BreezeMAX® Extreme

System Manual

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	New features in ASN-GW menu	September 2009
Service Profiles	Added a new Service Type - PPPoE	September 2009
Multiple Service Flows	Added support for Ethernet CS services. New Classifier types (VLAN ID, VLAN Priority)	September 2009
Service Interface	Added support for Ethernet CS services. New parameters (VLAN Transparency, VLAN Priority Marking, VLAN List)	September 2009
Sector DFS Parameters	Updated-added Radar Detection Threshold parameter.	September 2009
Integral 5 GHz Antenna	Updated specifications of 5 GHz Integral antenna (Table 1-9)	October 2009
External 5 GHz Antennas	Added 8 dBi OMNI (Table 1-10)	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
Radio Standard	Added FCC Part 90 Subpart Y, FCC Part 15 Subpart B (Table 1-16)	October 2009
Available Radio Bands	Removed 3.5 GHz units	October 2009
Timeout after 3 unsuccessful login attempts	Updated to 10 minutes (Section 4.2.1)	October 2009
Load to Shadow operation	Updated description-not allowed if the unit is running from Shadow (Section 4.5.5.4.3)	October 2009
Forwarding Rules - Relay Mode	Updated description (Section 4.6.2.11.3)	October 2009
Service Interface - VLAN Interface parameter	Updated description (Section 4.6.2.10.5)	October 2009
Service Rule Classifiers	No classifiers should be defined for PPPoE services (Sections 4.6.2.7, 4.6.2.8)	October 2009
Band Names for Australia	Updated parameters (Tables 4-3, 4-4, 4-20, 4-23)	October 2009
System Configurations Section 1.3.4	Updated, new configurations.	February 2010

Topic	Description	Date Issued
Data Communication (Ethernet Port) specifications Section 1.4.9	Corrected Standards Compliance (IEEE 8033u corrected to IEEE 802u). Maximum Packet Size corrected to Maximum Frame Size	February 2010
BTS Menu, Show Summary Section 4.5.1	Updated	February 2010
BTS Menu, Show Properties Section 4.5.2	Updated	February 2010
BTS Menu, Show License Properties Section 4.5.3	New feature	February 2010
Operation Modes Section 4.5.4.5.5	Updated (new options, added details)	February 2010
DL/UL Ratio Section 4.5.4.5.6	Updated description	February 2010
DFS/DCS Section 4.5.4.5.9	Updated, added DCS feature and new Random Channel Selection parameter.	February 2010
Unit Contro Section 4.5.5	Added new feature-License Files Control	February 2010
License Files Control Section 4.5.5.6	New feature	February 2010
BTS Performance Counters Section 4.5.7	Corrected (added BTS IP Address in Ethernet counters, corrected order of counters)	February 2010
Service Profile Type Section 4.6.2.4.3	Updated (new types)	February 2010
HARQ Repetitions Section 4.6.2.4.4	Updated (new service profile types)	February 2010
QoS Profiles Section 4.6.2.5	Updated to reflect support of ERT.	February 2010
Service Groups Section 4.6.2.9	Support of new DHCP modes and relevant parameters. New Service Group Gateway and Service Group VLAN ID parameters Updated description of Attribute 31 and Attribute 32.	February 2010
MAC Access Lists Section 4.6.3	Updated to reflect new features (Allow/Deny feature, single addresses/ranges lists, Default Access parameter).	February 2010

Topic	Description	Date Issued
Sector Menu Section 4.7	Support of configurations with 2 sectors and 2 BSs. New features-DCS, Spectrum Analyzer.. Updated functionality of Usable Frequencies Updated description of Bandwidth, Frequency, Tx Power. Updated description of DFS feature.	February 2010
BS Menu Section 4.8	Support of configurations with 2 BSs. Updated description of BS Bandwidth, Cell Radius, Diversity, Major Groups Updated range for Map Repetition. Removed: Perform and Show UL Thermal Noise Measurement. Added support of ERT in R6 Interface parameters (DSCP QoS Marking, VLAN Priority QoS Marking).	February 2010
Radio Channel Menu Section 4.9	Support of configurations with 2 BSs. Updated description of Radio Channel Frequency.	February 2010
Configuration and Management Section 1.4.10	Added Security	February 2010
3.65 GHz BTS Section 1.4.2	Added support of 7 MHz	February 2010
GPS Menu Section 4.11	Chaining is supported	February 2010
Select By MAC Section 4.12.5	Removed: Perform and Show MS Frequency Shift Measurement	February 2010
Network Architectures Section 1.3.3	New	February 2010
Power Supply Section 1.3.5	Updated	February 2010
GPS Antenna Section 1.3.7	Updated	February 2010
External 5 GHz Antennas Appendix 1.4.6.2	New antenna (BS 4.9-5.9GHz Dual Slant 90° 16dBi), removed ANT, BS, 5.15-5.875G, V8dBi, OMNI, updated names of ANT,BS,4.9-5.875G,90V, 16.5dBi,FLAT and ANT,BS,4.9-5.1G,120V, 15dBi, FLAT	February 2010
Introduction to Services Menu Section 4.6.2.1	New section	February 2010

Topic	Description	Date Issued
Working Mode names	Updated Working Mode names	February 2010
Sensitivity Section 1.4.4	Added table for 3.65 GHz band. Changed table for 5 GHz band to two tables (4.9 GHz band and 5.4 GHz band) with updated values.	February 2010
DFS Section 4.7.2.2.2.1	DFS parameters are not configurable	February 2010
Service Groups Section 4.6.2.9	Updated-new/removed/modified parameters	February 2010
Band Name Table 4-2, Table 4-3	Updated Band Names and dependent parameters	February 2010
Default Service Components Section 4.6.2.12	New	February 2010
Parameters Summary Section 4.13	Updated to reflect version 1.5 changes.	February 2010
Release 1.7	New release	November 2010
3.65 GHz Band Sections 4.5.4.5.6, 4.7.2.2.1.5, 4.7.2.2.1.6	Updated Tx Power range. Updated available Country Codes and default Country Code.	November 2010
3.6 GHz band Sections 1.3.1, 1.4.2, 4.5.4.5.5, 4.5.4.5.6, 4.7.2.2.1.4, 4.7.2.2.1.5, 4.7.2.2.1.6, 4.8.2.2.3.3	New product	November 2010
AAA Client Keep Alive Timeout Section 4.6.1.3.1.3	Updated range (upper limit increased from 180 seconds to 86400 seconds)	November 2010
DFS sections 4.5.1, 4.5.4.5, 4.5.4.5.9, 4.7.2.2.2.1	DFS support and related parameters are configurable in Universal Country Code	November 2010
MSF for PPPoE Services Section 4.6.2.6	Support VLAN ID/VLAN Priority classifiers	November 2010
DL/UL Ratio Section 4.5.4.5.7	New options	November 2010
Parameters Summary Section 4.13	Updated to reflect version 1.7 changes.	November 2010
Canadian Radio Standards Specifications (RSS) Compliance Statement	Added compliance to RSS 102	November 2010

Topic	Description	Date Issued
Show License Properties Section 4.5.3	Removed licensed features: Enable MIMO B, Video	November 2010
TCP Enhancer Section 4.5.4.5.8	New feature	November 2010
DL Multi Rate Type Section 4.8.2.2.4.6	New feature	November 2010
Service Profile Type Section 4.6.2.4.3	Added Optimized Video option, added description to Reliable Video	November 2010
HARQ Repetitions Section 4.6.2.4.4	Added value for Optimized Video	November 2010
Uplink Minimum Sub-Channels Section 4.8.2.2.4.1	Updated range (added range for 7 MHz BS BW)	November 2010
Default Service Profiles Table 4-16	Updated CIR/MIR values of SrvProfMng	November 2010
UL HARQ Channels Section 4.8.2.2.3.4	Updated configuration rules and default	November 2010
Parameters Summary Section 4.13	Updated to reflect all version 1.7 changes and updates	November 2010
Power Supply Sections 1.3.5, 1.4.7, 2.2.1.3, 2.4.2, 2.5.1.3	High Power AC/DC Power Supply removed from list of available products	November 2010
5.4 GHz FCC Sections 1.3.1, 1.4.3, 4.5.4.5.6, 4.7.2.2.1.5, 4.7.2.2.1.6	A new model supporting only FCC requirements	January 2011
Integral 5 GHz Antennas Section 1.4.6.1	Updated specifications of ANT BS, 90° Dual Slant	January 2011
External 5 GHz Antennas Section 1.4.6.2	Added ANT BS, 5.15-5.875G, V8dBi, OMNI	January 2011
Notes on Maximum Tx Power Limitations for 5 GHz Units Using FCC Country Code Section 1.4.13	Updated values in tables 1-17, 1-18. Added note on FCC Country Code setting.	January 2011
Frequency Section 4.7.2.2.1.5	Added 5.4 GHz FCC unit. Added details on supported frequencies in 5 GHz units. Updated general description/rules. Updated rule for default frequency.	January 2011
TDWR Interference Avoidance Sections 1.4.14, 3.2, 4.7.2.2.1.5	Instructions for TDWR interference avoidance and WISPA UDIA registration	January 2011

Topic	Description	Date Issued
Random Channel Selection Sections 4.5.4.5.6, 4.5.4.5.9.1, 4.7.2.2.1.5	Added/updated Caution note (added example)	January 2011
4.9 GHz Country Codes Tables 4-2, 4-19, 4-22	Updated (removed Japan, remove 5250-5350 Mhz sub-band in FCC and Canada Country Codes)	January 2011
MSs Default Services Section 4.6.2.12	Removed default IP CS Data service components (FrwRuleIP, SrvIfcIp, msfIP, SrvProfIP). Updated values of Interface IP Address, Interface Subnet Mask, Default Gateway and VLAN ID in srvGroup. Updated values of Uplink/Downlink Classifiers in msfMng.	January 2011
BTS Standards Compliance, General Section 1.4.12	Added RSS-111	January 2011

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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.

Canadian Radio Standards Specifications (RSS) Compliance Statement

This device has been designed to operate with the antennas listed in Section 1.4.6 of this manual ("5 GHz Antennas" on page 25), and having a maximum gain of 17 dBi. Antennas not included in this list or having a gain greater than 17 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

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

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Disposal of Electronic and Electrical Waste

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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

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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

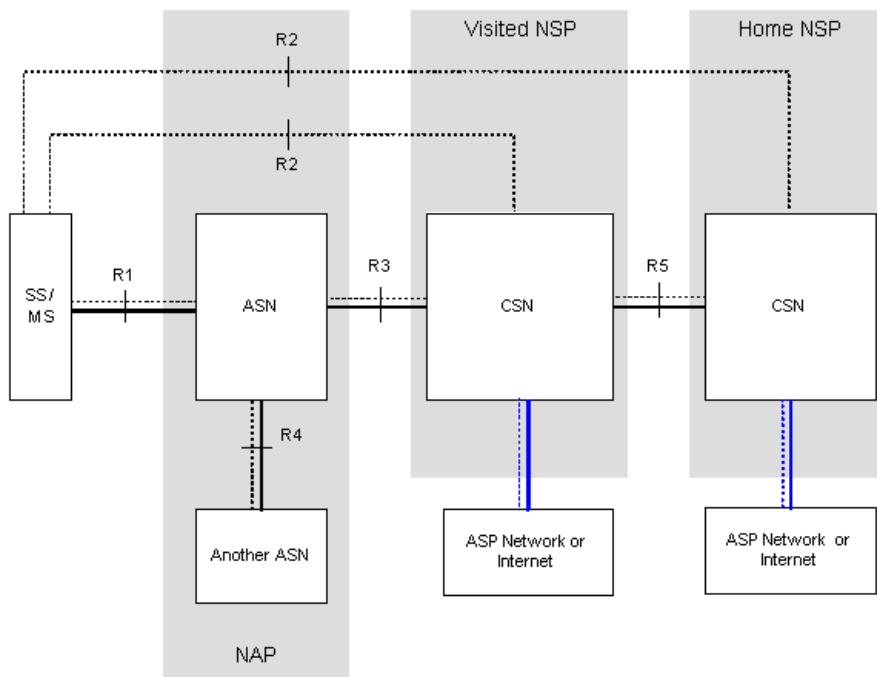Figure 1-1 shows the basic mobile WiMAX network architecture as defined by the WiMAX Forum NWG.

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).
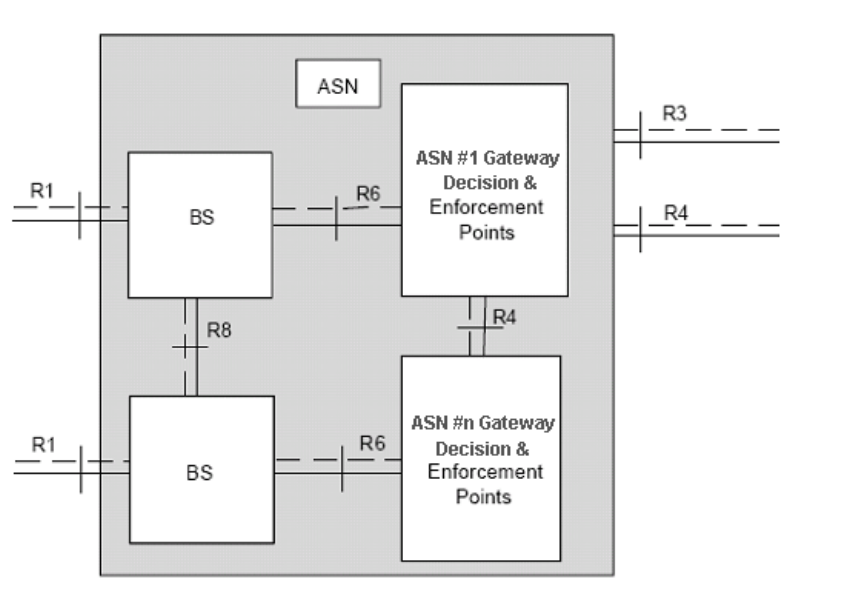
Figure 1-2: ASN Reference Model containing Multiple ASN-GWs

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 optionally, if applicable, 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.
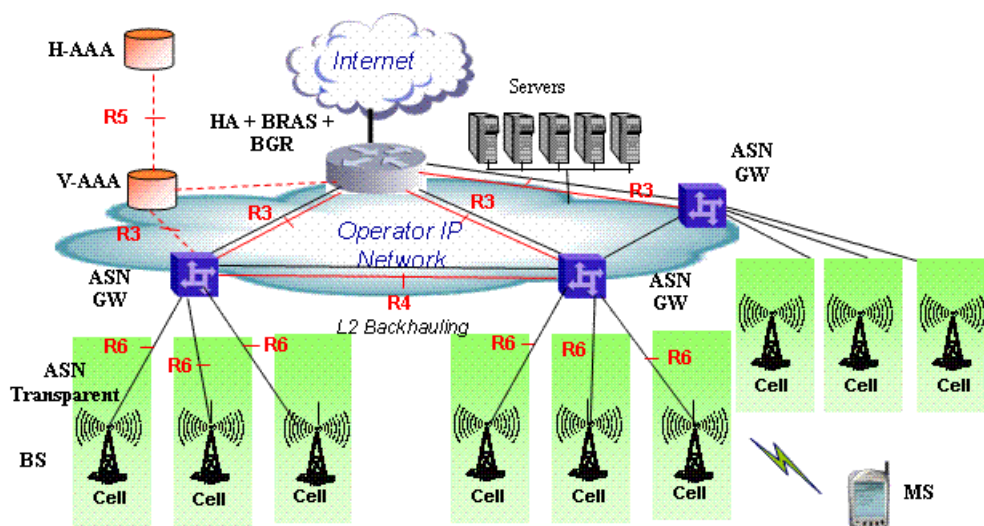

Figure 1-3: Centralized Network Reference Model

In the distributed approach, the BTS operates in ASN-GW mode, as shown in Figure 1-4.
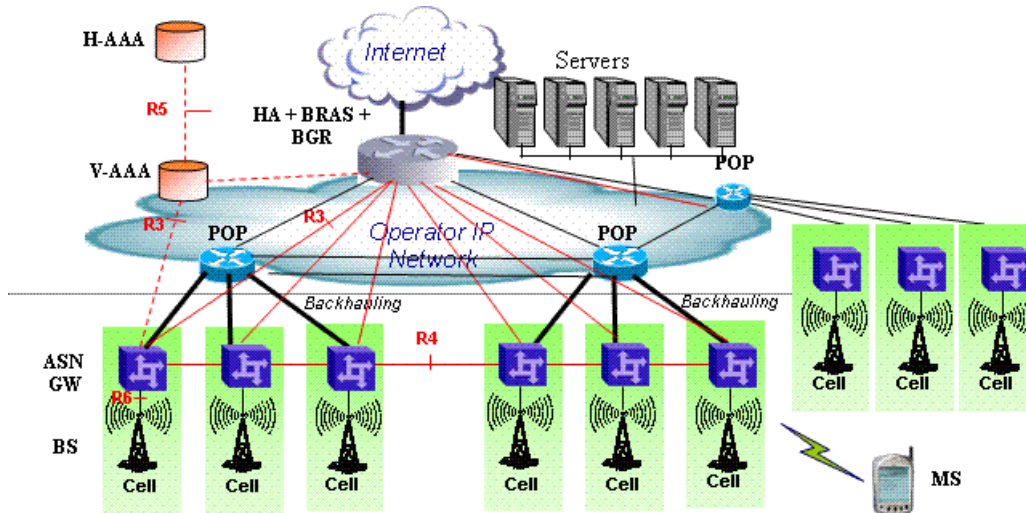

Figure 1-4: Distributed Network Reference Model

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** (if supported) 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 3.650-3.700 GHz (3.65 GHz band), 3.600-3.800 GHz (3.6 GHz band), 4.900-5.350 GHz (4.9 GHz band) and 5.470-5.950 GHz (5.4 GHz band) frequency bands. A 5.4 GHz FCC system is also available, supporting only the specific FCC requirements. This system can operate only in the 5.470-5.600 GHz and 5.650-5.725 GHz bands (with DFS) or in the 5.725-5.850 GHz band (without DFS). Actually available frequencies and other operational capabilities depend on the applicable local regulations according to the selected Country Code.

