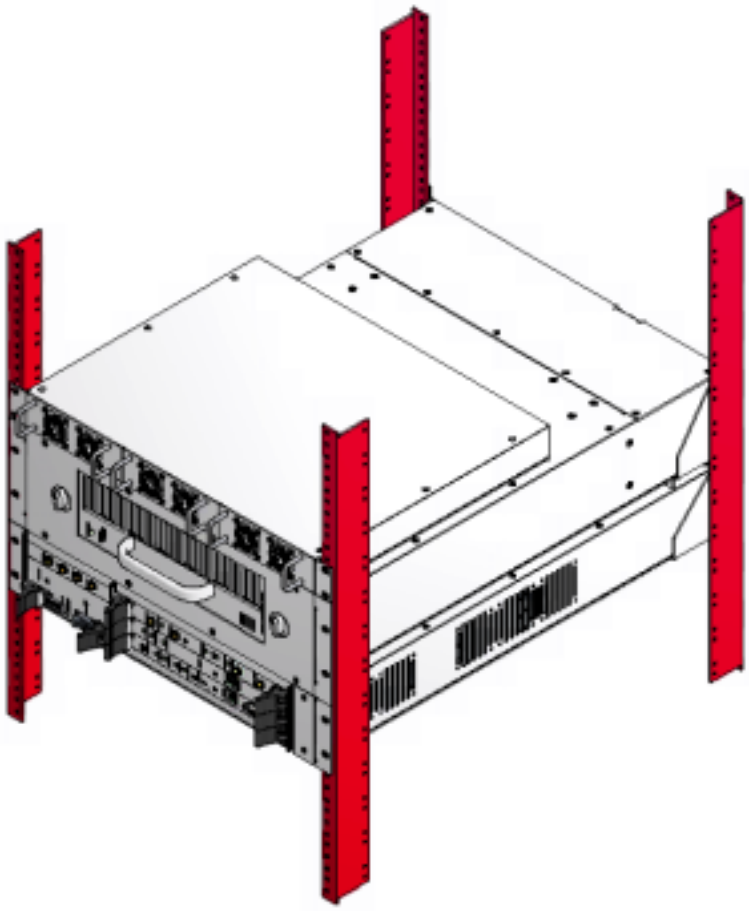
AIRNET

Base Station System (BSS)

BTS-4000RM
Installation & Maintenance

March 14, 2007

Part Number 06868-001, Rev 30



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REVISION PAGE

Revision	Date	Comments
30	3/14/07	Added Appendix H, Ancillary Equipment, and updated the Installation section.
20	2/26/07	Added TMA port, TX Mon port, TMA installation procedure and Transmit Gain Adjustment procedure. Modified Block Diagram in Appendix C.
10	1/19/07	Preliminary manual.

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Preface

General Information

This document describes the installation and setup procedures for hardware used in the AirNet BTS-4000RM.

Intended User of This Guide

This guide is intended for the individual(s) responsible for the installation and maintenance of the BTS-4000RM hardware and software. It is not intended for the end-user of the system.

Conventions Used in This Guide

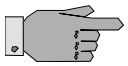
`Typed Input`	Input in procedures that needs to be typed will be shown in bold, Arial font. Example: Type **`abcde`** to continue.
`Terminal Simulation`	Non-bolded Courier font is used to simulate data printed on computer terminals.
Screen names	Screen names within sentences will be shown in italicized, Arial font. Example: The *Main Menu* will be displayed.

WARNING - Alerts the reader to a situation that might affect personal safety.

CAUTION - Alerts the reader to a situation that might affect the integrity of equipment, software, or data.

Note - Provides the reader with important or supporting information.

Hint - Informs the reader of a possible shortcut or timesaving hint.


GoTo

GoTo - Informs the reader that a sub-procedure is finished and that another procedure or sub-procedure must be started.

Stop - Informs the reader that a procedure is finished.

Guide Organization

The guide is organized as follows:

Section 1, "The AirNet BTS-4000RM", describes the subsystem and its characteristics.

Section 2, "User Interfaces", describes the methods by which the unit is configured and all of the possible menu options.

Section 3, "Installation", covers the procedures to unpack the equipment, install it, clean up after the installation, install software if necessary, and test the system to ensure it works properly.

Section 4, "Repair", provides troubleshooting, lists replaceable parts, and provides replacement instructions.

Section 7, "Technical Support", provides information to obtain additional technical assistance, if required.

Appendix A, "Acronyms", provides a list of acronyms used in this manual.

Appendix B, "I/O Connector Pinouts", provides pinouts for all external connectors on the BTS-4000RM.

Appendix C, "Block Diagram", shows the wiring of the BTS-4000RM.

Appendix D, "dBm to Watts Conversion Table", provides a dBm to Watts conversion table.

Appendix E, "ARFCN Frequencies", provides the ARFCN frequencies for the 850, 900, 1800, and 1900 MHz frequency bands.

Appendix F, "Technical Specifications", provides the technical data for the BTS-4000RM, such as environmental conditions, power, physical dimensions, etc.

Appendix G, "RMA Procedure", provides instructions for returning material to AirNet.

Appendix H, "Ancillary Equipment", provides a brief overview of the ancillary equipment used with the BTS-4000RM.

Safety Precautions

The following general safety precautions must be observed during all phases of system installation, service, and repair of this equipment. Failure to comply with these precautions or specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of this equipment. AirNet Communications Corporation assumes no liability for the customer's failure to comply with these requirements.

The safety precautions listed below represent warnings of certain dangers that AirNet Communications Corporation is aware. As the user of the product, you should follow these warnings for the safe operation of the equipment in your operating environment.

Additionally, the equipment is shipped with accompanying documentation from the original manufacturer of BTS-4000RM hardware. You should become familiar with the safety precautions outlined by the original manufacturer's documentation.

Read this Guide Thoroughly


Caution

CAUTION - The technician must be completely familiar with the procedures contained in this document before beginning the actual installation.

Complete all Steps


Caution

CAUTION - The technician must perform each procedure in its entirety.

Use the ESD Strap


Caution

CAUTION - An anti-static wrist strap is included with the BTS-4000RM and must be worn while handling circuit modules and other component assemblies.

Ground the Equipment


Warning

WARNING - To minimize shock hazard, the equipment must be connected to a chassis or electrical ground.

Only Qualified Personnel Should Service the Equipment


Warning

WARNING - Only trained personnel may remove equipment covers to install and service the internal assemblies of the BTS-4000RM. The BTS-4000RM contains high-energy equipment that can cause injury or death. Under certain conditions, dangerous voltages and/or currents may exist even with the power supply removed.

Do Not Service or Adjust Alone

WARNING - Do not attempt internal service or adjustment unless another person capable of rendering first aid and resuscitation is present. Dangerous voltages and/or currents, capable of causing injury or death, are present in this equipment.

Do Not Operate in an Explosive Atmosphere

WARNING - Do not operate the equipment in the presence of flammable gases or fumes. Operation of electrical equipment in such an environment creates a definite safety hazard.

Do Not Substitute Parts or Modify Equipment

WARNING - Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of equipment.

1. BTS-4000RM

The BTS-4000RM is a GSM base station that provides high capacity communication in an economical and compact package. It is portable, rapidly deployable, and able to support secure wireless voice and data communications. The design makes the BTS-4000RM ideal for the support of tactical communications for public safety, homeland security, and defense communications applications. This unit has been designed to work in a variety of network modes: including as a standalone BTS/BSS for mobile to mobile calling; as an ISDN PRI connected node off of a PBX or EO; as a BTS connected via AirNet Abis to a BSC; as a networked BSS connected via VOIP to the ipGSM Server; or as a networked BSS connected to an MSC/HLR over a standard A-interface over IP.

The BTS-4000RM eliminates the need for costly network elements such as the base station controller (BSC) and transcoding and rate adaption unit (TRAU). The BSC and TRAU functions are integrated to form a single unit.


Note

Note - Please note the discussion of switching and subscriber databases on the unit do not apply to the BTS-4000RM network mode, which is used when interoperating with an MSC/HLR or ipGSM Server.

The main features of the BTS-4000RM are as follows:

- Embedded standard A-interface support (via Signaling Gateway card)
- SIP mode provides all IP interconnect and backhaul.
- Support for single frequency bands (GSM-850, GSM-900, GSM-1800, or GSM-1900)
- Up to 4 simultaneous RF carriers
- Up to 32 simultaneous radio channels (8 channels per RF carrier)
- Up to 30 simultaneous traffic channels (15 simultaneous mobile-to-mobile connections). The other available channels are used to support control functions.
- Standalone and ISDN Mode subscriber database of up to 1000 subscriber IMSI and ISDN phone numbers
- Local Switching
- Circuit Switched Voice
- Circuit Switched Data
- Subscriber Authentication and Ciphering
- EDGE/GPRS support (when connected to an external SGSN)
- +27VDC Input Power
- AirSite Support
- Local Operation, Administration and Maintenance Port
- Auto-Boot Startup on Power-On or Reset

- Diagnostic Capability
- Multiple (5) Network Connection Modes
- Support for Tower Mounted Amplifiers (optional)

1.1 Frequency Bands

The BTS-4000RM supports one of four GSM frequency bands, 850, 900, 1800, and 1900 MHz.

Once the appropriate hardware for the GSM frequency band has been installed, the operator may configure the BTS-4000RM via its Ethernet/Local Maintenance Terminal port to specify the proper frequency channels within the installed frequency band.

1.2 Radio Channel Capacity

The BTS-4000RM can support up to four (4) simultaneous GSM RF carriers supporting circuit switched voice or circuit switched data. As a result, up to a maximum of 32 simultaneous radio channels (8 TCHs per RF carrier) can be configured.

The BTS-4000RM can support a maximum of 30 radio traffic channels (e.g. for support of up to 15 simultaneous mobile-to-mobile connections). The remaining radio channels are necessary to support control functions.

1.3 EDGE/GPRS Support

When in iBSS, SIP, Abis, or ISDN modes, the BTS-4000RM can be configured to interface to a compatible GSM SGSN to provide EDGE/GPRS service. The SGSN interface is an IP connection over the Ethernet.

1.4 AirSite Support

The BTS-4000RM supports AirNet AirSites, including handovers between AirSites or between AirSites and the BTS-4000RM.

1.5 Auto-Boot Startup

Upon power-up, or if reset during operation, the BTS-4000RM automatically “bootstrap” starts itself. This means it automatically seeks to bring itself to In-Service state by initializing from locally stored configuration parameters.

1.6 Circuit Switched Voice and Data Calls

The BTS-4000RM supports circuit switched voice (CSV) and circuit switched data (CSD) call connections between subscribed mobiles within the BTS-4000RM. It recognizes whether a call is CSV or CSD from signaling received from the mobile during call establishment.

1.7 Input Power

The BTS-4000RM requires +27VDC power. It can be directly connected to a +27VDC bulk power source or it can be powered via an AC-to-DC power supply unit. AirNet recommends purchasing the power supply unit that has been tested with the BTS-4000RM, the PowerStax Model R2250, AirNet Part Number 06853.

1.8 Certifications/Regulations

Testing and certifications for conformance to various regulatory agencies' requirements has not been performed on the BTS-4000RM. As such, the BTS-4000RM has not undergone any regulatory or safety testing which includes FCC title 47, parts 15, and 24 as well as UL 1950.

Safety and viability were paramount considerations in the development of the product. When used in accordance to this document, the BTS-4000RM follows generally accepted safety rules for telecommunications equipment including, but not limited to, protections against electrical and electrostatic shock; use of flame retardant and non-toxic materials; protections against excessive electromagnetic radiation exposure; physical stability and balance; weight considerations; accommodations to facilitate handling and transport; etc.

In addition to providing safety to the operator against the equipment, the equipment will also be designed to protect itself from human and environmental influences including, but not limited to, electrostatic discharge; power grounding; spurious electromagnetic emissions; temperature and humidity; noxious gases, etc.

The BTS-4000RM is intended for evaluation purposes only. It is not intended to support commercial service or other non-commercial communications service operations.

WARNING - The BTS-4000RM is intended for evaluation purposes only and has not undergone required regulatory and safety testing. The user of the BTS-4000RM is assumed to take responsibility and liability for the use and/or misuse of the BTS-4000RM, which may result in violation of US or other statutory regulations in the location of use and risks up to and including the potential loss of life.

1.9 Local Subscriber Database

When in Standalone or ISDN modes, the BTS-4000RM supports a subscriber database allowing for up to 1000 entries for subscribed mobiles and associated phone numbers.

The following rules apply to the 1000 subscriber database entries:

- Each IMSI may have multiple phone numbers assigned to it.
- A telephone number must be unique in the database and associated with only one IMSI.

If more than one telephone number is assigned to the same mobile's IMSI (i.e., that mobile has multiple telephone numbers by which it can be dialed), then fewer open entries remain for other mobile subscribers. For example, if one mobile has 500 telephone numbers assigned to it, then only 500 telephone number entries remain available for assignment to other subscribers.

A telephone number used with the BTS-4000RM may consist of 2 to 15-digits. Any number of digits may be used in the same database and is unique. For example, a 2-digit phone number is unique from a 15-digit phone number. Leading zeros is not assumed.

Additionally, the BTS-4000RM supports an IMSI capture mode that allows easy additions of subscribers into the subscriber database. The BTS-4000RM can be configured in IMSI mode via the LMT. When a mobile is powered up near the BTS-4000RM, it will attempt to register. If the mobile's IMSI is not in the database it will be displayed via the LMT interface. The BTS-4000RM operator will be asked if he/she wishes to have the IMSI added to the database. If so, a phone number to be associated with the IMSI is also required.

1.10 Network Mode Descriptions

The BTS-4000RM can support several modes for network connectivity.

- Stand-Alone
- ISDN PRI
- AirNet Abis
- iBSS
- SIP Mode

1.10.1 Stand-Alone Mode

In stand-alone mode the BTS-4000RM supports mobile-to-mobile communications, without any external network equipment. In this mode, the BTS-4000RM may also be configured to support AirNet's AirSite Backhaul Free™ base station supporting up to 4 cells of GSM coverage. The BTS-4000RM supports internal switching for call connection between mobile subscribers. The widely available GSM EFR vocoder is used as default and GSM FR only phones are not supported.

The BTS-4000RM only processes and completes dialed 2 to 15-digit numbers that map to phone numbers assigned in the subscriber database. It will only attempt termination to the IMSI that is associated with the dialed 2 to 15-digit number. Dialed numbers that are not listed in the database are not interpreted nor recognized, including numbers that may normally be associated with Emergency Calls (i.e., 911).

In this mode, typical telecommunication features are limited. Caller ID and signaling tones (e.g. ringing, busy, etc.) are supported, but standard supplementary services such as call forwarding, call conferencing and call waiting are not. These services are supported by the telecommunications switch to which the BTS-4000RM may interface via one of the other network modes.

In addition to voice calls, the BTS-4000RM supports mobile-to-mobile circuit switched data (CSD) transparent mode. CSD allows the support of secure (encrypted) communication using supported subscriber equipment such as the General Dynamics Sectéra® secure GSM mobile.

1.10.2 ISDN PRI Mode

In ISDN PRI mode, the BTS-4000RM may interface to any telecommunications switch or PBX that supports the network side of an ISDN primary rate interface (PRI). In this mode the BTS-4000RM

supports connectivity between mobile subscribers and external telecommunications networks. No additional equipment such as a GSM BSC or Mobile Switching Center (MSC) is required. The BTS-4000RM uses the same subscriber database as in stand-alone mode for authenticating mobile subscribers. Mobility and local switching for call traffic between AirSites and the serving BTS-4000RM are also supported in this mode. The widely available GSM EFR vocoder is used as default and GSM FR only phones are not supported. Mobility with GSM systems external to the BTS-4000RM, including other BTS-4000RMs is not supported, as ISDN does not support mobility.

The BTS-4000RM supports the user side of the ISDN PRI interface. Up to 2 T1 or 1 E1 network spans may be equipped. The BTS-4000RM supports several North American variants of ISDN as well as EuroISDN.

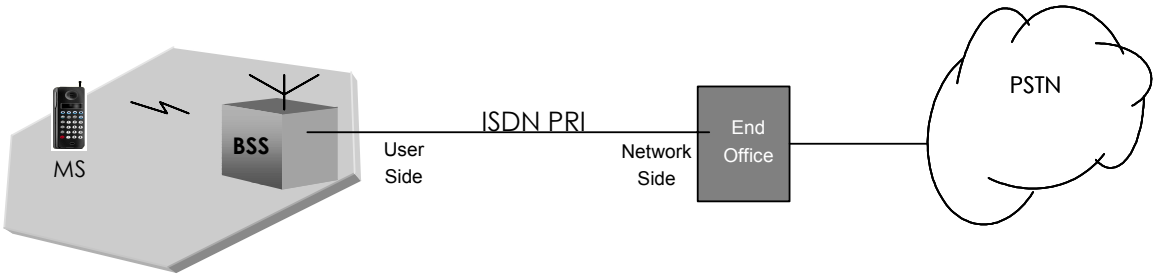


Figure 1-1 ISDN PRI Mode – End Office

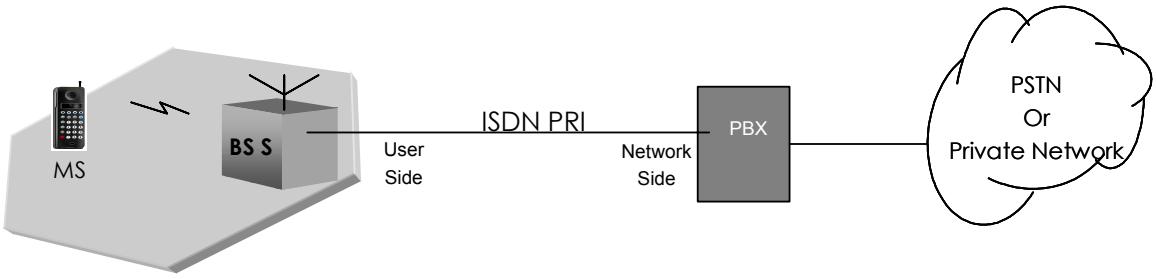


Figure 1-2 ISDN PRI Mode - PBX

ISDN may also be supported over a satellite link.

1.10.3 AirNet Abis Mode

The BTS-4000RM may also interface to standard GSM network infrastructure via an AirNet Base Station Controller (BSC) via the “Abis” interface. Abis is the GSM nomenclature for the network interface between a GSM base station and a BSC. When connected to a standard GSM network, the BTS-4000RM provides all of the capabilities that are available on most commercial GSM networks.

The Abis interface is also supported over a satellite link.

1.10.4 iBSS Mode

In iBSS mode the BTS-4000RM supports direct connection to a compatible GSM MSC. Signaling between the BTS-4000RM and MSC is via SS7 over IP. This capability provides a low cost and rapidly deployable alternative to standard GSM infrastructure, while providing the capabilities and features typically available only with commercial GSM networks, which includes connectivity to external public networks, mobility among BTS-4000RMs as well as other GSM base stations, and a centralized subscriber database.

With the BTS-4000RM, the SS7 communications link between the BSC and MSC is replaced with an A interface signaling link transported over IP (using SUA, SCTP, and IP communications layers). The BTS-4000RM requires a compatible GSM compliant MSC, capable of communicating on the A interface signaling link over IP using SCTP and SUA communication software layers. To operate the BTS-4000RM with a standard SS7 based interconnection to the MSC, a signaling gateway is required to handle the signaling link.

