PRELIMINARY

AIRNET™

Base Station System (BSS)

BTS-4000 Indoor Equipment Installation and Maintenance Manual

August 12, 2003

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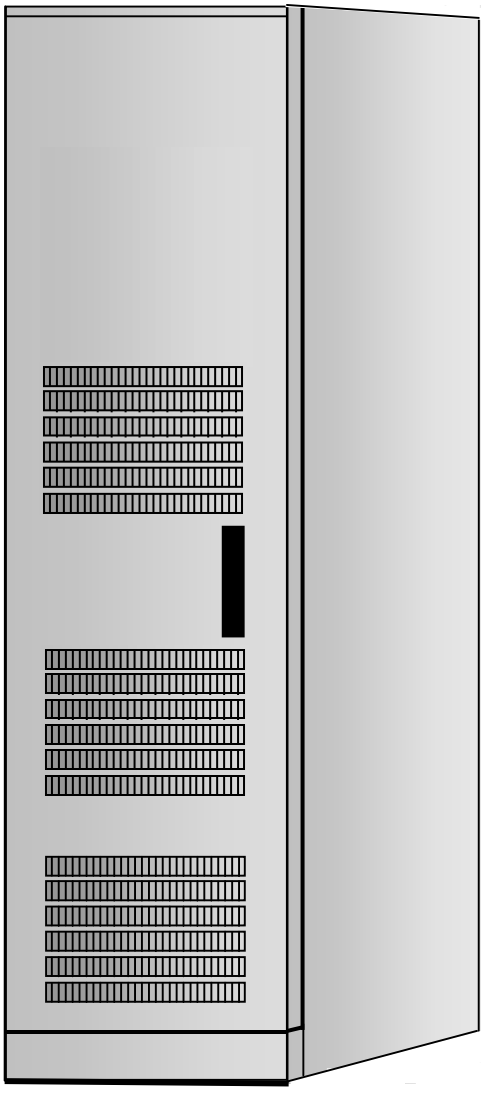

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COMPLIANCE NOTICES

WARNING: This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this manual, may cause harmful interference to radio communications.

The 1900 MHz version of this product has been authorized by the FCC under Part 24 to operate in the PCS-1900 band, under FCC ID: MZKBPU3000-1900 and CKE-JHU1900.

The 1900 MHz version of this product has been certified by Industry Canada to operate in the PCS-1900 band under certification number IC: 4226A-12074. The term "IC:" before the radio certification number only signifies that Industry Canada technical specifications were met.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numerique de la classe A est conforme à la norme NMB-003 du Canada.

The appearance of the ETL mark indicates this product has been certified for product safety by Intertek Testing Services ETL SEMKO, a Nationally Recognized Testing Laboratory (NRTL). This product has met the requirements of the UL1950, 3rd Ed. and CAN/CSA C22.2 No. 950-95 standards for information technology equipment for the United States and Canada.

Additionally, this product conforms to European safety standard for information technology equipment, EN 60950.

REVISION PAGE

REVISION	DATE	COMMENTS
10	08/12/03	Preliminary Release

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Read the latest

Product Release Notice

and Field Bulletins

for any deviations

from this manual.

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Preface

General Information

This document describes the installation and setup procedures for hardware used in the AirNet Broadband Transceiver System (BTS).

Intended User of This Guide

This guide is intended to be read by individuals responsible for the installation and maintenance of the BTS hardware and software. It is not intended for the end-user of the system.

Conventions Used in This Guide

Typed Input — Input that needs to be typed will be shown within an instructive sentence in bold, Courier font.

Ex: Type **`abcde`** to continue.

Terminal Simulation — `Courier font is used to simulate data printed on computer terminals.`

Screen names — Screen names within sentences will be shown exactly as they appear, in Courier font.

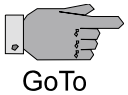
Ex: The `Main Menu` will be displayed.

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 - 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 Broadband Transceiver System", describes the subsystem and its characteristics.

Section 2, "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 3, "Troubleshooting and Repair", provides troubleshooting, lists replaceable parts, and provides replacement instructions.