The Limited model BTS can simultaneously serve up to 20 CPEs, with optional upgrades to support up to 50, 100, 150 or 250 CPEs. The "unlimited" BTS can serve up to 250 CPEs.

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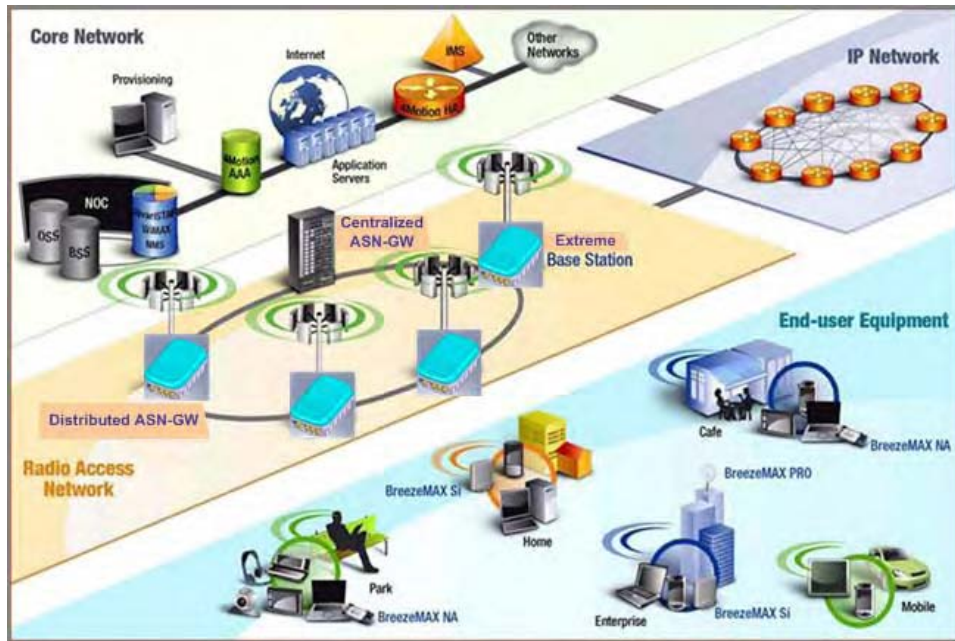
Figure 1-5: BreezeMAX Extreme System Architecture

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.

■ Embedded ASN-GW for distributed architecture, and optionally external ASN-GW for centralized architecture.

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

■ Outdoor and indoor CPEs supporting VoIP, Data, 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   Network Architectures

BreezeMAX Extreme supports different network architectures:

■   "Embedded Distributed ASN-GW Local Authentication"

■   "Embedded Distributed ASN-GW Centralized Authentication"

■   "External ASN-GW"

The units are supplied with an embedded ASN-GW, supporting the first two working modes. The External ASN-GW working mode is supported by the "unlimited" model. In the Limited model it is available only if the applicable license is installed.

Following is a description of each of these working modes:

1.3.3.1   Embedded Distributed ASN-GW Local Authentication

The ASN-GW functionality resides in the BTS (distributed architecture). Service components (Service Profiles and Service Flows) are configured in the internal ASN-GW of each BTS. MSs list and services provisioning including authentication are managed locally by the internal ASN-GW (AAA server not needed), based on the SU MAC address.
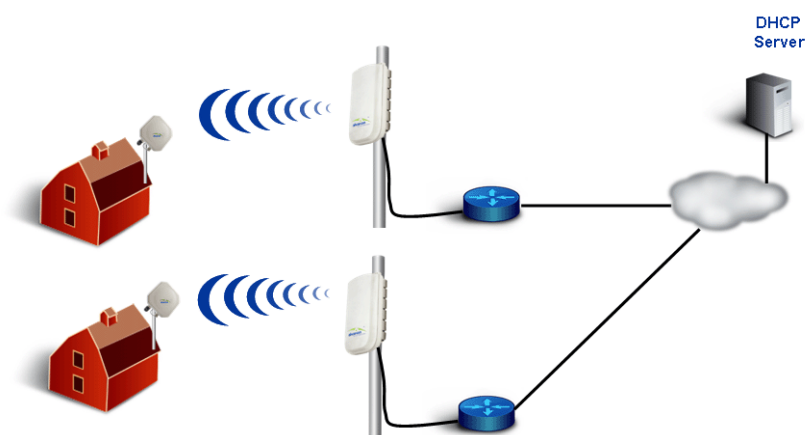

Figure 1-6: Embedded Distributed ASN-GW Local Authentication Network Architecture

1.3.3.2   Embedded Distributed ASN-GW Centralized Authentication

The ASN-GW functionality resides in the BTS (distributed architecture). Service components (Service Profiles and Service Flows) are configured locally in the BTS. MS authentication and service provisioning are managed centrally by an external AAA server, based on user credentials (user name and password).

Figure 1-7: Embedded Distributed ASN-GW Centralized Authentication Network Architecture

1.3.3.3   External ASN-GW

The ASN-GW is a separate entity (centralized architecture) that communicates with the BTS over R6 interface. Service components (Service Profiles and Service Flows) are configured in the external ASN-GW. MS authentication and services provisioning are managed by a centralized AAA server, based on user credentials (user name and password).
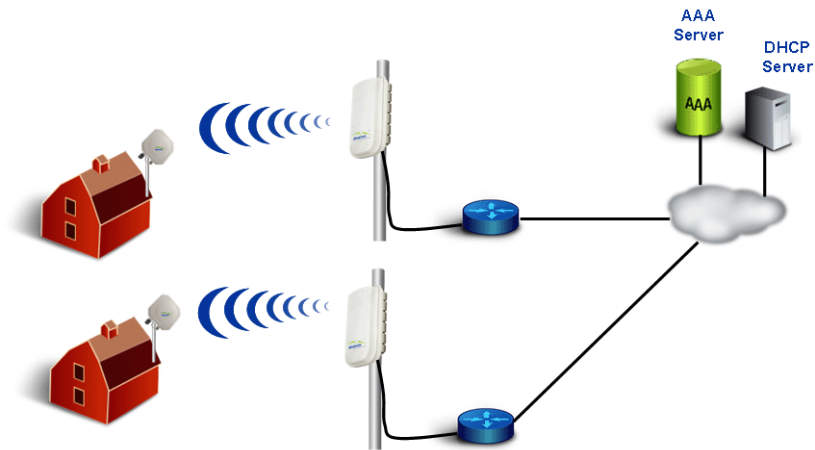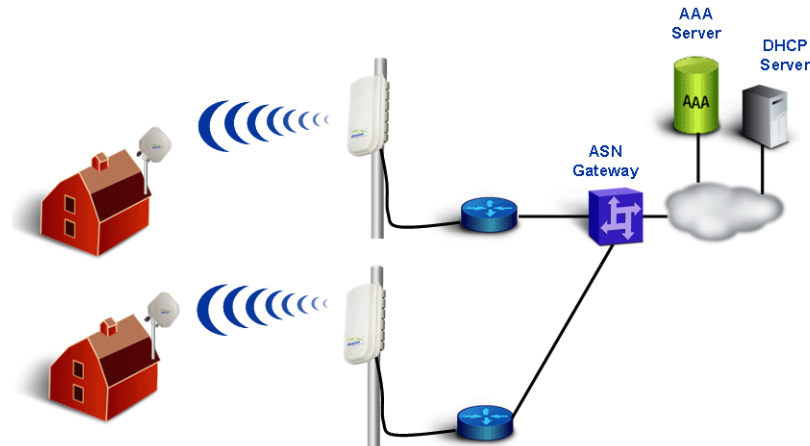
Figure 1-8: External ASN-GW Network Architecture

1.3.4   System Configurations

In the current release the following BTS configurations are available:

1.3.4.1   Single Sector, Second Order Diversity Configurations

Single Sector Second Order Diversity (1DIV models) units include two BSs connected to two internal radios with either an integral dual-slant antenna or two RF connections to external antenna(s). The basic 1DIV model units support only the Single Sector Single BS with Diversity operation mode, using a single BS to provide a bandwidth of 5, 7 (applicable only for 3.x GHz units), or 10 MHz per sector. 1DIV units with a license for 20 MHz bandwidth support also the Single Sector Dual BS with Diversity operation mode, using also the second BS to provide a total bandwidth of 14 (applicable only for 3.x GHz units) or 20 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.
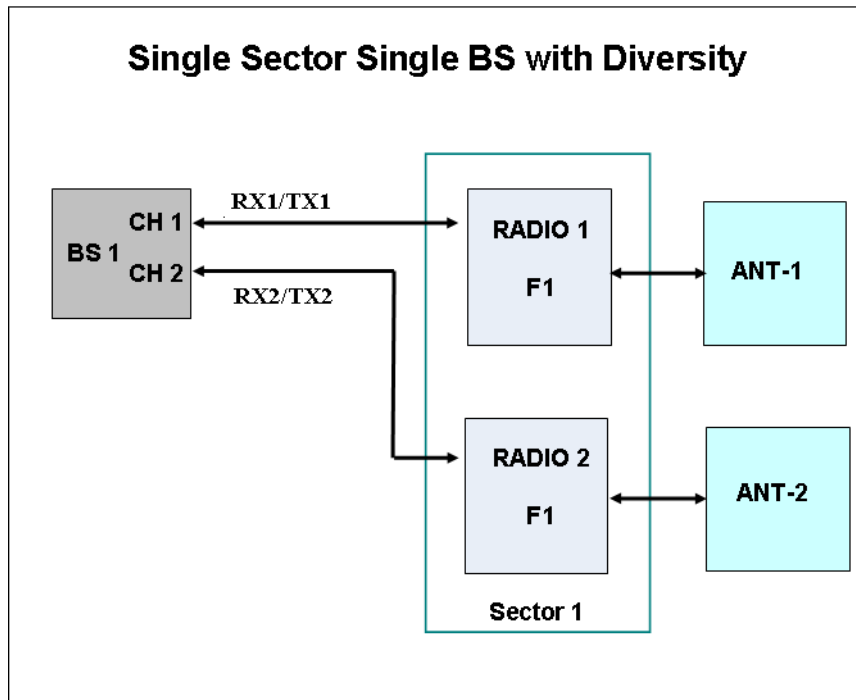
Figure 1-9: Single Sector Single BS with Diversity Operation Mode

Figure 1-10: Single Sector Dual BS with Diversity Operation Mode

1.3.4.2   Single Sector, No Diversity Configurations

Single Sector No Diversity (1SIS model) units include two BSs connected to a single 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. The basic 1SIS model units support only the Single Sector Single BS no Diversity operation mode, using a single BS to provide a bandwidth of 5, 7 (applicable only for 3.x GHz units), or 10 MHz per sector. 1SIS units with a license for 20 MHz bandwidth support also the Single Sector Dual BS no Diversity operation mode, using also the second BS to provide a total bandwidth of 14 (applicable only for 3.x GHz units) or 20 MHz per sector.

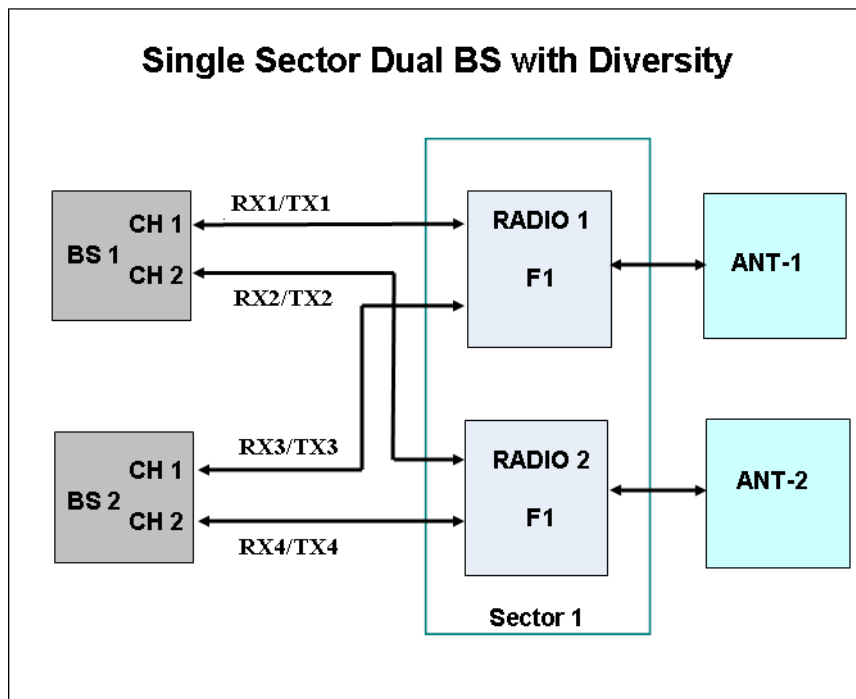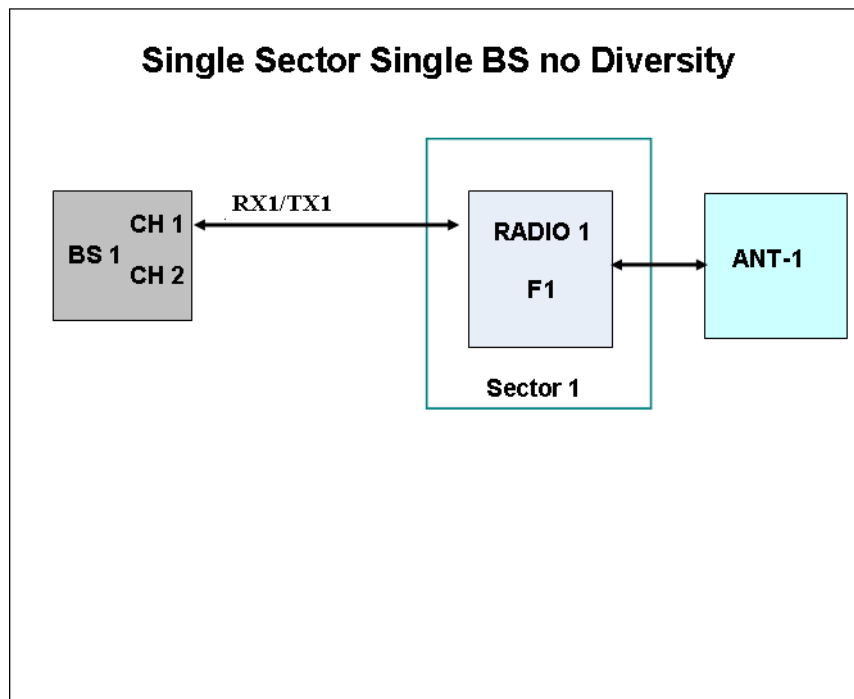**Figure 1-11: Single Sector Single BS without Diversity Operation Mode**

Figure 1-12: Single Sector Dual BS without Diversity Operation Mode

1.3.4.3   Two Sectors, No Diversity Configuration

Two Sector No Diversity (2SIS models) units include two BSs connected to two internal radios with two RF connections to external antennas. 2SIS model units support Dual Sector Dual BS no Diversity operation mode providing a bandwidth of 5, 7 (applicable only for 3.x GHz units), or 10 MHz per sector.