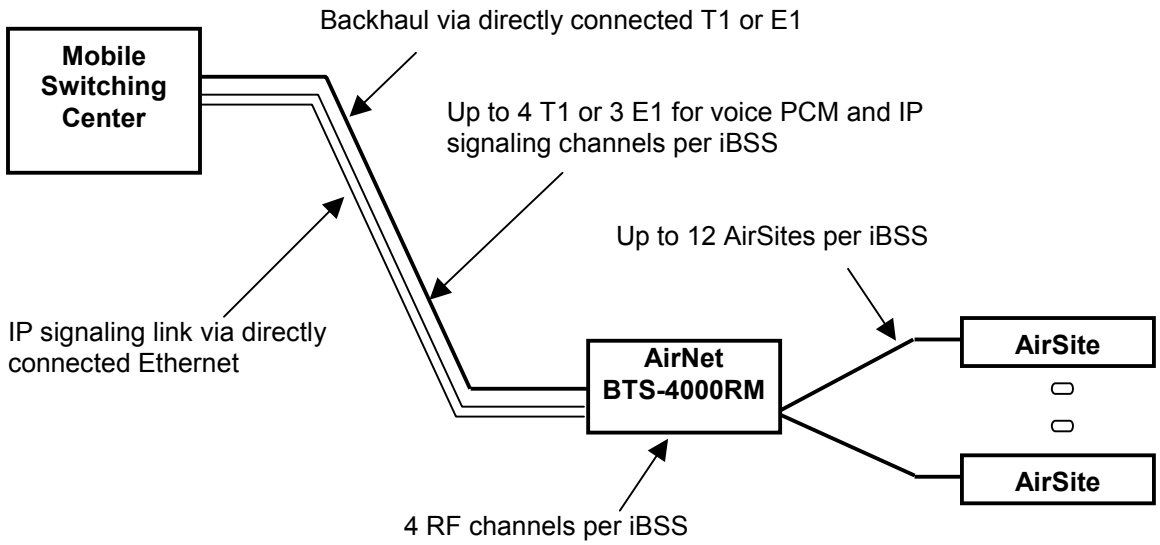


Figure 1-3 BTS-4000RM to MSC and AirSite base stations

Call processing operations with BTS-4000RM software are essentially unchanged from current operations. A mobile originated or terminated call on the BTS-4000RM or the AirSites will be completed in much the same manner as is currently done in a traditional GSM system. The BTS-4000RM communicates all necessary data to the MSC for authentication, validation and routing of the call. All radio and mobility management functions will be performed by the BTS-4000RM and MSC as is currently done. Functions associated with auxiliary equipment to the MSC, such as SMS message centers, authentication centers, home and visitor location registers, etc. are supported by the BTS-4000RM. The MSC continues to provide PSTN interface capabilities for voice and circuit switched data traffic. Mobile authentication and encryption is provided by the MSC and BTS-4000RM.

The full range of call features are available with the BTS-4000RM, including handover, AirSite support, short message service (SMS), mobile authentication, and ciphering. An embedded PCU and Gb interface for packet data support (GPRS/EDGE) is an optional feature, to be supported via an Ethernet connection to the GPRS Service Node.

1.10.5 SIP Mode

The BTS-4000RM also supports the SIP Mode which uses AirNet SIP to provide all tele-services other than GPRS. In SIP mode the BTS-4000RM supports direct connection to the ipGSM Server or a compatible SoftMSC. Signaling between the BTS-4000RM and ipGSM Server is via AirNet enhanced SIP. This capability provides a low cost and rapidly deployable alternative to standard GSM infrastructure, while providing the capabilities and features typically available only with commercial GSM networks, which includes connectivity to external public networks, mobility among BTS-4000RMs as well as other GSM base stations, and a centralized subscriber database.

The BTS-4000RM within the ipGSM network enables 2nd Generation GSM mobiles to be hosted within a distributed flat all-IP network. The ipGSM network also natively hosts SIP devices such as VoIP phones, Soft Phones, and VoIP Gateways.

An ipGSM network[1] is depicted in Figure 1-4.

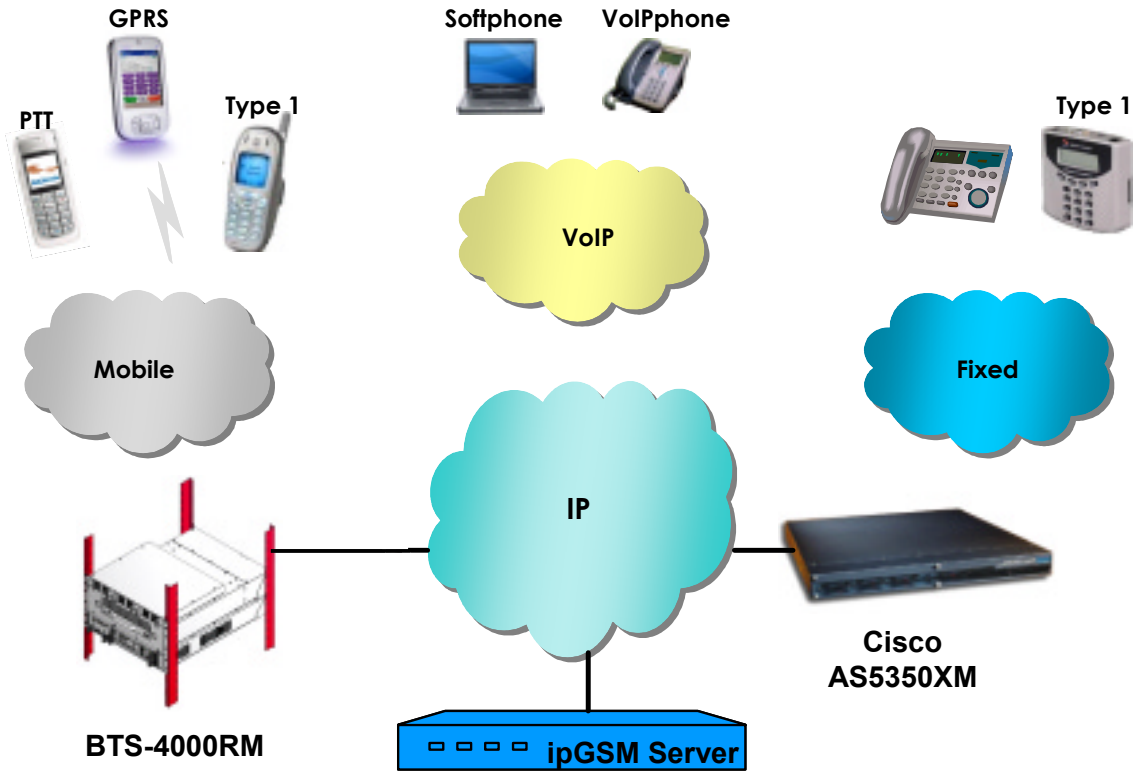


Figure 1-4 ipGSM Network

[1] Figure 1-4 shows

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1.11 Network Mode Capabilities

1.11.1 Stand-Alone Mode Capabilities

In Stand-Alone mode, mobile-to-mobile communication between mobiles subscribed to the BTS-4000RM is supported. Since the BTS-4000RM does not have any interconnection to external networks in stand-alone mode, it DOES NOT support the following:

- Intersystem, and public or private network calls
- An external switching platform (i.e., an MSC)
- Supplementary services normally provided by the MSC (such as call forwarding, Call Waiting, etc.)
- eMLPP (precedence and pre-emption)
- Location Updating

Since the BTS-4000RM has no connection to an MSC while in stand-alone mode, it provides local switching by dynamically establishing and tearing down call connections between the originating and terminating subscriber mobiles within the BTS-4000RM.

1.11.1.1 Registration

When a GSM mobile is first powered on, it will attempt to register with the network. This process is known as an IMSI Attach. The mobile will access the network. If the IMSI of the mobile is in the subscriber database, the BTS-4000RM will respond appropriately to the mobile indicating to the mobile that it is a valid subscriber. This will allow the mobile to originate calls as well as receive calls through the BTS-4000RM.

As BTS-4000RM implements the GSM standard, it is possible GSM mobiles subscribed to commercial GSM services may attempt to register with a BTS-4000RM and attempt to access the BTS-4000RM for service.

Unauthorized mobiles, i.e. those that do not have a valid IMSI in the BTS-4000RM subscriber database, that attempt to register with the BTS-4000RM are notified by the BTS-4000RM that access is forbidden and access will be denied. A GSM mobile that has been forbidden access will not re-attempt access to the BTS-4000RM until the mobile is power cycled.

Since the BTS-4000RM supports a small network of local coverage and coverage of any configured AirSites, the BTS-4000RM does not maintain a list of active, but idle, attached mobiles. For the purpose of establishing calls to mobiles, the BTS-4000RM assumes all mobiles in its subscriber database are active.

1.11.1.2 Call Establishment

When a mobile initiates an attempt to originate a call (referred to as the originating mobile), the BTS-4000RM scans its subscriber database for the IMSI reported by the mobile. The BTS-4000RM will continue normal call processing setup of the origination call path if there is a match between the IMSI of the originating mobile and an entry in the database.

After a connection between the originating mobile and the BTS-4000RM is established, the BTS-4000RM will scan its subscriber database for the phone number the originating mobile is attempting

to call. If the destination phone number for this "terminating" mobile is in the database, the BTS-4000RM will attempt to page the terminating mobile subscriber using the IMSI associated with the called phone number. Assuming the terminating mobile is active and idle within the BTS-4000RM's coverage area including the coverage area of any configured AirSites, the user of the originating mobile will hear a normal ringing tone until the user of the terminating mobile answers. Also, the terminating mobile phone may display the phone number or subscriber name of the origination mobile, if this feature is supported by the terminating mobile, i.e. Caller ID.

1.11.1.2.1 Terminating Mobile is Not Active

If for some reason, the terminating mobile is not active, i.e. turned off or not in the coverage area, the caller will hear re-order (fast busy) tone because the terminating mobile did not respond to a page within a reasonable period of time.

1.11.1.2.2 Terminating Mobile is Not In the Subscriber Database

If a search of all entries in the subscriber database does not result in a match for the phone number dialed by the caller, the caller will hear re-order (fast busy) tone and the BTS-4000RM will abort the call attempt.

1.11.1.2.3 Originating Mobile is Not In the Subscriber Database

Normally an originating mobile that does not have a valid IMSI in the subscriber database will not attempt to establish a call to the BTS-4000RM. A non-subscribed mobile is signaled during the registration process that it may not access the BTS-4000RM and typically will mark it as forbidden. However, there are cases where a non-subscribed mobile may attempt access anyway, for example, if a number designated in the mobile is for emergency calls.

If a non-subscribed mobile attempts to access the BTS-4000RM, the user of the originating mobile may hear an error tone and the BTS-4000RM will abort the call attempt.

Access denial extends to mobiles attempting to place an emergency call (i.e., dialing 911). Commercial GSM networks will allow access for unregistered GSM mobiles if an emergency call is placed. Any such emergency calls attempted will be unable to complete, potentially placing the caller at additional risk.

WARNING - The customer assumes all risks and liabilities for use of the BTS-4000RM where an emergency call establishment might be denied to a mobile not listed the BTS-4000RM subscriber database.

1.11.1.2.4 Terminating Mobile Busy

If the terminating mobile is on another call, the BTS-4000RM will signal the calling user of the originating mobile with a busy tone, or clear the call towards the caller over the ISDN with a cause value of busy and call establishment will abort.

1.11.2 ISDN Mode Capabilities

Mobile-to/from-mobile or mobile-to/from-landline communication is supported. Since the BTS-4000RM does have interconnection to external networks in ISDN mode, it MAY support the following (depending upon the connected (EO or PBX) capabilities):

- Intersystem, and public or private network calls
- Supplementary services, such as Caller ID, Call Forwarding, Call Waiting, etc.)

1.11.3 AirNet Abis Mode

Supports direct connectivity of the BTS-4000RM to a compatible Base Station Controller. The BTS-4000RM supports the AirNet Abis-interface over standard TDM SS7. All traditional GSM services are supported.

1.11.4 iBSS Mode Capabilities

Supports direct connectivity of the BTS-4000RM to a compatible Mobile Switching Center. Base Station Controller and Transcoder functionality is supported internal to the BTS-4000RM. The BTS-4000RM supports the GSM A-interface over an IP link using standard SS7 over IP protocols, i.e. SCTP and SUA and the GSM layer 3 messaging interface as defined in the GSM standards. All traditional GSM services are supported.

1.11.5 SIP Mode Capabilities

Supports direct IP connectivity of the BTS-4000RM to an ipGSM Server. Base Station Controller and Transcoder functionality is supported internal to the BTS-4000RM. The SIP Mode supports transcoder-free routed connections. This allows local calls to stay local. That is, a mobile to mobile call within the BTS-4000RM will consume no backhaul for bearer transport. Also, calls between BTSs are IP routed to keep the bearer within the Radio Area Network. This mode supports:

- Intersystem, and public or private network calls via VoIP Gateway.
- Supplementary services, such as Caller ID, Call Hold, Call Waiting, etc.
- GSM MLPP.
- Encrypted calling (Type 1 or AES) via CSD.
- Automatic Service Provisioning (ASP).
- Short Message Service.

1.12 BTS-4000RM Architecture

The BTS-4000RM consists of two modules, the Broadband Processing Unit (BPU) and the High Power Amplifier (HPA). The modules are designed for installation in a 19-inch rack. The distance between the front and rear rails in the rack must be 24-inches.

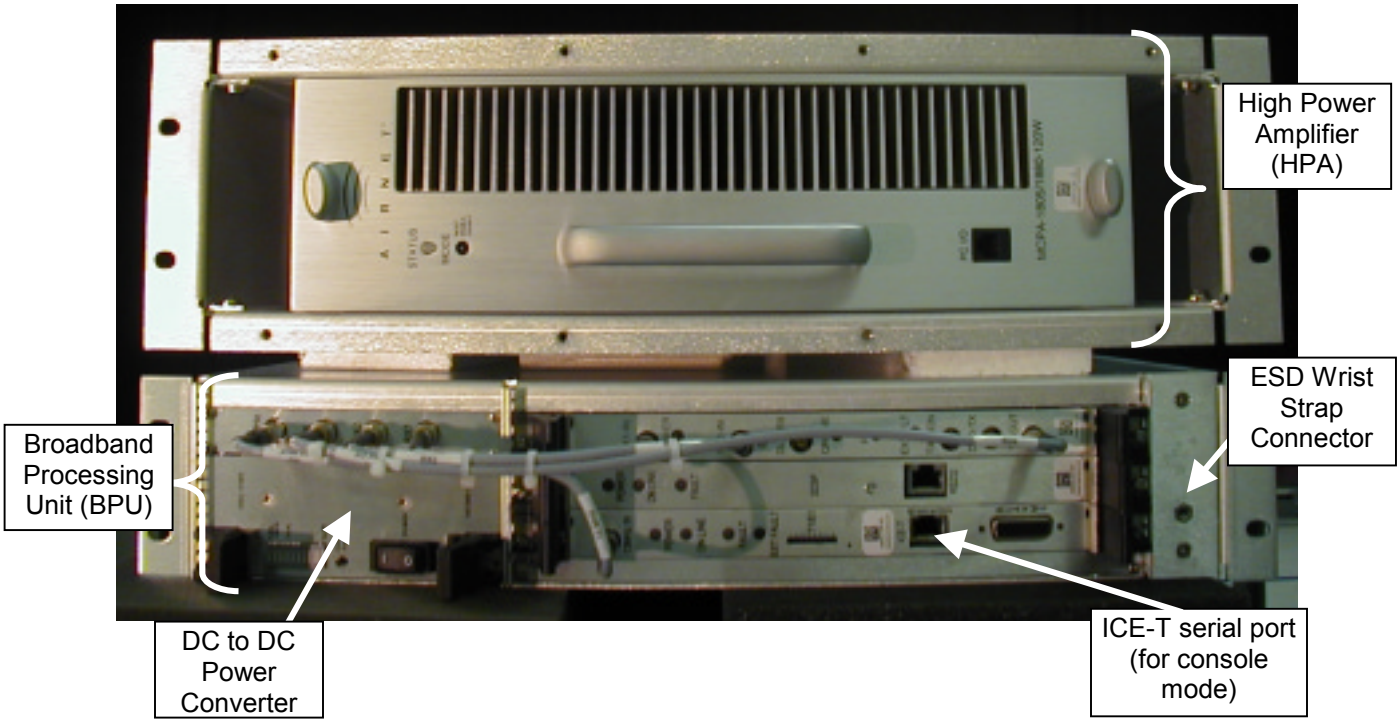

Figure 1-5 Front view

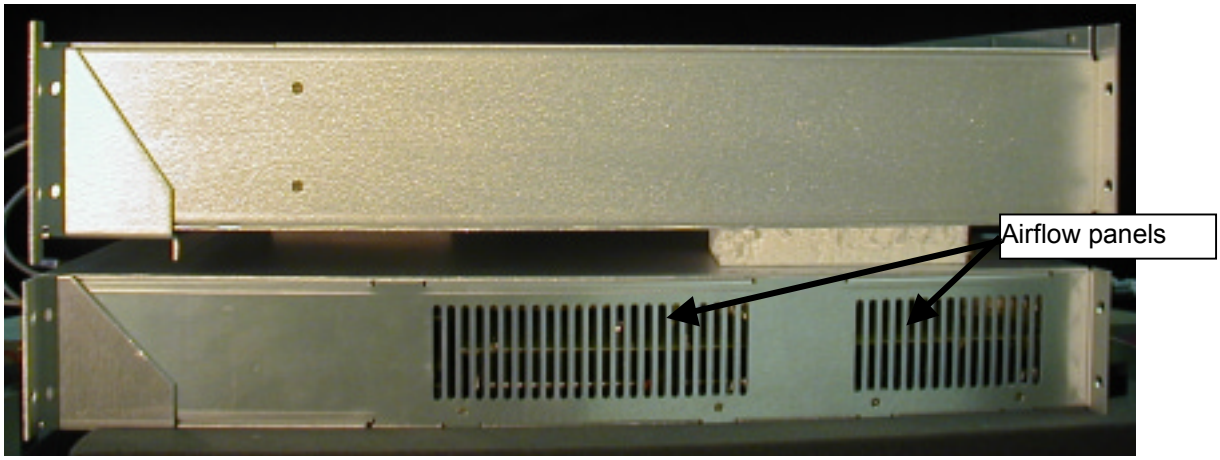

Figure 1-6 Side view

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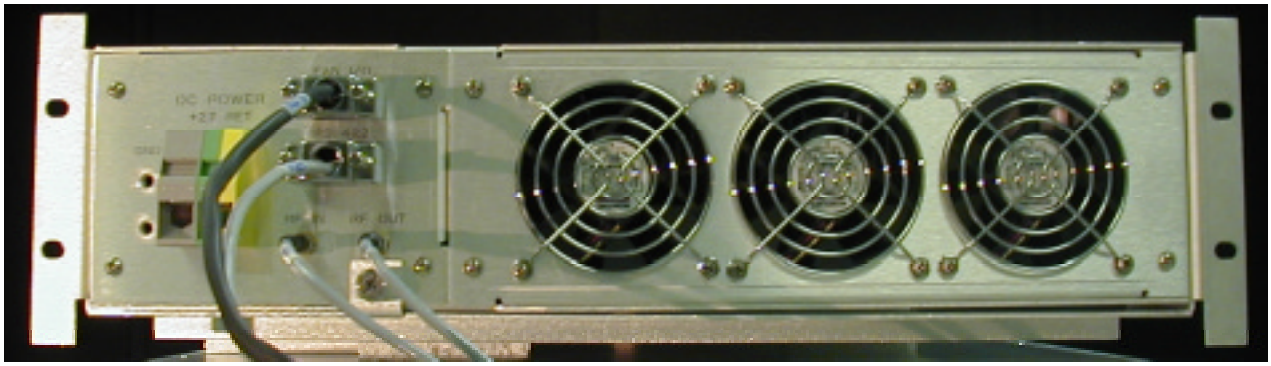

Figure 1-7 Rear view of HPA

Figure 1-8 Rear view of BPU

Note

Note – The TX MON port may be located above the TX OUT port, as shown in Figure 1-8 above, or below the TX IN port, as shown in Figure 1-10. Ensure that you check the silkscreen/label before connecting a cable to an I/O port.

