowed EIRP (according to the Configured Bandwidth) - the Configured Antenna Gain.

The default is the highest value that can actually be supported for the relevant Band Name (using the Gain of the installed Integral Antenna or the default value of 14 dBi for an External Antenna).

NOTE

For units using the 4.9 GHz FCC Band Name: For compliance with relevant FCC regulations the maximum Tx Power is 19 dBm (for all bandwidths/configurations).

4.7.2.2.2   DFS

The DFS parameters submenu is applicable only for units operating in the 5 GHz bands using a Band Name where DFS is not Required.

In certain regions there are radar systems operating in the 5 GHz band. Applicable regulations dictates that wireless access systems operating in these bands shall not interfere with the operation of the radar systems. This means that the wireless access system must be able to automatically detect the presence of radar signals and avoid transmissions on frequencies used by radar systems in its vicinity.

The Dynamic Frequency Selection (DFS) mechanism is based on monitoring of the frequency being used and automatic switching to a radar-free frequency upon detection of radar activity on the current frequency. The test for radar activity is performed according to the applicable standards (ETSI or FCC), according to the selected DFS Type (see "DFS Type" on page 80).

NOTE

For units using the 5.4 GHz ETSI and 5.4-5.8 GHz ETSI Band Name: For compliance with ETSI regulations, the Channel Availability Check Time (see "Channel Availability Check Time (sec)" on page 134) for frequencies in the range from to 5600 to 5650 MHz is set to 600 seconds (10 minutes), regardless of the value configured for this parameter.
For units using the 5.8 GHz ETSI, 5.4-5.8 GHz ETSI, 5.8 GHz FCC and 5.4-5.8 GHz FCC Band Name: DFS is not required by the relevant ETSI/FCC regulations for frequencies in the range from 5850 to 5875 MHz. These means that frequencies in this range included in the Usable Frequencies List are always considered as Available.

Before initiating transmission on a new frequency that is not defined as Available (at start-up after power up or reset none of the frequencies are defined as Available) the unit performs a Channel Availability Check to ensure that there is no radar operating on this frequency. During normal operation, the unit continues monitoring the operating frequency (In-Service Monitoring) to ensure that there is no radar operating on the frequency. After deciding that a frequency is Available, it is considered as an Available frequency for a period defined by the configurable Startup Test Valid Period parameter.

Upon detection of radar activity on the operating frequency, the unit will automatically stop transmissions on this frequency that will be marked as Unavailable (Radar Detected) channel. The unit may continue transmissions on this frequency for a very limited period, allowing it to complete some transmissions of data and send control and management signals to support the transition of the served devices to a new channel. The frequency on which radar was detected will be considered as Unavailable for a period defined by the configurable Channel Non Occupancy Period parameter. The unit will switch randomly to another frequency in the Usable Frequencies List that is not considered as Unavailable. If this frequency is not considered as Available, the unit will check for radar activity before initiating transmissions on the new frequency.

In configurations with two sectors, when the Frequencies Management Level (see "Frequencies Management Level" on page 82) is set to BTS Level, the frequencies table of each sector uses also the status information of relevant frequencies in the frequencies table of the other sector.

The DFS Menu includes the following options:

- Show

- Show Frequencies Status Table

- Update General Parameters

- Usable Frequencies

4.7.2.2.2.1 Show

Select this option to display the following:

- DFS Type: According to the DFS type defined in the Band Name (see "DFS" on page 80).

- Current DFS Support

- Configured DFS Support

- Current Channel Availability Check Time (sec)

- Configured Channel Availability Check Time (sec)

- Current Channel Non Occupancy Period (min)

■ Configured Channel Non Occupancy Period (min)

■ Current Startup Test Valid Period (hours)

■ Configured Startup Test Valid Period (hours)

■ Current Radar Detection Threshold (dBm)

■ Current Radar Detection Threshold (dBm)

■ Rx Antenna Gain (dBi): The value configured for the Antenna associated with the relevant Sector.

■ Bandwidth (MHz): The current Bandwidth of the Sector.

■ Tx Power (dBm): The current Tx Power of the Sector.

■ Frequencies List: The current list of frequencies configured for the DFS mechanism

4.7.2.2.2.2   Show Frequencies Status Table

The DFS Frequencies Status table provides status details for each of the relevant frequencies (see "Usable Frequencies" on page 135). The details provided for each entry are:

■ Frequency (MHz).

■ Detected Time: The last date and time at which the test results indicated a presence of radar activity on this frequency, or N/A if the frequency was not tested since last reset. The frequency is considered as Unavailable for selection by the DFS mechanism if the elapsed time since the Detected Time is not higher than Channel Non Occupancy Period.

■ Last Clear Channel Test: The last date and time at which the test results indicated that there is no radar activity on this frequency, or N/A if the frequency was not tested since last reset. The frequency is considered as Available for selection by the DFS mechanism if the elapsed time since the Last Clear Channel Test is not higher than Startup Test Valid Period.

4.7.2.2.2.3   Update General Parameters

The configurable DFS parameters and options are:

■ DFS Support

■ Channel Availability Check Time (sec)

■ Channel Non Occupancy Period (min)

■ Startup Test Valid Period (hours)

■ Radar Detection Threshold (dBm)

4.7.2.2.2.3.1 DFS Support

The DFS Support parameter defines whether the DFS mechanism is enabled or disabled.

CAUTION

In countries where DFS should be used for compliance with applicable regulations, DFS Support must be enabled.

The default is Disable

4.7.2.2.2.3.2 Channel Availability Check Time (sec)

The Channel Availability Check Time is the minimum time to check a frequency for the presence of radar activity.

The range is from 0 to 600 seconds.

The default is 60 seconds.

NOTE

For units using the 5.4 GHz ETSI and 5.4-5.8 GHz ETSI Band Name: For compliance with ETSI regulations, the Channel Availability Check Time for frequencies in the range from to 5600 to 5650 MHz is set to 600 seconds (10 minutes), regardless of the value configured for this parameter.

4.7.2.2.2.3.3 Channel Non Occupancy Period (min)

If radar was detected on a certain frequency, this frequency will be considered as Unavailable for a period defined by the Channel Non Occupancy Period parameter. During this period this frequency will not be used by the DFS mechanism.

The range is from 0 to 60 minutes.

The default is 30 minutes.

4.7.2.2.2.3.4 Startup Test Valid Period (hours)

After deciding that a frequency is Available (no radar was detected by the Channel Availability Check algorithm), it is considered as an Available frequency for a period defined by the Startup Test Valid Period parameter. During this period the unit may start transmitting on this frequency without performing a Channel Availability Check.

The range is from 0 to 48 hours.

The default is 6 hours.

4.7.2.2.2.3.5 Radar Detection Threshold (dBm)

The Radar Detection Threshold is the minimum level of received radar signal that must be detected by the algorithm assuming an Rx Antenna gain of 0 dBi. The higher the EIRP, the higher should be the Radar Detection Threshold.

The range is from -36 to -70 dBm.

The default depends on the EIRP (Tx Power + Antenna Gain) of the Sector:

Table 4-19: Radar Detection Threshold Defaults

EIRP (dBm)	Radar Detection Threshold (dBm)
>30	-67
23-30	-64
<23	-62

4.7.2.2.2.4 Usable Frequencies

The Usable Frequencies List can include frequencies to be used for DFS. The subset of usable frequencies list should be defined taking into account the allowed frequencies according to applicable regulations and the requirement for uniform spreading.

NOTE

For units using the 5.8 GHz ETSI, 5.4-5.8 GHz ETSI, 5.8 GHz FCC and 5.4-5.8 GHz FCC Band Name: DFS is not required by the relevant ETSI/FCC regulations for frequencies in the range from 5850 to 5875 MHz. These means that frequencies in this range included in the Usable Frequencies List are always considered as Available.

The Usable Frequency menu includes the following options:

■ Show: To display the current list

■ Add Frequencies: To add one or several frequencies (in MHz) to the list. Multiple entries are separated by semi-colon (;).

■ Delete Frequencies: To delete one or several frequencies (in MHz) from the list. Multiple entries are separated by semi-colon (;).

■ Delete Entire List: To clear the list.

4.8   BS Menu

According to the capabilities supported by the hardware one or two BSs. The BS menu enables viewing the current and configured parameters of each BS supported by the unit and modifying these parameters.

The BS menu includes the following options:

■ Show Summary: Select this option to view all relevant parameters of the supported BSs(s).

■ Select: Use this option to select the viewing and configuration mode for a specific BS.

NOTE

In the current release only configurations with a single BS (BS 1) are supported.

4.8.1   Show Summary

Select this option to view all relevant parameters of the supported BS(s). For each of the supported BSs the following details are displayed:

■ BS Index

■ BS ID: A unique identifier of the BS. The BS ID comprises 48 bits displayed in an IP format as x.x.x.x.x.x (x=0-255).

The BS ID is calculated as follows:

Table 4-20: BS ID Calculation

Operator ID	Cell ID		Sector ID
24 bits	16 bits		8 bits
0-255.0-255.0-255	0-255.0-255		0-3
0-16777215	Service Zone ID(11 bits): 0-2047	Cell Number (5 bits): 0-31	Segment Number: 0-3

For details on the parameters used for calculating the BS ID refer to:

Operator ID: See "Operator ID" on page 76

Service Zone ID: See "Service Zone ID" on page 76

Cell Number: See "Cell Number" on page 143

Segment Number: See "Segment Number" on page 143

- BS Name (refer to "BS Name" on page 143)

BS Properties

- ASIC HW Version

- ASIC SW Version

MAC

- Current Segment Number

- Configured Segment Number

- Current Cell Number

- Configured Cell Number

- Current Cell Radius (m)

- Configured Cell Radius (m)

- Current Map Repetition

- Configured Map Repetition

- Map Compression: Downlink/Uplink (not configurable). Indication that compression of MAP messages is enabled in both downlink and uplink.