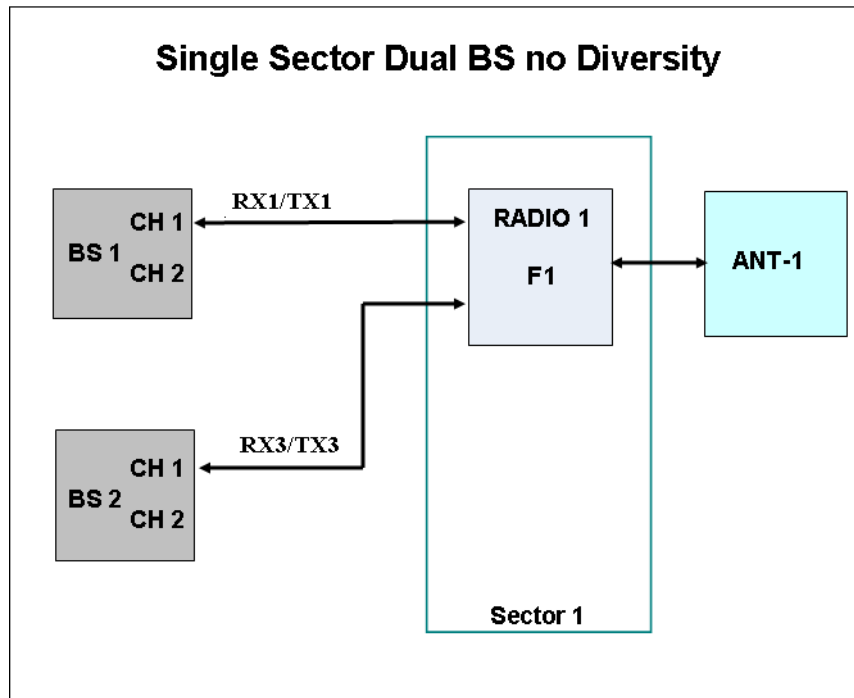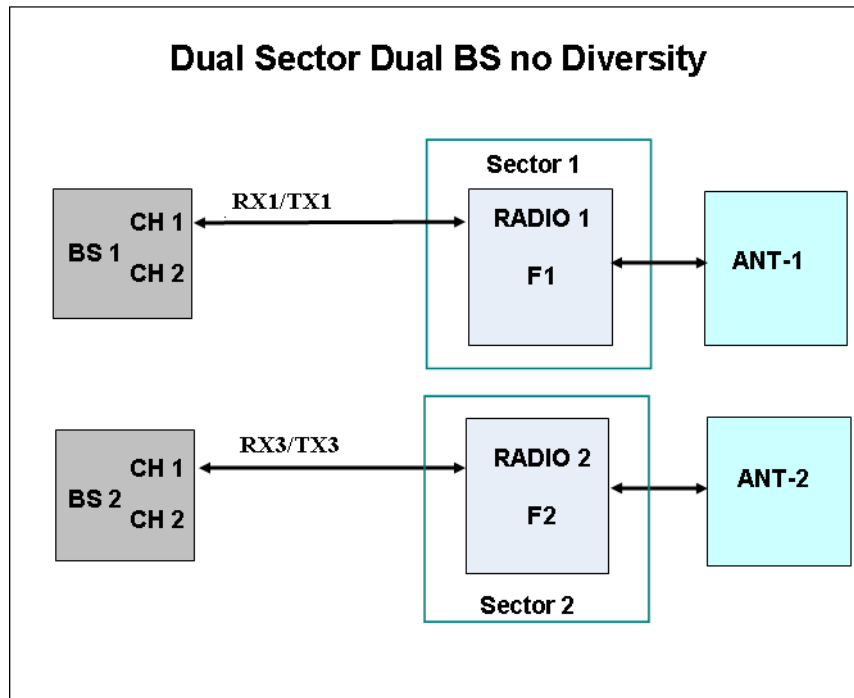**Figure 1-13: Dual Sector Dual BS no Diversity Operation Mode**

1.3.5   Power Supply

The BTS is powered from a 48V DC power source. Alvarion offers the PoE (Power over Ethernet) AC/DC power supply that can supply DC power to the BTS over the Ethernet connection to the DATA DC IN/OUT connector (this option is available only on the 5 GHz BTS units).

1.3.6   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.

1.3.7   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.

The system supports chaining of clock signals for up to six collocated units using a single GPS antenna.

Alvarion offers two types of GPS antennas:

■ High Profile, active high-gain (35dBi) antenna that can be installed at a distance of up to 25m from the BTS.

■ Miniature 28dBi antennas that can be installed at a distance of up to 3m from the BTS.

1.4   Specifications

1.4.1   General Modem and 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	■ 3.65 GHz Band: 3650-3700 MHz ■ 3.6 GHz Band: 3600-3800 MHz (actually supported frequencies depend on relevant regulations according to the Country Code being used)
Supported Sector Bandwidth	5 MHz, 7 MHz, 10MHz, 14 MHz (2 x 7 MHz), 20 MHz (2 x 10 MHz)
Central Frequency Resolution	125 KHz
Tx Power Range	3.65 GHz Band: 17-30 dBm 3.6 GHz Band: 20-30 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 ■ 5.4 GHz FCC Band: 5470-5600 MHz and 5650-5725 MHz (with DFS), or 5725-5850 MHz (without DFS) (actually supported frequencies depend on relevant regulations according to the Country Code being used)
Supported Sector Bandwidth	5 MHz, 10MHz, 20 MHz (2 x 10 MHz)
Central Frequency Resolution	■ 2.5 MHz @ 5 MHz sector bandwidth ■ 5 MHz @ 10 and 20 MHz sector 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 Consumption	Single Radio: 41.5W maximum Two Radios: 57W maximum

NOTE

Actually supported frequencies and Tx power range depend on relevant regulations according to the Country Code 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 Country Code.

See also the "Notes on Maximum Tx Power Limitations for 5 GHz Units Using FCC Country Code:" on page 29 and "TDWR Interference Avoidance" on page 30.

1.4.4   Sensitivity

Note: Following sensitivity values are for No Diversity configuration. For configurations with diversity the sensitivity is improved by approximately 3dB.

1.4.4.1   3.x GHz Units Sensitivity

Table 1-4: 3.x GHz Units Sensitivity, AWGN @ PER=1%, UL Fade Margin=2dB

Modulation & Coding	Sensitivity (dBm), 5 MHz Bandwidth	Sensitivity (dBm), 7 MHz Bandwidth	Sensitivity (dBm), 10 MHz Bandwidth
QPSK 1/2	-96	-95	-93
QPSK 3/4	-93	-92	-90
16QAM 1/2	-90	-89	-87
16QAM 3/4	-86	-85	-83
64QAM2/3	-81	-80	-78
64QAM3/4	-80	-79	-77
64QAM5/6	-78	-77	-75

1.4.4.2   4.9 GHz Units Sensitivity

Table 1-5: 4.9 GHz Units Sensitivity, AWGN @ PER=1%, UL Fade Margin=2dB

Modulation & Coding	Sensitivity (dBm), 5 MHz Bandwidth	Sensitivity (dBm), 10 MHz Bandwidth
QPSK 1/2	-96	-93
QPSK 3/4	-93	-90
16QAM 1/2	-90	-87
16QAM 3/4	-86	-83
64QAM2/3	-81	-78
64QAM3/4	-80	-77
64QAM5/6	-77	-74

1.4.4.3   5.4 GHz Units Sensitivity

Table 1-6: 5.4 GHz Units Sensitivity, AWGN @ PER=1%, UL Fade Margin=2dB

Modulation & Coding	Sensitivity (dBm), 5 MHz Bandwidth	Sensitivity (dBm), 10 MHz Bandwidth
QPSK 1/2	-95	-92

Table 1-6: 5.4 GHz Units Sensitivity, AWGN @ PER=1%, UL Fade Margin=2dB

Modulation & Coding	Sensitivity (dBm), 5 MHz Bandwidth	Sensitivity (dBm), 10 MHz Bandwidth
QPSK 3/4	-92	-89
16QAM 1/2	-89	-86
16QAM 3/4	-85	-82
64QAM2/3	-80	-77
64QAM3/4	-79	-76
64QAM5/6	-76	-73

1.4.5   3.x GHz Antennas

1.4.5.1   Integral 3.x GHz Antennas

Table 1-7: 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 1-8: 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.
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.

Table 1-8: External 3.x GHz Antennas Specifications

Item	Description
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 1-9: Integral 5 GHz Antennas Specifications

Item	Description
ANT BS, 90° Dual Slant	2x14.5dBi typical in the 4.9-5.35 GHz band, 2x15dBi typical in the 5.35-5.95 GHz band, 80°(±5) 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 1-10: 5 GHz Antennas Specifications

Item	Description
BS 4.9-5.9GHz Dual Slant 90° 16dBi	2x16 dBi typical in the 4.9-5.95 GHz band. 80° AZ x 6° EL sector antenna, dual slant ±45° polarization, RoHS compliant, compliant with ETSI EN 302 326-3 V1.3.1, 55 x 25 x 1.7 cm, 1.5kg, 2"-4" pole mountable.
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.
ANT,BS,4.9-5.875G,90V, 16.5dBi,FLAT	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.
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,BS,4.9-5.1G,120V, 15dBi, FLAT	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.

Table 1-10: 5 GHz Antennas Specifications (Continued)

Item	Description
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	8 dBi typical in the 5.150-5.875 GHz band, 360° AZ x 4.5° EL, vertical polarization, 70 cm high, 6 cm base diameter, 1.5 kg, 2.5"-4.5" pole mountable, RoHS compliant.

1.4.7   Power Supply

1.4.7.1   PoE AC/DC Power Supply for 5 GHz BTS

Table 1-11: PoE AC/DC Power Supply for 5 GHz BTS Specifications

Item	Description
Input Voltage	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 1-12: 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 1-13: Data Communication (Ethernet Port)

Item	Description
Standards Compliance	IEEE 802.3 CSMA/CD, IEEE 802.3u
Maximum Frame 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 1-14: 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
Security	Data Encryption using AES-CCM 128 bits

1.4.11   Environmental

Table 1-15: Environmental Specifications

Type	Unit	Details
Operating temperature	BTS	-40°C to +60°C
	AC/DC Power Supply	-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 1-16: BTS Standards Compliance, General

Type	Standard
EMC	■ ETSI EN 301 489-1/4 ■ ETSI EN55022 Class A ■ FCC Part 15 Class A
Safety	■ EN 60950-1/22 ■ UL 60 950-1/22
Environmental	ETSI 300 019-2-4 V2.2.2 Class T4.1E
3.65 GHz Radio	■ FCC Part 90 ■ FCC Part 2 ■ RSS-197
5 GHz and 3.6 GHz Radio	■ ETSI EN 302 326 ■ ETSI EN 301 390 ■ ETSI EN 302 502 v1.2.1 ■ ETSI EN 301 893 v1.5.1
5 GHz Radio	■ FCC Part 15.247 ■ FCC Part 15.407 ■ FCC Part 90 Subpart Y ■ FCC Part 15 Subpart B ■ UK IR 2007 ■ RSS-111 ■ RSS-210
Lightning Protection	■ ITU-T - K.20 ■ EN-61000-4-5
Ethernet	■ IEEE 802.3 CSMA/CD ■ IEEE 803.3u

Table 1-16: BTS Standards Compliance, General

Type	Standard
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 Using FCC Country Code:

According to the Country Code 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 4.9 GHz band using FCC Country Code the Maximum Tx Power at the antenna port for frequencies in the 4.940-4.990 Ghz sub-band 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 units operating in the 5.4 GHz band using FCC Country Code.

NOTE

In 4.9 GHz and 5.4 GHz units, after changing the Country Code to FCC, the Country Code becomes read-only and cannot be modified. In 5.4 GHz FCC units, the FCC Country Code is hard-coded and cannot be modified.

Table 1-17: Maximum Tx Power @ Antenna Connector, Frequencies in the 5470-5725 MHz Sub-Band

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

Table 1-17: Maximum Tx Power @ Antenna Connector, Frequencies in the 5470-5725 MHz Sub-Band

Antenna Type	RF Chains/BW	Maximum Tx Power (dBm)
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 1-18: Maximum Tx Power @ Antenna Connector, Frequencies in the 5725-5850 MHz Sub-Band

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).

1.4.14   TDWR Interference Avoidance

For units installed in the United States using FCC Country Code in the 5470-5600 and 5650-5725 MHz bands, the following guidelines must be followed:

The operating frequency of either a master or a client device installed within 22 miles (35 kilometers) of a Terminal Doppler Weather Radar (TDWR) location shall be separated by at least 30 MHz (center-to-center) from the TDWR operating frequency. For TDWRs location information refer to FCC KDB 443999 or to http://www.spectrumbridge.com/udia/search.aspx).

The installers and the operators have to register the devices in the Wireless Internet Service Providers Association (WISPA) UNII Device Interference Advisor (UDIA) sponsored database and registry, with the appropriate information regarding the location and operation of the device as well as the installer information; the registration form can be found at http://www.spectrumbridge.com/udia/home.aspx.

Chapter **2**

Installation

In This Chapter:

2.1 Site Deployment Options

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.

2.1.1 BTS Installation Options

The BreezeMAX Extreme BTS can be installed on straight or angled poles (±45° from upward position) and on a flat surface, such as walls. Each BTS package includes a tilt bracket that allows pole or wall mount deployment with up/down tilt of +7.5° to -10°, and rotation of ±45°.

2.1.2 Antenna Options

The BTS (depending on the model) is offered with either integrated antenna or external antenna. The following table details the options for each model.

Table 2-1: Antenna Configuration Options

Model	Integrated Antenna	External Antenna
Single sector MIMO	Yes	Yes
Single sector SISO	Yes	Yes
Dual sector SISO	No	Yes

For external antenna connection details refer to Section 2.6.

2.1.3 GPS Options

The BTS has an integrated GPS receiver and requires only a GPS antenna to connect to it. Two antenna kits are available from Alvarion: a basic GPS antenna kit, and a high gain GPS antenna kit.

When deploying a single sector without any adjacent systems, the BTS may be set to operate without GPS synchronization. A multi-sector deployment requires either one of the following GPS options:

■ For a site with a single BTS - the GPS antenna kit

■ For a multi-BTS site - using the GPS chaining option

The 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.

2.1.4 Power Feeding Options

There are several power feeding options for BTS including either (Power over Ethernet (PoE) or direct 48VDC. An additional option is available for backhauling CPE connectivity powered by the BTS. See also "Indoor Power Supply Installation" on page 54.

2.1.4.1 PoE Power Feeding

A typical site deployment with PoE power feeding a single PoE indoor-outdoor cable (8-wires CAT5 shielded cable, max. 70m) connects the BTS to a power supply unit, which is connected to an AC source and to Ethernet WAN/Backhaul. See "PoE AC/DC Power Supply" on page 54.