1.13 Front Panel Ports

Refer to Figure 1-5. The only interface available for customer use is the Serial port on the ICE-T module. This serial port is used to access the BTS-4000RM in console mode.

1.14 Rear I/O Panels

There are two I/O panels on the BPU and one on the HPA.

1.14.1 HPA I/O Panel

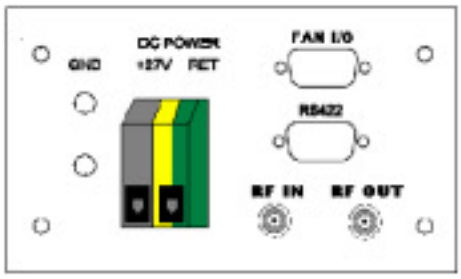

Figure 1-9 HPA Rear I/O Panel

1.14.2 BPU I/O Panels

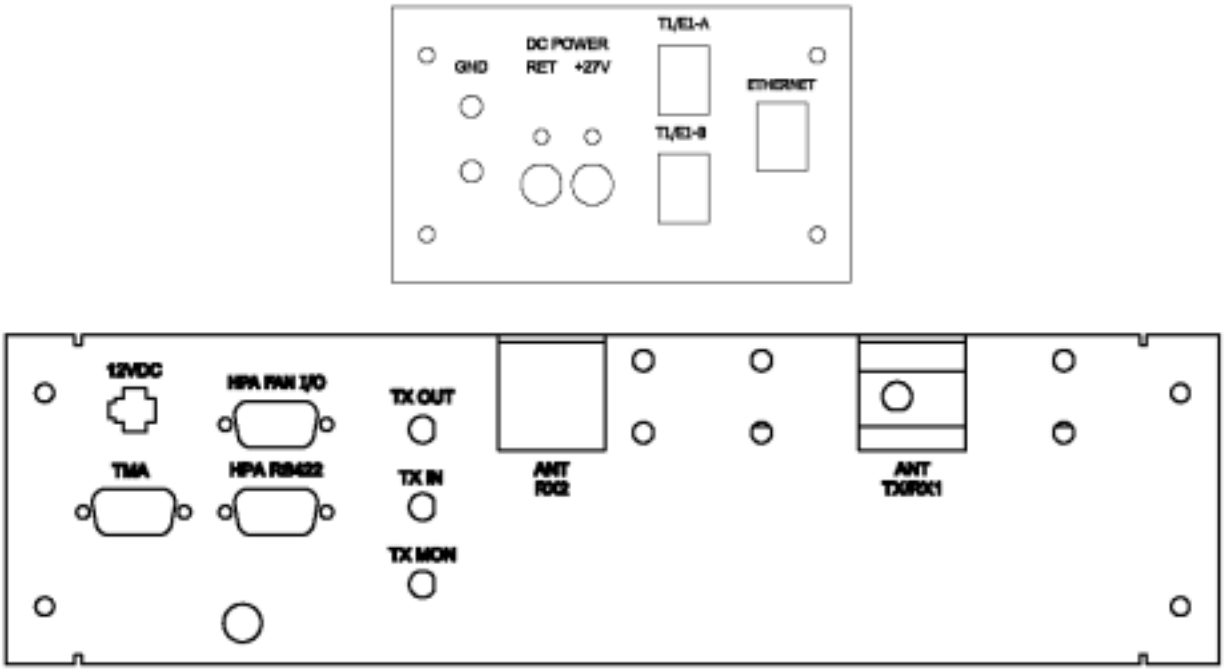

Figure 1-10 BPU Rear I/O Panels

Note

Note – The TX MON port may be located above the TX OUT port, as shown in Figure 1-8, or below the TX IN port, as shown in Figure 1-10 above. Ensure that you check the silkscreen/label before connecting to an I/O port.

1.15 External Connections

At the ICE-T Module (see Figure 1-5)

Serial Port:	The RJ-45 serial port on the front panel of the ICE-T module is used to connect a computer to the BTS-4000RM BPU for console mode access.

At the HPA I/O Panel (see Figure 1-9)

GND:	Grounding for power to the BTS-4000RM BPU.
DC POWER +27V:	+27VDC input to the HPA.
DC POWER RET:	Power return.
FAN I/O:	Connects to the 'HPA FAN I/O' port on the rear panel of the BPU.
RS-422:	Connects to the 'HPA RS-422' port on the rear panel of the BPU.
RF IN:	Connects to the 'TX OUT' port on the rear panel of the BPU.
RF OUT:	Connects to the 'TX IN' port on the rear panel of the BPU.

At the BPU Rear Panels (see Figure 1-10)

GND:	Grounding for power to the BTS-4000RM BPU.
DC POWER RET:	Power return.
DC POWER +27V:	+27VDC input to the BTS-4000RM BPU.
T1/E1-A:	T1 or E1 connection.
T1/E1-B:	T1 or E1 connection.
ETHERNET:	Ethernet connection to the BPU for Local Maintenance Terminal configuration. Use the appropriate Ethernet cable (straight through or crossover) for the type of connection (through an Ethernet hub or directly connected to the LMT).
12 VDC:	Used to power components when the BTS-4000RM is configured in an enclosure.
TMA:	Provides power to Tower Mounted Amplifiers (TMAs).
HPA FAN I/O:	Connects to the 'FAN I/O' port on the HPA I/O panel.
HPA RS-422:	Connects to the 'RS-422' port on the HPA I/O panel.
TX OUT:	Connects to the 'RF IN' port on the rear panel of the HPA.
TX IN:	Connects to the 'RF IN' port on the rear panel of the HPA.
TX MON:	Transmit monitor port. The coupling value at the Tx Monitor port is typically -30 dB ±0.5 dB.
ANT RX2:	Connection point for the diversity receive (RX2) antenna coax cable.
ANT TX/RX1:	Connection point for the transmit/receive antenna (TX/RX) coax cable.

1.15.1 Components

The BTS-4000RM BPU contains the following components:

- A Broadband Processing Unit, which contains:
  - A DC to DC power converter to convert the +27 VDC to +5 VDC and +12 VDC for the BPU modules
  - A High Stability Oscillator (HSO) module as clocking/frequency source
  - An ICE-T module for integrated CPU, Flash, and T1/E1 network connectivity
  - A SDSP module for digital signal processing
  - A Broadband Digital Transceiver (BDX) module
- A wholeband RF filter/duplexer to separate and/or combine TX and RX bands

1.15.2 BTS-4000RM Broadband Processing Unit (BPU)

Figure 1-11 shows the components in the BTS-4000RM BPU.

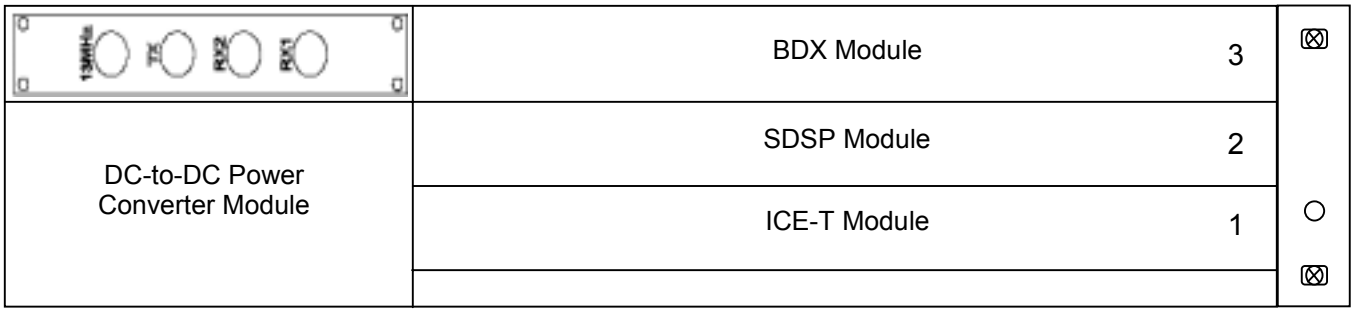

Figure 1-11 BTS-4000RM BPU

1.15.2.1 DC to DC Power Converter Module

The DC to DC Power Converter receives +27 VDC from an AC to DC Power Converter and converts it to +12 VDC and +5 VDC used by the modules in the BPU. Refer to Section 4.2.2 for a view of the DC-to-DC power converter module and additional information.

The backplane provides input voltage/output voltage/signal interface for all the modules.

The power converter module has a power switch on the front panel. For the power converter module to operate, the switch must be in the ON position.

1.15.2.2 High Stability Oscillator Module (Clocking/Frequency Source)

The BTS-4000RM uses a Rubidium-based High Stability Oscillator (HSO) module as a local frequency reference and to generate internal clock timing. See

1.15.2.3 ICE-T Module

The ICE-T (integrated CPU, E1/T1) module is used to configure and monitor all other modules. As such, it is responsible for call processing, fault management, and general operation and maintenance of the BTS-4000RM.

The ICE-T module also provides flash memory storage for the hardware configuration and boot image, and Compact Flash module as bulk memory storage for the control processor. The Compact Flash module is removable, but not accessible from the front panel.

The ICE-T module has the following features:

- A front panel serial interface for configuration of the processor's boot source, diagnostics, etc.
- An Ethernet interface (10/100BaseT) used to load software, access the local maintenance terminal, etc.
- Card level reset in the event that software is not functioning properly.
- Alarms via the front panel LEDs.

1.15.2.4 SDSP Module

The SDSP module processes voice and signaling data from the telecommunication network and modulates the data for transmission to the mobile subscriber. Likewise, modulated data from the mobile subscriber are received by the SDSP as digitally sampled baseband signals. These signals are demodulated and formatted for transfer over the telecommunications network. Modulation and data formats are specific to the air-interface protocol of the wireless system. The SDSP module uses general-purpose digital signal processors allowing flexibility in the implementation of the protocol for a given application.

The BTS-4000RM currently supports one SDSP module. A SDSP module processes up to 4 GSM RF carriers as well as voice transcoding for voice channels on those RF carriers. Transcoding converts the voice signal from the speech-compressed format in the GSM radio signal to standard PCM for compatibility with public switched telecommunications networks (PSTN).

1.15.2.5 Broadband Digital Transceiver (BDX) Module

The Broadband Digital Transceiver (BDX) module provides the link between the SDSP module and the desired RF spectrum. The BDX module performs frequency conversion of a 5 MHz block of spectrum between the RF frequency transmitted and received over the air, and the IF frequency used to process the broadband signal. It is also programmable to support the carrier frequency bandwidth of any air-interface protocol.

The BDX module provides one transmit path and two receive paths (for receiver diversity). These paths are used to route communication channels between the BSS antenna and the SDSP while implementing the baseband/broadband conversion process.

On the receive side, the BDX takes the broadband RF signal from the antenna assembly and translates it to a composite IF signal consisting of frequency multiplexed RF carriers. It then channelizes the IF spectrum into individual modulated baseband signals and time multiplexes those signals for transfer to the DSP modules.

On the transmit side, the BDX receives multiple modulated baseband signals from the DSP modules and translates each baseband signal to a unique IF frequency that is then mixed up to an RF carrier frequency. The resulting transmit signal is filtered, level adjusted, and output to the HPA module (if installed).

All BDX local oscillator RF signals and ADC / DAC clocks are phase locked and time-synchronized with reference signals (13 MHz, 1PPS) generated in the HSO module.

The BDX can also be configured in a loopback mode for diagnostic and performance testing.

Following is a list of BDX module features:

- Down converts two low-noise diversity receive RF paths to 12 digitally filtered receive channel pairs.
- Combines and up converts 12 digital transmit channels to one composite RF waveform.
- Provides downlink RF loopback, where either the internal TX RF signal or an external TX RF signal is mixed into both RX RF paths. The 12 TX signals loop into the 12 pairs of RX paths.
- Provides downlink digital loopback, where digital TX signal is looped back into both RX paths.
- Provides uplink digital loopback, where either RX path may be looped back to the TX path.
- Performs Analog/Digital conversion via two high-speed analog-to-digital (A/D) converters and one high-speed digital-to-analog (D/A) converter sampling.
  - The A/D-D/A sample clock, TX RF LO, TX IF LO, RX RF LO, RX IF LO, and loopback synthesizers are all low phase noise and actively phase-locked to a common HSO frequency and timing reference.
  - Provides twelve pairs of digital down conversion and decimation paths for the A/D data receive paths.
  - Provides twelve digital up conversion and interpolation paths for the D/A data transmit path.
- Provides up to 30 dB of automatic gain control (AGC) in 1 dB steps up in both RX paths.
- Provides up to 14 dB of static power control (SPC) attenuation with 2 dB steps in the TX path.
- Includes internal controller for synthesizer programming, AGC control, and alarm monitoring.
- Fully synthesized for 200 kHz step increments with 5 MHz of instantaneous bandwidth.
- Contains serial non-volatile memory that is used to store module's revision ID, serial number, transmit IF gain, transmit LO gain, receive IF gain attenuator adjustments, and calibration offsets.
- "Hot swappable" while the BTS-4000RM chassis is powered.
- Allows the transmit output level to be adjusted electronically over a 15.5 dB range in 0.5 dB steps to compensate for HPA gain variations (if HPA is installed).

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2. USER INTERFACES

The BTS-4000RM has three user interfaces:

BTS-4000RM BPU Console:

Advanced command line interface for maintenance, debugging, software installation, etc. Accessed using the serial port on the front panel of the ICE-T module.

Local Maintenance Terminal (LMT):

Easy to use, text based menus for routine BTS-4000RM BPU administration. Functionality includes changing BTS-4000RM BPU configuration, etc. Accessed from the Ethernet interface on the rear I/O panel of the unit.

2.1 BTS-4000RM BPU Console

The BTS-4000RM BPU console is accessed using the RJ-45 serial connection on the front panel of the ICE-T module. This port is for access by trained administrators only. Uses for the BTS-4000RM BPU console include:

- Changes to the boot configuration (IP address, etc.)
- Software changes/upgrades
- Diagnostics
- Debug access
- Log access

2.1.1 Accessing the BTS-4000RM BPU in Console Mode

To access the BTS-4000RM BPU in console mode, it is necessary to connect a PC (e.g. a laptop) with terminal communication software (such as HyperTerminal) to the serial port on the front panel of the ICE-T module. Console mode is used to determine the status of the equipment and run diagnostics on the BTS-4000RM BPU components.

Use the following procedure to connect to the BTS-4000RM BPU.

1. Using a serial cable, connect a PC with a Terminal Emulator program (such as HyperTerminal) to the RJ-45 serial connector on the front panel of the ICE-T module.

2. Turn on power to the PC and verify the terminal settings of the PC terminal software are set as follows:

Terminal Emulation:	TTY
Baud Rate:	9600
Data Bits:	8
Stop Bits:	1
Parity:	NONE
Flow Control:	NONE

If the above settings do not appear, reference the User's manual for your communications software to troubleshoot the problem.

3. Start the terminal emulation connection to the BTS-4000RM BPU. The `AirNet BTS->` prompt will appear.

2.2 Local Maintenance Terminal (LMT)

The LMT is the primary user interface to the BTS-4000RM BPU. It is accessed via the Ethernet interface, located on the rear I/O panel. The Ethernet interface is typically routed through a network hub. Functionality accessible through this configuration interface includes:

- Accessing the phone number database (adding/deleting users, etc).
- Changing configuration of the BTS-4000RM BPU (transmit power level, frequencies, adding AirSites, etc).
- Rebooting the BTS-4000RM BPU

The Ethernet interface can be connected to a normal IP network (e.g. an Ethernet hub) or direct connected to a PC (e.g. a laptop).

Each time the BTS-4000RM BPU reboots, the user must reestablish the connection to the LMT software. The LMT is available once the BTS-4000RM BPU has rebooted and initialized (about 3 minutes after rebooting).

2.2.1 Accessing the BTS-4000RM BPU using the LMT

Perform the following procedure to connect a Local Maintenance Terminal to the BTS-4000RM BPU:

1. If using a laptop computer to make a local Ethernet connection, connect the laptop to the Ethernet port using an Ethernet cable. Ensure that the laptop is configured with an IP address that allows communication with the BTS-4000RM BPU.

2. Telnet to the BTS-4000RM BPU IP address[2] as follows:

   From a computer running Microsoft® Windows® Start->Run menu or a UNIX command line prompt, type:

   `telnet xxx.xxx.xxx.xxx 2002 <ENTER>`

   The following greeting is displayed:

   ```
   Welcome to the BTS LMT!
   Press <Enter> to continue
   ```

[2] If you do not know the IP address of the iBSS BPU, it can be determined from the boot parameters while in console mode.

3. Press **Enter** to continue. The Main Menu is displayed:

```
======================
iBSS Main Menu
======================
  1) Phone number database
  2) Current config/status
  3) Staged config
  4) Software version info
  5) IP Address Configuration
  6) Reboot BTS

Enter menu selection:
```

4. The LMT is a text based menu driven interface. To select a menu option, select the number of your choice and then press **Enter**. The steps to select the Main Menu options are provided in subsections 2.2.2 through 2.2.7.


Note

Note - If you type a selection from the Main Menu, but are unable to see it on the screen (for example, if you type 1 to select 'Phone Number Database', and the 1 is not displayed on the screen), you must enable the Local Echo parameter. In most Microsoft operating systems, this parameter is found in the Hyperterminal properties window. However, in some operating systems, such as Windows 2000, this parameter is set by performing the following steps:

1. Press the **CTRL** key and the right bracket **]**, and then press **Enter**.

2. Type **set LOCAL_ECHO**, and then press **Enter**.

3. Repeat the Telnet command.

2.2.2 Phone Number Database

From the “Phone number database” option on the LMT, a user can:

- display the phone numbers in the database
- add phones by automatically capturing IMSI
- add phones by manually entering IMSI
- delete phones from the database

Selecting **1** from the Main Menu displays the Phone number database options shown below:

```
1) Phone Number Database
========================
  1) Display phone database
  2) Capture/Add IMSI from phone
  3) Add phone to database
  4) Delete phone from database
  5) Edit phone database
  6) Save database to disk

  7) Upload Database (Xmodem)
  8) Download Database (Xmodem)

  p) Previous menu
  m) Main menu

Enter menu selection:
```

The steps to select the Phone Number Database options are provided in subsections 2.2.2.1 through 2.2.2.8.

2.2.2.1 Display the phone database

1. From the Phone Number Database menu, type **1** and press **Enter** to select "*Display phone database*". The complete HLR database and total number of entries is displayed. Following is an example with five entries:

```
HLR Database (5 entries):
Entry                Phone #                  IMSI
=====        ==============       ===============
1)                      5845       000000000001013
2)                      2318       001010000002010
3)                      8275       001010000002004
4)                      8276       001010000002006
5)                    123456       001010000002017

End of HLR Database
Press <Enter> to continue:
```

2. Press **Enter** to return to the Phone Number Database menu.

2.2.2.2 Capture/Add IMSI From Phone

Option 2 from the Phone Number Database menu is used to capture the IMSI from any mobile during the process of registration with the BTS. The captured IMSI is from a mobile that is not configured in the BTS HLR.

1. From the Phone Number Database menu, type **2** and press **Enter** to select "*Capture/Add IMSI from phone"*.

```
Attempt network selection on phone that you want to add.

We'll capture IMSI's until you hit <Enter>

Press <Enter> to continue:
```

2. Press **Enter** to continue.

3. Attempt to access the network with the mobile phone. You should see a response similar to the following displayed on the screen:

```
Captured ISMI: xxxxxxxxxxxxxxx
```


Note

Note - If a valid IMSI is not detected, the message *No valid IMSI's captured'* is displayed.