- Preamble Index: a read only index of the preamble to use. The Preamble Index is calculated by:

  » For Segment Number 0-3: 3 x (Cell Number) + Segment Number.

  » For Segment Number 4: 96 + Cell Number.

Tables 437 & 438 in the standard provide the series to use for each Preamble Index according to FFT size.

For details on MAC parameters refer to "MAC" on page 143

PHY

■ Current Diversity Mode

■ Configured Diversity Mode

■ Current UL Thermal Noise level

■ Configured UL Thermal Noise level

■ Bandwidth (MHz): The BS Bandwidth depends on the configured Sector Bandwidth and Operation Mode. For Single Sector Single BS (with or without Diversity) Operation Modes the BS Bandwidth equals the Sector Bandwidth (see "Bandwidth" on page 127).

For details on PHY parameters refer to "PHY" on page 144

Multi Rate

■ UL Minimum Sub-Channels

■ Current Uplink Multi Rate Support

■ Configured Uplink Multi Rate Support

■ Current Uplink Basic Rate

■ Configured Uplink Basic Rate

■ Current Uplink Fade Margin

■ Configured Uplink Fade Margin

■ Current Downlink Multi Rate Support

■ Configured Downlink Multi Rate Support

■ Current Downlink Basic Rate

■ Configured Downlink Basic Rate

■ Current Downlink Fade Margin

■ Configured Downlink Fade Margin

For details on Multi Rate parameters refer to "Multi Rate" on page 145

Channelization

■ Current DL Permutation Base

■ Configured DL Permutation Base

■ Current DL Permutation Base Value

■ Configured DL Permutation Base Value

■ Current UL Permutation Base

■ Configured UL Permutation Base

■ Current UL Permutation Base Value

■ Configured UL Permutation Base Value

■ Current Major Group

■ Configured Major Group

For details on Channelization parameters refer to "Channelization" on page 149

BS Connectivity (applicable only in External ASN-GW Working Mode)

■ Current IP Address

■ Configured IP Address

■ Current Subnet Mask

■ Configured Subnet Mask

■ Current Default Gateway

■ Configured Default Gateway

■ MTU Size (Bytes): In current release MTU Size is not configurable and is set to 1700 bytes.

For details on BS Connectivity parameters refer to "Connectivity" on page 151.

ASN-GW Connectivity (applicable only in External ASN-GW Working Mode)

■ Current IP Address

■ Configured IP Address

■ Current VLAN ID

■ Configured VLAN ID

■ Current VLAN Priority

■ Configured VLAN Priority

■ Current DSCP

■ Configured DSCP

■ ASN-GW Operational Status (Up/Down. Presented only if Keep Alive Support is enabled).

For details on ASN-GW Connectivity parameters refer to "Connectivity" on page 151.

DSCP QoS Marking (applicable only in External ASN-GW Working Mode)

■ NRT DSCP Marking Mode and DSCP Value

■ BE DSCP Marking Mode and DSCP Value

For details on DSCP QoS Marking parameters refer to "DSCP QoS Marking" on page 152.

VLAN Priority QoS Marking (applicable only in External ASN-GW Working Mode)

■ NRT: VLAN Priority Marking Mode and VLAN Priority Value

■   BE: VLAN Priority Marking Mode and VLAN Priority Value

For details on VLAN Priority QoS Marking parameters refer to "VLAN Priority QoS Marking" on page 153.

BS and ASN-GW Keep Alive (applicable only in External ASN-GW Working Mode)

■   Keep Alive Support

■   Keep Alive Timer (Seconds)

■   Keep Alive Interval (Seconds)

■   Maximum Number Of Keep Alive Failures

If Keep Alive Support is disabled, other Keep alive parameters will not be presented. For details on BS and ASN-GW Keep Alive parameters refer to "BS and ASN-GW Keep Alive" on page 155.

4.8.2   Select

Use this option to select the viewing and configuration mode for a specific BS. The following options are available for the selected BS:

■   Show

■   Configuration

■   Performance Counters

4.8.2.1   Show

Select this option to view the relevant parameters of the selected BS. The displayed information is the same as described in Show Summary (Section 4.8.1) above.

4.8.2.2   Configuration

Select this option to view (Show option) or modify (Update option) the following parameters of the BS:

■   General Parameters

■ MAC

■ PHY

■ Multi Rate

■ Channelization

■ R6 Interface (applicable only in External ASN-GW Working Mode)

4.8.2.2.1 General Parameters

The General Parameters submenu enables viewing/updating the following parameter:

4.8.2.2.1.1 BS Name

An optional descriptive parameter. A string of up to 32 printable characters.

The default is null (an empty string).

4.8.2.2.2 MAC

The MAC submenu enables viewing/updating the following parameters:

■ Segment Number

■ Cell Number

■ Cell Radius (m)

■ Map Repetition

4.8.2.2.2.1 Segment Number

Each cell can include up to a maximum of 4 sectors. The Segment Number defines the sector number in the cell.

The range is from 0 to 3.

The default Segment Number is 0.

4.8.2.2.2.2 Cell Number

The Cell Number is the unique identifier of the Cell in the Service Zone.

The maximum number of Cells per Service Zone is 32, with a maximum of 18 Cells with 4 sectors.

The range of the Cell Number parameter is from 0 to 31. For Cells with 4 sectors the range is from 0 to 17.

The default Cell Number is 0.

4.8.2.2.2.3 Cell Radius (m)

The maximum cell radius in meters. This is the distance from the BTS of the farthest MS that it can serve.

The range is from 8000 to 40000 meter.

In the current release only Cell Radius values of 8000 and 40000 are supported.

The default Cell Radius is 40000 (m).

4.8.2.2.2.4 Map Repetition

The number of repetitions to use for transmitting DL MAP, UL Map, UCD (Uplink Channel Descriptor), DCD (Downlink Channel Descriptor), and DIUC (Downlink Interval Usage Code) messages.

The available values are 1, 2, 4.

The default value is 1.

4.8.2.2.3 PHY

The PHY submenu includes the following options:

■ Show: Select this option to view the relevant PHY parameters of the selected BS. The displayed information is the same as described in the PHY section of Show Summary (Section 4.8.1).

■ Perform and Show UL Thermal Noise Measurement: Select this option to perform uplink thermal noise measurement. The measurement is performed by scheduling an empty uplink frame and extrapolating from the power measured on this frame the average noise and interference (NI) level per subcarrier. The measurement assumes that the NI level is constant across the whole bandwidth, and it is performed on an empty uplink frame to avoid taking into account the interference generated by the MS. The test takes about one minute, and at the end the measured NI is displayed. The measured NI is used for configuring the UL Thermal Noise Level parameter (see below). Note that during the test the available throughput is affected because of the allocation of empty uplink frames.

■ Update: Select this option to update the configured values of the following parameters:

» Diversity

» UL Thermal Noise Level (dBm)

4.8.2.2.3.1 Diversity

In the current release the supported diversity modes are:

■ SISO (Single Input Single Output): This is the only mode that can be used by units using No Diversity operation mode.

■ MIMO Matrix A: Supported by units using Diversity operation mode.

4.8.2.2.3.2 UL Thermal Noise Level (dBm)

This parameter defines the target noise level to be used for calculating uplink CINR values that are necessary for various functions such as the power control mechanism. The BS broadcasts the targeted UL Thermal Noise Level level that is used by the MSs in open loop power control mode. Increasing the advertised NI causes the MS to transmit more power to support the same modulation. The NI value is typically set 6 dB higher than thermal noise (NI) that is measured in this test.

The range is from -130 to -100 dBm.

The default is -125 dBm.

CAUTION

A correct value of this parameter is critical for proper performance of the system. Do not change it from the default value unless advised to modify it by Alvarion's experts.

4.8.2.2.4 Multi Rate

The system employs a multirate algorithm to dynamically adapt the modulation scheme and Forward Error Correction (FEC) coding to actual link conditions. The algorithm is managed by the BS taking into account also information received from the served MSs. Optimal values are calculated separately for the uplink and downlink for each MS. MAP messages transmitted to the MSs include information on the uplink rate that should be used by each MS for its next transmission.

The multirate algorithm optimizes the trade-off between capacity and error rate: In most deployments, most of the links use high order modulation most of the time, maximizing capacity. "Bad" links use lower order modulation, maximizing

availability. The algorithm provides independent adaptation per MS, and it is performed independently for UL and DL, based on link quality information. The algorithm provides dynamic adaptation - modulation can be changed on a per burst basis.

The Multi Rate submenu enables viewing/updating the following parameters:

- Uplink Multi Rate Support

- Uplink Basic Rate

- Uplink Fade Margin

- Downlink Multi Rate Support

- Downlink Basic Rate

- Downlink Fade Margin

4.8.2.2.4.1   UL Minimum Sub-Channels

The minimum number of sub-channels to be used by the uplink rate adaptation mechanism. At each rate, the mechanism will move from the highest supported number of sub-channels (35 for 10 MHz bandwidth, 17 for 5 MHz bandwidth) down to the value of this parameter before reaching a decision to switch to a lower rate. In the other direction, the mechanism will start at this value and move up to the highest supported number of sub-channels before reaching a decision to switch to a higher rate.

The range is from 1 to 17 for a 5 MHz bandwidth and from 1 to 35 for a 10 MHz bandwidth.

The default is 4 sub-channels.