Section 4, "Upgrades to the BTS", provides instructions for BTS upgrades

Section 5, "Transmit Gain Adjustment", provides the procedure to adjust the transmit gain on the BTS.

Section 6, "Periodic Maintenance", describes the procedures that should be performed periodically to ensure the BTS operates properly.

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, "Connector Pinouts", provides pinouts for all external connectors on the BTS-4000.

Appendix C, "Alarms", provides alarm wiring diagrams for troubleshooting purposes.

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

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

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

Related Documentation

The following documents may be helpful and are available from AirNet Communications Corporation:

BSS Operator's Guide provides the operator's instructions for operation, administration, and maintenance of the BTS, using the AirNet Operations and Maintenance Center-Radio (OMC-R).

AirNet Enterprise Network Field Installation & Maintenance Manual provides instructions to set up, install, and configure the Enterprise Network feature on the AirNet BSS.

These documents are available on the AirNet Customer Documentation CD.

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 hardware. You should become familiar with the safety precautions outlined by the original manufacturer's documentation.

Read this Guide Thoroughly

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

Complete all Steps

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

Use the ESD Strap

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

Ground the Equipment

WARNING - To minimize shock hazard, the equipment chassis and cabinet must be connected to an electrical ground.

Only Qualified Personnel Should Service the Equipment

WARNING - Only trained personnel may remove equipment covers to install and service the internal assemblies of the BTS. The BTS 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. MODEL BTS-4000 BROADBAND TRANSCEIVER SYSTEM

The AirNet Model BTS-4000 Broadband Transceiver System (BTS-4000) provides the radio transmission and reception functions of a wireless telecommunication system. A single AirNet BTS-4000 can process up to 96 traffic and control channels.

The Indoor BTS-4000 consists of a single 6' tall cabinet that houses the following three primary components:

1. The Broadband Processor Unit (BPU) chassis, which provides control, status, and alarm functions, call processing functions, an interface for network (T1/E1) connections, RF channel baseband processing including RF channel combining (downlink path) and channelization (uplink path) between baseband signals and a composite wideband signal, DC power, and GPS functionality.

   The cards and modules contained in the BPU are:

   ICE-T cards (integrated CPU, Flash, and T1/E1 functionality)
   Alarm cards (provide alarms and external interfaces)
   SuperDSP cards (digital signal processing)
   BDX (Broadband Digital Transceiver) cards (provide frequency translation, RF signal routing, and analog signal processing)

   Power Supply Modules
   GPS Modules
2. The Multi-Carrier High Power Amplifier (MCPA), which amplifies RF signals from the BPU.
3. The RF Filters/Duplexers

The BTS can be configured to support from 1 to 4 sectors. For each sector supported, the following is required:

- BDX card
- MCPA
- RF Filter/duplexer.

These parts will be discussed in detail in this section.


Note

Note - The Indoor BTS-4000 shown in Figure 1-1 is fully loaded as a 4-sector system. All slots may not be populated in all systems.