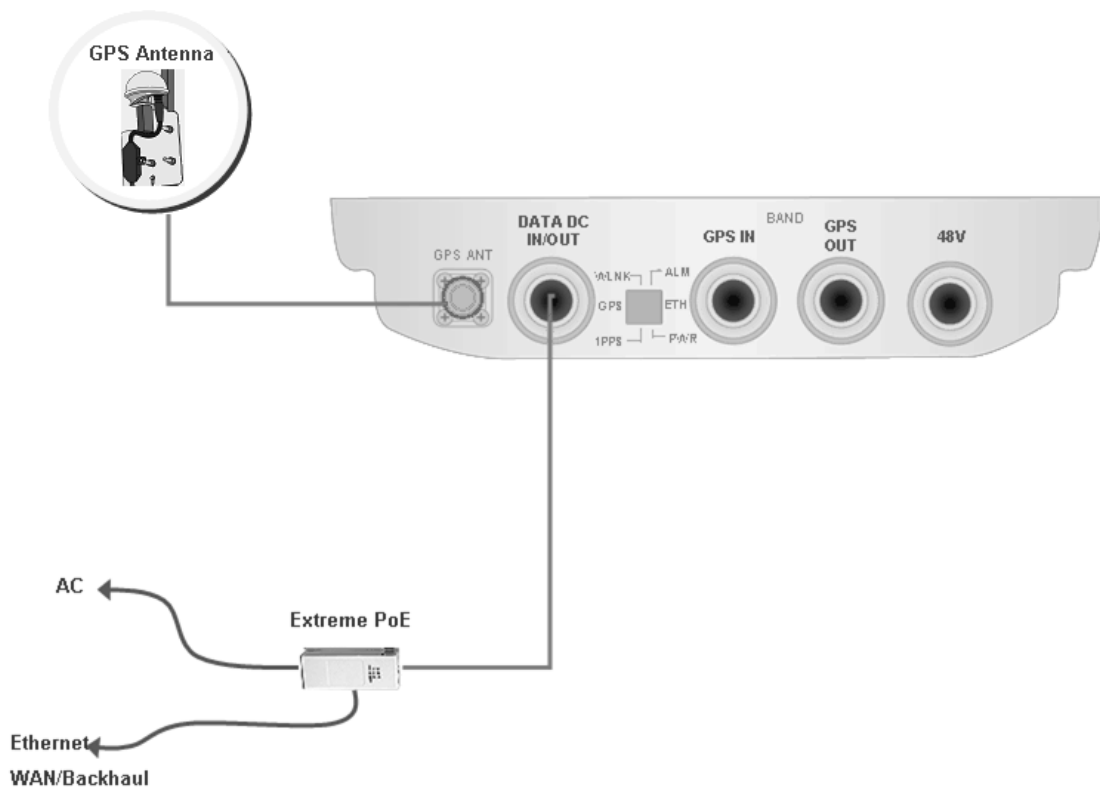**Figure 2-1: PoE Power Feeding Option**

2.1.4.2   48VDC Power Feeding

In a typical site deployment with direct 48VDC power feeding, the BTS is connected with two different cables:

■ A DC cable feeding the 48V DC

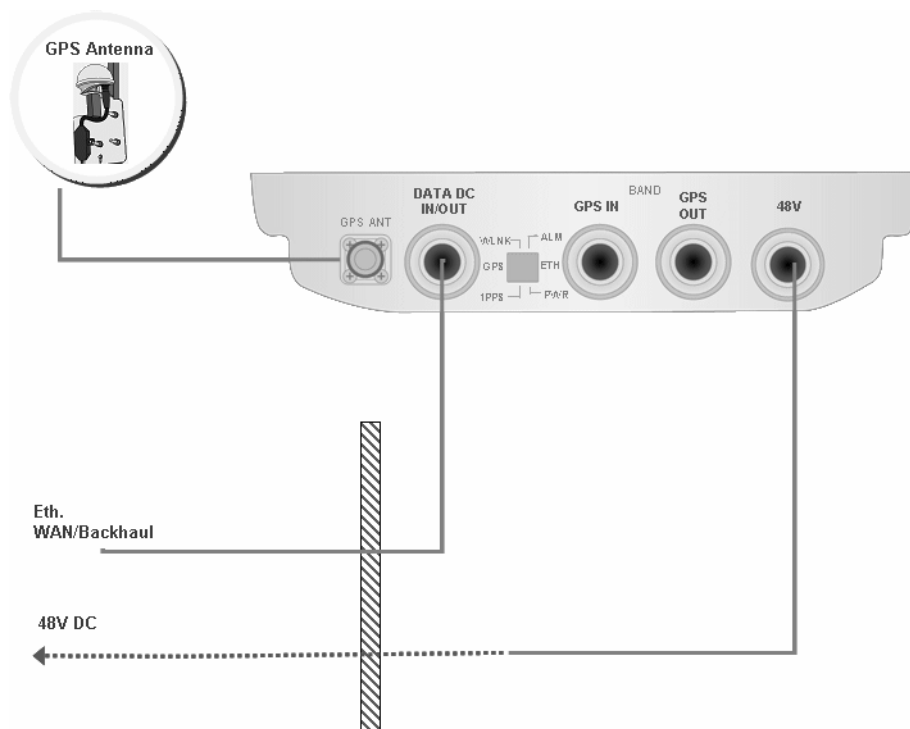■ A DAT cable (4wires CAT5 shielded cable) connecting the BTS to the backhaul/WAN

Figure 2-2: 48VDC Power Feeding Option

2.1.4.3   48VDC Power Feeding + Backhaul CPE

A unique option allows connecting and feeding a backhaul Alvarion CPE (e.g. BreezeNET B-100) directly to the BTS. In this case the BTS is connected by a DC cable to the 48V DC source. The BTS feeds power to the backhaul CPE. The cable connecting between the backhaul CPE and BTS is a CAT5 shielded outdoor cable.
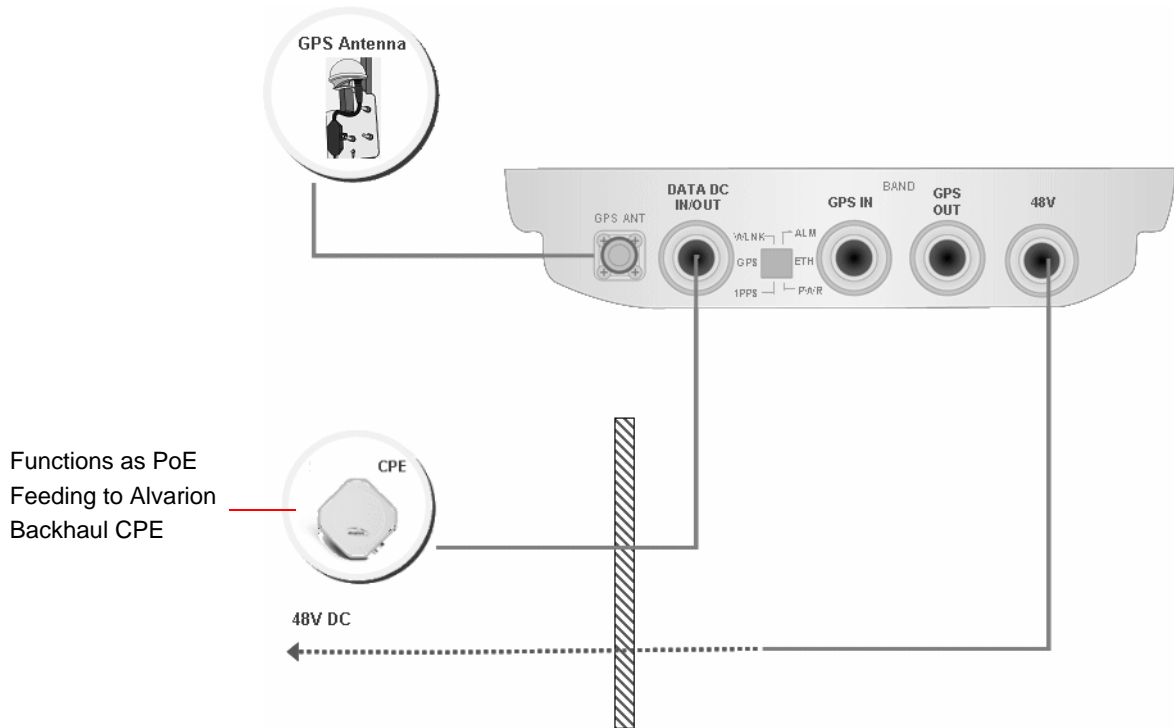
Figure 2-3: 48VDC Power Feeding including Backhaul CPE Option

2.2   BTS Installation

2.2.1   Installation Requirements

2.2.1.1   Packing List

- BTS (weight: 10.7 Kg.)

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

- Sealing Gland Fastening Tool

- Carrying hook

2.2.1.2   Optional Components

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

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

   » 48VDC Power Supply unit and DC power cable.

- 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 49):

 » 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.

■ For GPS chaining, if applicable: Outdoor CAT5 cable(s)

■ Installation tools and materials.

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

NOTE

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

2.2.1.4   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

2.2.2   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 the supplied carrying hook (see Figure 2-4) and a harness to lift the units.
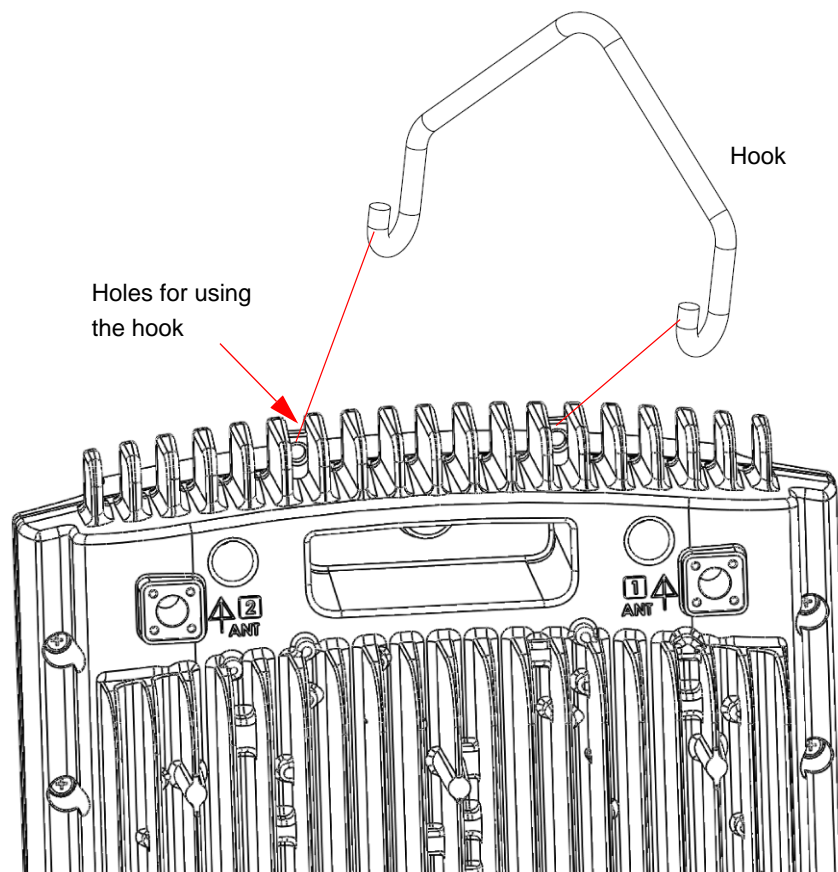
Install the unit using the supplied kit only.

Figure 2-4: Carrying Hook

To assemble the bracket on the BTS:

Place the tilt bracket on the BTS and fasten its M8 screws (see Figure 2-5 and Figure 2-6). Apply torque of 80 [Lib*In] = 9 [N*m]
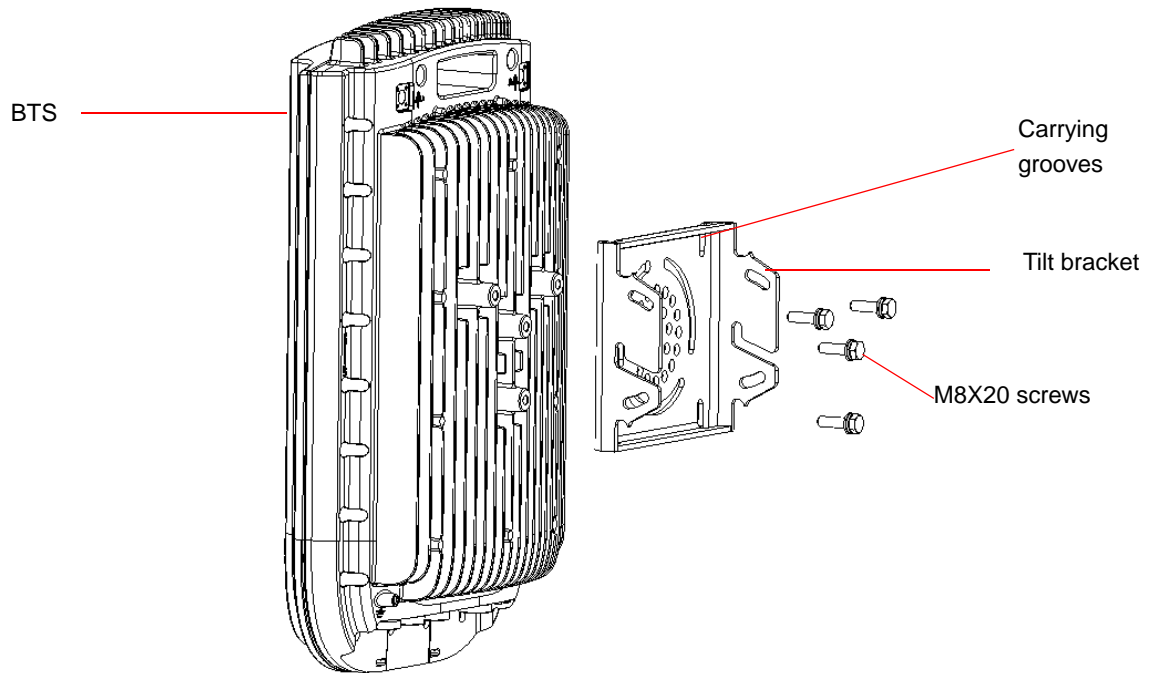
BTS

Carrying grooves

Tilt bracket

M8X20 screws

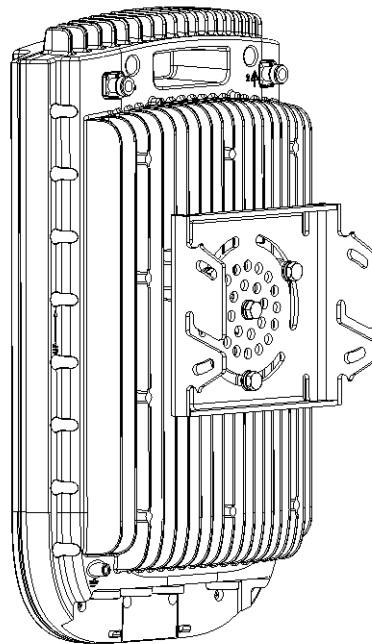**Figure 2-5: Assembling the Tilt Bracket on the BTS**

Figure 2-6: Tilt Bracket Installed on BTS

2.2.3   Installing a Lightning Arrestor

The lightning arrestor near the BTS is mandatory for protecting the BTS from lightning coming through the GPS antenna (both basic and High-Gain GPS units). If you use a High-Gain GPS antenna with a cable longer than 3m, an additional lightning arrestor must be installed near the GPS.

➤   **To install a lightning arrestor on the carriage:**

1   Install the lightning arrestor (part of the GPS Kit, see "GPS Installation" on page 49) at the designated location at the bottom of the carriage (see Figure 2-7).
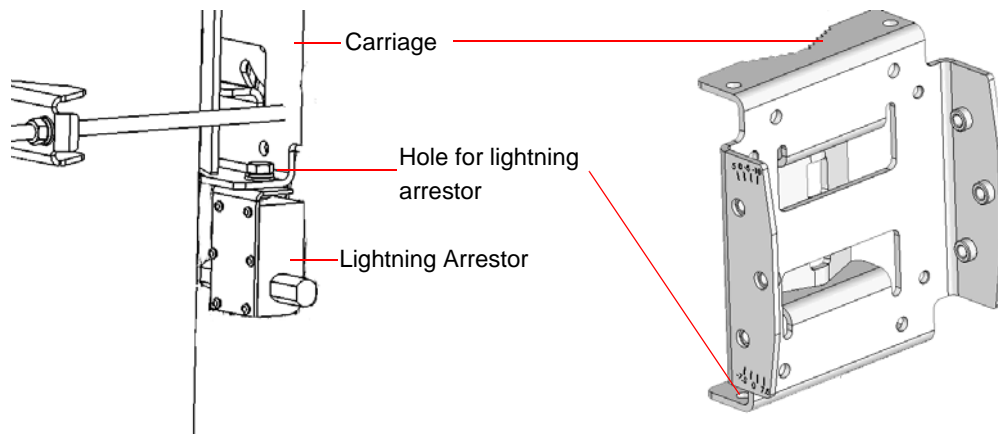
Figure 2-7: Installing the Lightning Arrestor on the Carriage

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

2.2.4 Installing the BTS on a Pole

The BTS can be installed on poles of various sizes, using the supplied carriage (see Figure 2-8). For poles of 1.5"-4" in diameter, use the supplied metal clamps. For poles larger than 4" use metal bands.
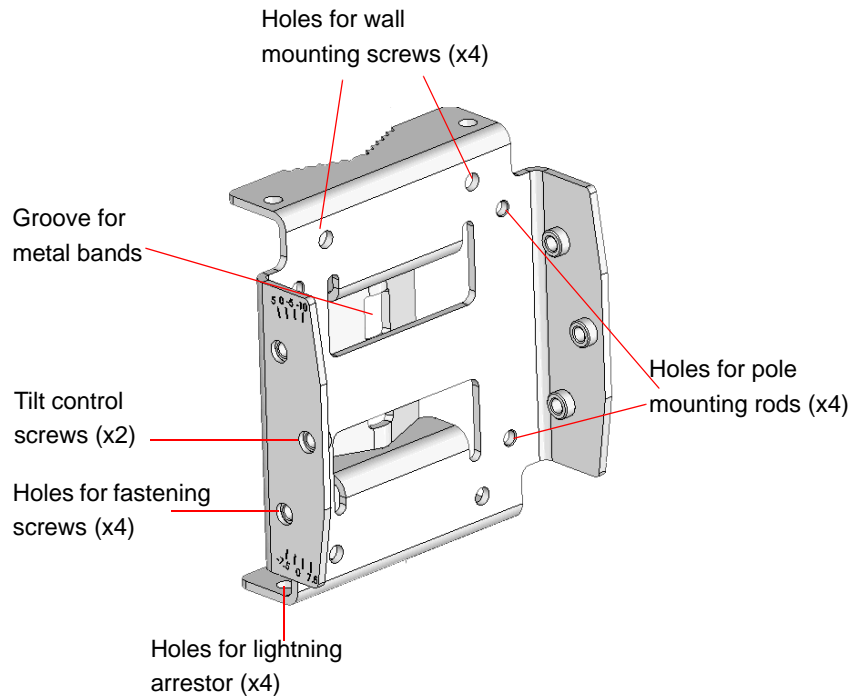
Holes for wall
mounting screws (x4)

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 2-8: 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 39).