4.8.2.2.4.2   Uplink Multi Rate Support

Defines whether the multi rate algorithm will be used in the uplink. Under normal operating conditions the Uplink Multi Rate Support should always be enabled.The option to disable it is provided primarily for testing purposes.

The default is Enable.

4.8.2.2.4.3   Uplink Basic Rate

When Uplink Multi Rate Support is enabled, the Uplink Basic Rate defines the lowest rate that can be used by the multi rate algorithm in the uplink. MSs that cannot communicate with the BS at this rate will not be served. This can be used

to deny service to MSs with very poor link conditions, thus improving the overall capacity.

When Uplink Multi Rate Support is disabled, this is the fixed rate at which the BS will communicate with all MSs it can serve.

The available options are:

■ QPSK-CTC-1/2 REP4

■ QPSK-CTC-1/2 REP2

■ QPSK-CTC-1/2

■ QPSK-CTC-3/4

■ QAM16-CTC-1/2

■ QAM16-CTC-3/4

■ QAM64-CTC-2/3

■ QAM64-CTC-3/4

■ QAM64-CTC-5/6

The default rate is QPSK-CTC-1/2.

4.8.2.2.4.4   Uplink Fade Margin

The system uses hard-coded SNR thresholds for rate-adaptation decisions according to the Diversity Mode. The Uplink Fade Margin is added to the uplink thresholds, thus enabling to change the actual thresholds used by the uplink multirate algorithm ("reducing" the sensitivity according to the radio planning).

The range is from 0 to 15 dB.

The default is 2 dB.

4.8.2.2.4.5   Downlink Multi Rate Support

Defines whether the multi rate algorithm will be used in the downlink. Under normal operating conditions the Downlink Multi Rate Support should always be enabled. The option to disable it is provided primarily for testing purposes.

The default is Enable.

4.8.2.2.4.6 Downlink Basic Rate

When Downlink Multi Rate Support is enabled, the Downlink Basic Rate defines the lowest rate that can be used by the multi rate algorithm in the downlink. MSs that cannot communicate with the BS at this rate will not be served. This can be used to deny service to MSs with very poor link conditions, thus improving the overall capacity.

When Downlink Multi Rate Support is disabled, this is the fixed rate at which the BS will communicate with all MSs it can serve.

The available options are:

- QPSK-CTC-1/2 REP4

- QPSK-CTC-1/2 REP2

- QPSK-CTC-1/2

- QPSK-CTC-3/4

- QAM16-CTC-1/2

- QAM16-CTC-3/4

- QAM64-CTC-2/3

- QAM64-CTC-3/4

- QAM64-CTC-5/6

The default rate is QPSK-CTC-1/2.

4.8.2.2.4.7 Downlink Fade Margin

The system uses hard-coded SNR thresholds for rate-adaptation decisions according to the Diversity Mode. The Downlink Fade Margin is added to the downlink thresholds, thus enabling to change the actual thresholds used by the downlink multirate algorithm ("reducing" the sensitivity according to the radio planning).

The range is from 0 to 15 dB.

The default is 2 dB.

4.8.2.2.5   Channelization

The Channelization submenu enables viewing/updating the following parameters:

■ DL Permutation Base

■ DL Permutation Base Value

■ UL Permutation Base

■ UL Permutation Base Value

■ Major Group

4.8.2.2.5.1   DL Permutation Base

The method for configuring/calculating the permutation base used for downlink sub-channelization.

The available options are Fix, Variable and Rotated.

■ Fix: The permutation base is defined by the DL Permutation Base Value parameter (see below).

■ Variable: The formula is (4*Cell number + Segment number) modulo 32.

■ Rotated: The formula starts with (4*Cell number + Segment number) modulo 32 (the same as for Variable), incremented by 1 (modulo 32) each frame.

The default is Fix.

In the current release only the Fix option is supported.

4.8.2.2.5.2   DL Permutation Base Value

The value of the downlink permutation base for Fix DL Permutation Base.

The range is from 0 to 31.

The default is 0.

4.8.2.2.5.3   UL Permutation Base

The method for configuring/calculating the permutation base used for uplink sub-channelization.

The available options are Fix, Variable and Rotated.

■ Fix: The permutation base is defined by the UL Permutation Base Value parameter (see below).

■ Variable: The permutation base depends on the calculated Preamble Index as follows:

Table 4-21: Variable UL Permutation Base Calculation

Calculated Preamble Index	UL Permutation Base
0-69	= Preamble Index
70-95	= Preamble Index-70
96-111	= Preamble Index-42
112-113	= Preamble Index-112

■ Rotated: Starts with the same value as calculated for Variable, incremented by 1 (modulo 70) each frame.

The default is Fix.

In the current release only the Fix option is supported.

4.8.2.2.5.4   UL Permutation Base Value

The value of the uplink permutation base for Fix UL Permutation Base.

The range is from 0 to 69.

The default is 0.

4.8.2.2.5.5   Major Group

The subchannelization major groups to be used.

A number from 0 to 63 representing the bit map of major groups 0 to 5. A bit is set if the applicable major group is selected. The supported combinations depend on the bandwidth: For BS Bandwidth of 5MHz major group can be 0, 2, 4 or any combination of 0 and 2 or 0 and 4 or 2 and 4. For BS Bandwidth of 10MHz major groups can be 0,1 or 2,3 or 4,5 or 0,1 and 2,3 or 2,3 and 4,5 or 0,1 and 4,5 or 0,1,2,3,4,5.

The default for bandwidth of 10 MHz is 63 (all major groups selected). The default for bandwidth of 5 MHz is 21 (major groups 0, 2 and 4 selected).

In the current release only the default value (63) is supported.

4.8.2.2.6 R6 Interface

The R6 Interface menu enables viewing/modifying the parameters of the R6 tunnel between the BS and an external ASN-GW. The R6 Interface menu is applicable only in External ASN-GW Working Mode.

The R6 Parameters menu includes the following sub-menus:

■ Connectivity

■ DSCP QoS Marking

■ VLAN Priority QoS Marking

■ BS and ASN-GW Keep Alive

4.8.2.2.6.1 Connectivity

The BS Connectivity submenu enables viewing/configuring the following parameters that affect communication over the R6 tunnel with an external ASN-GW:

■ BS IP Address

■ BS Subnet Mask

■ BS Default Gateway

■ MTU Size

■ ASN-GW IP Address

■ ASN-GW Default VLAN ID

■ ASN-GW Default VLAN Priority

■ ASN-GW DSCP

4.8.2.2.6.1.1 BS IP Address

The Bearer Interface IP address used for communication with the external ASN-GW.

4.8.2.2.6.1.2 BS Subnet Mask

The subnet mask of the Bearer Interface IP address.

4.8.2.2.6.1.3 BS Default Gateway

The default gateway IP address for the Bearer Interface. The BS Default Gateway must be in the subnet of the BS IP Address.

4.8.2.2.6.1.4 MTU Size

The maximum MTU size in Bytes. In the current release this parameter is not configurable and is set to 1700 bytes.

4.8.2.2.6.1.5 ASN-GW IP Address

The IP address of the external ASN-GW. The ASN-GW IP Address must be in the subnet of the BS IP Address.

4.8.2.2.6.1.6 ASN-GW Default VLAN ID

The default VLAN ID to be used in communication with the external ASN-GW.

The range is from 1 to 4094 or 4096 for None (untagged).

The default is 4096 (None).

4.8.2.2.6.1.7 ASN-GW Default VLAN Priority

Applicable only if the ASN-GW VLAN ID is other than None (4096). The default VLAN Priority to be used in communication with the external ASN-GW.

The range is from 0 to 7.

4.8.2.2.6.1.8 ASN-GW DSCP

The DSCP value to be used in communication with the external ASN-GW.

The range is from 0 to 63.

The default is 0.

4.8.2.2.6.2 DSCP QoS Marking

The DSCP QoS Marking submenu enables viewing/updating the following parameters per QoS type:

> **NOTE**
>
> In the current release only NRT and BE QoS are supported.

4.8.2.2.6.2.1 NRT DSCP Marking Mode

The NRT DSCP Marking Mode define how to handle the outer DSCP marking of the GRE tunnel for NRT traffic.

If set to Marking, a configurable DSCP value will be added at uplink direction and removed at downlink direction together with the GRE tunnel.

If set to Transparent, the value of the inner DSCP will be used also as the outer DSCP in the uplink direction. No specific action is required at downlink direction assuming that the inner DSCP is assigned properly.

The following Value parameter is applicable only if NRT DSCP Marking Mode is set to Marking.

The default is Transparent.

4.8.2.2.6.2.2 NRT DSCP Value

Applicable only if NRT DSCP Marking Mode is set to Marking. The DSCP value to be applied in the uplink to packets in NRT connections.

A value in the range from 0 to 63.

The default is 0.

4.8.2.2.6.2.3 BE DSCP Marking Mode

The BE DSCP Marking Mode define how to handle the outer DSCP marking of the GRE tunnel for BE traffic.

If set to Marking, a configurable DSCP value will be added at uplink direction and removed at downlink direction together with the GRE tunnel.

If set to Transparent, the value of the inner DSCP will be used also as the outer DSCP in the uplink direction. No specific action is required at downlink direction assuming that the inner DSCP is assigned properly.

The following Value parameter is applicable only if BE DSCP Marking Mode is set to Marking.

The default is Transparent.

4.8.2.2.6.2.4 BE DSCP Value

Applicable only if BE DSCP Marking Mode is set to Marking. The DSCP value to be applied in the uplink to packets in BE connections.

A value in the range from 0 to 63.

The default is 0.