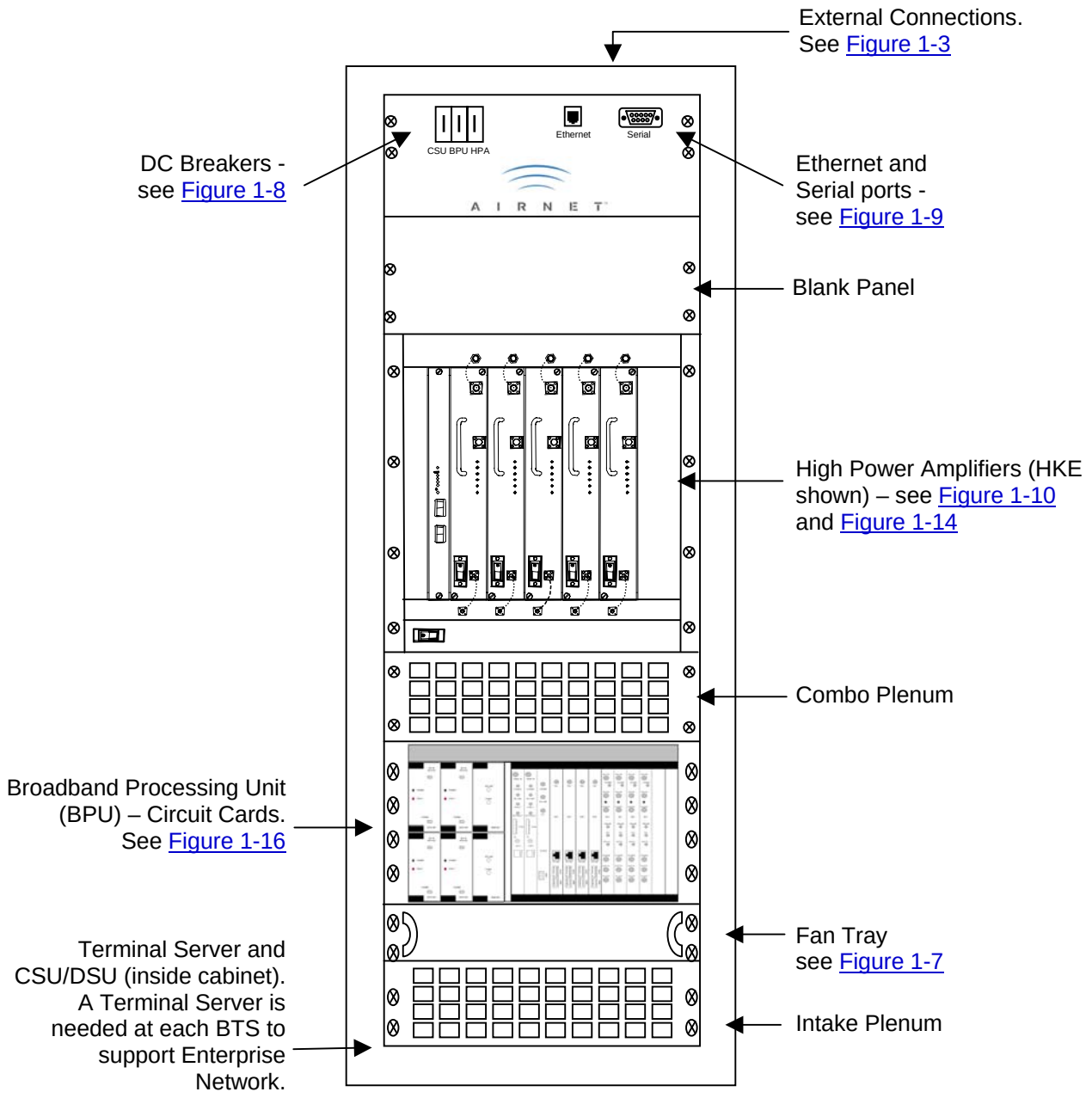


Figure 1-1 BTS-4000 Indoor Enclosure, Front Door Removed

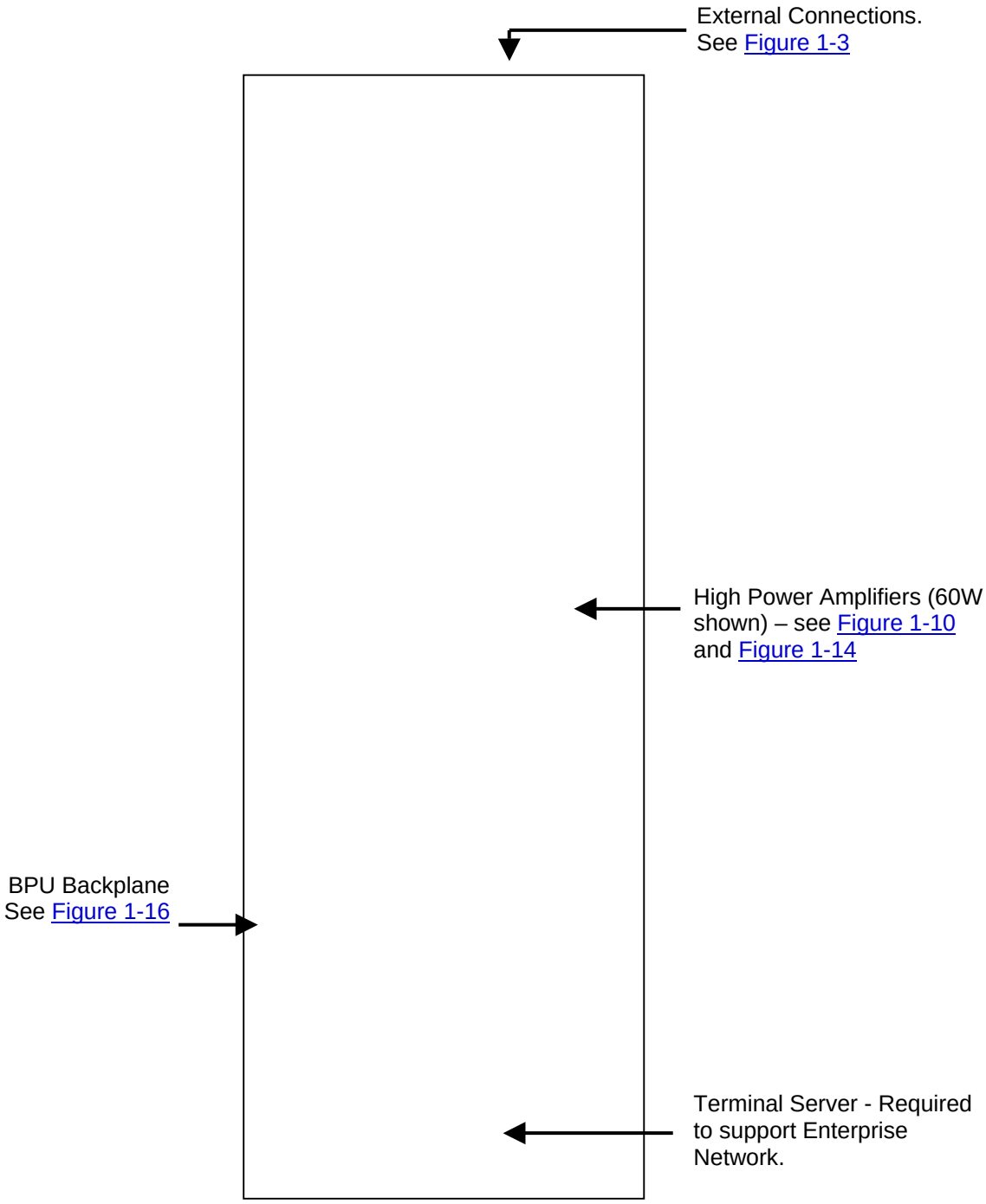


Figure 1-2 BTS-4000 Indoor Enclosure, Rear Door Removed

1.1 External Connections

All external connections for the BTS-4000 Indoor equipment are made at the top of the BTS cabinet (see Figure 1-3).