4. Press **Enter** to select the IMSI shown on the screen. You are prompted to add the new IMSI or to quit.

```
1) Add xxxxxxxxxxxxxxx
q) To quit without adding any more phones
```

5. Press **1** to add the IMSI shown on your screen to the BTS. A confirmation message is displayed:

```
Adding IMSI xxxxxxxxxxxxxxx
Enter phone number (2 to 15 digits):
```

6. Enter the phone number associated with this IMSI and then press **Enter**. The phone number can contain 2 to 15-digits. A confirmation message is displayed.

```
Successfully added xxxxxxxxxxxxxxx as phone number yyyyyyyyyy
```

The Main Menu is displayed again.

7. When the Phone Number Database menu is displayed again, type **6** to select "*Save database to disk*".

2.2.2.3 Add a phone number to the database

This procedure can be used to manually add a phone number to the HLR database.

1. From the Phone Number Database menu, type **3** and press **Enter** to select "*Add phone to database*". The following prompt is displayed:

   ```
   Enter ISMI (15 digits) of phone to add (or q to quit):
   ```

2. Type the fifteen-digit IMSI and then press **Enter**. The following prompt is displayed:

   ```
   Enter phone number (2 to 15 digits) (or q to quit):
   ```

3. Type a two to fifteen-digit phone number and then press **Enter**. A success message should be displayed similar to the following example:

   ```
   Successfully added xxxxxxxxxxxxxxx as phone number yyyy.
   Enter IMSI (15 digits) of phone to add (or q to quit):
   ```

4. Type **q** to return to the Phone Number Database menu.

2.2.2.4 Delete a phone number from the database

This procedure can be used to manually delete a phone number from the HLR database.

1. From the Phone Number Database menu, type **4** and press **Enter** to select "*Delete phone from database*". The following prompt is displayed:

   ```
   Enter Phone Number to delete (or q to quit):
   ```

2. Type the phone number you wish to delete and then press **Enter**. If the phone number is found in the database, the following message is displayed:

   ```
   Successfully deleted xxxx from database.
   Enter Phone Number to delete (or q to quit):
   ```

3. Type **q** to return to the Phone Number Database menu.


Note

Note - If the number is not found in the database, the message "`Unable to find xxxx in database`" is displayed. The user will be prompted to press Enter to continue, which returns them to the Phone Number Database menu.

2.2.2.5 Edit the phone database

This procedure can be used to edit the HLR database.

1. From the Phone Number Database menu, type **5** and press **Enter** to select "*Edit phone database*". The following menu is displayed:

```
Edit phone database:
    c = Change phone number
    d = Delete phone number / IMSI
    p = Goto previous entry
    <#> = Goto given entry
    q = Quit

HLR Database (5 entries):
Entry               Phone #                IMSI
=====         ==============      ===============
1)                  1234567      000000000001013  (c, d, p, <#>, q)?
```

2. Type the appropriate selection (**c**, **d**, **p**, **#**, or **q**) depending on how you would like to proceed. Follow the prompts that are displayed.

3. When you are done editing the phone database, type **q** to return to the Phone Number Database menu.


Note

Note - If the number is not found in the database, the message "`Unable to find xxxx in database`" is displayed. The user will be prompted to press Enter to continue, which returns them to the Phone Number Database menu.

2.2.2.6 Save the HLR Database to Disk

This option saves the HLR database to disk. Always save any HLR configuration after you are done making changes.

1. From the Phone Number Database menu, type **6** and press **Enter** to select "*Save database to disk*". The following message is displayed:

```
Saving HLR database to disk.
Save completed.
Press <Enter> to continue:
```

2. Press **Enter** to return to the Phone Number Database menu.

2.2.2.7 Upload Database (Xmodem)

This option is used to upload a phone number database. It is only applicable in Standalone mode or ISDN mode.

2.2.2.8 Download Database (Xmodem)

This option is used to download a phone number database. It is only applicable in Standalone mode or ISDN mode.

2.2.3 Current Configuration

The LMT provides access to the current configuration and the staged configuration. The current configuration is the configuration setup that is currently being used by the BTS-4000RM BPU. The staged configuration is the configuration that the user can modify and save to the BTS-4000RM BPU flash.

Selecting 2 from the Main Menu displays the Current Configuration options shown below:

```
2) Current Configuration
========================
  1) Current configuration
  2) Cell status
  3) Active call summary
  4) Call measurement summary

  p) Previous menu
  m) Main menu

Enter menu selection:
```

The steps to select the Current Configuration Menu options are provided in subsections 2.2.3.1, through 2.2.3.4.

2.2.3.1 Display the Current Configuration

3. At the *Current Configuration* menu, type **1** and press **Enter** to select "*Current configuration*". The current BTS MIB is displayed. Following is an example of the BTS MIB:

```
Current BTS Mib:
================
        BTS Mode:   A_OVER_IP
         MCC/MNC:   310/99
    Network Type:   E1
          MSC IP:   1.2.3.4
 Starting PCM ID:   1            MSC Point Code:    5-14-228
  SUA ID/IBSS ID:   1            BSC Point Code:    5-14-108
        E1 spans:   A
    SGSN IP Addr:   1.2.3.4
       SGSN Port:   23000                NSVCI:    1
        PCU Port:   22000                 NSCI:    1
Cell 0 (local):
GSM Cell Id: 15       BSIC: 0    LAC: 0     Max Data RFs: 1
  RF     ARFCN       EDGE
  ==     =====       ====
   0       812        yes
   1       814         no

Press <Enter> to continue:
```

4. Press **Enter** to return to the *Current Configuration* menu.

2.2.3.2 Display the Current Cell Status

1. At the Current Configuration menu, type **2** and press **Enter** to select "*Cell status*". The current cell status is displayed. Following is an example of the cell status:

```
Current SUA Status
====================
Local Allowed - Remote Allowed

Current Cell Status
====================
Local Cell => In Service

Enter r to refresh, or Enter to continue:
```

2. Press **Enter** to return to the Current Configuration menu.

2.2.3.3 Display a Summary of Active Calls

1. At the Current Configuration menu, type **3** and press **Enter** to select "*Active call summary*". The summary is displayed. Following is an example of an active call summary:

```
                Num Active
 Cell Name     Voice Calls
==========     ===========
Local Cell               1

Press Enter to refresh, q to quit:
```

2. Press **q** and then press **Enter** to return to the Current Configuration menu.

2.2.3.4 Display a Call Measurement Summary

1. At the Current Configuration menu, type **4** and press **Enter** to select "*Call measurement summary*". The summary is displayed. Following is an example of a call measurement summary:

```
        CellName  #VoiceCalls   AvgLen(Sec)  #SMS
      ==========  ===========  ===========  =====
Since Reboot:
   Local Cell           784          117      0

Last hour:
   Local Cell           205          127      0

Press <Enter> to continue:
```

2. Press **Enter** to return to the Current Configuration menu.

2.2.4 Staged Configuration (Changing the BTS-4000RM BPU Configuration)

The LMT provides access to the current configuration and the staged configuration. The current configuration is the configuration setup that is currently being used by the BTS-4000RM BPU. The staged configuration is the configuration that the user can modify and save to the BTS-4000RM BPU flash.

The following must take place for the staged configuration to take effect:

- the staged configuration must be saved to flash (using the LMT) AND
- the BTS-4000RM BPU must be rebooted.

Selecting 3 from the Main Menu displays the Staged Configuration options shown below:

```
3) Staged Configuration
=======================
  1) Change BSS configuration parameters
  2) Change MSC I/F parameters
  3) Change IDSN I/F parameters
  4) Change PCU Parameters
  5) Change SIP I/F Parameters

  6) Display staged config
  7) Save staged changes to flash

  8) Create new staged config

  p) Previous menu
  m) Main menu
Enter menu selection:
```

The Staged Configuration Menu options are explained in subsections 2.2.4.1 through 2.2.4.8.

2.2.4.1 Change BSS Configuration Parameters

1. At the *Staged Configuration* menu, type **1** and press **Enter** to select "*Change BSS configuration parameters*". The following menu is displayed:

```
3.1) BSS Configuration Params
============================
  1) Change country/network code
  2) Change full scale power
  3) Change RF frequencies
  4) Change AirSite config
  5) Change neighbor cells
  6) Change network name

  p) Previous menu
  m) Main menu
Enter menu selection:
```

The steps to select the BSS Configuration Params Menu options are provided in subsections 2.2.4.1.1 through 2.2.4.1.6.

2.2.4.1.1 Change Country/Network Code

1. At the *BSS Configuration params* menu, type **1** and press **Enter** to select "*Change country/network code*". The following prompt is displayed:

```
Enter Country Code(MCC)(default=xxx):
```

2. Type the Country Code and then press **Enter**. The following prompt is displayed:

```
Enter Network Code(MNC)(default=xx):
```

3. Enter the Network Code and then press **Enter**. The following message is displayed:

```
Setting staged Country/Network code to xxx/xx
Press <Enter> to continue:
```

4. Press **Enter** to return to the *BSS Configuration params* menu.

2.2.4.1.2 Change Full Scale Power


Note

Notes:

1) Full Scale Power is the maximum RF transmit power level for any RF on the BTS. Valid values are 36 to 44 dBm in 1dB steps. The default is 43 dBm (20 watts).

2) If an HPA is not used, the message "You can't set full scale power with no HPAs!" is displayed.

1. At the *BSS Configuration params* menu, type **2** and press **Enter** to select "*Change full scale power*". The following messages are displayed:

```
Full scale power can be 36 - 44 dBm in 1 dB steps.
Enter full scale power (in dBm)(default=43):
```

2. Enter the full scale power value and then press **Enter**. A message similar to the following is displayed:

```
Setting staged full scale power to xx dBm
Press <Enter> to continue:
```

3. Press **Enter** to return to the *BSS Configuration params* menu.

2.2.4.1.3 Change RF frequencies

The RapidCell stores ARFCNs for each configured RF for each frequency band (850, 900, 1800, or 1900 MHz). When changing the ARFCNs you will be able to change the set corresponding to the current frequency band. If a 1900 HPA module is installed, the user is prompted for 1900 ARFCNs.

1. At the *BSS Configuration params* menu, type **3** and press **Enter** to select "*Change RF Frequencies*". A list of staged ARFCNs is displayed. Following is an example of this list:

```
Staged ARFCNs:
==============
         Freq Band:   1900   1800    900    850
====================  ====   ====   ====   ====
RF 0 (cell 0) ARFCN:   750    851      4    130
RF 1 (cell 1) ARFCN:   752    853      6    132

Enter 1900-ARFCN for RF 0, cell 0 (default=750):
```

2. A prompt for each RF will be displayed. Enter the desired 'staged' ARFCN for each RF and then press **Enter** to continue. The New Staged ARFCNs are displayed. In the following example, ARFCN 743 was selected for RF 0, and ARFCN 745 was selected for RF 1.

```
New Staged ARFCNs:
==================
         Freq Band:   1900   1800    900    850
====================  ====   ====   ====   ====
RF 0 (cell 0) ARFCN:   743    851      4    130
RF 1 (cell 1) ARFCN:   745    853      6    132

Press <Enter> to continue:
```

3. Press **`Enter`** to return to the *BSS Configuration params* menu.

4. Type **p** and press **Enter** to return to the *Staged Configuration* menu. Type **7** and press **Enter** to save the changes to flash. The changes will take effect after the next reboot. A message similar to the following is displayed:

```
Saving mib to flash...   Successful!
Changes take effect on next reboot.
Press <Enter> to continue:
```

5. Press **Enter** to return to the *Staged Configuration* menu.

2.2.4.1.4 Change AirSite Configuration

1. At the *BSS Configuration params* menu, type **4** and press **Enter** to select "*Change AirSite config*". A list of AirSites on the network is displayed.


Note

Note - If there are no AirSites on the network, the message "There are no AirSites in the staged config" is displayed.

2.2.4.1.5 Change Neighbor Cells

1. At the *BSS Configuration params* menu, type **5** and press **Enter** to select "*Change neighbor cells*". A list of neighbor cells is displayed:

```
Neighbor Cells
Neighbor # MCC/MNC    LAC   Cell ID    ARFCN BSIC
========== =======    ===   =======    ===== ====
none

Edit neighbor configuration:
   - (c) Change existing neighbor cell
   - (d) Delete existing neighbor cell
   - (a) Add new neighbor cell
   - (q) Quit
   (c, d, a, q)?
```

2. Choose c, d, a, or q and then press **Enter**.

If you choose 'c' you will be prompted for the neighbor cell number to change and then you will be prompted for the modified neighbor cell information (Country Code (MCC), Network Code (MNC), LAC, GSM Cell ID, ARFCN, and BSIC).

If you choose 'd' you will be prompted for the neighbor cell number. When you enter the neighbor cell number, the neighbor cell information is displayed and you are prompted to confirm if you want to delete this neighbor cell. Press **y** to confirm.

If you choose 'a' you will be prompted for the Country Code (MCC), Network code (MNC), GSM Cell ID, ARFCN, BSIC, and LAC of the neighbor cell that you are adding.

Selecting 'q' returns you to the *BSS Configuration Params* menu.

2.2.4.1.6 Change Network Name

1. At the *BSS Configuration params* menu, type **6** and press **Enter** to select "*Change neighbor cells*". The following prompt is displayed: `Enter new network name (default = <current name>):`

2. Type a new network name and then press **Enter**. The following message is displayed: `Setting Network Name to <  >. Press <Enter> to continue.`

3. Press **Enter** to return to the *BSS Configuration params* menu.

2.2.4.2 Change MSC I/F parameters


Note

Note - The "*Change MSC I/F Parameters*" option is only available in 'iBSS' (A-over-IP) mode.

1. At the *Staged Configuration* menu, type **2** . The following menu is displayed:

```
3.2) MSC Interface Configuration Params
=======================================
  1) Change MSC IP address
  2) Change point codes
  3) Change PCM group id
  4) Change SUA routing context
  5) Change cell id/LAC/BSIC
  6) Change E1/T1 span config

  p) Previous menu
  m) Main menu

Enter menu selection:
```

The MSC Interface Configuration Params options are explained in subsections 2.2.4.2.1 through 2.2.4.2.6.

2.2.4.2.1 Change MSC IP Address

1. At the *MSC Interface Configuration Params* menu, type **1** and press **Enter** to select "Change MSC IP address". The following messages are displayed:

```
Enter MSC's IP address (default = 1.2.3.4):

Setting staged MSC IP address to 1.2.3.4
Press <Enter> to continue:
```

2. Press **Enter** to continue. The *MSC Interface Configuration Params* menu is displayed again.

2.2.4.2.2 Change Point Codes

1. At the *MSC Interface Configuration Params* menu, type **2** and press **Enter** to select "Change point codes". The following messages are displayed:

```
Enter MSC Point Code (default = 5-14-228):
Enter BSS Point Code (default = 5-14-108):
Press <Enter> to continue:
```

2. Press **Enter** to continue. The *MSC Interface Configuration Params* menu is displayed again.

2.2.4.2.3 Change PCM Group ID

1. At the *MSC Interface Configuration Params* menu, type **3** and press **Enter** to select "Change PCM group id". The following messages are displayed:

```
Enter starting PCM Group ID (default = 1):
Press <Enter> to continue:
```

2. Press **Enter** to continue. The *MSC Interface Configuration Params* menu is displayed again.

2.2.4.2.4 Change SUA Routing Context

1. At the *MSC Interface Configuration Params* menu, type **4** and press **Enter** to select "Change SUA routing context". The following messages are displayed:

```
Enter SUA Routing Context/IBSS ID (default = 1):
Press <Enter> to continue:
```

2. Press **Enter** to continue. The *MSC Interface Configuration Params* menu is displayed again.

2.2.4.2.5 Change Cell ID/LAC/BSIC

1. At the *MSC Interface Configuration Params* menu, type **5** and press **Enter** to select "Change cell id/LAC/BSIC ". The following messages are displayed:

```
Enter GSM Cell ID for Local Cell? (default = 15)
Press <Enter> to continue:
```

2. Press **Enter** to continue. The *MSC Interface Configuration Params* menu is displayed again.

2.2.4.2.6 Change E1/T1 Span Config

1. At the *MSC Interface Configuration Params* menu, type **6** and press **Enter** to select "Change E1/T1 span config ". The following messages are displayed

```
Enter network type, e (E1) or t (T1) (default = t):

Setting network type to T1
Enter E1/T1 Spans to configure (default = B):
Configuring spans B
Press <Enter> to continue:
```

2. Press **Enter** to continue. The *MSC Interface Configuration Params* menu is displayed again.

3. Press **m** to return to the *Main Menu*.

2.2.4.3 Change ISDN I/F parameters


Note

Note - The "*Change ISDN I/F Parameters*" option is only available in 'ISDN' mode.


Note

Note – The switch connected to the BTS needs to be appropriately configured to match the BTS configuration. The connected switch or PBX should be configured as:

1. Having matching ISDN variant(s).
2. The “Network Side”.
3. Calling party number screening turned off.
4. Having the BTS HLR DNs associated with the connected spans to allow MT calls.
5. Delivering the called number digits exactly as entered in the HLR database. That is, if the HLR contains 10-digit DNs (e.g., 3219841990), the PBX must send 10 digits to the BTS. Traditionally, a PBX would only send the extension (e.g., 1990), omitting the area and office codes (e.g., 321 and 984).

1. At the *Staged Configuration* menu, type **3** and press **Enter** to select "*Change ISDN I/F parameters*". The following messages are displayed:

```
3.3) ISDN Interface Configuration Params
=======================================
  1) Change E1/T1 span config
  2) Change ISDN variant
  3) Change emergency digits
  p) Previous menu
  m) Main menu
```

```
Enter menu selection:
```

The ISDN Interface Configuration Params options are explained in subsections 2.2.4.3.1, 2.2.4.3.2, and 2.2.4.3.3.

2.2.4.3.1 Change E1/T1 span config

1. At the *ISDN Interface Configuration Params* menu, type **1** and press **Enter** to select "*Change E1/T1 span config*". The following message is displayed:

   ```
   Enter network type, e (E1) or t (T1) (default = t):
   ```

2. Enter the span type and then press **Enter**. You should see a message similar to the following:

   ```
   Setting network type to T1
   Enter E1/T1 Spans to configure (default = ABCD):B
   ```

3. Enter the span to configure and then press **Enter**. You should see a message similar to the following:

   ```
   Configuring spans B
   Press <Enter> to continue:
   ```

4. Press **Enter** to return to the *ISDN Interface Configuration Params* menu.

2.2.4.3.2 Change ISDN Variant

1. At the *ISDN Interface Configuration Params* menu, type **2** and press **Enter** to select "*Change ISDN Variant*". The following messages are displayed:

   ```
   Select ISDN variant
    - (1) NI2 (T1)
    - (2) ATT 4ESS (T1)
    - (3) ATT 5ESS (T1)
    - (4) DMS 100/250 (T1)
    - (5) NET5 (E1)
    - (6) NI2 NFAS (T1)
    - (7) ATT 4ESS NFAS (T1)
    - (8) ATT 5ESS NFAS (T1)
    - (9) DMS 100/250 NFAS (T1)

   Enter ISDN variant for all spans (default=DMS100[3]):
   ```

2. Enter the ISDN variant and then press **Enter**. You should see a message similar to the following:

   ```
   Configuring <your selected ISDN variant> for all spans
   Press <Enter> to continue:
   ```

3. Press **Enter** to return to the *ISDN Interface Configuration Params* menu.

[3] The default is option (4).

2.2.4.3.3 Change Emergency Digits


Note

Note - For mobile originated emergency calls, the emergency digits will be inserted into the called party number IE of the ISDN setup message.