4.8.2.2.6.3 VLAN Priority QoS Marking

The VLAN Priority QoS Marking submenu is not applicable if the ASN-GW Default VLAN ID (see "ASN-GW Default VLAN ID" on page 152) is set to None (untagged). The submenu enables viewing/updating the following parameters per QoS type:

NOTE

In the current release only NRT and BE QoS are supported.

4.8.2.2.6.3.1 NRT VLAN Priority Marking Mode

The NRT VLAN Priority Marking Mode define how to handle the outer VLAN Priority marking of the GRE tunnel for NRT traffic.

If set to Marking, a configurable VLAN Priority value will be added at uplink direction and removed at downlink direction together with the GRE tunnel.

If set to None Specific, then the ASN-GW Default VLAN Priority (see "ASN-GW Default VLAN Priority" on page 152) will be used for all QoS types.

If set to Transparent, the value of the inner VLAN Priority will be used also as the outer VLAN parameters in the uplink direction. No specific action is required at downlink direction assuming that the inner VLAN is assigned properly.

NOTE

In the current release the Transparent option is not supported.

The following Value parameters are applicable only if NRT VLAN Priority Marking Mode is set to Marking.

The default is None Specific.

4.8.2.2.6.3.2 NRT VLAN Priority Value

Applicable only if NRT VLAN Priority Marking Mode is set to Marking. Enables configuration of the outer VLAN Priority to be applied in the uplink to packets in NRT connections.

A value in the range 0 to 7. The default is 0.

4.8.2.2.6.3.3 BE VLAN Priority Marking Mode

The BE VLAN Priority Marking Mode define how to handle the outer VLAN Priority marking of the GRE tunnel for BE traffic.

If set to Marking, a configurable VLAN Priority value will be added at uplink direction and removed at downlink direction together with the GRE tunnel.

If set to None Specific, then the ASN-GW Default VLAN Priority (see "ASN-GW Default VLAN Priority" on page 152) will be used for all QoS types.

If set to Transparent, the value of the inner VLAN Priority will be used also as the outer VLAN parameters in the uplink direction. No specific action is required at downlink direction assuming that the inner VLAN is assigned properly.

> **NOTE**
>
> In the current release the Transparent option is not supported.

The following Value parameters are applicable only if BE VLAN Priority Marking Mode is set to Marking.

The default is None Specific.

4.8.2.2.6.3.4 BE VLAN Priority Value

Applicable only if VLAN Priority Marking Mode is set to Marking. Enables configuration of the outer VLAN Priority to be applied in the uplink to packets in BE connections.

A value in the range 0 to 7. The default is 0.

4.8.2.2.6.4 BS and ASN-GW Keep Alive

The BS and ASN-GW Keep Alive submenu enables viewing/updating the parameters of the keep-alive mechanism between the BS and the external ASN-GW:

4.8.2.2.6.4.1 Keep Alive Support

The Keep Alive Support parameter defines whether the keep alive mechanism is disabled or enabled.

The default is Disable.

If Keep Alive Support is set to Disable the following parameters are not applicable and are not presented.

4.8.2.2.6.4.2 Keep Alive Timer (Seconds)

The Keep Alive Timer parameter defines the time between PING transmissions to the ASN-GW.

The range is from 60 to 180 seconds. The default is 60 seconds.

4.8.2.2.6.4.3 Keep Alive Interval (Seconds)

The Keep Alive Interval defines the time to wait for a keep-alive response from the ASN-GW.

The range is from 1 to 30 seconds. The default is 5 seconds.

4.8.2.2.6.4.4 Maximum Number of Keep Alive Failures

The Maximum Number of Keep Alive Failures defines the maximum number of keep-alive failures before reaching a decision that the ASN-GW is not reachable.

The range is from 1 to 10. The default is 3.

4.8.2.3   Performance Counters

The Performance Counters menu enables showing or resetting the following BS Wireless counters:

- ■ UL Received Packets: The total number of packets received by the BS.

- ■ UL Received Bytes: The total number of bytes received by the BS.

- ■ UL Discarded Packets: The total number of packets received by the BS that were discarded.

- ■ DL Transmitted Packets: The total number of packets transmitted by the BS.

- ■ DL Transmitted Bytes: The total number of bytes transmitted by the BS.

- ■ DL Discarded Packets: The total number of packets intended for transmission by the BS that were discarded before transmission.

4.9   Radio Channel Menu

Each BS has two Radio Channels. In configurations using Operation Mode with no Diversity, only one Radio Channel is used. In configurations using Operation Mode with Diversity, two Radio Channels are used.

The Radio Channel menu includes the following options:

■ Show Summary: Select this option to view all relevant parameters of the available Radio Channel(s).

■ Select: Use this option to select the viewing and configuration mode for a specific Radio Channel.

NOTE

In the current release, only Radio Channels 1 and 2 (the Radio channels of BS1) are applicable.

4.9.1   Show Summary

Select this option to view all relevant parameters of the available Radio Channel(s). For each of the Radio Channels the following details are displayed:

■ Radio Channel ID

General Parameters

■ Admin Status (for details see "Admin Status" on page 158)

■ Operational Status (Up/Down)

■ Frequency (MHz): Calculated based on the Operation Mode and Frequency Settings for relevant Sector(s). For the Operation Modes supported in the current release (Single Sector Single BS with or without Diversity) the Channel(s) Frequency equals the Sector's Frequency.

4.9.2   Select

Use this option to select the viewing and configuration mode for a specific Radio Channel. The following options are available for the selected Radio Channel:

■ Show

■ Update

4.9.2.1   Show

Select this option to view the relevant parameters of the selected Radio Channel. The displayed information is the same as described in Show Summary (Section 4.9.1) above.

4.9.2.2   Update

Select this option to modify the Admin Status parameter of the Radio Channel:

4.9.2.2.0.1   Admin Status

The Admin Status parameter is used to control the administrative status of the channel.

For proper operation the Admin Status of all applicable channels should be enabled.

The default Admin status is Disable.

4.10   Antenna Menu

According to the capabilities supported by the hardware and (if applicable) the selected Operation Mode, the unit can use one or two antennas. For Integral Antennas the parameters are read only and cannot be modified. For External Antennas the parameters are configurable.

The Antenna menu enables viewing the configured parameters of each Antenna and modifying the parameters of External Antenna(s).

The Antenna menu includes the following options:

■ Show Summary: Select this option to view all relevant parameters of the Antenna(s).

■ Select: Use this option to select the viewing and configuration mode for a specific Antenna.

NOTE

In configurations that supports a single Antenna only Antenna 1 is available.

4.10.1   Show Summary

Select this option to view all relevant parameters of the configured Antenna(s). For each of the available Antennas the following details are displayed:

■ Antenna ID

■ Current Antenna Gain (dBi)

■ Configured Antenna Gain (dBi)

■ Beam Width (degrees)

■ Antenna Polarization

■ Antenna Type: Integral or External according to the unit's type.

Refer to Section 4.10.2.2 for details on these parameters.

4.10.2 Select

Use this option to select the viewing and configuration mode for a specific Antenna. The following options are available for the selected Antenna:

4.10.2.1 Show

Select this option to view the relevant parameters of the selected Antenna. The displayed information is the same as described in Show Summary (Section 4.10.1) above.

4.10.2.2 Update

This option is applicable only for external Antennas. Select this option to configure/modify the following parameters of the selected Antenna:

■ Antenna Gain (dBi)

■ Beam Width (degrees)

■ Antenna Polarization

NOTE

For a Dual Slant antenna only Antenna 1 should be configured. The read-only configuration of Antenna 2 will be copied from the configuration of Antenna 1.

4.10.2.2.1 Antenna Gain (dBi)

The gain of the antenna in dBi.

The range is from 0 to 40 dBi.

The defaults is 14 dBi.

NOTE

For units using a Band Name with limitation on the maximum allowed EIRP, the configuration range for Antenna Gain depends on the currently configured values for Tx Power and Bandwidth. For more details refer to "Tx Power" on page 129.

For such units using two antennas per sector, the gain of both antennas must be set to the same value.

4.10.2.2.2 Beam Width (degrees)

The antenna's beamwidth in degrees.

Available values are 60, 90, 120 and 360 degrees.

The default is 0 (a different value must be configured).

4.10.2.2.3 Antenna Polarization

The polarization of the antenna.

Available options are Vertical, Horizontal, Dual Slant and Omni. The Omni option is available only if the configured Beam Width is 360 degrees. No other option is supported for a beamwidth of 360 degrees.

4.11   GPS Menu

The GPS menu enables viewing the status and general GPS information and the current and configured values of the GPS parameters. It also enables updating the configurable GPS parameters.

The GPS menu includes the following options:

4.11.1   Show Summary

Select the Show Summary option to view the following details:

Chain parameters

■ Chain Number

■ Current GPS Type

■ Configured GPS Type

■ Hold Over Passed Timeout (min)

■ Stop TX after Hold over Timeout

■ Time Zone Offset From UTC (hours)

■ Daylight Saving

■ Start Date

■ Stop Date

■ Advance Hour Factor

For details refer to "Chain Parameters" on page 164. The Start Date, Stop Date and Advance Hour Factor parameters are applicable only if Daylight Saving is set to Enable.

Clock Parameters

■ Clock Mode

■ External 1 PPS Clock

■ External 10 MHz Clock

For details refer to "Clock Parameters" on page 166.

GPS Info Parameters

The GPS Info Parameters include read-only information received from the GPS receiver (when available).

■ Number Of Received Satellites: The number of satellites received by the GPS receiver. For proper operation at least four satellites should be received.