2 Install a lightning arrestor on the carriage as described in "Installing a Lightning Arrestor" on page 41.

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.
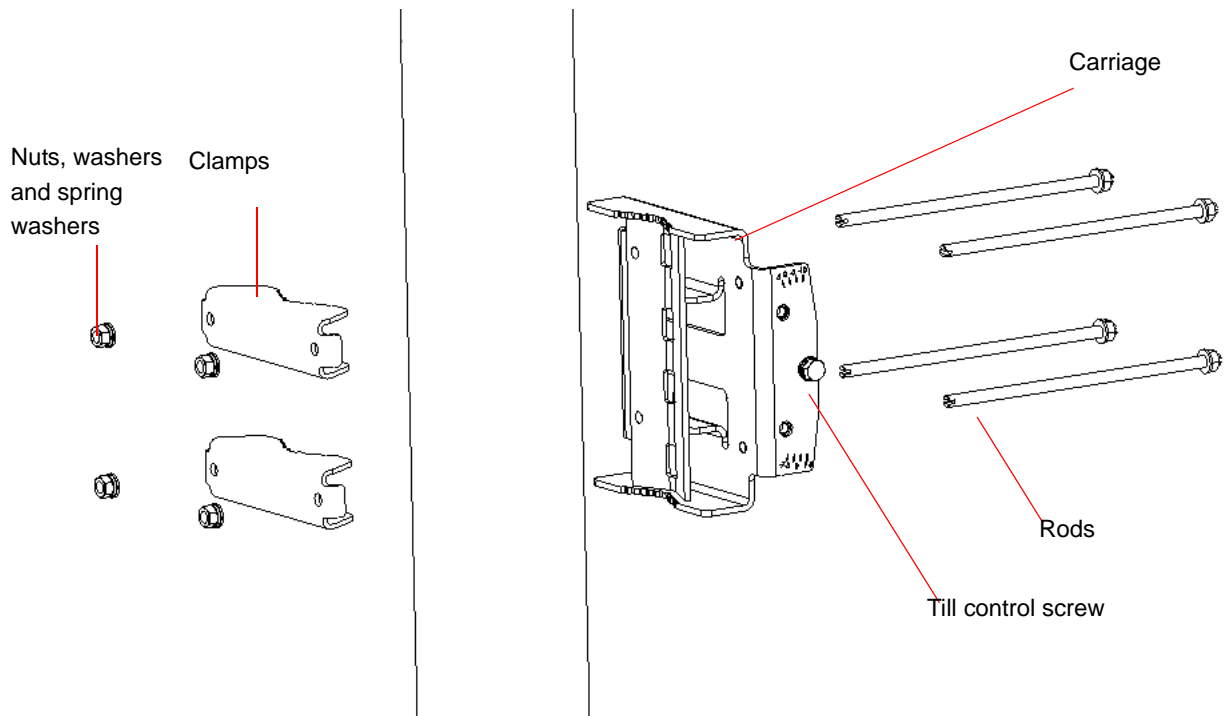
Nuts, washers and spring washers

Clamps

Carriage

Rods

Till control screw

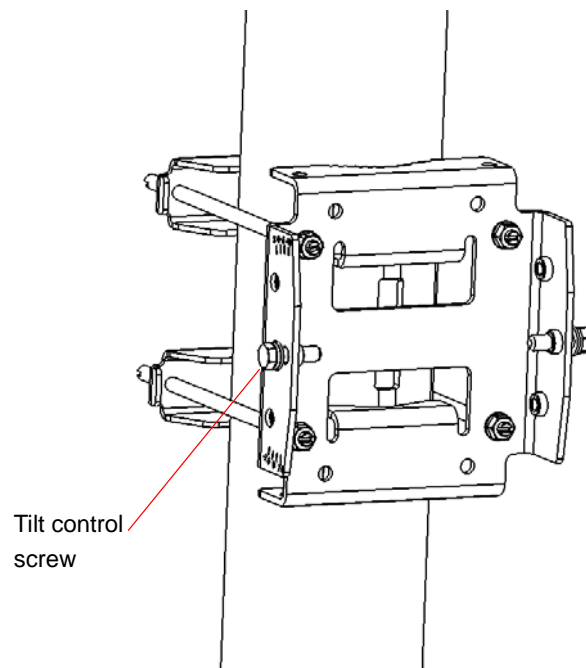**Figure 2-9: Assembling BTS Carriage and Clamps**

Tilt control screw

Figure 2-10: 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 39).

2 Thread the four metal bands through the grooves on the BTS carriage and fasten them (see Figure 2-11).

3 Attach the carriage to the pole and fasten the metal bands (see Figure 2-11).

4 Insert the tilt control screws into the middle-side hole of the carriage on both sides (Figure 2-11).

Metal bands

Tilt control screws
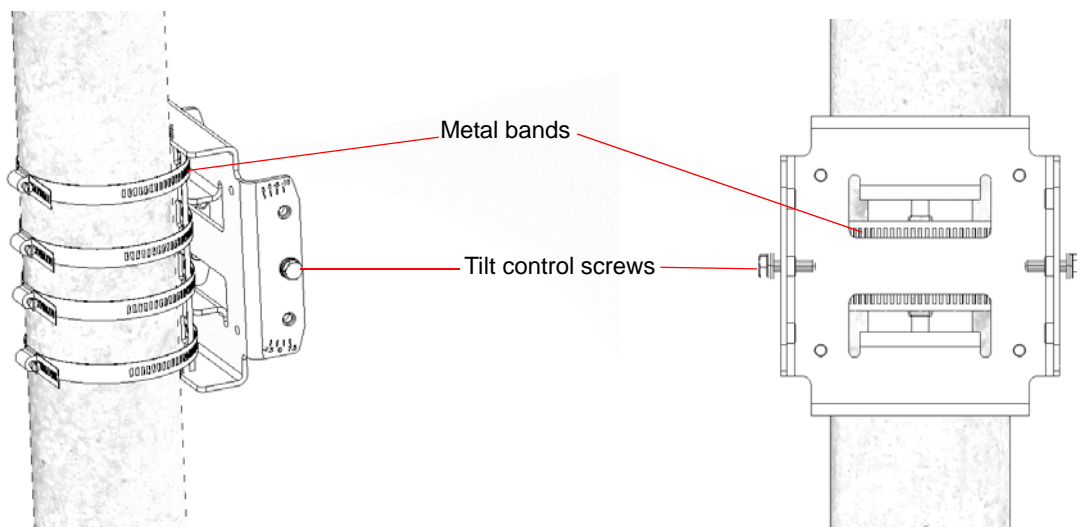
Figure 2-11: Installed Carriage with Metal Bands

2.2.5   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.
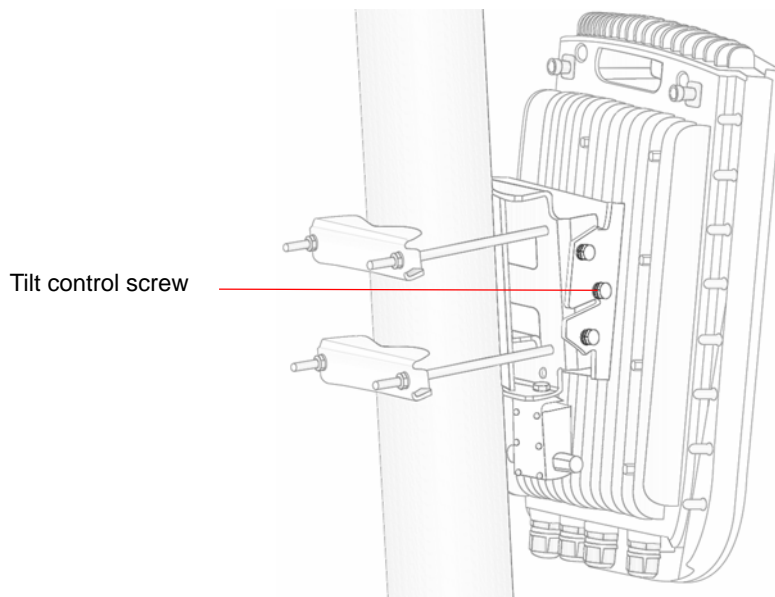
Tilt control screw

Figure 2-12: BTS Mounted on a 1.5"-4" Pole (with Clamps)

Figure 2-13: BTS Mounted on a Pole Larger than 4" (with Metal Bands)

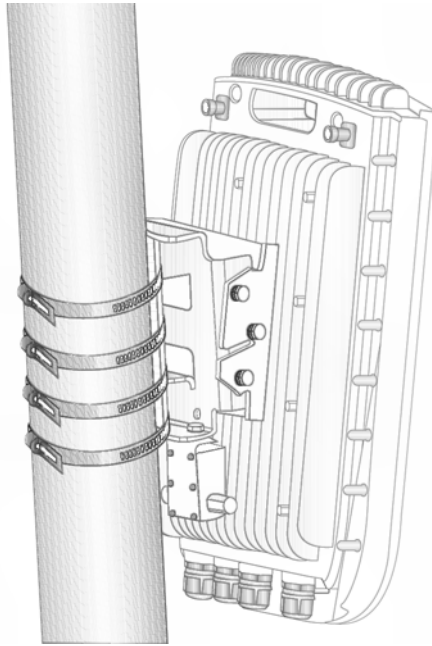**3**   If required, slightly release the tilt bracket screws to enable rotation, and the tilt control screws to enable tilting; Adjust the BTS position and tighten the screws. Apply torques of 45 [Lib*In.] = 5 [N*m] to the M6 Tilt-control screws, and 80 [Lib*In] = 9 [N*m] to the M8 screws.

2.2.6   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 .

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 2-14).

Carriage

Holes for
wall mount

Till control screw

screws (to be
fastened using
dowels

Figure 2-14: Mounting the Carriage on the Wall
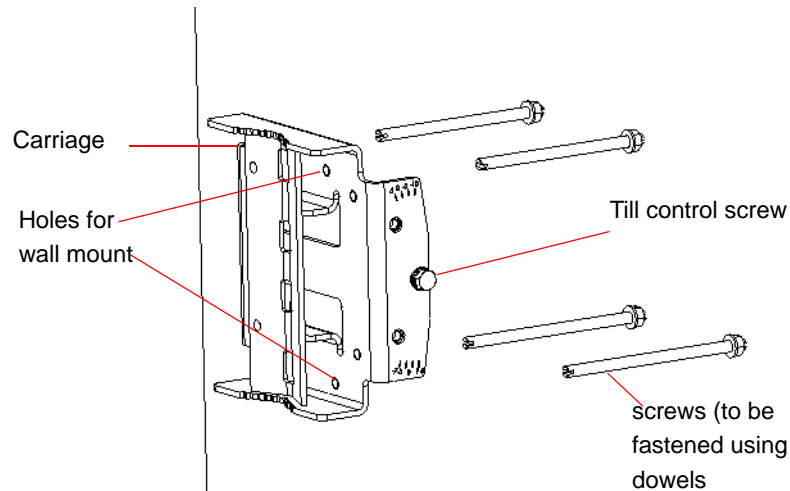
6 Hang the BTS with the tilt bracket on the tilt control screws of the BTS carriage.

7 Attach and fasten all the screws at both sides of the carriage (see Figure 2-14). 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.

2.3   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 26 in the Specifications section for more information.

When installing a site with more than one BTS (e.g. a 3 or 4 sector deployment), you may leverage GPS chaining capability of the BreezeMAX Extreme BTS. The system supports chaining of clock signals for up to 4 collocated units using a single GPS antenna: One BTS is connected to a GPS antenna, and the other BTSs are chained (up to 4 additional BTS) to the first BTS using an outdoor CAT5 cable.

2.3.1   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" on page 41).

■ 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.

■ For GPS chaining: outdoor CAT5 cable(s)

2.3.2   Packing List

GPS Mounting Kit: One of the following options:

■ Basic GPS Antenna

   » 28 dBi GPS 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 (35 dBi) 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.

2.3.3   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   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.

3   Connect one end of the GPS 3m cable to the lightning arrestor, and the other end to the GPS antenna.
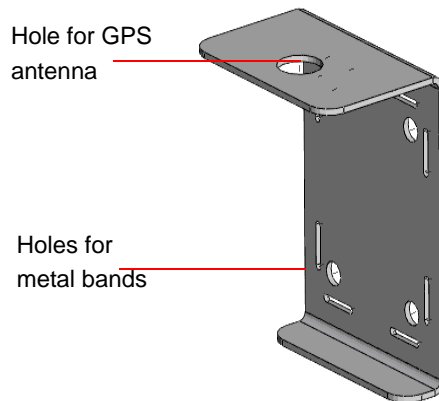
Figure 2-15: Bracket for Basic GPS

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   If you use a GPS cable longer than 3m, 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.

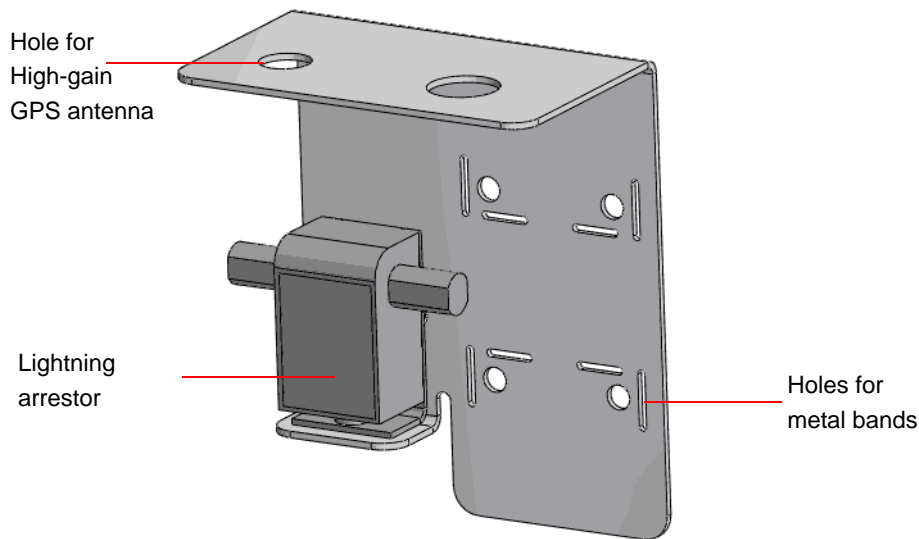**Figure 2-16: Bracket for High-Gain GPS**

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" on page 41). 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.

To connect BTSs in GPS chaining:

Refer to Figure 2-17.

1 Connect one end of the CAT5 cable to the GPS OUT connector of the BTS with the GPS antenna, and the other end to the GPS IN connector of the chained (target) BTS.