1. At the *ISDN Interface Configuration Params* menu, type **3** and press **Enter** to select "*Change Emergency digits*". The following messages are displayed:

```
Enter Emergency Digits(default=911):
```

2. Enter the emergency digits (maximum of 4 digits) and then press **Enter**. You should see a message similar to the following:

```
Setting emergency digits to xxx
Press <Enter> to continue:
```

3. Press **Enter** to return to the *ISDN Interface Configuration Params* menu.

2.2.4.4 Change PCU Parameters


Note

Note - The "*Change PCU parameters*" menu is only available when GPRS/EDGE is enabled.

1. At the *Staged Configuration* menu, type **4** and press **Enter** to select "*Change PCU parameters*". The following messages are displayed:

```
3.4) PCU Parameters
====================
  1) Enable/Disable PCU
  2) Change SGSN IP
  3) Change SGSN Port
  4) Change PCU  Port
  5) Change NSVCI
  6) Change NSEI

  p) Previous menu
  m) Main menu

Enter menu selection:
```

The PCU Configuration Parameter options are explained in subsections 2.2.4.4.1 through 2.2.4.4.6.

2.2.4.4.1 Enable or Disable the PCU

1. At the *PCU Parameters* menu, type **1** and press **Enter** to select "Enable/Disable PCU". The following messages are displayed:

```
Enter PCU usage, y (use PCU) or n (don't use PCU) (default =
n): y
```

2. Enter "**y**" or "**n**" to enable or disable the PCU and then press **Enter**. You should see a message similar to the following:

```
Configuring PCU to run
Press <Enter> to continue:
```

3. Press **Enter** to return to the *PCU Parameters* menu.

2.2.4.4.2 Change the SGSN IP Address

1. At the *PCU Parameters* menu, type **2** and press **Enter** to select "Change SGSN IP". The following messages are displayed:

```
Enter SGSN IP address (default = <current IP address>):
```

2. Enter the SGSN IP Address and then press **Enter**. You should see a message similar to the following:

```
Setting SGSN IP to xxx.xxx.xxx.xxx
Press <Enter> to continue:
```

3. Press **Enter** to return to the *PCU Parameters* menu.

2.2.4.4.3 Change the SGSN Port Number

1. At the *PCU Parameters* menu, type **3** and press **Enter** to select "Change SGSN Port". The following messages are displayed:

```
Enter SGSN Port (default = <current SGSN port>):
```

2. Enter the SGSN Port Number and then press **Enter**. You should see a message similar to the following:

```
Setting SGSN Port to xxxx
Press <Enter> to continue:
```

3. Press **Enter** to return to the *PCU Parameters* menu.

2.2.4.4.4 Changing the PCU Port Number

1. At the *PCU Parameters* menu, type **4** and press **Enter** to select "Change PCU Port". The following messages are displayed:

```
Enter PCU  Port (default = <current PCU port>):
```

2. Enter the PCU Port Number and then press **Enter**. You should see a message similar to the following:

```
Setting PCU Port to xxxx
Press <Enter> to continue:
```

3. Press **Enter** to return to the *PCU Parameters* menu.

2.2.4.4.5 Changing the NSVCI

1. At the *PCU Parameters* menu, type **5** and press **Enter** to select "Change NSVCI". The following messages are displayed:

```
Enter NSVCI (default = <current NSVCI>):
```

2. Enter the NSVCI and then press **Enter**. You should see a message similar to the following:

```
Setting NSVCI to xx
Press <Enter> to continue:
```

3. Press **Enter** to return to the *PCU Parameters* menu.

2.2.4.4.6 Changing the NSEI

1. At the *PCU Parameters* menu, type **6** and press **Enter** to select "Change NSEI". The following messages are displayed:

```
Enter NSEI (default = <current NSEI>):
```

2. Enter the NSEI and then press **Enter**. You should see a message similar to the following:

```
Setting NSEI to xx
Press <Enter> to continue:
```

3. Press **Enter** to return to the *PCU Parameters* menu.

2.2.4.5 Change SIP I/F Parameters


Note

Note - The "*Change SIP Interface Configuration Params*" menu is only available in SIP mode.

1. At the *Staged Configuration* menu, type **5** and press **Enter** to select "*Change SIP I/F Parameters*". The SIP Interface Configuration Params menu is displayed:

```
3.5) SIP Interface Configuration Params
=======================================
  1) Change Proxy Server address
  2) Change Registration Interval
  3) Change Registration Password
  4) Change Realm Identifier

  p) Previous menu
  m) Main menu

Enter menu selection:
```

2.2.4.5.1 Change Proxy Server Address

1. At the *SIP Interface Configuration Params* menu, type **1** and press **Enter** to select "*Change Proxy Server Address*". The following prompt is displayed:

```
Enter Proxy Server IP Address (default = <current proxy server
IP address>):
```

2. Enter the new proxy server IP address and then press **Enter**. The following message is displayed:

```
Setting SIP Proxy Server IP Address to xxx.xxx.xxx.xxx
Press <Enter> to continue.
```

3. Press **Enter** to return to the *SIP Interface Configuration Params* menu.

2.2.4.5.2 Change Registration Interval

1. At the *SIP Interface Configuration Params* menu, type **2** and press **Enter** to select "*Change Registration Interval*". The following prompt is displayed:

```
Enter SIP Proxy Registration Interval (default = <current SIP
Proxy Registration Interval>):
```

2. The value of this field is an integral number of seconds (in decimal) between 0 and 9999. Enter the new proxy registration interval and then press **Enter**. The following message is displayed:

```
Setting SIP Registration Interval to xxxx
Press <Enter> to continue.
```

3. Press **Enter** to return to the *SIP Interface Configuration Params* menu.

2.2.4.5.3 Change Registration Password

1. At the SIP Interface Configuration Params menu, type **3** and press **Enter** to select "Change Registration Password".

```
Enter SIP Registration password string (default = <current SIP
Registration Password>):
```

2. Enter the new SIP registration password and then press **Enter**. The following message is displayed:

```
Setting SIP Registration Password to xxxxxxx
Press <Enter> to continue.
```

3. Press **Enter** to return to the *SIP Interface Configuration Params* menu.

2.2.4.5.4 Change Realm Identifier

1. At the SIP Interface Configuration Params menu, type **4** and press **Enter** to select "Change Realm Identifier".

```
Enter SIP realm identifier string (default = <current Realm
Identifier>):
```

2. Enter the new SIP realm identifier string and then press **Enter**. The following message is displayed:

```
Setting SIP Realm Identifier to xxxxx.xxxxx.xxx
Press <Enter> to continue.
```

3. Press **Enter** to return to the *SIP Interface Configuration Params* menu.

2.2.4.6 Display Staged Configuration

Perform the following steps to display the staged configuration.

1. At the *Staged Configuration* menu, type **6** and press **Enter** to select "*Display staged config*". Following is an example of the Staged BTS MIB that is displayed (when in SIP mode):

```
Staged BTS Mib:
===============
    Network Name:  <current name>
        BTS Mode:  SIP
         MCC/MNC:  123/45
        Local IP:  xxx.xxx.xxx.xxx
    SIP Proxy IP:  xxx.xxx.xxx.xxx
   Reg. Interval:  3600
   Reg. Password:  <current password>
Realm Identifier:  xxxxxxxxx.xxxxxx.com

Cell 0 (local):
 GSM Cell Id: 15    BSIC: 35   LAC: 1
 RF  ARFCN  EDGE
 ==  =====  ====
  0   660   no

   Press <Enter> to continue:
```

2. Press **Enter** to return to the *BSS Configuration params* menu.

2.2.4.7 Save Staged Changes to Flash

Perform the following procedure to save the staged changes to Flash Memory.

1. At the *Staged Configuration* menu, type **7** and press **Enter** to select "*Save staged changes to flash*". A message similar to the following should be displayed:

```
Saving mib to flash...   Successful!
Changes take effect on next reboot.
Press <Enter> to continue:
```

2. Press **Enter** to return to the *Staged Configuration* menu.

2.2.4.8 Create New Staged Configuration

When adding/deleting RF carriers or configuring a new AirSite, the user needs to create a new staged config.

1. At the Staged Configuration menu, type **8** and press **Enter** to select "*Create new staged config*".

2. If in Standalone Mode the following messages will be displayed:

```
Select BTS Mode:
 - (s) Standalone mode (No MSC, etc)
 - (a) iBSS mode (A-interface to MSC over IP)
 - (i) ISDN mode (ISDN interface to switch)
 - (v) SIP  mode (VOIP interface to proxy)

Enter BTS Mode (s/a/i) (default=s): s
Enter Country Code(MCC)(default=310):
Enter Network Code(MNC)(default=99):

Full scale power can be 36 - 44 dBm in 1 dB steps.
Enter full scale power (in dBm)(default=43):


Enter number of RFs in local cell (1 to 12) (default=1):
Enter 1900-ARFCN for RF 0, cell 0 (default=737):
Enter 1800-ARFCN for RF 0, cell 0 (default=812):
Enter 900-ARFCN for RF 0, cell 0 (default=92):
Enter 850-ARFCN for RF 0, cell 0 (default=130):

Enter number of AirSites (0 to 11) (default=0):
```

If in iBSS mode the following messages will be displayed :

```
Select BTS Mode:
 - (s) Standalone mode (No MSC, etc)
 - (a) iBSS mode (A-interface to MSC over IP)
 - (i) ISDN mode (ISDN interface to switch)
 - (v) SIP mode (VOIP interface to proxy)

Enter BTS Mode (s/a/i) (default=s): a
Enter Country Code(MCC)(default=310):
Enter Network Code(MNC)(default=99):
Enter network type, e (E1) or t (T1) (default = e):
Enter E1/T1 Spans to configure (default = A):
Configuring spans A
Enter MSC's IP address (default = 1.2.3.4):
Enter MSC Point Code (default = 5-14-228):
Enter BSS Point Code (default = 5-14-108):
Enter starting PCM Group ID (default = 1):
Enter SUA Routing Context/iBSS ID (default = 1):
Enter PCU usage, y (use PCU) or n (don't use PCU) (default =
n):
Enter SGSN IP address (default = 1.2.3.4):
Enter SGSN Port (default = 23000):
Enter PCU Port (default = 22000):
Enter NSVCI (default = 1):
Enter NSEI (default = 1):
```

```
   Enter GSM Cell ID for Local Cell? (default = 15)
   Enter  LAC for Cell 0 (default = 1):
   Enter BSIC for Cell 0 (default = 0):
   Enter number of RFs in local cell (1 to 12) (default=2):
   Enter number of RFs configured with EDGE for cell 1 (default =
   1):
   Enter 1800-ARFCN for RF 0, cell 0 (default=812):

   Enter number of AirSites (0 to 10) (default=0):

   Neighbor Cells
   Neighbor # MCC/MNC    LAC   Cell ID    ARFCN BSIC
   ========== =======    ===   =======    ===== ====
   none

Edit neighbor configuration:
   - (c) Change existing neighbor cell
   - (d) Delete existing neighbor cell
   - (a) Add new neighbor cell
   - (q) Quit
   (c, d, a, q)?
```

If in ISDN Mode the following messages will be displayed:

```
   Select BTS Mode:
    - (s) Standalone mode (No MSC, etc)
    - (a) iBSS mode (A-interface to MSC over IP)
    - (i) ISDN mode (ISDN interface to switch)
    - (v) SIP  mode (VOIP interface to proxy)

   Enter BTS Mode (s/a/i) (default=s): i
   Enter Country Code(MCC)(default=310):
   Enter Network Code(MNC)(default=99):
   Enter network type, e (E1) or t (T1) (default = e): e
   Enter E1/T1 Spans to configure (default = A): A
   Configuring spans A

   Select ISDN variant
    - (1) NI2 (T1)
    - (2) ATT 4ESS (T1)
    - (3) ATT 5ESS (T1)
    - (4) DMS 100/250 (T1)
    - (5) NET5 (E1)
   ------------------------
    - (6) NI2 NFAS
    - (7) ATT 4ESS NFAS
    - (8) ATT 5ESS NFAS
    - (9) DMS 100/250 NFAS
```

```
Enter ISDN variant for all spans (default=ATT5ESS):
Configuring default (ATT5ESS) for all spans

Enter Emergency Digits (default=911):
Enter PCU usage, y (use PCU) or n (don't use PCU) (default =
n):

Full scale power can be 36 - 44 dBm in 1 dB steps.
Enter full scale power (in dBm)(default=43):

Enter number of RFs in local cell (1 to 12) (default=1):
Enter 1900-ARFCN for RF 0, cell 0 (default=737):
Enter 1800-ARFCN for RF 0, cell 0 (default=812):
Enter 900-ARFCN for RF 0, cell 0 (default=1):
Enter 850-ARFCN for RF 0, cell 0 (default=130):

Enter number of AirSites (0 to 8) (default=0):

Enter serial number for AirSite 1:
Enter distance in kilometers (0-38) for AirSite 1 (default=0
km):
Enter ground ARFCN for AirSite 1 BCCH RF (default=738):
```


Note

Note - Full Scale Power is the maximum RF transmit power level for any RF on the iBSS BPU. Valid values are 36 through 44 in 1 dB steps. The default is 43 dBm (20 watts).

If in SIP mode the following messages will be displayed:

```
Select BTS Mode:
 - (s) Standalone mode (No MSC, etc)
 - (a) iBSS mode (A-interface to MSC over IP)
 - (i) ISDN mode (ISDN interface to switch)
 - (v) SIP  mode (VOIP interface to proxy)

Enter BTS Mode (s/a/i/v) (default=v): v
Enter new Network Name (default=<current name>:
Enter Country Code(MCC)(default=123):
Enter Network Code(MNC)(default=45):
Enter Proxy Server IP address (default = <current IP address>:
Enter SIP Proxy Registration Interval (default = 3600):
Enter SIP Proxy password string (default=<current password>:
Enter SIP realm identifier string (default=xxxxxx.xxxxxx.com):
Enter PCU usage, y (use PCU) or n (don't use PCU) (default =
n):

Enter GSM Cell ID for Local Cell? (default = 15)
Enter LAC for local cell (default = 1):
```

```
Enter BSIC for Cell 0 (default = 35):
Enter number of RFs in local cell (1 to 12) (default=1):
Enter 1900-ARFCN for RF 0, cell 0 (default=660):

Enter number of AirSites (0 to 11) (default=0):

 Neighbor Cells
 Neighbor # MCC/MNC LAC Cell ID ARFCN BSIC
 ========== ======= === ======= ===== ====
 none

Edit neighbor configuration:
 - (c) Change existing neighbor cell
 - (d) Delete existing neighbor cell
 - (a) Add new neighbor cell
 - (q) Quit
 (c, d, a, q)?
```

3. After these prompts, the new MIB is displayed. Press **Enter** to continue. The following message is displayed:

```
To apply new Staged Mib:
 - Save staged changes to flash
 - Reboot BTS

Press <Enter> to continue:
```

4. Press **Enter** to return to the Staged Configuration menu.

5. To apply the new staged configuration, type **7** and press **Enter** to save the staged changes to flash. The following messages are displayed:

```
Saving mib to flash... Successful!

Changes take effect on next reboot.

Press <Enter> to continue:
```

6. Press **Enter** to return to the Staged Configuration menu.

7. Press **m** to return to the Main Menu.

8. Press **6** to select 'Reboot BTS' from the Main Menu.

2.2.5 Software Version Info

1. At the Main Menu, type **4** and press **Enter** to select "*Software Version Info*". A message similar to the following is displayed:

```
LMT:   lmt.o iBSS.1.0 iBSS.1.0  Jun 8 2006 16:42:51

Press <Enter> to continue:
```

2. Press **Enter** to return to the Main Menu.

2.2.6 IP Address Configuration

1. At the Main Menu, type **5** and press **Enter** to select "*IP address configuration*". The following menu is displayed:

```
5) IP Address Configuration
  1) Display IP Address Config
  2) Change IP Address
  3) Change IP Gateway

  p) Previous menu
  m) Main menu

Enter menu selection:
```

2.2.6.1 Displaying the IP Address Configuration

1. At the IP Address Configuration menu, type **1** and press **Enter**. The IP address and IP gateway are displayed.

2. Press **Enter** to return to the IP Address Configuration menu.

2.2.6.2 Changing the IP Address

1. At the IP Address Configuration menu, type **2** and press **Enter**. The current IP address is displayed and you are prompted for the new IP address string.

2. Type the new IP address string and then press **Enter**. A message displays that the changes were made successfully.

3. Press **Enter** to return to the IP Address Configuration menu.

2.2.6.3 Changing the IP Gateway

1. At the IP Address Configuration menu, type **3** and press **Enter**. The current IP gateway is displayed and you are prompted for the new IP address gateway.

2. Type the new IP address gateway and then press **Enter**. A message displays that the changes were made successfully.

3. Press **Enter** to return to the IP Address Configuration menu.

2.2.7 Reboot BTS

1. At the Main Menu, type **6** and press **Enter** to select "*Reboot BTS*". A message similar to the following is displayed:

```
Do you really want to reboot now?
=================================
  y) Yes! Reboot now!

  p) Previous menu
  m) Main menu

Enter menu selection:
```

2. Type **y** and press **Enter** to reboot the BTS-4000RM BPU. The following message is displayed:

```
Rebooting now!...
```

3. The LMT connection to the BTS-4000RM BPU can be restored after the BTS-4000RM BPU has rebooted and initialized (about 3 minutes after reboot).

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2.3 User Interface Options

Table 2-1 provides a list of all the available parameters and settings for the BTS-4000RM BPU. The blank column can be used to write down any changes to these parameters.

Table 2-1 User Interface Options

Parameter Location	Option/Parameter Name	Settings	Description	Note any changes in this column:
Main Menu	Phone number database	N/A	Displays additional menu options. See 'Main Menu > Phone Number Database'	
	Current config/status	N/A	Displays additional menu options. See 'Main Menu > Current config/status'	
	Staged config	N/A	Displays additional menu options. See 'Main Menu > Staged config'	
	Software version Info	N/A	Displays the current software version.	
	IP Address Configuration	N/A	Allows the user to display/change the IP address as well as change the IP gateway. See 'Main Menu > IP Address Configuration'.	
	Reboot BTS	N/A	Allows the user to reboot the BTS-4000RM BPU.	

Parameter Location	Option/Parameter Name	Settings	Description	Note any changes in this column:
Main Menu > Phone Number Database	Display phone database	N/A	Displays the complete HLR database and the total number of entries.	N/A
	Capture/add IMSI from phone	Valid IMSIs are 15 digits.	Captures IMSIs as the user accesses the network with the mobile phone.	
	Add phone to database	Valid IMSIs length - 15 digits. Valid phone number length - 2 to 15 digits.	Allows the user to manually add a phone number to the HLR database.	
	Delete phone from database	N/A	Allows the user to manually delete a phone number from the HLR database.	
	Edit phone database	N/A	Allows the user to edit the HLR database.	
	Save database to disk	N/A	Saves the HLR database to disk.	
	Upload database (Xmodem)	N/A	Used to upload an HLR database. This menu option is only applicable in Standalone mode or ISDN mode.	
	Download database (Xmodem)	N/A	Used to upload an HLR database. This menu option is only applicable in Standalone mode or ISDN mode.	

Parameter Location	Option/Parameter Name	Settings	Description	Note any changes in this column:
Main Menu > Current config/status	Current configuration	N/A	Displays the current BTS MIB.	
	Cell status	N/A	Displays the current cell status.	
	Active call summary	N/A	Displays a summary of current call activity.	
	Call measurement summary	N/A	Displays a summary of past call statistics.	
Main Menu > Staged Configuration	Change BSS configuration parameters	N/A	Displays additional menu options. See 'Main Menu > Staged configuration > Change BSS configuration parameters'	
	Change MSC I/F parameters	N/A	Displays additional menu options. See 'Main Menu > Staged configuration > Change MSC I/F parameters'	
	Change ISDN I/F parameters	N/A	Not applicable when the BTS-4000RM BPU is configured to connect to an MSC.	
	Change PCU parameters	N/A	Displays additional menu options. See 'Main Menu > Staged configuration > Change PCU parameters '	
	Change SIP I/F parameters	N/A	Displays additional menu options. See 'Main Menu > Staged configuration > Change SIP I/F parameters '.	
	Display staged config	N/A	Displays the staged BTS MIB.	