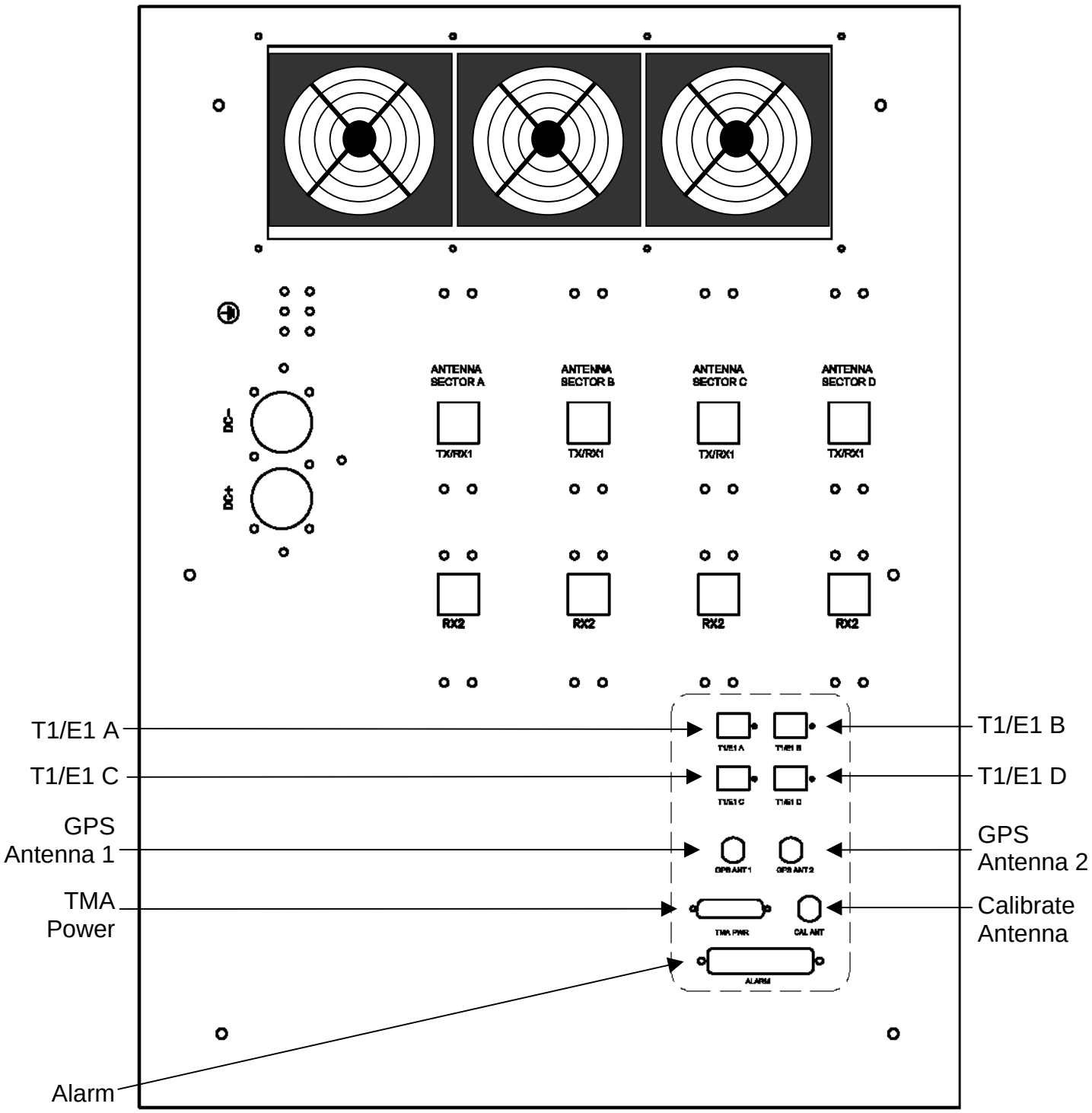


Figure 1-3 Top of the BTS-4000

1.1.1 Description of I/O Connectors

1.1.1.1 DC-

Provides a connection point for the external DC Return wire.

1.1.1.2 DC+

Provides a connection point for the external +DC wire.

1.1.1.3 RF Connectors

Provide the connection points for the diversity receive (RX) antenna and the transmit/receive antenna (TX/RX) coax cables. There are four of each on the I/O panel to support up to four sectors.

1.1.1.4 T1/E1 Connectors

Provide the T1/E1 interfaces to the ICE-T card(s). The current release only makes use of the B port, which connects to the ICE-T card in slot 1.

1.1.1.5 GPS Antenna

Provides connection points for both GPS modules.

1.1.1.6 TMA Power

Provides an external port for cabling from the BDX cards to the Tower Mounted Amplifiers.

1.1.1.7 Calibrate Antenna

Provides an external port to connect the Adaptive Array test mobile.

1.1.1.8 Alarm

Provides an external port for cabling the external (user) alarms.