2 To chain an additional BTS, connect one end of the CAT5 cable to the GPS OUT connector of the chained BTS, and the other end to the GPS IN connector of the added (target) BTS.
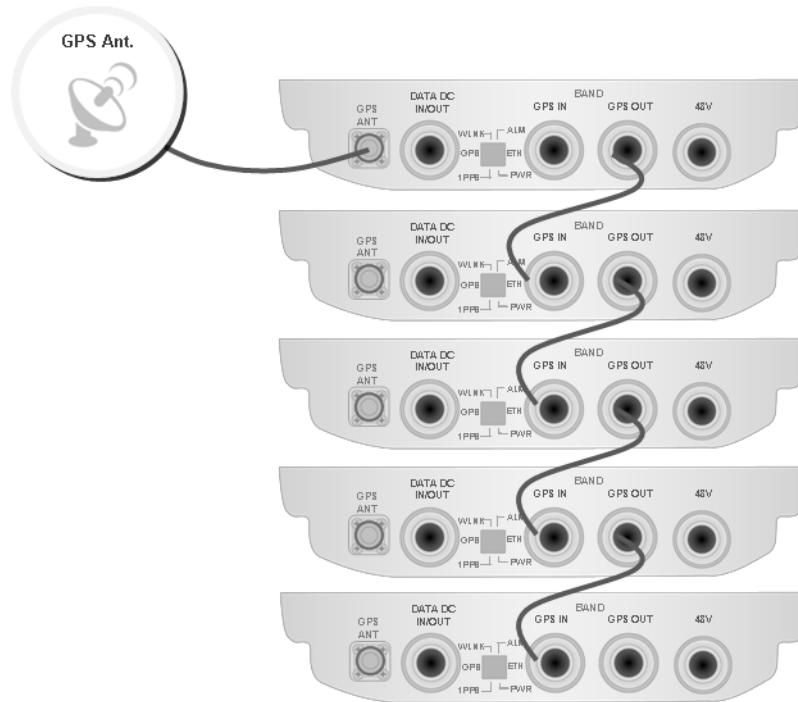
Figure 2-17: GPS Chaining

2.4   Indoor Power Supply Installation

The BTS is powered from a 48V DC power source. Alvarion offers the PoE AC/DC power supply that can supply DC power over the Ethernet to the BTS via the DATA DC IN/OUT connection. This option is available in the 5 GHz BTS units only (see Section 2.4.1).

CAUTION

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

2.4.1   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

Figure 2-18: PoE AC/DC Power Supply

2.4.2   48VDC Power Supply Unit

To install the indoor 48VDC power supply unit:

1   Install the power supply according to the relevant instructions.

2   For cable connection, refer to "Cable Connection" on page 58.

2.5   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.

For the GPS ANT connector, a weather-proof metal cap seals the connection. If this connector is not used, do not remove the metal cap. In case there is only a rubber cap on this connector, use additional sealing methods to protect this connection. Use high quality sealing material such as Scotchfil™ Electrical Insulation Putty from 3M (or equivalent) over-wrapped with either Super 33+ or Super 88 vinyl Electrical Tape (or equivalent) to ensure IP-67 compliant protection against dust and water.

A dedicated tool is supplied for fastening the sealing glands (see Figure 2-19).
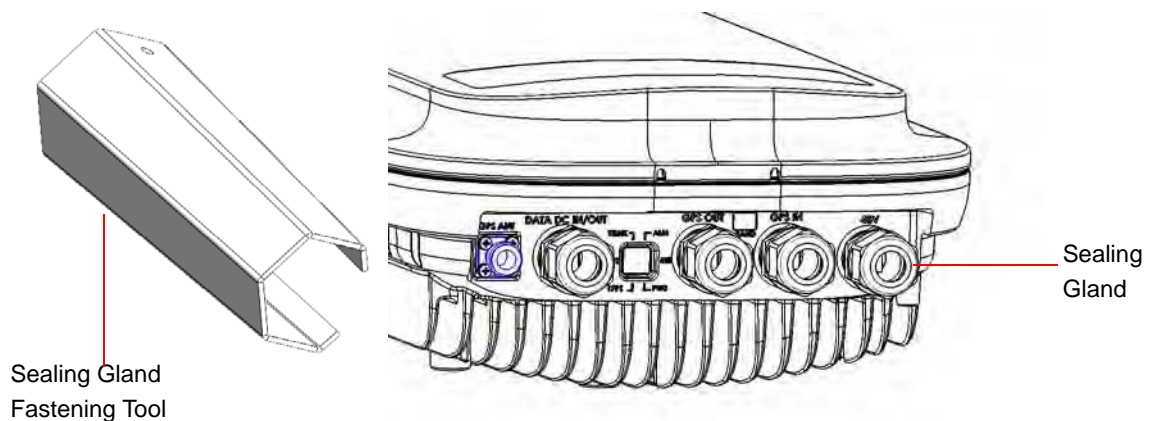
Figure 2-19: BTS with Sealing Gland and Gland Fastening Tool
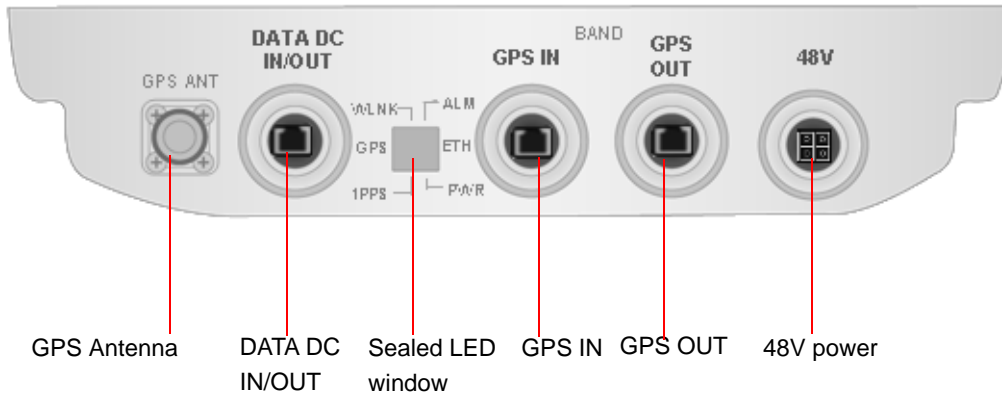
Figure 2-20: BTS Connectors (Bottom View)

Table 2-2: BTS 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.
GPS Out	RJ-45	GPS signalling to another BTS.
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). See Section 2.6. (Not applicable for models with integral antenna)

CAUTION

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

For LED indication refer to "Operation Verification" on page 69.

2.5.1   Cable Connection

2.5.1.1   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.

2.5.1.2   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 2-3. 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 54), 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 2-3: 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 data cable to one of the following:

» If you are not using PoE - directly to the backhauling equipment. See Figure 2-21.

» 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. See Figure 2-22.

NOTE

The combined lengths of the Ethernet cables should not exceed 100m.
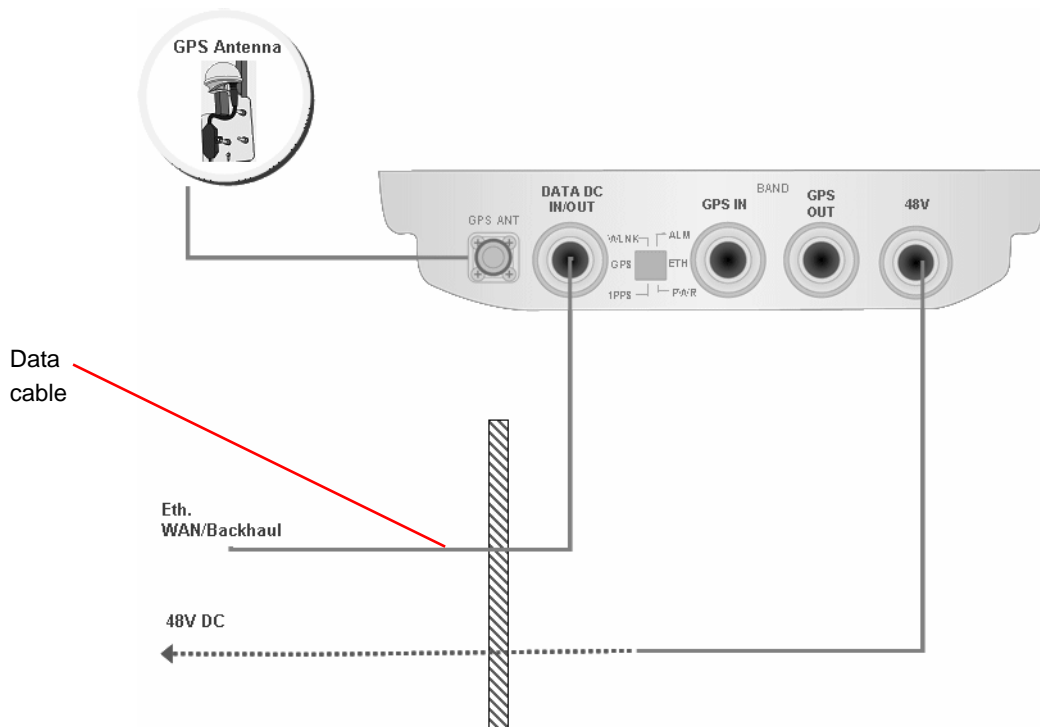
Figure 2-21: Connecting Data Cable Directly to the Backhauling Equipment
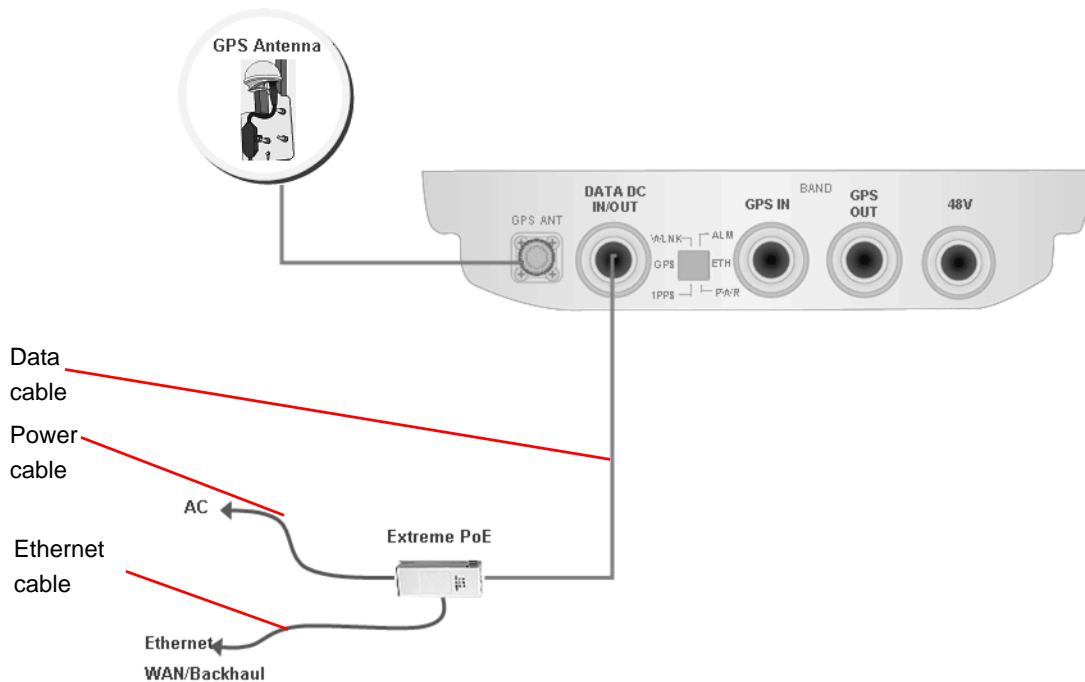
Figure 2-22: Connecting Data Cable When Using PoE (for 5 GHz Units Only)

2.5.1.3   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 open ended at the Power Supply side.

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 48VDC power source.
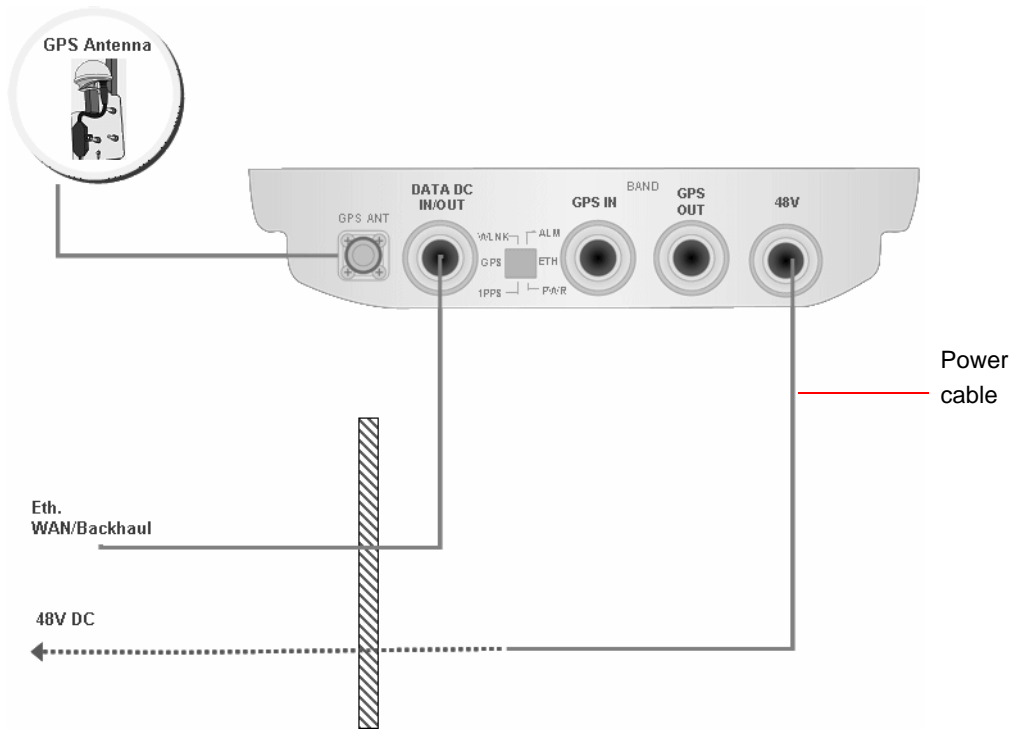
Figure 2-23: Connecting Power Cable to the Mains

2.6   External Antennas Connection

Two N-type connectors are used for optional external antenna connection (see Figure 2-24). The connectors should have an impedance 50Ω and should be protected against lightning.
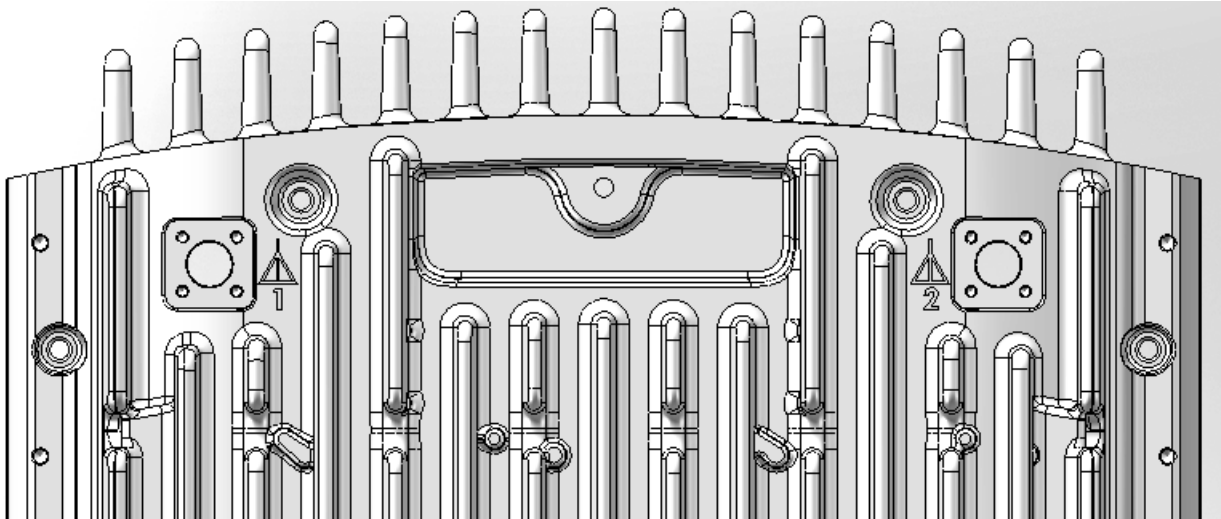
Figure 2-24: BTS Rear View - External Antenna Connections

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

1   Connect one end of the coaxial RF cable to the connector (marked   ) 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.
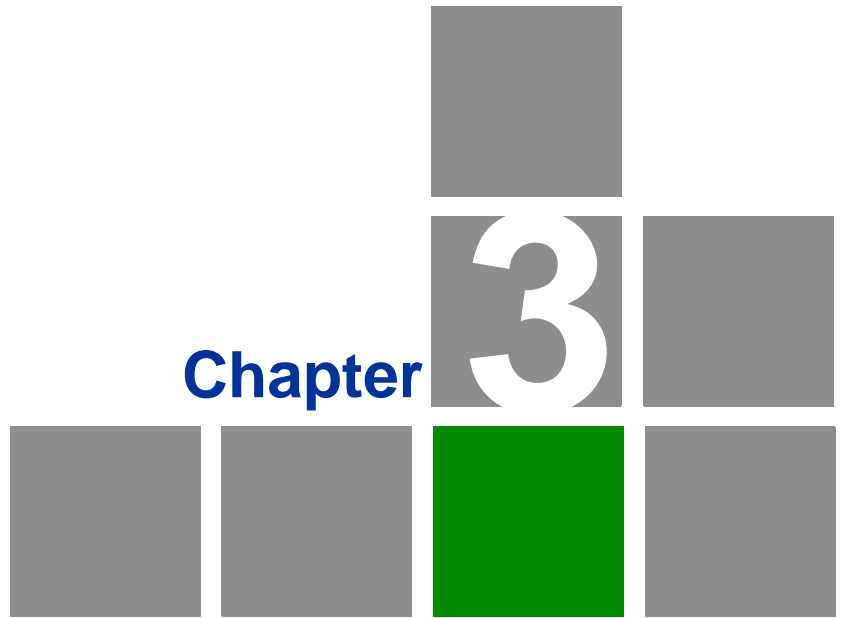
Chapter **3**

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. Traps will be sent only to defined Authorized Managers (provided traps distribution to the manager is enabled).