Parameter Location	Option/Parameter Name	Settings	Description	Note any changes in this column:
Main Menu > Staged Configuration (Continued)	Save staged changes to flash	N/A	Saves the staged changes to flash memory.	
	Save staged changes to flash	N/A	Saves the staged changes to flash memory.	
	Create new staged config	The prompts presented to the user are different for standalone mode, ISDN mode, or iBSS mode.	Prompts the user for the information required to create a new staged configuration. After the user answers all prompts, the new MIB is displayed.	
Main Menu > Staged configuration > Change BSS configuration parameters	Change country/network code	Three-digit Mobile Country Code and Mobile Network Code	Allows the user to change the Mobile Country Code and Mobile Network Code	
	Change full scale power	Values = 36 to 44 Default = 43	Allows the user to change the full scale power in dBm.	
	Change RF frequencies	See ARFCN tables in Appendix E	Displays a list of staged ARFCNs and prompts the user for the ARFCN of each RF.	
	Change AirSite config	N/A	N/A	
	Change Neighbor Cells		Used to change/delete/add neighbor cells.	
	Change Network Name	N/A	Allows the user to modify the network name.	

Parameter Location	Option/Parameter Name	Settings	Description	Note any changes in this column:
Main Menu > Staged config > Change MSC I/F parameters Note: These options are only available in iBSS (A-over-IP) mode.	Change MSC IP address	N/A	Allows the user to change the MSC's IP address	
	Change point codes	Default MSC point code = 5-14-228 Default BSS point code = 5-14-108	Allows the user to enter the MSC's point code and BSS point code.	
	Change PCM group id	Default = 1	Allows the user to change the PCM group ID.	
	Change SUA routing context	Default = 1	Allows the user to change the SUA routing context	
	Change cell id/LAC/BSIC	Default = 15	Allows the user to change the GSM Cell ID/LAC/BSIC.	
	Change E1/T1 span config	Default network type = t (T1) Default spans = B	Allows the user to change the network type (E1 or T1) and spans.	

Parameter Location	Option/Parameter Name	Settings	Description	Note any changes in this column:
Main Menu > Staged config > Change ISDN I/F parameters	Change E1/T1 span config.	Default network type = t (T1) Default spans = B	Allows the user to change the network type (E1 or T1) and spans.	
	Change ISDN variant	Values: (1) NI2 (T1) (2) ATT 4ESS (T1) (3) ATT 5ESS (T1) (4) DMS 100/250 (T1) (5) NET5 (E1) (6) NI2 NFAS (T1) (7) ATT 4ESS NFAS (T1) (8) ATT 5ESS NFAS (T1) (9) DMS 100/250 NFAS (T1) Default = (4) DMS 100/250 (T1)	Allows the user to select the ISDN variant.	
	Change emergency digits	Default = 911	Allows the user to select the emergency digits (typically 911).	

Parameter Location	Option/Parameter Name	Settings	Description	Note any changes in this column:
Main Menu > Staged config > Change PCU Parameters	Enable/Disable PCU	Subsequent PCU configuration parameters are not requested if the PCU is disabled.	Allows the user to enable or disable the integrated PCU.	
	Change SGSN IP	N/A	Allows the user to change the IP Address of the SGSN.	
	Change SGSN Port	N/A	Allows the user to change the IP Port number of the SGSN.	
	Change PCU Port	N/A	Allows the user to change the IP Port number of the integrated PCU.	
	Change NSVCI	N/A	Allows the user to change the NSVCI.	
	Change NSEI	N/A	Allows the user to change the NSEI.	
Main Menu > Staged config > Change SIP I/F Parameters	Change Proxy Server Address	N/A	Allows the user to change the proxy server address.	
	Change Registration Interval	N/A	Allows the user to change the registration interval.	
	Change Registration Password	N/A	Allows the user to change the registration password.	
	Change Realm Identifier	N/A	Allows the user to change the realm identifier.	

Parameter Location	Option/Parameter Name	Settings	Description	Note any changes in this column:
Main Menu > IP Address Configuration	Display IP address Config	N/A	Displays the current IP address and IP gateway.	
	Change IP Address	N/A	Allows the user to change the current IP address.	
	Change IP Gateway	N/A	Allows the user to change the current IP gateway.	

3. INSTALLATION

Please read this section

in its entirety

before proceeding

with the installation.

PRELIMINARY

This section is subdivided as follows:

3.1 Installing BTS-4000RM Equipment

This section contains the procedures required to unpack, install the BTS-4000RM equipment, connect power and ground cables, connect the T1 or E1, and connect the RF antenna cables.

3.1.1 Selecting an Installation Location

Meets Specifications

Install the BTS-4000RM in an environment that meets the specifications in Appendix F.

Restricted Access

Choose a location where access to the BTS-4000RM can be restricted to authorized personnel only.

Airflow Considerations

Airflow for the HPA is from front to back, and airflow for the BPU is from right to left (facing the front of the unit). Please take this into consideration when installing the BTS-4000RM.

3.1.2 Tools and Materials Required

Refer to Table 3-1 for a list of the tools and materials required for installation.

Table 3-1 Tools and Materials Required for Installation

Standard Tool Kit
Personal computer or laptop
Serial cable to connect to the RJ-45 serial port on the front panel of the ICE-T card in the BTS-4000RM BPU (for maintenance)
Ethernet cable to connect to the Ethernet port on the I/O panel of the BTS-4000RM.

3.1.3 Unpack the BTS-4000RM

The BTS-4000RM modules (BPU and HPA) are shipped fully assembled. The packing slip indicates the contents.

WARNING - The BTS-4000RM package is heavy (approximately 123 lbs. - 55.84 kgs. for the BPU and HPA) At least two people are required to lift the package. Safe lifting and moving techniques should be exercised.

1. Inspect the package for signs of damage. If damage is found, immediately notify the carrier that delivered the package.

2. Place the package containing the BTS-4000RM components upright in an area with several feet of clearance on all sides.

3. Carefully remove the BTS-4000RM from the package.

4. Move remnants of the package out of the work area.

5. Inventory and inspect the contents per packing slip. Report any discrepancies or damage to AirNet Communications Corporation.

3.1.4 Rack Mount the BTS-4000RM

The BTS-4000RM is designed for installation in a 19" rack. The distance between the front and back rails must be 24-inches.

The BPU module fits in a 2U area, the HPA fits into a 3U area, and the optional AC-to-DC power supply fits in a 1U area.

1. The rear mounting bracket is affixed to the BPU with one thumbscrew. Remove the rear mounting bracket from the BPU.

2. Attach the BPU rear support shelf to the desired location on the rack.

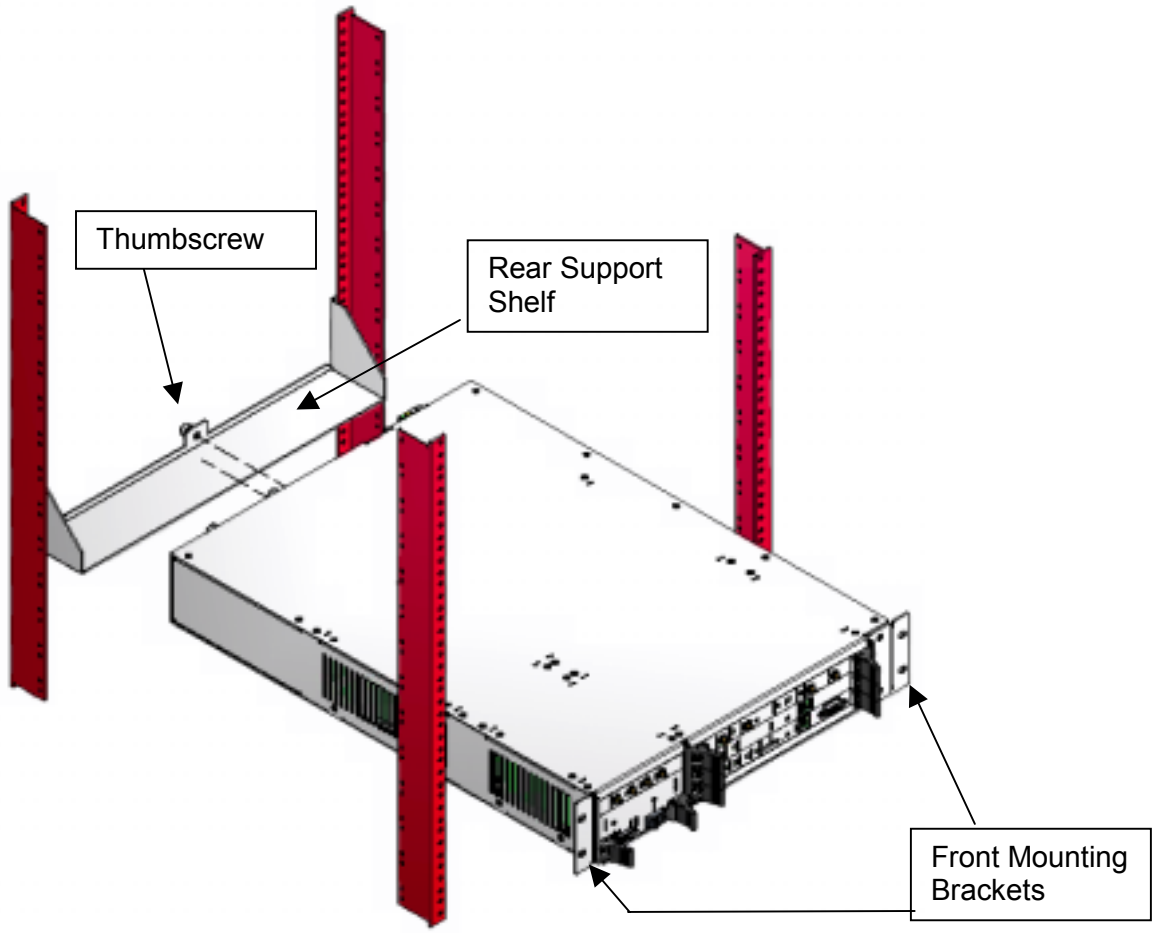


Figure 3-1 Attach Rear Mounting Bracket

3. Slide the BPU onto the rear support shelf and then secure the front mounting brackets to the rack.

4. Secure the BPU to the rear support shelf by turning the thumbscrew.

5. Remove the rear support shelf from the HPA module.

6. Attach the HPA rear support shelf to the desired location on the rack. It should be installed directly above the BPU leaving no space in between, as shown in Figure 3-2.

7. Slide the HPA onto the rear support shelf and then secure the front mounting brackets to the rack.

8. Secure the HPA to the rear support shelf by turning the thumbscrew.

9. If you are installing an AC to DC power supply (optional), install it above the HPA module as shown in Figure 3-2.

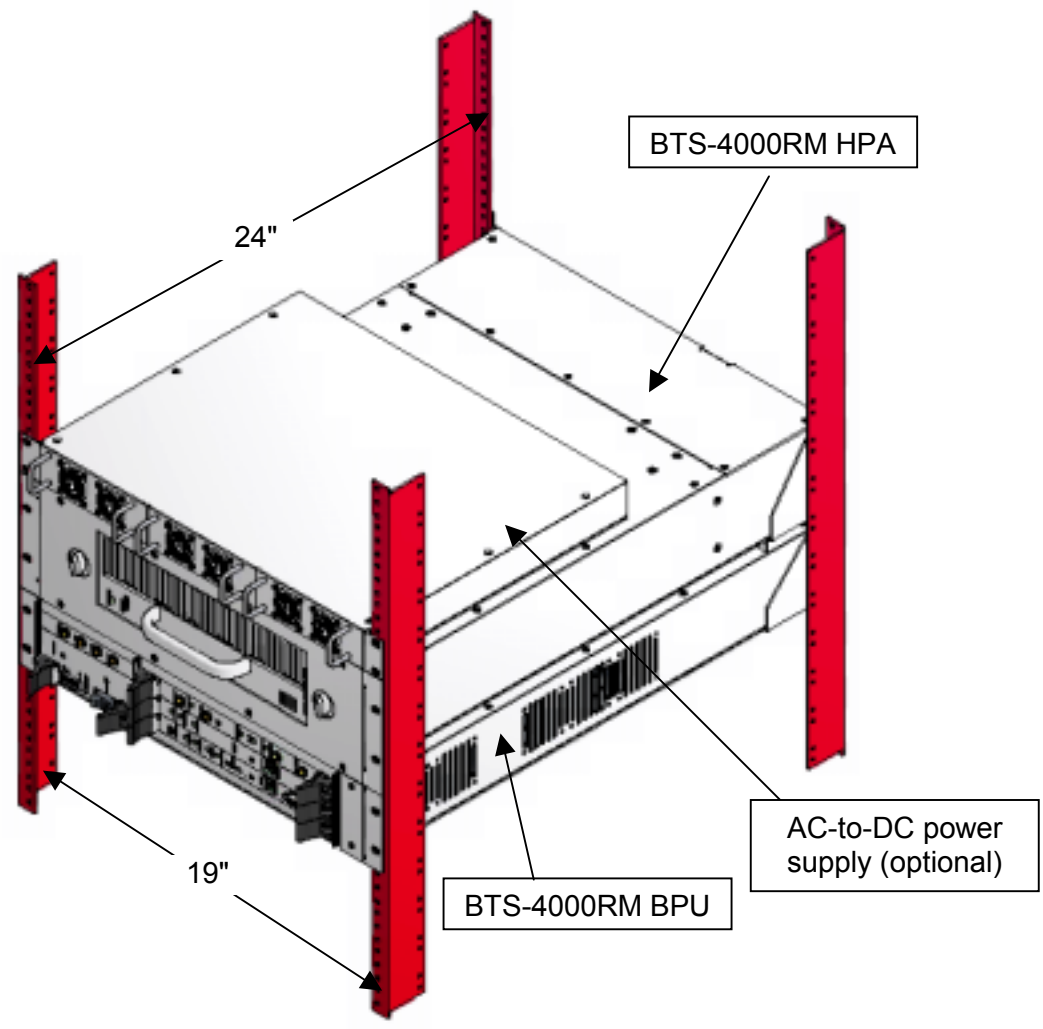


Figure 3-2 Rack Mounted BTS-4000RM

3.1.5 External Cable Connections

Reference the drawings in Section 1.14 for the location of the ports mentioned below. Also reference the block diagram in Appendix C for wiring information.

3.1.5.1 BPU FRONT PANEL - RF CABLES

1. If the RF cables are not already installed on the front panel of the BPU module as shown in Figure 1-5, install them as follows:

a) Connect cable PN 06814 to the 'RX1 IN' port on the BDX module and the 'RX1' port on the RF I/O panel on the front of the BPU.

b) Connect cable PN 06815 to the 'RX2 IN' port on the BDX module and the 'RX2' port on the RF I/O panel on the front of the BPU.

c) Connect cable PN 06813 to the '13 MHz IN' port on the ICE-T module and the '13 MHz' port on the RF I/O panel on the front of the BPU.

d) Connect cable PN 06816 to the 'TX OUT' port on the BDX module and the 'TX' port on the RF I/O panel on the front of the BPU.

e) Bundle the cables neatly using zip ties as shown in Figure 1-5.

3.1.5.2 HPA REAR PANEL - HPA and TX RF CABLES

2. If the HPA and TX RF cables are not already installed on the rear panel of the BPU module as shown in Figure 1-7, install them as follows:

a) Connect the cable labeled TX OUT to the 'TX OUT' and 'RF IN' ports on the rear panel of the BPU.

b) Connect the cable labeled TX IN to the 'TX IN' and 'RF OUT' ports on the rear panel of the BPU.

c) Connect the cable labeled 'RS-422 to the 'HPA RS-422 port on the rear panel of the BPU and the 'RS-42' port on the rear panel of the HPA. Hand tighten the screws on each end of the cable.

d) Connect the cable labeled 'HPA FAN I/O' to the 'HPA FAN I/O' port on the rear panel of the BPU and the 'FAN I/O' port on the rear panel of the HPA. Hand tighten the screws on each end of the cable.

3.1.5.3 BPU REAR PANEL - T1/E1 CABLE(S)

3. The BTS-4000RM is designed for physical connection to a MDF or DSX using a standard
RJ-45 connector. Connect the T1/E1-A and/or T1/E1-B ports to the MDF or DSX and define the cross-connects as needed.

3.1.5.4 BPU REAR PANEL - ETHERNET CABLE

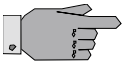
4. Connect the RJ-45 ETHERNET port to the Customer's network switch/hub.

3.1.5.5 BPU FRONT PANEL - ESD WRIST STRAP

5. Connect the ESD wrist strap to the small connector to the right of the ICE-T module. The location is shown in Figure 1-5.

3.1.5.6 BPU and HPA REAR PANELS - GROUND CABLES

6. Connect an 8 AWG ground wire from the BPU to the HPA and also from the BPU to chassis ground.


GoTo

GoTo - If Tower Mounted Amplifiers (TMAs) will be used, proceed to subsection 3.1.5.7. Otherwise, go to subsection 3.1.5.8.

PRELIMINARY

3.1.5.7 HPA REAR PANEL - ANTENNA CABLES (with TMAs)

If TMAs will be used with the BTS-4000RM, follow the steps in this subsection for TMA cabling. The TMA port on the rear panel of the BTS-4000RM BPU supplies power to external DC injectors that are installed in line with the antenna connectors, as shown in Figure 3-3.

7. Assemble one cable for each TMA, as shown in Figure 3-3 and Table 3-2.

8. Connect the cables as shown in Figure 3-3.

9. Connect the diversity receive port on the rear panel of the BTS-4000RM BPU to the RX DC Injector, as shown in Figure 3-3.

10. Connect the transmit/receive port on the rear panel of the BTS-4000RM BPU to the TX/RX DC Injector, as shown in Figure 3-3.