■ Longitude: The longitude as calculated by the GPS receiver. The format is <xxx.yyy A>, where xxx is the longitude in degrees, yyy is in minutes, and A is either N (North) or S (South).

■ Latitude: The latitude as calculated by the GPS receiver. The format is <xxx.yyy A>, where xxx is the longitude in degrees, yyy is in minutes, and B is either E (East) or W (West).

■ Altitude: The altitude in meters as calculated by the GPS receiver.

■ Calculated Local Date and Time: The local date and time (using 24 hours clock) as calculated using the data received from the GPS receiver and taking into account the configured Time Zone Offset From UTC and Daylight Saving parameters.

■ Navigation Processor SW Version: The number and date of the GPS Navigation Processor SW Version.

■ Signal Processor SW Version: The number and date of the GPS Signal Processor SW Version.

■ GPS HW Version: The GPS HW Version.

GPS Status

■ External 1PPS: The status of External 1PPS clock (OK or Failed).

■ External 10MHz: The status of External 16MHz clock (OK or Failed).

- 4 Satellites And More: Applicable only for Trimble GPS, indicating whether 4 (the minimum required for initial synchronization) or more satellites are received by the GPS receiver (OK or Failed).

- 2 Satellites And More: Applicable only for Trimble GPS, indicating whether 2 (the minimum number required for maintaining synchronization) or more satellites are received by the GPS receiver (OK or Failed).

- GPS Com: Applicable only for Trimble GPS, indicating the status of communication with the GPS receiver (OK or Failed).

- Hold Over Entered: Indicating whether the device has entered into Hold Over state (None or Started).

- Hold Over T/O Passed: Indicating whether Hold Over Timeout has passed (None or Passed).

- BS Stopped to Transmit: Indicating whether the BSs are transmitting or not (OK/Stopped).

4.11.2 Configuration

The GPS Configuration menu enables managing the following:

4.11.2.1 Chain Parameters

Chaining of co-located BTSs is required to fully support intra-site synchronization. When two or more BTSs are chained, all clocks are sent from the Master BTS to the Slave BTSs. The Chain menu includes parameters that should be shared by all BTSs belonging to the same chain.

In the current release chaining is not supported yet and all BTSs are configured as Master.

The Chain menu includes the following:

4.11.2.1.1 Chain Number

The Chain Number is used as a unique identifier of a chain. All BTSs belonging to the same chain should be configured with the same Chain Number. The Chain Number can be used by a central management system to guarantee that certain limitations are met: in each chain, one, and only one BTS should be defined as Master.

The range is from 1 to 1500.

The default is 0, indicating that a Chain Number is not configured yet. A valid Chain Number must be configured, and this number must be unique in the managed network to properly support future implementation of chaining.

4.11.2.1.2   GPS Type

The GPS Type defines the GPS receiver.

The available options are None and Trimble.

The default is Trimble.

4.11.2.1.3   Stop Tx After Hold Over Timeout

For initial synchronization, a minimum of four satellites must be received properly (meeting certain criteria). Upon losing the 1PPS clock from the GPS, or if the received clock is not considered accurate enough because the number of received satellites dropped below the minimum (two satellites), the local 1PPS clock will be generated using the internal 10MHz clock. After a certain time (defined by the Hold Over Passed Timeout parameter described below), it is assumed that due to clock drifts there might be interferences among sectors belonging to the BTS and sectors belonging to neighboring BTSs. If the Stop Tx After Hold Over Timeout parameter is set to Enable, the BTS will stop transmitting after this timeout (unless the number of properly received satellites has increased again to four or more), to prevent interferences to the sectors belonging to other BTSs. If it is set to Disable, transmissions will continue indefinitely, at the expense of potential interferences to sectors belonging to other BTSs.

The default is Disable (Hold Over indefinitely).

4.11.2.1.4   Hold Over Passed Timeout (Min)

This parameter defines the Hold Over timeout, after which there might be interferences to other sectors. When the Stop Tx After Hold Over Timeout is enabled, transmissions will stop after this timeout. When the Stop Tx After Hold Over Timeout is disabled, this timeout is used to generate a trap indicating that there might be interferences to neighboring sectors.

The range is from 0 to 2880 (minutes).

The default is 30 (minutes).

4.11.2.1.5   Time Zone Offset From UTC

This is the offset of the local time from UTC (Coordinated Universal Time).

The range is from -12:00 up to +13:00 in 30 minutes resolution. The format must be either -XX:YY or +XX:YY where YY is either 00 or 30.

The default is +00:00.

4.11.2.1.6   Daylight Saving

The Daylight Saving parameter is used to enable or disable the daylight saving feature using the following Start Date, End Date and Advance Hour Factor parameters.

The default is Disable

4.11.2.1.7   Start Date

When Daylight Saving is enabled, this parameter defines the date for starting the daylight saving feature. At the beginning of this date (midnight at the beginning of this date), the clock will be advanced by the amount of hours specified by the Daylight Saving Advance Factor (see below).

Use the format dd:mm to define the date and month at which to start activating the Daylight Saving feature.

4.11.2.1.8   End Date

When Daylight Saving is enabled, this parameter defines the date for ending the daylight saving feature (at "Daylight Saving Advance Factor" hours after midnight at the end of this date).

Use the format dd:mm to define the date and month at which to end activating the Daylight Saving feature.

4.11.2.1.9   Advance Hour Factor

This parameter enables configuring the amount of time by which the clock should be advanced during the daylight saving period.

The range is from 0 to 4:45 (hours) in steps of 15 minutes.

4.11.2.2   Clock Parameters

In the current release Clock Parameters are not configurable. The Show option for Clock Parameters displays the default Clock Mode (Master) and the sources for the main clocks in the system according to the Clock Mode.

The Clock Parameters submenu includes the following:

■   Clock Mode

■   External 1PPS Clock

■   External 10MHz Clock

4.11.2.2.1 Clock Mode

The Clock Mode parameters defines the location of the unit in the chain. The available options (not applicable for the current release) are:

■ Master

■ Slave#1 (the first Slave unit in the chain, connected to the Master unit)

■ Slave#2 (the second Slave unit in the chain, connected to Slave#1)

■ Slave#3 (the third Slave unit in the chain, connected to Slave#2)

■ Slave#4 (the fourth Slave unit in the chain, connected to Slave#3)

■ Slave#5 (the fifth Slave unit in the chain, connected to Slave#4)

The default is Master.

Under normal conditions, the clocks are supplied by the Master unit to the Slave units. If Slave#1 will detect that it does not receive clocks for a certain period of time, it will assume that the Master unit has failed and will start using its internal 10 MHz clock, supplying the clocks also to the other slave units (if exist). Slave#2 will wait for a longer period of time before assuming that both the Master and Slave#1 have failed, and so on.

The functionality and operation mode of the main clocks is:

4.11.2.2.2 External 1PPS Clock

The 1PPS (Pulse Per Second) clock is used to determine the air-frame start time. Assuming that all systems use the same air-frame size and DL/UL Ratio, then, when the 1PPS clock is received from a GPS system, this mechanism ensures inter-site and intra-site synchronization among all sectors, preventing cross interference and saturation problems. When using the internal 1PPS clock (derived from the 10MHz clock source), only intra-site synchronization among sectors can be achieved.

For a Master unit the default External 1PPS Clock is Disable (use internal 1PPS clock source derived from either the built-in GPS receiver or from the 10MHz clock).

For Slave units the default External 1PPS Clock is Enable (derived from the previous unit in the chain).

4.11.2.2.3 External 10MHz Clock

The 10MHz clock source is used for generation of all main clocking signals in the system, including the internal 1PPS clock when GPS Type is set to None or when the GPS receiver does not function properly.

For a Master unit the default External 10MHz Clock is Disable (use internal clock source).

For Slave units the default External 10MHz Clock is Enable (derived from the previous unit in the chain).

4.12 MS Menu

The MS menu enables viewing general details on MSs that exist in the database. It also enables resetting (de-registering) a connected MS. In Embedded Distributed ASN-GW Not Authenticated working mode it also enables adding/deleting MSs to/from the database.

The MS menu includes the following options:

■ Show Summary

■ Show Concise Summary

■ Show Summary by BS

■ Show Concise Summary by BS

■ Select By MAC

■ Add

4.12.1 Show Summary

Select this option to view summary information and main details for all connected and pre-configured MSs.

For each MS, the following information is displayed:

■ MS MAC Address

■ MS IP Address: The MS Management IP address

■ BS ID: The BS to which the MS is connected (1 or 2), or 0 if the MS is not connected to any BS.

■ Operational Status (the current state in the network entry process):

  » Service Defined Not In Use

  » Radio Up

  » Authorized

  » In Service

■ UL RSSI (dBm)

■ UL CINR (dB)

In addition, the following summary information is provided:

■ Total Number of MSs: The total number of SUs in the database (including connected and pre-configured MSs)

■ Total Number of MSs Connected to BS1

■ Total Number of MSs Connected to BS2

4.12.2 Show Concise Summary

Select this option to view the summary information for all MSs:

■ Total Number of MSs: The total number of SUs in the database (including connected and pre-configured MSs)

■ Total Number of MSs Connected to BS1

■ Total Number of MSs Connected to BS2

4.12.3 Show Summary by BS

Select this option to view the total number of MSs connected to a specific BS as well as main details on these MSs, as described in Section 4.12.1. You will be prompted to select the required BS ID.

4.12.4 Show Concise Summary by BS

Select this option to view the total number of MSs connected to a specific BS. You will be prompted to select the required BS ID.