1.2 Fan Trays

1.2.1 Upper Fan Tray

The Upper Fan Tray is located at the top of the BTS. It houses three fans. Figure 1-4 displays the upper fan tray.

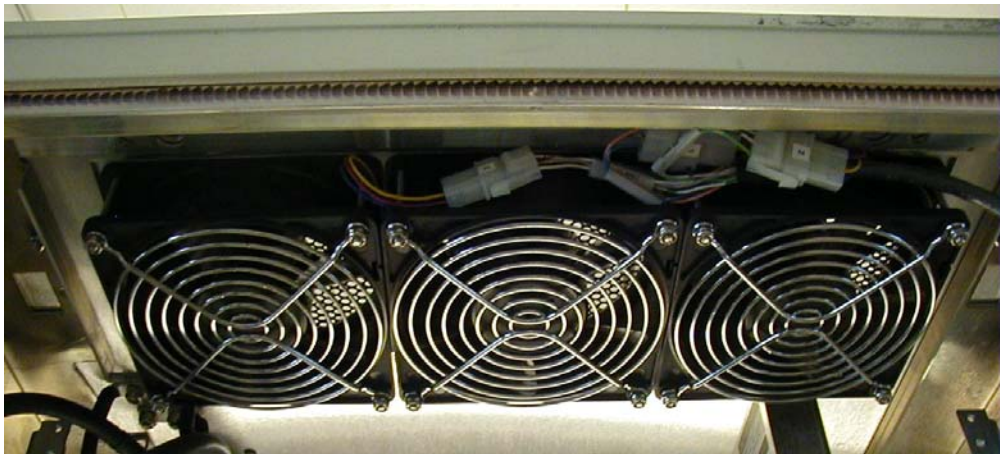


Figure 1-4 Upper Fan Tray

1.2.2 HKE MCPA Rack Fan Tray

The HKE MCPA Rack has a fan tray directly below the MCPA modules. It houses six fans, as shown in Figure 1-5.

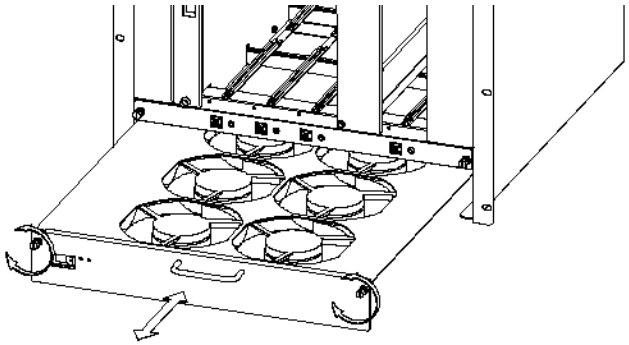


Figure 1-5 MCPA Fan Tray

Figure 1-6 displays the power switch and LEDs located on the front panel of the HKE MCPA fan tray.

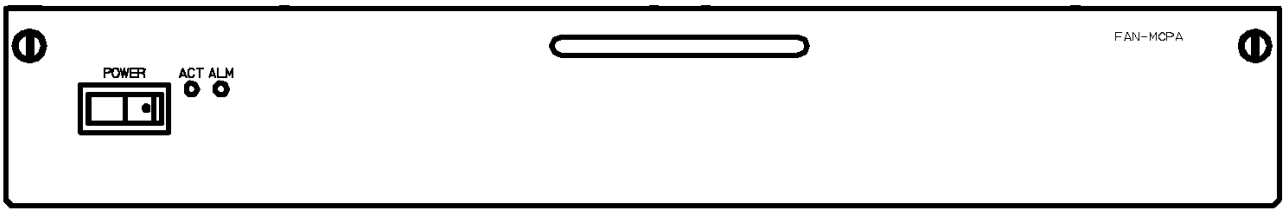


Figure 1-6 Front Panel of HKE MCPA Fan Tray

The ACT led indicates activity. The ALM LED indicates an alarm condition.