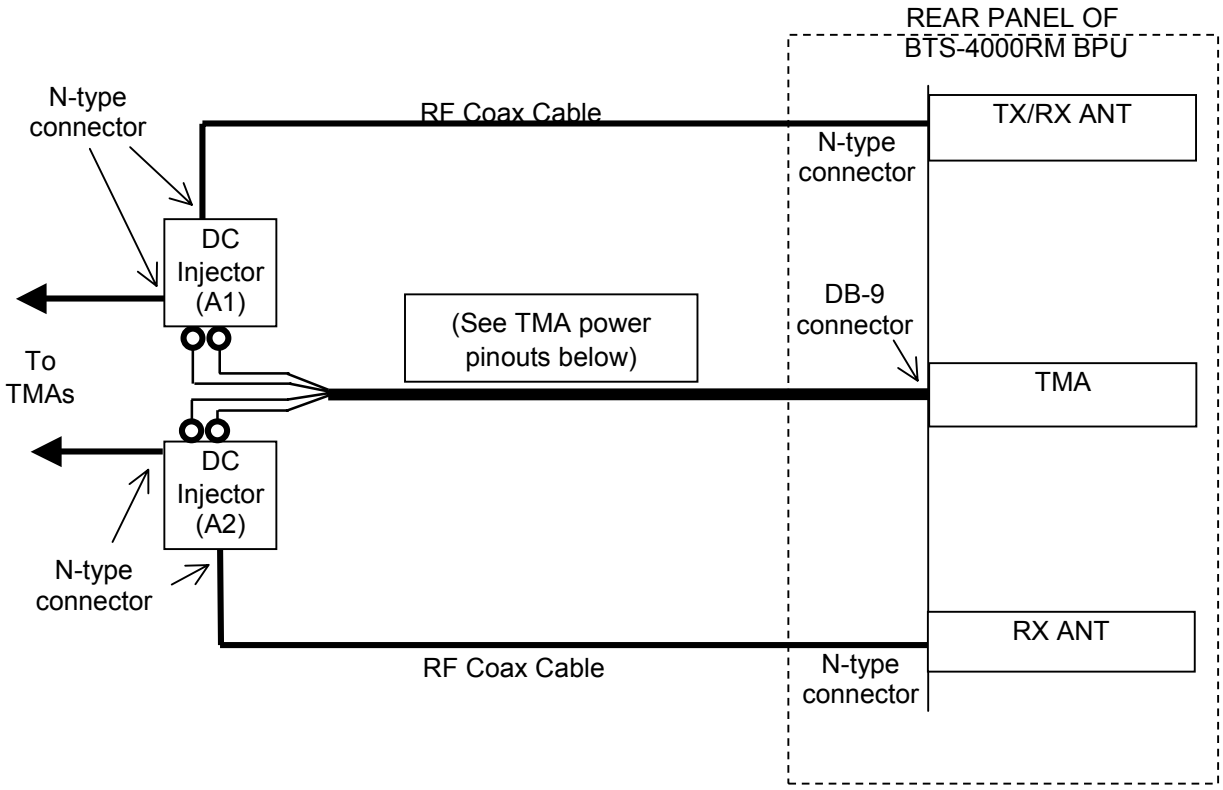
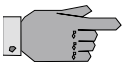


Figure 3-3 TMA Cables

Table 3-2 Pinout for TMA Cable

Pin	Signal	Location
1	TX/RX1	A1 – POS
6	TX/RX1	A1 – GND
5	RX2	A2 – POS
9	RX2	A2 - GND



GoTo - Proceed to subsection 3.1.5.10.

3.1.5.8 HPA REAR PANEL - ANTENNA CABLES (without TMAs)

Only perform steps 11 and 12 if TMAs are not used with the BTS-4000RM.

11. Connect the diversity receive antenna to the ANT RX2 RF connector on the BPU rear I/O panel.

12. Connect the transmit/receive antenna to the ANT TX/RX1 RF connector on the BPU rear I/O panel.

3.1.5.9 BPU and HPA REAR PANELS - DC POWER

The BTS-4000RM BPU and HPA require +27VDC power. **Use 6 AWG wire for all DC supply connections**.

One 50 Amp breaker rated for +27VDC is required for both the BPU and HPA. AirNet recommends a 1U circuit breaker panel, such as the Unipower Telecom Model DPB1U-A for the 50 Amp breaker.

See Appendix H for more information about the Unipower Telecom circuit breaker panel.

3.1.5.10 BPU and HPA REAR PANELS - AC POWER (Optional)

The BTS-4000RM BPU and HPA can be connected to a +27VDC power source, or DC power can be supplied by an AC-to-DC power supply. AirNet has tested the following AC-to-DC power supply for use with the BTS-4000RM: PowerStax Model R2250, AirNet Part Number 06853.

If an AC-to-DC power supply is used to power the BSS, it is recommended to route the AC through a surge protection strip with an on off switch.

See Appendix H for more information about the PowerStax AC-to-DC Power Supply.

3.2 Clean Up

1. Pick up any packing or wire debris left around the work site and dispose of any packing material or wire that will not be re-used.

2. Sweep or vacuum the site floor.

3. Remove packing material from the site.

3.3 System Test

This section describes the procedures for start up and test the BTS-4000RM. During this procedure, the installer will be asked to verify the proper parameters on the console. If the proper parameters do not appear on the screen, the installer should stop the test and contact the AirNet Customer Response Center.


Caution

CAUTION - If during any part the following procedure, the BTS-4000RM fails to respond properly, STOP immediately and contact the AirNet Customer Response Center.

1. Connect a computer to the BTS-4000RM BPU for maintenance mode, as described in Section 2.1.1. Continue to step 2 when `the AirNet BTS->` prompt is displayed.

2. At the `AirNet BTS->` prompt, type **reboot**.

3. Watch the screen. You will see the prompt "*Press any key to stop auto-boot*" followed by a countdown. Press a key during the countdown to stop the autoboot and display the arrow prompt.

4. At the arrow prompt, type **c** and then press **Enter**.

   ```
   [VxWorks Boot]: c
   ```

   You will be prompted for each of the boot parameters.

5. The `boot device:` prompt is displayed. If `flash` is already entered, press **Enter** to continue. Otherwise, type `flash` and then press **Enter**.

6. The `unit number:` prompt is displayed. If `0` is already entered, press **Enter** to continue. Otherwise, type **0** and then press **Enter**.

7. The `processor number:` prompt is displayed. If `0` is already entered, press **Enter** to continue. Otherwise, type **0** and then press **Enter**.

8. The `file name:` prompt is displayed. If `SD4a:/vxworks` is already entered, press **Enter** to continue. Otherwise, type **`SD4a:/vxworks`** and then press **Enter**.

9. The `inet on ethernet (e):` prompt is displayed. Enter the appropriate IP address followed by a colon and ffffff00 (example: 10.10.10.201:ffffff00) and then press **Enter**.

10. The `gateway inet (g):` prompt is displayed. Enter the appropriate IP address and then press **Enter**.

11. The `host inet (h):` prompt is displayed. Enter the appropriate IP address and then press **Enter**.

12. The `user (u):` prompt is displayed. Type a username (such as sysadmin) and then press **Enter**.

13. The `flags (f):` prompt is displayed. If `0x0` is already entered, press **Enter** to continue. Otherwise, type **`0x0`** and then press **Enter**.

14. The `target name(tn):` prompt is displayed. Type a name for the BTS-4000RM BPU and then press **Enter**.

15. The `startup script (s):` prompt is displayed. Type a period (.) and then press **Enter**.

16. The `other (o):` prompt is displayed. If `motfcc` is already entered, press **Enter** to continue. Otherwise, type **`motfcc`** and then press **Enter**.

17. Type **p** and press **Enter** to view the parameters. They should appear as follows:

```
boot device:            flash
unit number:            0
processor number:       0
file name:              SD4a:vxworks
inet on ethernet (e):   xxx.xxx.xxx.xxx:ffffff00
host inet (h):          xxx.xxx.xxx.xxx
gateway inet (g):       xxx.xxx.xxx.xxx
user (u):               (selected user name here)
flags (f):              0x0
target name(tn):        (selected name here)
startup script (s):     .
other (o):              motfcc
```

18. At the prompt, type **@** as shown, and press **Enter**.

```
[VxWorks Boot]: @
```

The BTS-4000RM BPU will boot and load the application code.

19. At the prompt, type **< btsdiag** as shown, and press **Enter**.

```
-> < btsdiag
```

20. The diagnostics program will run for approximately 5 to 10 minutes.

21. Upon completion of diagnostics, the shell prompt will appear.

22. Verify that diagnostics program completed with no errors by reviewing the output on the screen.

23. At the `AirNet BTS->` prompt, type **reboot**.

24. Watch the screen. You will see the prompt "*Press any key to stop auto-boot*" followed by a countdown. Press a key during the countdown to stop the autoboot and display the arrow prompt.

25. At the arrow prompt, type **c** and then press **Enter**.

```
[VxWorks Boot]: c
```

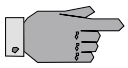
You will be prompted for each of the boot parameters. Press Enter on all except the startup script parameter. Change the startup script to **start.bts**.

26. Reboot the BTS-4000RM BPU.

27. Ensure that the LEDs on the front panel of the AC-to-DC power supply are illuminated and solid green.

28. Check the status of the following LEDs to verify proper operation. Allow several minutes for all LEDs to turn solid green.

- HPA - 'Status' LED should be illuminated and solid green.
- DC-to-DC power supply - 'Vin OK' LED should be illuminated and solid green.
- ICE-T, BDX, and SDSP - 'Power' and 'On-line' LEDs should be illuminated and solid green.



GoTo – Perform the Transmit Gain Adjustment procedure in Section 5.

STOP - If all steps have been successfully completed, then the installation of the BTS-4000RM is done. Complete the Installation Quick Checklist and FAX it to the AirNet CRC.

3.4 BTS-4000RM Installation Quick Checklist

FAX a copy of this completed form to the AirNet Customer Response Center at 1-321-757-0624

Customer name _____

Site name _____ **Date** _____

Inspection Item	Done (Init)
All circuit cards and MCPA modules tightened down and secure.	
Transmit gain adjustment performed.	
Input voltage checked.	
Power cables firmly connected and polarity marked.	
Power cables tied off and neatly bundled with no chafe points.	
Equipment is properly grounded.	
RF line lightning protectors installed and grounded.	
Lightning protectors on all lines coming into BTS.	
Lightning protection installed on power line.	
Antenna sweep performed, VSWR < 1.5:1	
Successful call placed on each configured Traffic Channel.	

Installer _____

Date _____

PRELIMINARY

4. REPAIR

4.1 Shutdown and Restart

4.1.1 Shutdown the BTS-4000RM BPU and HPA

Perform the following procedure before removing or replacing hardware or when a power cycle is necessary.

1. Connect a computer to the BTS-4000RM BPU for maintenance mode, as described in Section 2.1.1. Continue to step 5 when `the AirNet BTS->` prompt is displayed.

2. At the `AirNet BTS->` prompt, type **reboot**.

3. Watch the screen. You will see the prompt "*Press any key to stop auto-boot*" followed by a countdown. Press a key during the countdown to stop the autoboot and display the arrow prompt. It is now safe to power off the BTS-4000RM BPU.

4. If direct +27VDC power is provided for the BTS-4000RM, turn off DC power to the **BPU** at the power source.

   If an AC-to-DC power supply is used with the BTS-4000RM, shut off power to the **BPU** at the power strip (if available). If a power strip is not used, unplug all AC plugs from the AC-to-DC power supply.


Caution

CAUTION – Do not leave the HPA powered on while the BPU is powered off. The HPA module can overheat which may damage the module.

4.1.2 Normal Restart

1. Reconnect power to the BTS-4000RM HPA and BPU. Allow a few minutes for both modules to boot.

4.2 Field Replaceable Units (FRUs)


Caution

CAUTION – AirNet Communications does not take responsibility for any damage to personnel or equipment, or loss of operability due to the use or installation of unauthorized parts.

Complete disassembly of the BTS-4000RM is not authorized or recommended. Repair consists of removing components found to be defective during troubleshooting, performing repair or replacement procedures as outlined in this section, and installing the repaired or replacement components.

The replacement procedures in this section are for the components that can be accessed from the front of the BPU or HPA without removing any cover panels. If the BTS-4000RM has an issue that requires the removal of cover panels, the unit must be returned to AirNet for repair.


Caution

CAUTION – Spare parts should be stored in the protective packaging, as received. Use this packaging to return replaced part to AirNet. Parts can sustain damage during shipment to the site or other location if not packaged properly. When requesting an RMA please indicate to the Customer Response Center (+1-321-953-6673) if packing materials are needed.

The following is a list of the parts that can be ordered and replaced in the field.

Table 4-1 Field Replaceable Units

Name / Description	Part Number
BDX	05986 (850 MHz) 05915 (900 MHz) 05989 (1800 MHz) 05992 (1900 MHz)
DC-to-DC Power Converter (+5V,+12V)	06188
HPA Module	05884 (850 MHz) 05667 (900 MHz) 05875 (1800 MHz) 05874 (1800 MHz)
ICE-T Module	06062
SDSP Module	05838

When an FRU is used, another should be ordered to replenish the Field Support Kit. Contact your management for information on using, returning, and ordering FRUs.

4.2.1 BDX (Broadband Digital Transceiver) Module

4.2.1.1 BDX Module - Front Panel

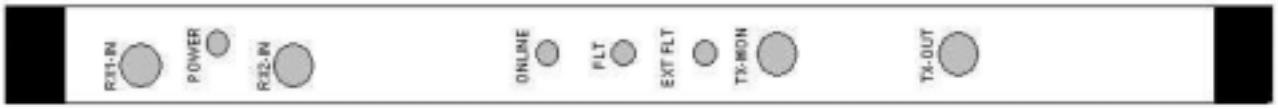


Figure 4-1 Front Panel of BDX Module

4.2.1.2 BDX Module - Front Panel Interfaces

Table 4-2 BDX Front Panel Interfaces

Label	Location	RF Signal	Signal Type	In/Out	Description
RX1-IN	J1	Rx1 RF	RF - 50 Ohm	In	RF Input of Receive 1, 824 - 1910 MHz
RX2-IN	J2	Rx2 RF	RF - 50 Ohm	In	RF Input of Receive 2, 824 - 1910 MHz
DLO RX	J3	Rx Ext LO	RF - 50 Ohm	In	Duplexed RF and IF Receive Local Oscillators (Optional)
DLO TX	J4	Tx Ext LO	RF - 50 Ohm	In	Duplexed RF and IF Transmit Local Oscillators (Optional)
TX MON	J5	Tx Ext Loopback	RF - 50 Ohm	In	-30 dB Coupled Transmit after HPA (Not applicable in iBSS mode)
TX OUT	J6	Tx RF	RF - 50 Ohm	Out	RF Output of Transmit, 869 - 1990 MHz

4.2.1.3 BDX Module - LEDs

Table 4-3 BDX LED Table

LED Name	Description
Power	Green LED. If illuminated, indicates that power is applied to the board.
Online	Green LED. If illuminated, indicates that the BDX has been successfully initialized by software.
Fault	Red LED. If illuminated, indicates an internal BDX alarm, such as clock unlock, etc. If not illuminated, no alarms are present.
Ext fault	Red LED. If illuminated, indicates an external fault such as TMA fault (low current, high current, soft alarm, or crowbar alarm). If not illuminated, no TMA alarms are present.

4.2.1.4 BDX Module - Side View

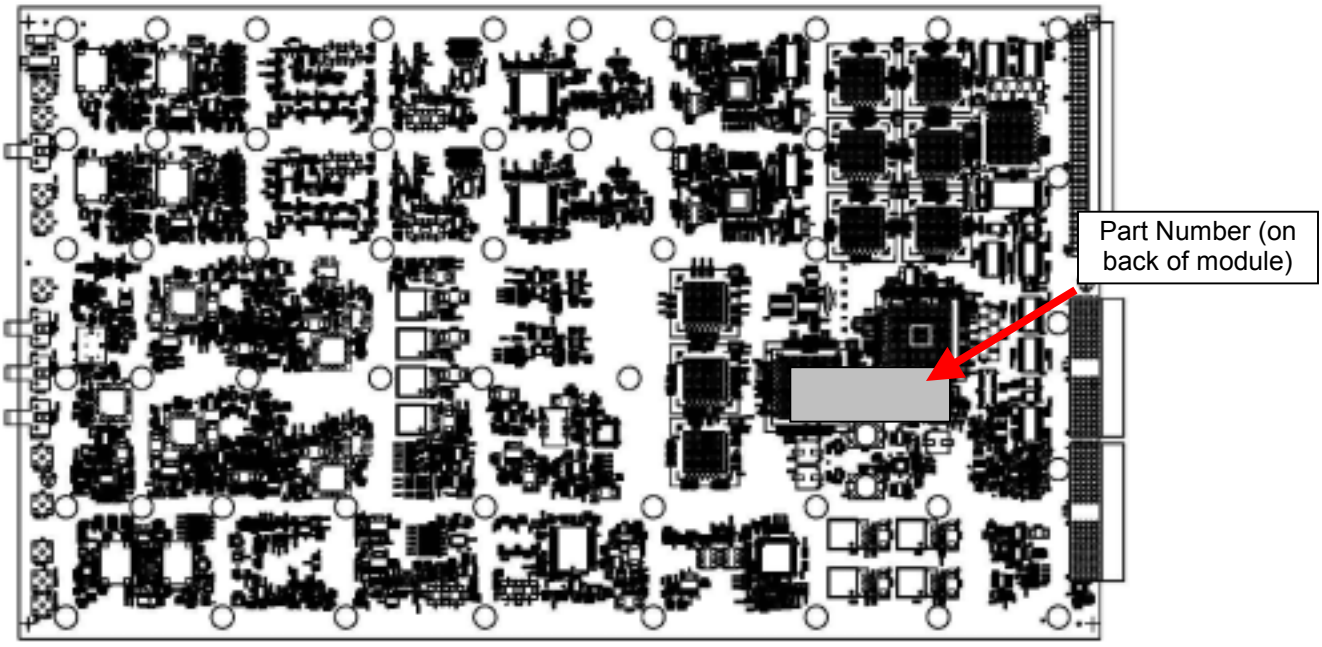


Figure 4-2 Side View of BDX Module

4.2.1.5 BDX Module - Configuration

No configuration is required for the BDX module.

4.2.1.6 BDX Module - Replacement

1. Shut down the BTS-4000RM BPU and HPA using the procedure in Section 4.1.1.
2. Put on the ESD wrist strap.
3. Disconnect all cables from the front panel of the BDX module.
4. Remove the two small screws from the top and bottom edge of the BDX module (behind the handles).
5. Push the handles away from the BPU rack and carefully remove the BDX module.
6. Install the replacement module into the appropriate slot in the BPU.
7. Reconnect the cables to the front panel of the module.
8. Push the handles toward the BDX module to secure it.
9. Install the two small screws you removed in step 4.
10. Turn on power to the BTS-4000RM BPU and HPA.
11. Ensure that the Power and Online LEDs are illuminated and are solid green.

IMPORTANT! *A Transmit Gain Adjustment must be performed after replacing or adding any element in the Transmit path, including HPA module, BDX module, or any Transmit cables. See Section 5 for the instructions to perform a Transmit Gain Adjustment on the BTS-4000RM.*

4.2.2 DC to DC Power Supply Module

4.2.2.1 DC to DC Power Supply Module - Front Panel

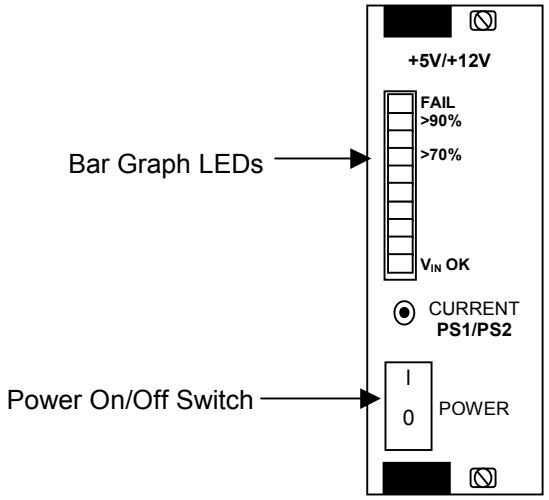


Figure 4-3 Front Panel of Power Supply Module

Caution

CAUTION – The Power On/Off switch on the DC/DC power supply module should NOT be used to power on or power off the BPU. This power switch does not turn the internal fans on or off. See Section 4.1 for the recommended Shutdown and Restart procedures.

4.2.2.2 DC to DC Power Supply Module - LEDs

Table 4-4 Power Converter Module LEDs

LED Name	Description
Vin OK	Input power is applied to the Power Supply Module. If not illuminated, something is wrong with the input power.

LED Name	Description
Bar Graph LED	The top position of the bar graph LED is reserved for a “plug-in failed” visual indication. If this position is illuminated, the plug-in is not capable of providing one or more of its voltage rails. The top LED of the bar graph is displayed whenever the plug-in provides an alarm output. The middle 8 positions of this bar graph indicate the percentage of +5V current being supplied by the plug-in. There is a push button near the bar graph that can be used to monitor the current of the secondary voltage of the plug-in (the second voltage listed on the front panel). The bottom position of the bar graph LED indicates that voltage in is ok.