4.12.5 Select By MAC

Select this option to select a specific MS by its MAC address. The menu for the selected MS includes the following options:

- ■ Show

- ■ Show Allocated IP Addresses

- ■ Perform and Show MS Frequency Shift Measurement

- ■ Counters

- ■ De-Register MS

- ■ Delete

4.12.5.1 Show

Select this option to view the general details of the selected MS:

- ■ MS IP Address:

- ■ BS ID

- ■ Operational Status

4.12.5.2 Show Allocated IP Addresses

Select this option to view the IP addresses allocated to the MS. For each allocated IP address the Connectivity Type (Data, Voice, or Management) will be indicated.

4.12.5.3 Perform and Show MS Frequency Shift Measurement

Select this option to measure the average frequency error of the uplink bursts transmitted by the MS. The measured frequency shift in Hz will be displayed.

If the frequency error is too high, the MS generates interference limiting the ability of the BS to properly process received bursts and the maximum rate that can be used is limited. If the measured frequency shift is higher than 100 Hz it is

recommended to check the MS and try to correct the situation, since the use of rates that are lower than expected may reduce also the overall throughput of the entire cell.

4.12.5.4   Counters

Select this option to view or reset the counters of the MS:

■ UL RSSI (dBm)

■ UL CINR (dB)

■ UL Rate

■ UL Total Received Bytes

■ UL Total Received Packets

■ UL Total Lost Packets

■ UL Total Received Bursts

■ UL HARQ ACK Bursts*

■ UL HARQ NACK Bursts*

■ UL HARQ Dropped Bursts*

■ DL RSSI (dBm)

■ DL CINR (dB)

■ DL Rate

■ DL Total Transmitted Bytes

■ DL Total Transmitted Packets

■ DL Total Lost Packets

■ DL Total Transmitted Bursts

■ DL HARQ ACK Bursts*

- DL HARQ NACK Bursts*

- DL HARQ Dropped Bursts*

NOTE

DL/UL HARQ counters are not supported in current releaase.

4.12.5.5 De-Register MS

Select this option to force de-registration (link disconnection) of the MS by sending a De-Registration message from the BTS to the MS. The MS will re-initiate network entry.

4.12.5.6 Delete

Select this option to delete the selected MS from the database. Applicable only in Embedded Distributed ASN-GW Not Authenticated working mode.

4.12.6 Add

Select this option to Add an MS to the database. You will be prompted to enter the MAC address. Applicable only in Embedded Distributed ASN-GW Not Authenticated working mode.

4.13   Parameters Summary

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
BTS - Configuration - General Parameter			
BTS Number	1-999999	0	No
BTS Name	Up to 32 printable characters	Null	Yes
BTS Location	Up to 64 printable characters	Null	Yes
BTS Contact	Up to 64 printable characters	Null	Yes
BTS - Configuration - Working Mode			
BTS Working Mode	■ Embedded Distributed ASN-GW Authenticated ■ Embedded Distributed ASN-GW Not Authenticated ■ External ASN-GW (not supported in current release)	Embedded Distributed ASN-GW Authenticated	No
BTS - Configuration - Connectivity			
IP Address	IP address	1.1.1.23	No
Subnet Mask	subnet mask	255.255.255.0	No
Default Gateway	IP address	0.0.0.0 (none)	No
VLAN ID	1-4094 or 4096 for No VLAN	4096	No
VLAN Priority	0-7		No
BTS - Configuration - Authorized Managers			
Authorized Manager IP Address	IP address		Yes
Authorized Manager Read Community	Up to 32 printable characters, case sensitive	public	Yes
Authorized Manager Write Community	Up to 32 printable characters, case sensitive	private	Yes
Traps Distribution Enabled	■ Disable ■ Enable	Enable	Yes
BTS - Configuration - Radio Parameters			

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
Operator ID	x.y.z, where x, y, z are in the range 0 to 255	0.0.0 (must be changed)	No
Operator Name	Up to 32 printable characters	Null	Yes
Service Zone ID	0-2047	0 (must be changed)	No
Service Zone Name	Up to 32 printable characters	Null	Yes
Operation Mode	■ Single Sector Single BS no Diversity ■ Single Sector Single BS no Diversity	According to supplied hardware	No
DL/UL Ratio	In current release only DL = 60% : UL = 40% is supported	DL = 60% : UL = 40%	No
Band Name	Applicable only for 5 GHz units. Available options depend on HW type	4.9 GHz units: 4.9 GHz Universal. 5.4 GHz units: 4.9 GHz Universal.	No
Frequencies Management Level (if DFS supported by Band Name)	■ Sector Level ■ BTS Level	Sector Level	No
BTS - Unit Control - Change Password			
Administrator Password	1 to 16 printable characters, case sensitive	admin	Yes
Installer Password	1 to 16 printable characters, case sensitive	installer	Yes
Monitor Password	1 to 16 printable characters, case sensitive	monitor	Yes
BTS - Unit Control - SW Version Control - Load to Shadow			
TFTP Server IP Address	IP address		Yes
File Name	up to 80 printable characters		Yes
BTS-Unit Control-Configuration File Control-Upload Configuration File-Activate Upload Operation			
File Type	■ Full Configuration ■ Services (SP & MSF) File (not applicable in External ASN-GW working mode)		Yes
TFTP Server IP Address	IP address		Yes

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
File Name	up to 80 printable characters	■ Full Configuration: backup.res ■ Services: profiles_srvc.res	Yes
BTS-Unit Control-Configuration File Control-Download Configuration File-Activate Upload Operation			
File Type	■ Full Configuration ■ Services (SP & MSF) File (not applicable in External ASN-GW working mode) ■ Frequency File		Yes
TFTP Server IP Address	IP address		Yes
File Name	up to 80 printable characters	■ Full Configuration: backup.res ■ Services: profiles_srvc.res ■ Frequency File: Rfu.db	Yes
BTS-Unit Control-Monitor Inactivity Timeout			
Monitor Inactivity Timeout (min)	0-60 minutes. 0 means no timeout.	10 minutes	Yes
BTS-Fault Management-Trap Configuration-Distribution Enabled-Update			
Trap ID	Trap ID		Yes
Trap Distribution Enabled	■ Disable ■ Enable	Enable	Yes
BTS-Fault Management-Trap Configuration-Alarm Severity-Update			
Trap ID	Alarm Trap ID		Yes
Trap Severity	■ Indeterminate ■ Critical ■ Major ■ Minor ■ Warning	Depends on trap	Yes

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
BTS-Fault Management-Trap Configuration-Suppression Interval-Update			
Trap ID	Trap ID		Yes
Trap Suppression Interval (sec)	0-86400 seconds. 0 means no suppression.	0	Yes
BTS-Fault Management-Event Log Selection Criteris			
Minimum Severity	■ Clear ■ Indeterminate ■ Critical ■ Major ■ Minor ■ Warning	Clear	Yes
Last Days	1-31 days	1 day	Yes
Managed Object Type	■ All ■ BTS ■ ASN GW ■ Sector ■ BS ■ Radio Channel ■ GPS ■ Antenna ■ MS	All	Yes
Specific Event Category	■ All ■ Alarm ■ State Change ■ Configuration Change ■ System Event	All	Yes

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
ASN-GW - AAA - Configuration - AAA Client			
Retry Interval (sec)	1-30 (seconds)	5 (seconds)	Yes
Maximum Number of Retries	1-10	3	Yes
Keep Alive Timeout (sec)	60-180 (seconds)	60 (seconds)	Yes
ASN-GW - AAA - Configuration - Authentication Server			
Server Address	IP address	Null	Yes
Server Alias	1-32 printable characters	Null	Yes
Shared Secret	1 to 16 printable characters, case sensitive	Null	Yes
UDP Port Number	1-65535	1812	Yes
ASN-GW - AAA - Configuration - Accounting Server			
Server Address	IP address	Null	Yes
Server Alias	1-32 printable characters	Null	Yes
Shared Secret	1 to 16 printable characters, case sensitive	Null	Yes
UDP Port Number	1-65535	1813	Yes
ASN-GW - Services - MSs Services			
MS MAC Address	MAC address (must exist in database)		Yes
Admin Status	■ Enable ■ Disable		Yes
Multiple Service Flow Name	A Multiple Service Flow Name that exists in database.		Yes
Service Profile Name	A Service Profile Name that exists in database.		Yes
ASN-GW - Services - Service Profiles			
Service Profile Name	1-32 printable characters		Yes
Service Profile Type	■ Data ■ VoIP ■ Management ■ PPPoE		Yes

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
ASN-GW - Services - Service Profiles - Selected Service Profile - QoS Profiles			
Uplink QoS Type	■ BE ■ NRT		Yes
Uplink CP	0-2 BE: only 0 is supported. NRT: 1-2 are supported.		Yes
Uplink CIR (NRT QoS)	32-54000 Kbps		Yes
Uplink CIR (BE&NRT QoS)	32-54000 Kbps (in NRT cannot be lower than Uplink CIR)		Yes
Downlink QoS Type	■ BE ■ NRT		Yes
Downlink CP	0-2 BE: only 0 is supported. NRT: 1-2 are supported.		Yes
Downlink CIR (NRT QoS)	32-54000 Kbps		Yes
Downlink CIR (BE&NRT QoS)	32-54000 Kbps (in NRT cannot be lower than Downlink CIR)		Yes
ASN-GW - Services - Multiple Service Flows			
Multiple Service Flow Name	1-32 printable characters		Yes
Service Group Name	A Service Group Name that exists in database.		Yes
Service Operation Mode	■ Bridge ■ Router		Yes
ASN-GW - Services - Multiple Service Flows - Selected Multiple Service Flow - Service Rules			
Service Interface Name	A Service Interface Name that exists in database.		Yes
ASN-GW - Services - Multiple Service Flows - Selected Multiple Service Flow - Service Rules - Selected Service Rule - Classifiers			