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

3.2   TDWR Interference Avoidance

For units installed in the United States using FCC Country Code in the 5470-5600 and 5650-5725 MHz bands, the following guidelines must be followed:

The operating frequency of either a master or a client device installed within 22 miles (35 kilometers) of a Terminal Doppler Weather Radar (TDWR) location shall be separated by at least 30 MHz (center-to-center) from the TDWR operating frequency. For TDWRs location information refer to FCC KDB 443999 or to http://www.spectrumbridge.com/udia/search.aspx).

The installers and the operators have to register the devices in the Wireless Internet Service Providers Association (WISPA) UNII Device Interference Advisor (UDIA) sponsored database and registry, with the appropriate information regarding the location and operation of the device as well as the installer information; the registration form can be found at http://www.spectrumbridge.com/udia/home.aspx.

3.3   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 if the GPS is reporting on reception of at least 4 satellites. ■ 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: ■ 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.
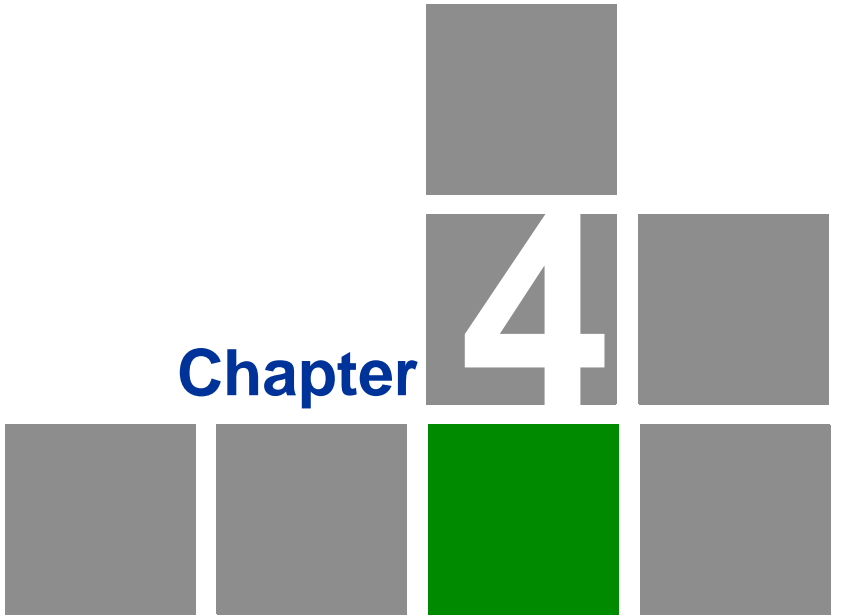
Chapter 4

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 88).

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 approximately 10 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 111), 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

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)

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 79)

2 - ASN-GW (see "ASN-GW Menu" on page 119)

3 - Sector (see "Sector Menu" on page 159)

4 - BS (see "BS Menu" on page 184)

5 - Radio Channel (see "Radio Channel Menu" on page 206)

6 - Antenna (see "Antenna Menu" on page 208)

7 - GPS (see "GPS Menu" on page 211)

8 - MS (see "MS Menu" on page 218)

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

■ Show License 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

For details on General BTS parameters refer to "General Parameters" on page 86.

BTS Working Mode:

■ Current BTS Working Mode

■ Configured BTS Working Mode

For details on BTS Working Mode parameter refer to "BTS Working Mode" on page 87.

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*

* VLAN Priority values (Current and/or Configured) are available only if the corresponding VLAN ID is other than Untagged.

For details on Management Connectivity parameters refer to "Connectivity" on page 88.

Ethernet Interface

Speed and Duplex After Negotiation (Mbps)

The BTS operates in Auto Negotiation mode. This parameter shows the speed and duplex mode of the Ethernet port after auto-negotiation has been completed.

Authorized Managers (for each defined manager):

■ Authorized Managers Index

■ Manager IP Address

■ Read Community

■ Write Community

■ Trap Distribution Enabled

For details on Authorized Managers refer to "Authorized Managers" on page 89.

General Radio:

■ Current Operator ID

■ Configured Operator ID

■ Operator Name

■ Current Service Zone ID

■ Configured Service Zone ID

■ Service Zone Name

For details on General Radio parameters refer to "Radio" on page 90.

Unit Operation Mode:

■ Current Operation Mode

■ Configured Operation Mode

For details on Operation Mode parameter refer to "Operation Mode" on page 94.

Country Code:

■ Current Country Code

■ Configured Country Code

For details on Country Code parameter refer to "Country Code" on page 99.

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.

DL/UL Ratio:

■ Current DL / UL Ratio

■ Configured UDL / UL Ratio

For details on DL/UL Ratio parameter refer to "DL / UL Ratio" on page 101.

DFS / DCS

■ Current Random Channels Selection

■ Configured Random Channels Selection

■ If Country Code in use is other than Universal and DFS is required by the Country Code: DFS Type, per Sector (FCC or ETSI).

 If Country Code is Universal: Current DFS Type and Configured DFS Type will be displayed.)

■ Current DFS Frequency Management Level

■ Configured DFS Frequency Management Level

DFS/DCS parameters are applicable only for 5 GHz units. DFS Frequency Management parameters are applicable only for Dual Sector Operation Mode. For details on DFS and DCS parameters refer to "DFS/DCS" on page 102.

4.5.2 Show Properties

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

■ Product Type (BMAX-Extreme)

■ 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: The frequency band supported by the radio

- Radio 1 HW version

- Radio 1 HPA Version

- Radio 2 (if exists): The frequency band supported by the radio

- Radio 2 HW version

- Radio 2 HPA Version

- Serial Number

- 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)

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

- FPGA Version

- BTS MAC Address

■ Country Code

4.5.3   Show License Properties

Select this option to view the properties of the current license or the properties of the primary license file and secondary license files previously loaded to the device (if applicable).

Starting in release 1.5, each unit is shipped with a primary license file that includes the following:

■ Basic hardware dependent capabilities that cannot be modified:

» **Operational Modes**: The Operational Mode(s) that can be supported.

NOTE

For a 1SIS unit the basic operation mode is Single Sector Single BS no Diversity. The Single Sector Dual BS no Diversity operation mode is applicable only if 20 MHz bandwidth (see below) is supported.

For a 1DIV unit the basic operation mode is Single Sector Single BS with Diversity. The Single Sector Dual BS with Diversity operation mode is applicable only if 20 MHz bandwidth (see below) is supported.

» **Antenna Type**: Internal or External

» **Antenna Gain (dBi)**: The gain of the antenna. In the current release the gain of the internal antenna is 14 dBi. Not applicable for an external antenna.

» **Antenna Beam Width (degrees)**: The beam width in degrees of the antenna. In the current release the beam width of the internal antenna is 90 degrees. Not applicable for an external antenna.

» **Antenna Polarization**: The polarization of the antenna. In the current release the polarization of the internal antenna is Dual Slant (including units where only one single slant antenna is used). Not applicable for an external antenna.

■ Modifiable features and capabilities:

   » **Maximum Number of MSs**: The maximum number of MSs that can be served simultaneously by the unit.

   » **Internal ASN-Gateway**: Indicates whether the internal ASN-GW is supported (supported by default for all units).

   » **External ASN-GW**: Indicates whether operation with an external ASN-GW over R6 is supported.

   » **20 MHz**: Indicates whether operation with a 14 MHz (3.x GHz units only) or 20 MHz bandwidth is supported (20 MHz support availability depends also on the specific unit's hardware. This feature is not applicable for 2SIS units).

License files with support for additional capabilities can be loaded to the device using TFTP. For details on loading license files refer to "Download License File To Unit" on page 110 or to the relevant AlvariSTAR/AlvariCRAFT User Manual. Each secondary license file can include licenses for any number of the modifiable features. The licensing feature is additive (once support for a certain capability is enabled it cannot be disabled). A license file is prepared for a specific unit using unique identifiers (MAC address and Serial Number) and can be loaded successfully only to this unit.

The Show License Properties menu include the following options:

■ Show License Summary

■ Show License Files

4.5.3.1   Show License Summary

Select this option to view the current licenses status. The displayed information includes the basic hardware dependent features and the current status of all modifiable features, taking into account all the license files loaded to the unit (if applicable). In addition, the **Number of Connected MSs** is shown next to the **Maximum Number of MSs** entry. This is the current number of MSs served by the unit, and the information is provided to enable the administrator to decide whether additional MSs can be served with the current license capabilities.

4.5.3.2   Show License Files

Select this features to view the license files history. The display includes the content of the primary license file loaded during production, followed by the

details of additional secondary license files loaded to the device (if applicable) according to the order of activation. In addition to the license of relevant capabilities, identification details of each file (file name and catalog name) are also provided.

4.5.4   Configuration

The Configuration menu includes the following options:

■   General Parameters

■   BTS Working Mode

■   Connectivity

■   Authorized Managers

■   Radio

4.5.4.1   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

4.5.4.1.1   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.

4.5.4.1.2   BTS Name

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

The default is null (an empty string).

4.5.4.1.3   BTS Location

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

The default is null (an empty string).

4.5.4.1.4   BTS Contact

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

The default is null (an empty string).

4.5.4.2   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 Centralized Authentication: 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 218) cannot be added or deleted, and MS Services (see "MSs Services" on page 130) are not configurable locally (read-only).

- Embedded Distributed ASN-GW Local Authentication: 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 119) 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 218) cannot be added or deleted. All Services configuration (see "Services Menu" on page 129) are managed by the external ASN-GW and are not available to the user. The AAA menu (see "AAA" on page 119) is not applicable.

When changing the BTS Working Mode from Embedded Distributed ASN-GW Local Authentication 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 129) and AAA servers (see "AAA" on page 119) are erased.

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

4.5.4.3   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

4.5.4.3.1   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 77.

4.5.4.3.2   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 77.

4.5.4.3.3   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 77.

4.5.4.3.4   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).

4.5.4.3.5   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.

4.5.4.4   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

4.5.4.4.1   Show Summary

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

4.5.4.4.2   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.

4.5.4.4.3 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

4.5.4.4.3.1 Manager IP Address

The IP address of the Authorized Manager. Refer to the limitations described in "IP Addresses Configuration" on page 77.

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

4.5.4.4.3.2 Read Community

The SNMP Read Community to be used by the Authorized Manager.

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

The default is public.

4.5.4.4.3.3 Write Community

The SNMP Write Community to be used by the Authorized Manager.

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

The default is private.

4.5.4.4.3.4 Traps Distribution Enabled

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

The default is Enable.

4.5.4.5 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

» Country Code

◊ Current Country Code

◊ Configured Country Code

» 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/DCS (if applicable)

◊ Current Random Channels Selection

◊ Configured Random Channels Selection

◊ If Country Code in use is other than Universal and DFS is required by the Country Code: DFS Type, per Sector (FCC or ETSI).

If Country Code is Universal: Current DFS Type and Configured DFS Type will be displayed.

◊ Current DFS Frequencies Management Level

◊ Configured DFS Frequencies Management Level

Current/Configured DFS Frequencies Management Level are applicable only for Dual Sector Operation Mode.

■ **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

■ Country Code

■ DL / UL Ratio

■ DFS/DCS (applicable only for 5 GHz units)

4.5.4.5.1 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.

4.5.4.5.2 Operator Name

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

The default is null (an empty string).

4.5.4.5.3 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.

4.5.4.5.4 Service Zone Name

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

The default is null (an empty string).

4.5.4.5.5 Operation Mode

The following operation modes are supported in current release:

■ Single Sector Single BS no Diversity
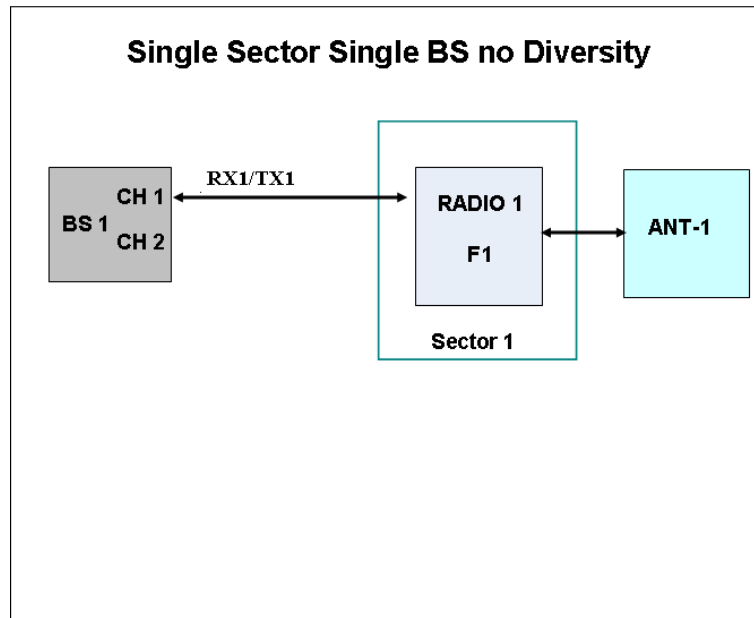
The Single Sector Single BS no Diversity operation mode is applicable only for 1SIS model units. A single Radio Channel of a single BS connected to a single internal radio provides a bandwidth of 5, 7 (applicable only for 3.x GHz units), or 10 MHz per sector.

Only SISO (no diversity) Diversity Mode can be supported by units operating in this mode.

■ Single Sector Dual BS no Diversity

The Single Sector Dual BS no Diversity operation mode is applicable only for 1SIS model units with a license for 20 MHz bandwidth. Two BSs connected to a single internal radio with one Radio Channel per each BS provide a total bandwidth of 14 (applicable only for 3.x GHz units) or 20 MHz per sector.

Only SISO (no diversity) Diversity Mode can be supported by units operating in this mode.