4.2.2.3 DC to DC Power Supply Module - Configuration

No configuration is required for the DC to DC power supply module.

4.2.2.4 DC to DC Power Supply Module - Replacement

Ensure that the power switch on the module is in the OFF position before removing or replacing the module.

1. Shut down the BTS-4000RM BPU and HPA using the procedure in Section 4.1.1.
2. Put on the ESD wrist strap.
3. Move the switch on the power supply to the OFF position.
4. Remove the two small screws from the top and bottom edge of the module (behind the handles).
5. Push the handles away from the BPU and then carefully remove the module.
6. Install the replacement DC to DC power supply module into the slot.
7. Push the handles toward the module to secure it.
8. Install the two small screws you removed in step 3.
9. Ensure that the power switch is in the ON position.
10. Turn on power to the BTS-4000RM BPU and HPA.
11. Ensure that the Voltage IN OK led is illuminated and is solid green.

4.2.3 HPA Module

4.2.3.1 HPA Module - Front Panel

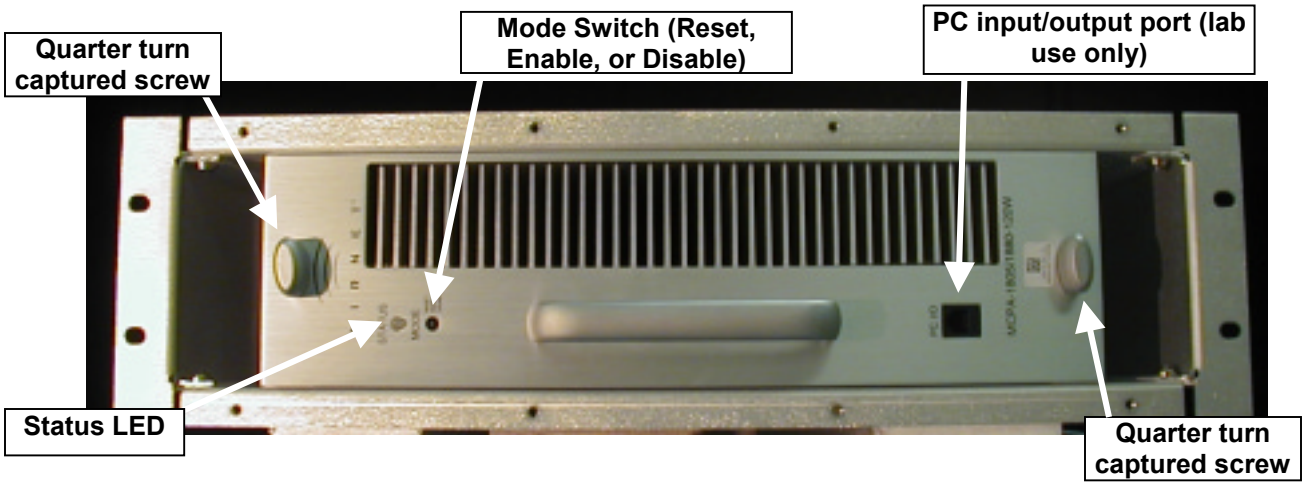


Figure 4-4 Front Panel of HPA Module

4.2.3.2 HPA Module - Rear Panel

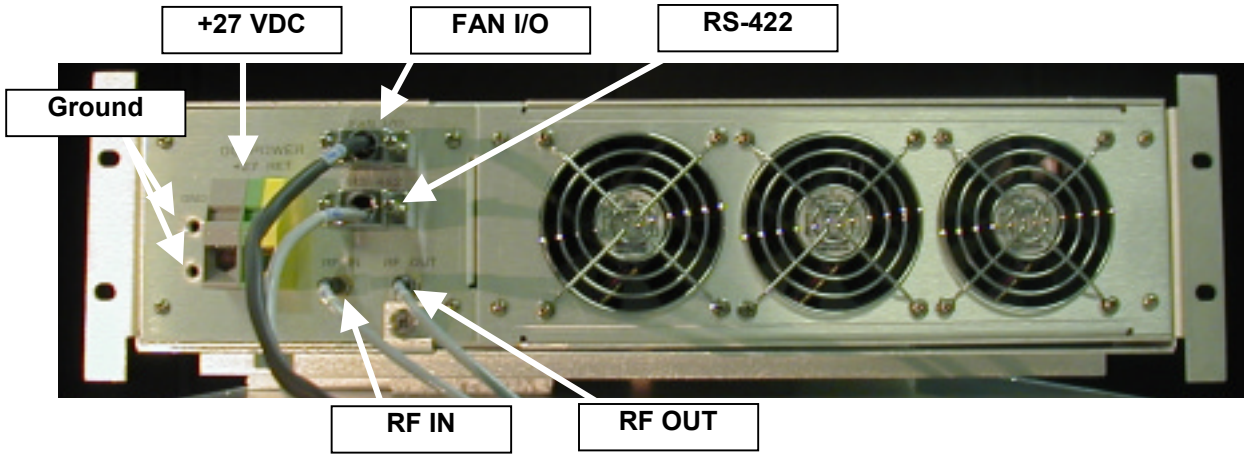


Figure 4-5 Rear Panel of HPA Module

PRELIMINARY

4.2.3.3 HPA Module - Controls and Indicators

Table 4-5 HPA LED Table

Control /Indicator	Color	Description
HPA Module Status LED	Green (solid)	RF Enabled, No Alarms.
	Green (blinking)	RF Disabled, No Alarm.
	Yellow (blinking)	Reverse Power Alarm Status.
	Yellow (solid)	Initialization & Optimization.
	Red (blinking)	RF Enabled, Alarm Status.
	Red (solid)	RF Disabled, Shutdown Status.
	Red/Yellow (alternating)	Boot Mode. Application Running.
Mode	Reset Enable Disable	Resets the Serial Interface. Enables the HPA module. Disables the HPA module.
RJ-11 PC Interface	For lab use only (serial interface).	

4.2.3.4 HPA Module - Configuration

No configuration is necessary when replacing an HPA Module.

4.2.3.5 HPA Module - Replacement


Caution

CAUTION – The HPA module weighs approx. 42 lbs (19.06 kgs). Use caution when handling.

Refer to Figure 4-4 when performing the following steps:

1. Shut down the BTS-4000RM BPU and HPA using the procedure in Section 4.1.

2. Put on the ESD wrist strap.

3. Loosen the ¼-turn captured screws at the top and bottom of the front panel of the HPA module.

4. Carefully remove the old HPA module.

5. Insert the replacement HPA module.

6. Tighten the ¼-turn captured screws on the front panel of the module.

7. Turn on power to the BTS-4000RM BPU and HPA.


Caution

CAUTION – Before applying power to the HPA, make sure that the input and output of the amplifier are properly terminated at 50 ohms. Do not operate the amplifier without a load attached.

8. Power on the HPA module by resetting the enable switch fully upward.


Caution

CAUTION – The power amplifier must be warmed up for a minimum of 20 minutes prior to setting power levels. Failure to properly warm the amplifier may result in lower output power, once the amplifier reaches operating temperature..

9. Confirm that the HPA **Status** LED is illuminated and is solid green.

IMPORTANT! *A Transmit Gain Adjustment must be performed after replacing or adding any element in the Transmit path, including HPA module, BDX module, or any Transmit cables. See Section 5 for the instructions to perform a Transmit Gain Adjustment on the BTS-4000RM.*

4.2.4 ICE-T Module

4.2.4.1 ICE-T Module - Front Panel

Figure 4-6 Front Panel of ICE-T Module

4.2.4.2 ICE-T Module - Connectors/LEDs

Table 4-6 ICE-T Module Connector/LED Table

LED Name	Description
13MHz	13 MHz Sine input. Connects to the 13MHz connector on the front panel of the HSO module.
Power	Green LED. If illuminated, indicates that all power supplies are functional.
On-Line	Green LED. If illuminated, indicates that the ICE-T module is online and operational.
Fault	Red LED. If illuminated, indicates an internal alarm (component failure).
Ext Fault	Red LED. If illuminated, indicates an external alarm, such as: The 1 PPS, 13 MHz, or RS-232 from the GPS module is not functioning or the GPS module has sent an alarm via software command. The RS-422 to the MPCA module is not functioning.
T1/E1	Visual indicator LEDs that indicate T1/E1 span activity on each of the four T1/E1 spans, respectively. The span LEDs will illuminate when the corresponding span has detected a layer 1 signal. The LEDs are off when no layer 1 signal is detected. Only the top four LEDs (four-spans) are used in the current release.
Reset	Small hole in the front panel used to manually reset the module (e.g. using paper clip). If the ICE-T module is the VME system controller, this will also reset the VMEBus.
RS-232	Serial console used to access the BTS-4000RM BPU in console mode.

4.2.4.3 ICE-T Module - Side View

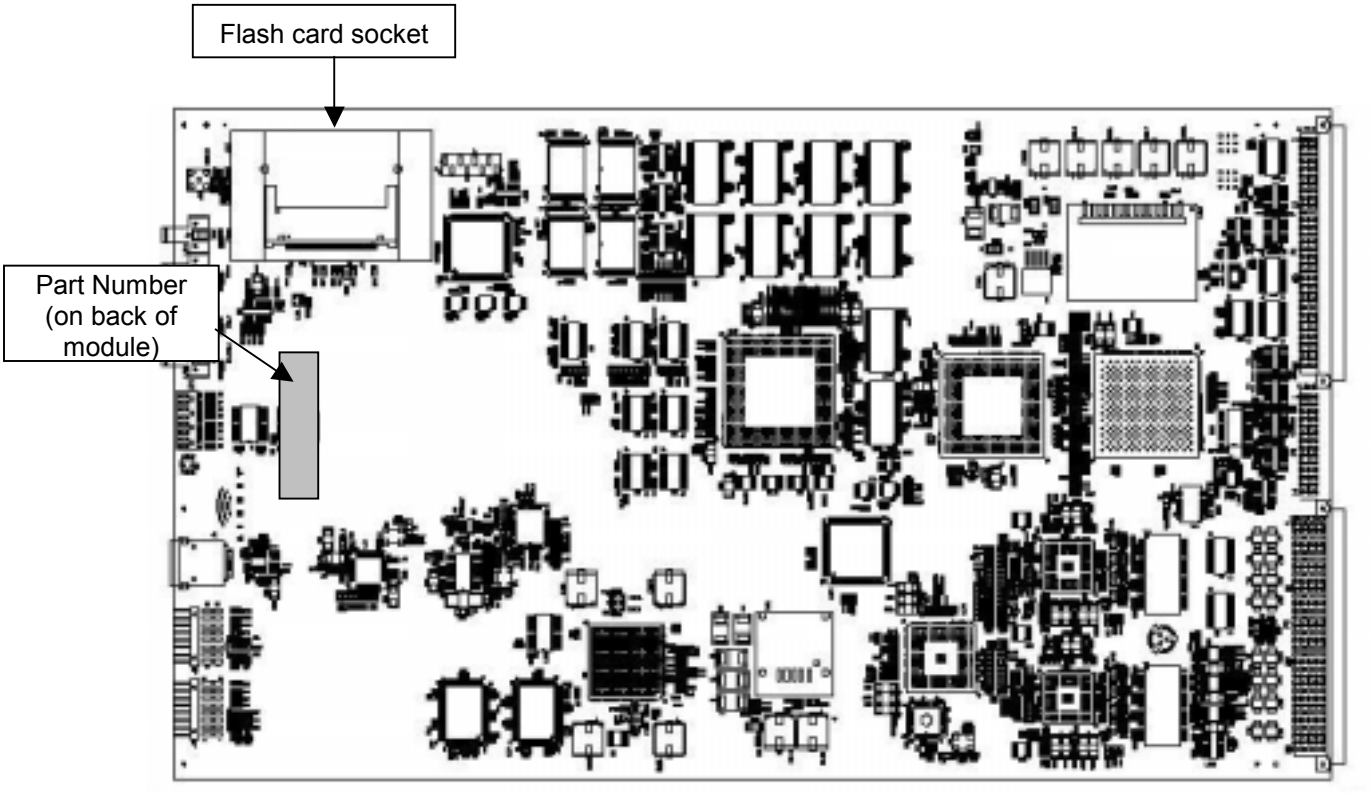


Figure 4-7 Side View of ICE-T Module

4.2.4.4 ICE-T Module - Configuration

No configuration is required for the ICE-T module.

4.2.4.5 ICE-T Module - Replacement

1. Shut down the BTS-4000RM BPU and HPA using the procedure in Section 4.1.1.
2. Put on the ESD wrist strap.
3. Disconnect the 13MHz reference RF connector.
4. Remove the two small screws from the top and bottom edge of the module (behind the handles).
5. Push the handles away from the BPU and then carefully remove the ICE-T module.
6. Install the replacement ICE-T module into the appropriate slot in the BPU.
7. Push the handles toward the module to secure it.

8. Install the two small screws you removed in step 4.

9. Reconnect the 13 MHz Reference RF connector.

10. Turn on power to the BTS-4000RM BPU and HPA.

11. Ensure that the Power and On-Line LEDs on the ICE-T module are illuminated and are solid green.

4.2.5 SDSP Module

4.2.5.1 SDSP Module - Front Panel

Figure 4-8 Front Panel of SDSP Module

4.2.5.2 SDSP Module - Front Panel Connectors/LEDs

Table 4-7 SDSP Module Connector/LED Table

Connector/LED Name	Description
Power	When solidly illuminated, this green LED indicates that all required voltages are present. This LED will flash when hot-removal of the SDSP module is initiated (the eject switch is opened). Once the module is out of service, this LED will turn off indicating that the module can be safely removed.
Online	When solidly illuminated, this green LED indicates that the module is online and operational. This LED is controlled by the embedded processor. If the embedded processor is reset or crashes, this LED is automatically turned off.
Fault	When solidly illuminated, this red LED indicates that a BTS-4000RM BPU internal or external alarm exists. If the embedded processor is reset or crashes, this LED is automatically turned on. This LED is software-controlled.
RS-232	Serial port connector (RJ-45).

4.2.5.3 SDSP Module - Side View

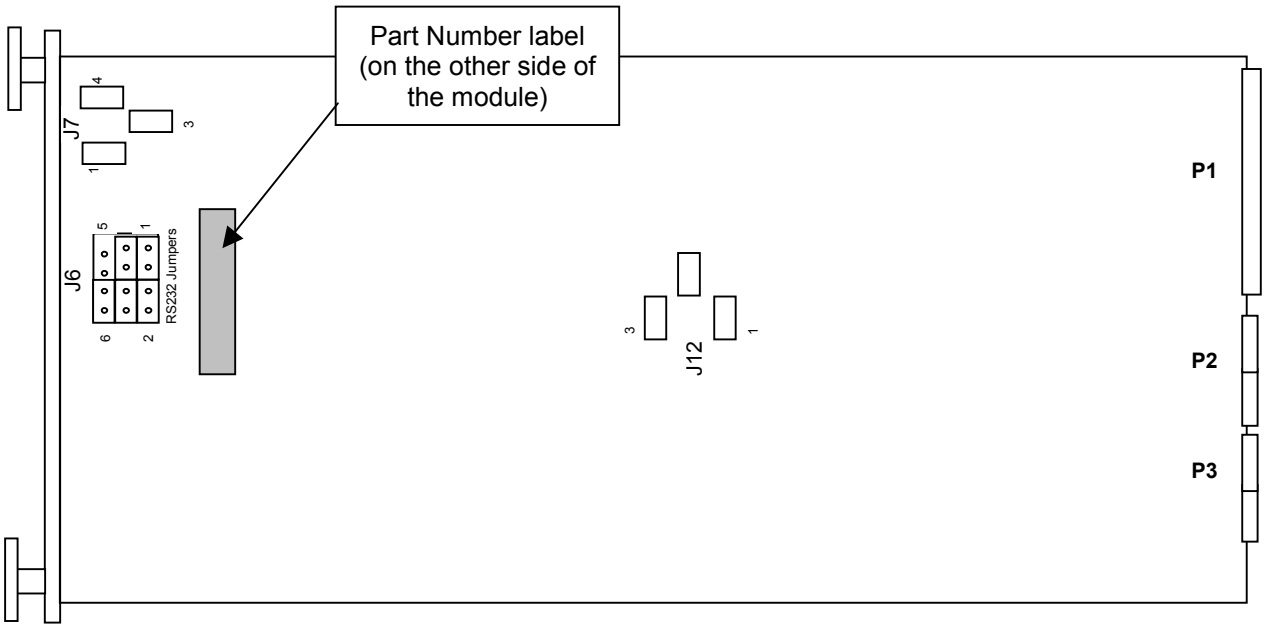


Figure 4-9 Side View of DSP Module

4.2.5.4 SDSP Module - Configuration

Table 4-8 DSP Module Jumper Settings

Jumper	Description	Settings
J6	RS-232 Jumper block	Set RS-232 to backplane (default configuration) by installing shunts on pins 1-3 and 2-4.
J7	JTAGB Jumper block	Install a jumper shunt on pins 2-3 (default configuration)
J12	MPC Clock Select Jumper Block	Install a jumper shunt on pins 2-3 (default configuration)


Note

Note - These jumpers will be installed prior to product shipment.

PRELIMINARY

4.2.5.5 SDSP Module - Replacement

1. Shut down the BTS-4000RM BPU and HPA using the procedure in Section 4.1.1.
2. Put on the ESD wrist strap.
3. Remove the two small screws from the top and bottom edge of the SDSP module (behind the handles).
4. Push the handles away from the BPU and carefully remove the SDSP module.
5. Verify that the jumpers on the replacement SDSP module are installed according to Section 4.2.5.4
6. Install the replacement SDSP module into the appropriate slot in the BPU.
7. Push the handles toward the SDSP module to secure it.
8. Install the two small screws you removed in step 3.
9. Turn on power to the BTS-4000RM BPU and HPA
10. Ensure that the Power and Online LEDs are illuminated and are solid green.

5. TRANSMIT GAIN ADJUSTMENT

This adjustment procedure is typically performed at AirNet. This procedure should only need to be performed during the initial installation, when modifying the transmit power per RF carrier, or when replacing any element in the transmit path, such as HPA module, BDX module, or any transmit cables.

5.1 Tools and Materials Required

Table 5-1 provides a list of the tools and materials required to perform this procedure.

Table 5-1 Tools and Materials Required for Adjustment

Calibrated Test Cable
Spectrum Analyzer

5.2 Procedure

1. Locate the ARFCN for RF 0 and the 'Full Scale Power' setting. These can be located via the LMT. See Section 2.2 for the procedure to access the BTS-4000RM via the LMT. The ARFCN can be viewed by selecting 'Current Configuration > View the Current Configuration'. The Full Scale Power value can be viewed by selecting 'Staged Configuration > Change BSS Configuration Parameters > Change Full Scale Power'. The 'default value' displays the last saved setting.

2. Using a calibrated test cable, connect a spectrum analyzer to the TX MON port, shown in Figure 1-10.

The coupling value at the Tx Monitor port is typically **-30 dB ±0.5 dB**. Be sure to include this value when calculating the Reference Level Offset at the spectrum analyzer, as described in Table 5-2.

3. Set up the spectrum analyzer.

Table 5-2 Spectrum Analyzer Settings

Frequency	Per BCCH ARFCN
Span	5.0 MHz
Ref Level Offset	30 dB for the Tx MON port, plus 1 dB for each dB that the BTS-4000RM is set below the maximum full scale power (44 dB), plus 8 dB for measuring in 30 kHz BW, plus test cable loss. Example: For a 6' test cable with Full Scale Power set to 43 dB, the Ref Level Offset would be approximately 30+1+8+1.5 = 40.5 dB.