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
Uplink Classifier Type	■ Any ■ DSCP ■ VLAN ID ■ VLAN Priority		
Uplink Classifier Parameter 1	DSCP: 0-63 VLAN ID: 1-4094 VLAN Priority: 0-7		Yes
Uplink Classifier Parameter 2	DSCP: 0-63 VLAN ID: 1-4094 VLAN Priority: 0-7 (cannot be lower than Uplink Classifier Parameter 1)		Yes
Downlink Classifier Type	■ Any ■ DSCP		
Downlink Classifier Parameter 1	0-63		Yes
Downlink Classifier Parameter 2	0-63 (cannot be lower than Downlink Classifier Parameter 1)		Yes
ASN-GW - Services - Service Groups			
Service Group Name	1-32 printable characters		Yes
DHCP Type	Transparent (in current release only Transparent mode is supported)		Yes
Nomadic Mode	■ Enable ■ Disable	Disable	Yes
Attribute 31	■ None ■ CPE MAC Address ■ CPE Fully Qualified Domain Name	CPE MAC Address	Yes

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
Attribute 32	■ None ■ BTS MAC Address ■ GIADDR ■ Service Interface VLAN ■ Management IP Address ■ BS ID ■ BTS Name ■ Free Text		
Attribute 32 Free Text	1-32 printable characters		Yes
ASN-GW - Services - Service Interfaces			
Service Interface Name	1-32 printable characters		Yes
Forwarding Rule Name	A Forwarding Rule Name that exists in database.		Yes
CS Type	■ Ethernet CS ■ IP CS In current release only IP CS is supported	IP CS	Yes
VLAN Interface	■ Enable ■ Disable	Enable	Yes
VLAN Transparency	■ Enable ■ Disable	Disable	Yes
VLAN ID	1-4094 or null for No VLAN		Yes
VLAN Priority Marking	■ Enable ■ Disable	Disable	Yes
VLAN Priority	0-7		Yes
VLAN List	Up to 16 VLAN IDs (1-4094) separated by commas or empty for All (including none)	empty	Yes

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
Inner DSCP Marking	■ Enable ■ Disable		Yes
Inner DSCP	0-63		Yes
ASN-GW - Services - Forwarding Rules			
Forwarding Rule Name	1-32 printable characters		Yes
Relay Mode	■ Enable ■ Disable		Yes
Unknown Address Forwarding Mode	■ Forward ■ Discard		Yes
QoS Type	■ BE ■ NRT		Yes
CP	0-2 BE: only 0 is supported. NRT: 1-2 are supported.		Yes
CIR (NRT QoS)	32-54000 Kbps		Yes
CIR (BE&NRT QoS)	32-54000 Kbps (in NRT cannot be lower than CIR)		Yes
Sector - General Parameter			
Sector Name	Up to 32 printable characters	null	Yes
Sector Location	Up to 64 printable characters	Null	Yes
Sector Heading	0-359 (degrees)	0	Yes
Bandwidth	■ 5 MHz ■ 10 MHz	10 MHz	No
Frequency	Depends on supported frequency band and configured Bandwidth. In 5 GHz units depend also on Band Name.	Depends on supported frequency band. In 5 GHz units depend also on Band Name.	No

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
Tx Power	Depends on unit type. In 5 GHz units depend also on Band Name and Antenna Gain.	Depends on unit type. In 5 GHz units depend also on Band Name and Antenna Gain.	No
DFS (5 GHz units using a Band Name supporting DFS)			
DFS Support	■ Enable ■ Disable	Enable	No
Channel Availability Check Time	0-600 seconds	60 seconds	No
Channel Non Occupancy Period	0-60 minutes	30 minutes	No
Startup Test Valid Period	0-48 hours	6 hours	No
Radar Detection Threshold	-36 to -70 dBm	EIRP>30 dBm: -67 EIRP=23-30 dBm:-64 EIRP<23 dBm: -62	No
BS - General Parameters			
BS Name	Up to 32 printable characters	Null	Yes
BS - MAC			
Segment Number	0-3	0	No
Cell Number	0-31. For cells with 4 sectors the range is 0-17.	0	No
Cell Radius	8000-40000 (meter) In current release only 8000 and 40000 are supported	40000	No
Map Repetition	1, 2, 4.	1	No
BS - PHY			
Diversity	■ SISO ■ MIMO Matrix A	Single Sector Single BS no Diversity: SISO Single Sector Single BS with Diversity: MIMO Matrix A	No
UL Thermal Noise Level	-130 to -100 (dBm)	-125	No

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
BS - Multi Rate			
UL Minimum Sub-Channels	■ 5 MHz BW: 1-17 ■ 10 MHz BW: 1-35	4	Yes
Uplink Multi Rate Support	■ Enable ■ Disable	Enable	No
Uplink Basic Rate	■ QPSK-CTC-1/2 REP4 ■ QPSK-CTC-1/2 REP2 ■ QPSK-CTC-1/2 ■ QPSK-CTC-3/4 ■ QAM16-CTC-1/2 ■ QAM16-CTC-3/4 ■ QAM64-CTC-2/3 ■ QAM64-CTC-3/4 ■ QAM64-CTC-5/6	QAM64-CTC-1/2	No
Uplink Fade Margin	0-15 (dB)	2 (dB)	No
Downlink Multi Rate Support	■ Enable ■ Disable	Enable	No

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
Downlink Basic Rate	■ QPSK-CTC-1/2 REP4 ■ QPSK-CTC-1/2 REP2 ■ QPSK-CTC-1/2 ■ QPSK-CTC-3/4 ■ QAM16-CTC-1/2 ■ QAM16-CTC-3/4 ■ QAM64-CTC-2/3 ■ QAM64-CTC-3/4 ■ QAM64-CTC-5/6	QAM64-CTC-1/2	No
Uplink Fade Margin	0-15 (dB)	2 (dB)	No
BS - Channelization			
DL Permutation Base	■ Fix ■ Variable ■ Rotated In current release only Fix is supported	Fix	No
DL Permutation Base Value	0-31	0	No
UL Permutation Base	■ Fix ■ Variable ■ Rotated In current release only Fix is supported	Fix	No
UL Permutation Base Value	0-69	0	No
Major Group	0-63. In current release only the default is supported (63 for BS BW 10 MHz, 21 for BS BW 5 MHz).)	63 for BS bandwidth of 10 MHz. 21 for BS bandwidth of 5 MHz.	No
BS - R6 Interface - Connectivity			
BS IP Address	IP address		No

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
BS Subnet Mask	subnet mask		No
BS Default Gateway	IP address		No
ASN-GW IP Address	IP address		No
ASN-GW Subnet Mask	subnet mask		No
ASN-GW Default Gateway	IP address		No
ASN-GW Default VLAN ID	1-4094 or 4096 for No VLAN	4096	No
ASN-GW Default VLAN Priority	0-7		No
ASN-GW DSCP	0-63	0	No
BS - R6 Interface - DSCP QoS Marking			
NRT DSCP Marking Mode	■ Transparent ■ Marking	Transparent	Yes
NRT DSCP Value	0-63	0	Yes
BE DSCP Marking Mode	■ Transparent ■ Marking	Transparent	Yes
BE DSCP Value	0-63	0	Yes
BS - R6 Interface - VLAN Priority QoS Marking			
NRT VLAN Priority Marking Mode	■ None Specific ■ Transparent (not supported in current release) ■ Marking	None Specific	Yes
NRT VLAN Priority Value	0-7	0	Yes
BE VLAN Priority Marking Mode	■ None Specific ■ Transparent (not supported in current release) ■ Marking	None Specific	Yes
BE VLAN Priority Value	0-7	0	Yes
BS - R6 Interface - BS and ASN-GW Keep Alive			

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
Keep Alive Support	■ Enable ■ Disable	Disable	Yes
Keep Alive Timer (sec)	60-180 seconds	60	Yes
Keep Alive Interval (sec)	1-30 seconds	5	Yes
Maximum Number of Keep Alive Failures	1-10	3	Yes
Radio Channel - General			
Admin Status	■ Enable ■ Disable	Disable	Yes
Antenna (configurable only for external antenna)			
Antenna Gain	0-40 dBi	14	No
Beam Width	60, 90, 120 or 360 degrees		Yes
Antenna Polarization	Vertical, Horizontal, Dual Slant or Omni		Yes
GPS - Chain Parameters			
Chain Number	1 - 1500	0 (means not defined yet-must be defined)	No
GPS Type	■ None ■ Trimble	Trimble	Yes
Hold Over Passed Timeout	0 - 2880 (minutes)	30 (minutes)	No
Stop Tx After Hold Over Timeout	■ Disable ■ Enable	Disable	No
Time Zone Offset From UTC	-12:00 to +13:00 in steps of 30 minutes	+00:00	No
Daylight Saving	■ Disable ■ Enable	Disable	No
Daylight Saving Start Date	dd.mm		Yes
Daylight Saving End Date	dd.mm		Yes
Daylight Saving Advance Factor	0 to 4:45 hours in 15 minutes steps	+00:00	Yes
GPS - Clock Parameters			

Table 4-22: BTS Parameters Summary

Parameter	Range	Default	Run-Time Updated
Clock Mode	■ Master ■ Slave#1 ■ Slave#2 ■ Slave#3 ■ Slave#4 ■ Slave#5 Not configurable in the current release: only Master is supported (no chaining).	Master	No
External 1 PPS Clock	■ Enable ■ Disable Not configurable in the current release.	Master: Disable Slave: Enable	No
External 10 MHz Clock	■ Enable ■ Disable Not configurable in the current release.	Master: Disable Slave: Enable	No
MS - Add (applicable only in Embedded Distributed ASN-GW Not Authenticated working mode)			
Select MS MAC	MAC address		Yes