■ Single Sector Single BS with Diversity:
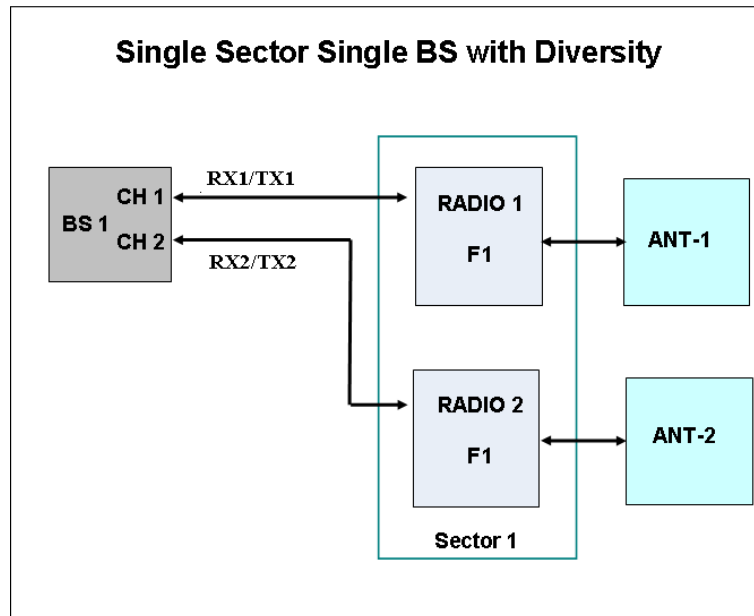
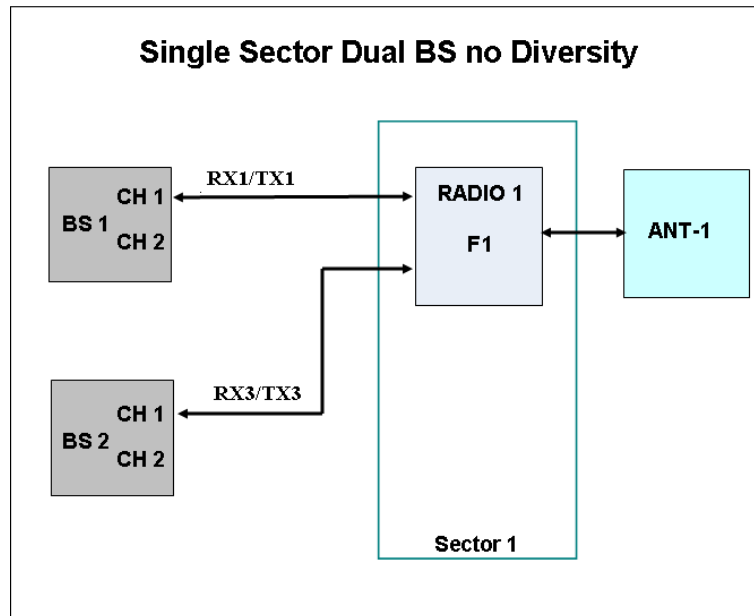The Single Sector Single BS with Diversity operation mode is applicable only for 1DIV model units. The two Radio Channels of a single BS connected to two internal radios provide a bandwidth of 5, 7 (applicable only for 3.x GHz units), or 10 MHz per sector.

Units operating in this mode can use either MIMO Matrix A or MIMO Matrix A&B Diversity Mode.

■ Single Sector Dual BS with Diversity
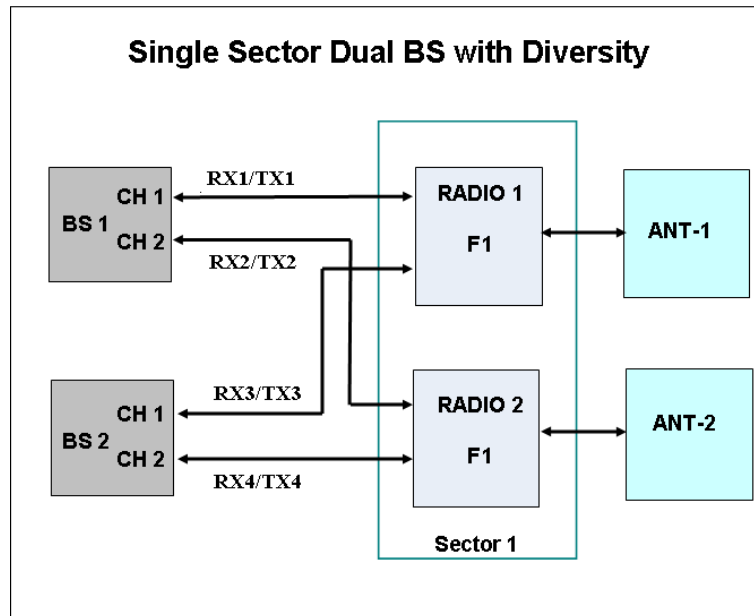
The Single Sector Dual BS with Diversity operation mode is applicable only for 1DIV model units with a license for 20 MHz bandwidth. Two BSs connected to two internal radios with two Radio Channels per each BS provide a total bandwidth of 14 (applicable only for 3.x GHz units), or 20 MHz per sector.

Units operating in this mode can use either MIMO Matrix A or MIMO Matrix A&B Diversity Mode. They can also use MIMO B.

■ Dual Sector Dual BS no Diversity
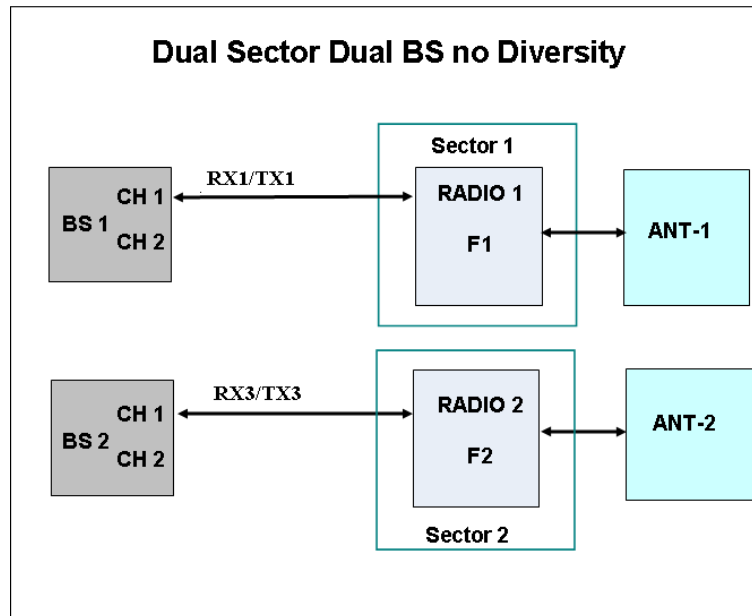
The Dual Sector Dual BS no Diversity operation mode is applicable only for 2SIS model units. Each of the two BSs is connected with a single Radio Channel to a different internal radio, providing a bandwidth of 5, 7 (applicable only for 3.x GHz units), or 10 MHz per sector.

Only SISO (no diversity) Diversity Mode can be supported by units operating in this mode.

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

■ 1SIS units:

» Single Sector Single BS no Diversity

» Single Sector Dual BS no Diversity (available only if 20 MHz license is installed)

- 1DIV units:

  » Single Sector Single BS with Diversity

  » Single Sector Dual BS with Diversity (available only if 20 MHz license is installed)

- 2SIS units:

  » Dual Sector Dual BS no Diversity

4.5.4.5.6   Country Code

The Country Code to be used.

In units operating in the 3.65 GHz band two Country Codes are available: FCC (the default) and Canada. These Country Codes supports a limited band from 3650-3675 MHz.

In 3.6 GHz units the available Country Codes are Universal (the default), ETSI, and Australia.

In 5.4 GHz FCC units a single Country Code (FCC) is supported.

In 4.9 GHz and 5.4 GHz units (excluding 5.4 GHz FCC) several Country Code options are available to support different local regulations.

CAUTION

In 4.9 GHz and 5.4 GHz units, it is the responsibility of the Administrator to verify that the selected Country Code, and usable frequencies within the selected Country Code, are in accordance with relevant local regulations.

The default for all 4.9 GHz and 5.4 GHz bands is Universal.

NOTE

In 4.9 GHz and 5.4 GHz units, after changing the Country Code to FCC, the Country Code becomes read-only and cannot be modified.

The parameters that are affected by the selected Country Code in 4.9 GHz and 5.4 GHz units are:

- Supported frequency range. For details refer to "Frequency" on page 164. Some Country Codes may support two or more sub-bands, where some parameters may differ among the supported sub-bands.

■ Maximum EIRP allowed by regulations. This parameter affects the allowed range for Tx Power. For more details refer to "Tx Power" on page 168.

■ Required DFS algorithm. For more details refer to "DFS/DCS" on page 102.

■ Channel Availability Check Time (applicable only if DFS is supported). For details refer to "DFS" on page 170.

Table 4-2: Country Code's Dependent Parameters, 4.9 GHz Units

Country Code	Frequency Range (MHz)	Maximum EIRP (dBm)			Supported DFS	Channel Availability Check Time (sec)
		5 MHz BW	10 MHz BW	20 MHz BW		
Universal	4900-5350	No Limit	No Limit	No Limit	None	NA
Canada	4940-4990	53	56	Not Supported	None	Not Applicable
FCC	4940-4990	53	56	Not Supported	None	Not Applicable
ETSI	5150-5250	17	20	23	None	Not Applicable
	5250-5350	17	20	23	ETSI	60
5.1 GHz FAA	5090-5150	No Limit	No Limit	No Limit	None	Not Applicable

Table 4-3: Country Code's Dependent Parameters, 5.4 GHz Units

Country Code	Frequency Range (MHz)	Maximum EIRP (dBm)			Supported DFS	Channel Availability Check Time (sec)
		5 MHz BW	10 MHz BW	20 MHz BW		
Universal	5470-5950*	No Limit	No Limit	No Limit	None	Not Applicable
Canada	5470-5600	24	27	Not Supported	FCC	60
	5650-5725	24	27	Not Supported	FCC	60
	5725-5850	36	36	Not Supported	None	Not Applicable
Australia	5470-5600	24	27	30	FCC	600
	5650-5725	24	27	30	FCC	600
	5725-5850	36	36	36	FCC	600
ETSI	5470-5600	24	27	30	ETSI	60
	5600-5650	24	27	30	ETSI	600
	5650-5725	24	27	30	ETSI	60
	5725-5875	30	33	36	ETSI	60

Table 4-3: Country Code's Dependent Parameters, 5.4 GHz Units

Country Code	Frequency Range (MHz)	Maximum EIRP (dBm)			Supported DFS	Channel Availability Check Time (sec)
		5 MHz BW	10 MHz BW	20 MHz BW		
FCC	5470-5600	24	27	Not Supported	FCC	60
	5650-5725	24	27	Not Supported	FCC	60
	5725-5850	36	36	36	None	Not Applicable
UK	5725-5795	30	33	36	ETSI	600
	5815-5850	30	33	36	ETSI	600
India	5825-5875	36	36	36	None	Not Applicable

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

> **CAUTION**
>
> If due to either restrictions imposed by local regulations or any other reason you cannot use the entire frequency band supported by the selected Country Code, you should disable the Random Channel Selection option (see Section 4.5.4.5.9.1) and use the Usable Frequency option to define the frequencies manually (see Section 4.7.2.2.2.3).
>
> For example, when using the 5.4 GHz FCC Country Code, you may use either frequencies in the 5470-5600 MHz and 5650-5725 MHz bands (with FCC), or frequencies in the 5725-5850 MHz band.

4.5.4.5.7   DL / UL Ratio

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

The available values are:

■ DL = 75%: UL = 25% (not applicable for 3.x GHz units operating with a 7/14 MHz bandwidth)

■ DL = 70%: UL = 30% (applicable only for 3.x GHz units operating with a 7/14 MHz bandwidth)

■ DL = 60%: UL = 40%

■ DL = 35%: UL = 65%

The default is DL = 60%: UL = 40%.

4.5.4.5.8   TCP Enhancer

When TCP Enhancer is enabled, TCP ACK packets rate on the downlink (for uplink TCP data traffic) is moderated, thus increasing the TCP ACK rate on uplink direction for the downlink TCP data traffic. It is mainly useful in extreme asynchronous DL/UL ratios (e.g. DL=75/UL=25), thus maximizing capacity in both directions.

The options are Disable and Enable. The default is Disable.

4.5.4.5.9   DFS/DCS

The DFS/DCS parameters are applicable only for 5 GHz units. The DFS (Dynamic Frequency Selection) feature is applicable only for units using a Country Code specifying that DFS must be used (DFS may also be enabled in units using Universal Country Code). Note that for certain Country Codes DFS support and Channel Availability Check Time may vary among the relevant sub-bands supported by the Country Code.

Most parameters of the DFS and DCS features are managed at the sector level (see "DFS/DCS (5 GHz units only)" on page 170).

The DFS/DCS parameters at the BTS level that are common to both sectors (if applicable) include:

■ Random Channel Selection

■ DFS Type

■ DFS Frequencies Management Level

4.5.4.5.9.1   Random Channel Selection

The Random Channel Selection parameter defines the method of selecting channels for scanning by the DCS and/or the DFS mechanisms.

When the DCS mechanism is enabled and Random Channel Selection is enabled, the list of channels to be scanned is selected randomly from the list of all available channels in the relevant band according to the Country Code. The number of channels in the list is defined by the Number of Channels to Scan parameter (see "Number of Channels to Scan" on page 180). If Random Channel Selection is disabled, the list of channels will be defined by the user (see "Usable Frequencies" on page 180).

If DCS is disabled and DFS is enabled, the Random Channel Selection parameter defines the method of selecting channels for the DFS mechanism.

If Random Channel Selection is enabled, a new channel to be tested is selected randomly from the list of all available channels in the relevant band. If Random Channel Selection is disabled, the new channel to be tested will be selected from the list of channels defined by the user (see "Usable Frequencies" on page 180).

The default is Disable (use the Usable Frequencies list).

CAUTION

If due to either restrictions imposed by local regulations or any other reason you cannot use the entire frequency band supported by the selected Country Code, you should disable the Random Channel Selection option and use the Usable Frequency option to define the frequencies manually (see Section 4.7.2.2.2.3).

For example, when using the 5.4 GHz FCC Country Code, you may use either frequencies in the 5470-5600 MHz and 5650-5725 MHz bands (with FCC), or frequencies in the 5725-5850 MHz band.

4.5.4.5.9.2   DFS Type

The DFS Type parameter defines the DFS algorithm to be used. DFS Type is configurable only for Universal Country Code.

The available DFS algorithm are ETSI, FCC, Normal ETSI, Normal FCC.

■ 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.

■ 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).

The default is Normal ETSI.

4.5.4.5.9.3   DFS Frequencies Management Level

The Frequencies Management Level parameter is not applicable if the selected Country Code does not support DFS. The DFS Frequencies Management Level parameter defines the method of handling the DFS Frequencies Status Table (see "Show Frequencies Status Table" on page 175) in units using Dual Sector Dual BS no Diversity operation mode. 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.

4.5.5   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 files.

The Unit Control menu includes the following options:

- Change Password

- Reset BTS

- Reset to BTS Factory Defaults

- SW Version Control

- Configuration Files Control

- License Files Control

- Monitor Inactivity Timeout

4.5.5.1   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

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 4-4: Default Passwords

Access Level	Default Password
Administrator	admin

Table 4-4: Default Passwords

Access Level	Default Password
Installer	installer
Monitor	monitor

4.5.5.2   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 223 for information on which parameters are changeable in run time and which changes are applied only after reset.

4.5.5.3   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 223 for information on the factory default values of all parameters.

4.5.5.4   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.

- 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

4.5.5.4.1   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

4.5.5.4.2   Show Activation and Status Parameters

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

- **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, the unit is running from the Shadow version, there is not sufficient memory space or a CRC error.

4.5.5.4.3 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.

NOTE

If the unit is running from Shadow, the Load to Shadow operation is not allowed.

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.

4.5.5.4.4 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.

4.5.5.4.5 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.

4.5.5.5 Configuration Files Control

The Configuration Files 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 Files Control menu also enables downloading a Country Codes File or a RFU Heads File to the BTS. The option to download these files enables loading an updated version of the file (if necessary) without the need to replace the SW version.

The Configuration Files Control menu includes the following menu options:

■ Upload Configuration File (Backup File)

■ Download Configuration File (Restore File)

■ Show Activation and Status Parameters

4.5.5.5.1 Upload Configuration File (Backup File)

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

4.5.5.5.1.1 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.

4.5.5.5.1.2 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.

4.5.5.5.1.3 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.

4.5.5.5.1.4 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

4.5.5.5.2   Download Configuration File (Restore File)

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:

■ **File Type**: Full Configuration, Services (SP & MSF) File, Country Codes File, RFU Heads 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

To view the results of the download process, use the Show Activation and Status Parameters option (see below). To fully activate the new configuration, reset the unit after successful completion of the download operation.