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.
AAS	Adaptive Antenna System, also called Advanced Antenna System, is a technology to enable the network operators to increase the wireless network capacity. In addition, adaptive antenna systems offer the potential of increased spectrum efficiency, extended range of coverage and higher rate of frequency reuse. Adaptive antenna systems consist of multiple antenna elements at the transmitting and/or receiving side of the communication link, whose signals are processed adaptively in order to exploit the spatial dimension of the mobile radio channel. Depending on whether the processing is performed at the transmitter, receiver, or both ends of the communication link, the adaptive antenna technique is defined as multiple-input single-output (MISO), single-input multiple-output (SIMO), or multiple-input multiple-output (MIMO).
ASCII	American Standard Code for Information Interchange. A code for representing English characters as numbers, with each letter assigned a number from 0 to 127.
ASN	Access Service Network. An ASN is defined as a complete set of network functions needed to provide radio access to a WiMAX subscriber. An ASN is comprised of network elements such as one or more Base Stations (BS) and one or more ASN gateways (ASN-GW). An ASN may be shared by more than one Connectivity Service Network (CSN).
ASN-GW	Access Service Network Gateway. The ASN-GW is a network entity that acts as a gateway between the ASN and CSN. The ASN functions hosted in an ASN-GW may be viewed as consisting of two groups - the decision point (DP) that provides control functionality and enforcement point (EP) that provides bearer transport.
AU	Access Unit
AWG	An electronics industry acronym for American Wire Gauge. AWG is a measure of the thickness of copper, aluminum and other wiring.
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.
BW	Bandwidth
CINR	Carrier-to-Interference plus Noise Ratio (expressed in dB)
CIR	Committed Information Rate. The rate (in bits per second) at which a network guarantees to transfer information under normal conditions, averaged over a minimum increment of time.
CLI	Command Line Interface. A user interface that accepts typed commands to instruct the managed device on the task to perform.
CPU	Central Processing Unit.
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.
CSN	Connectivity Service Network. A CSN is defined as a set of network functions that provide IP connectivity services to WiMAX subscribers and all the IP core network functions. A CSN is comprised of network elements such as routers, proxy/servers, user databases, and inter-working gateway devices.
CTC	Convolutional Turbo Code is a type of turbo codes with some of the convolutional schemes used. For its high-performance error correction nature, CTC is the iterative decoding scheme of choice as evidenced by their wide adoption in standards bodies.
DCD	Downlink Channel Descriptor.
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.
DNS	Domain Naming System. A system that stores information about hostnames and domain names. DNS provides an IP address for each hostname, and lists the e-mail exchange servers accepting e-mail addresses for each domain.
DSL	Digital Subscriber Line. A technology that exploits unused frequencies on copper telephone lines to transmit traffic typically at multi-megabit speeds. DSL can allow voice and high-speed data to be sent simultaneously over the same line. Because the service is 'always available,' end-users don't need to dial in or wait for call set-up.
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.
EDT	Electrical Down-Tilt
EIRP	Equavalent Isotropic Radiated Power. The apparent power transmitted towards the receiver, if it is assumed that the signal is radiated equally in all directions. The EIRP is equal to the power (in dBm) at the antenna port, plus the power gained from the directivity of the antenna (in dBi).
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.

ETS	European Telecommunications Standard
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.
GPS	Global Positioning System. A system that uses satellites, receivers and software to allow users to determine their precise geographic position.
GRE	General Routing Encapsulation. A method or technique of adding an IP standard header and trailer to a message that does not follow IP protocols. The encapsulated message is sent over a public network while received messages are stripped of the wrapper and processed. This permits non-standard data and totally encrypted messages to use the Internet. The technology is an important element in Virtual Private Network (VPN) offerings.
HP	High Power.
IEEE	Institute of Electrical and Electronics Engineers. IEEE (pronounced I-triple-E) is an organization 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 802.16	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).
IEEE 802.1p	A QoS method - A three-bit value that can be placed inside an 802.1Q frame tag.
IEEE 802.1q	The IEEE 802.1q standard defines the operation of VLAN Bridges that permit the definition, operation and administration of Virtual LAN topologies within a Bridged LAN infrastructure. The 802.1q specification establishes a standard method for inserting VLAN membership information into Ethernet frames. A tag field containing VLAN (and/or 802.1p priority) information can be inserted into an Ethernet frame, carrying VLAN membership information.
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.
IF	Intermediate Frequency. Radio communications systems modulate a carrier frequency with a baseband signal in order to achieve radio transmission. In many cases, the carrier is not modulated directly. Instead, a lower IF signal is modulated and processed. At a later circuit stage, the IF signal is converted up to the transmission frequency band.

IGMP	Internet Group Membership Protocol) is protocol used by IP hosts to report their host group memberships to any immediately neighboring multicast routers.
	The use of IP multicasting in TCP/IP networks is defined as a TCP/IP standard in RFC 1112. In addition to defining address and host extensions for how IP hosts support multicasting, this RFC also defines the IGMP version 1. Version 2 of IGMP is defined in RFC 2236. Both versions of IGMP provide a protocol to exchange and update information about host membership in specific multicast groups.
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.
LED	Light Emitting Diode.
MAC	Media Access Control. The lower of the two sub-layers of the data link layer defined by the IEEE. The MAC sub-layer handles access to shared media, such as whether token passing or contention will be used.
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.
MDT	Mechanical Down-Tilt
MIB	Management Information Base. A database of objects that can be monitored by a network management system. SNMP uses standardized MIB formats that allow any SNMP tools to monitor any device defined by a MIB.
MIMO	Multiple Input, Multiple Output. A technique for faster wireless communication. MIMO allows for the use of multiple transmitter and receiver antennas to increase throughput and range.
MIP	Mobile IP. A protocol used to provide IP mobility to IPv4-based nodes, defined in RFC-2002.
MIR	Maximum Information Rate. Specifies the maximum rate of information that can be available to a user. The MIR is used by the traffic policing mechanism to prevent users from sending excess traffic to the network.
MTU	Maximum Transmission Unit. This is the greatest amount of data that can be transferred in one physical frame on the network. If a packet that has a smaller MTU than the packet's frame length is sent, fragmentation will occur. For TCP, MTU can range from 68 to 1500 bytes. Larger MTUs provide for lower overhead (fewer headers).
MS	Mobile Station. The equipment used by the end user to access the WiMAX network.
NAP	Network Access Provider. A NAP is a business entity that provides WiMAX radio access infrastructure to one or more Network Service Providers (NSPs). An NAP implements this infrastructure using one or more ASNs.

NMS	Network Management System. A system responsible for managing at least part of a network. An NMS is generally a reasonably powerful and well-equipped computer, such as an engineering workstation. NMSs communicate with agents to help keep track of network statistics and resources.
NSP	Network Service Provider. An NSP is a business entity that provides IP connectivity and WiMAX services to WiMAX subscribers compliant with the established service level agreement. The NSP concept is an extension of the Internet service provider (ISP) concept, providing network services beyond Internet access. To provide these services, an NSP establishes contractual agreements with one or more NAPs. An NSP may also establish roaming agreements with other NSPs and contractual agreements with third-party application providers (e.g. ASP, ISP) for the delivery of WiMAX services to subscribers. From a WiMAX subscriber standpoint, an NSP may be classified as a home or visited NSP.
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.
PS	Power Supply
QoS	Quality of Service. Measure of performance for a transmission system that reflects its transmission quality and service availability.
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.
RFC	Request For Comments. The name of the result and the process for creating a standard on the Internet. New standards are proposed and published on the Internet, as a Request For Comments. The proposal is reviewed by the Internet Engineering Task Force.
RoHS	Restriction of the use of certain Hazardous Substances in electrical and electronic equipment, reference EC Directive 2002/95/EC of 27 January 2003.
RSSI	Received Signal Strength Indicator. A signal or circuit that indicates the strength of the incoming (received) signal in a receiver.
Rx	Receive
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.
SSH	Secure Shell is a protocol for secure remote login and other secure network services over an insecure network.
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.
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.
Tx	Transmit
U	Abbreviation for "Unit" or standard height measurement which defines the vertical height for plug-in modules in the 19" construction system. One U equals 44.5 mm.
UCD	Uplink Channel Descriptor.
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.

WCS   Wireless Communications Service is defined by the Federal Communications Commission as radio communications that may provide fixed, mobile, radio location, or satellite communication services to individuals and businesses within their assigned spectrum block and geographical area. The WCS is in the 2.3 GHz band from 2,305 to 2,320 MHz and 2,345 to 2,360 MHz..

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.

Wi-Fi   Wi-Fi (short for wireless fidelity and pronounced 'why-fye') is a term for certain types of wireless local area network that use specifications in the IEEE 802.11 family. The term Wi-Fi was created by an organization called the Wi-Fi Alliance, which oversees tests that certify product interoperability.

WiMAX   WiMAX is an acronym that stands for Worldwide Interoperability for Microwave Access. WiMAX is a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL. WiMAX provides fixed, nomadic, portable, and mobile wireless broadband connectivity without the need for direct line-of-sight to a base station.

XML   Extensible Markup Language. Language used for defining a set of markers, called tags, that define the function and hierarchical relationships of the parts of a document or data set. It is a flexible way to create common information formats and share both the format and the data, most commonly on the web. It generally similar to HTML and helps share information in a consistent way. XML is "extensible" because, unlike HTML, the markup symbols are unlimited and self-defining.