1.2.3 Lower Fan Tray

The lower fan tray is above the intake plenum. It houses nine fans, as shown in Figure 1-7:

Figure 1-7 Lower Fan Tray

1.3 DC Circuit Breakers

As shown in the following figure, the +27 VDC devices (CSU/DSU, BPU rack, and MCPA rack) have circuit breakers on the BTS cabinet.

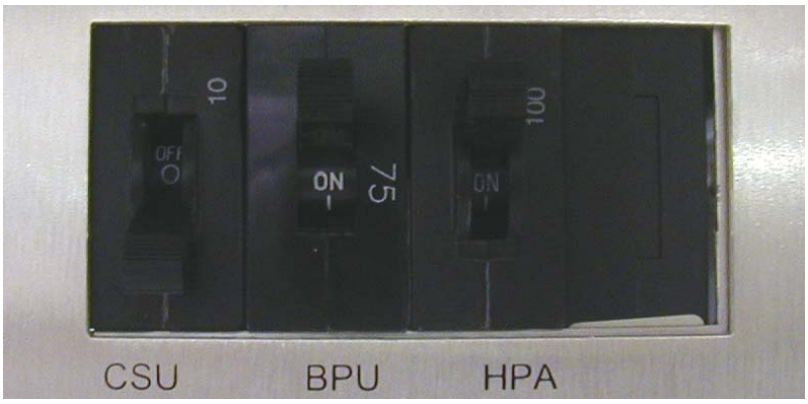


Figure 1-8 Circuit Breakers on Front Panel of BTS-4000

1.4 Ethernet and Serial Ports

As shown in the following figure, the BTS provides an Ethernet and a Serial port on the front of the BTS cabinet.

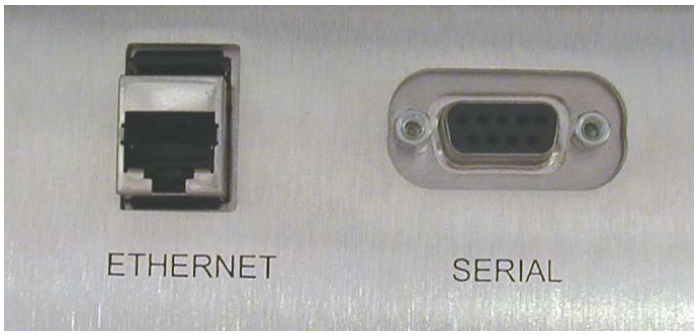


Figure 1-9 Ethernet and Serial Ports on Front Panel of BTS-4000

1.4.1 Ethernet Port

The Ethernet port on the front of the BTS cabinet is wired internally to the terminal server to allow network access to the various cards and modules that are connected to the terminal server (ICE-T, SuperDSP, Alarm card, etc.). Refer to Appendix B for a pinout table.

1.4.2 Serial Port

The Serial port on the front of the BTS cabinet provides RS-232 signals from the ICE-T, SuperDSP, BDX, and Alarm cards. It is wired internally to the Terminal Server. Refer to Appendix B for a pinout table.

1.5 Multi-Carrier High Power Amplifier (MCPA)

The Multi-Carrier High Power Amplifier (MCPA) is a subassembly of the AirNet Broadband Transceiver System (BTS), which is a component of the AirNet Base Station System (BSS) (see Figure 1-1).

The MCPA is the link between the BDX card and the BTS-4000 transmit antenna. It simultaneously amplifies multiple RF carriers to high power levels with low intermodulation distortion products, high dynamic range, and low noise.

A GSM-900 BTS-4000 may come equipped with 60 or 80-Watt MCPA modules, depending on the customers requirements. A GSM-1800 or GSM-1900 BTS-4000 will come equipped with 40-Watt MCPA modules.

The 40-Watt MCPA used in the BTS-4000 is manufactured by Japan Radio Company (JRC). See section 1.5.4 for more information on the JRC MCPA.

The 60-Watt MCPA used in the BTS-4000 is manufactured by Hitachi Kokusai Electric (HKE). See Section 1.5.2 for more information on the HKE MCPA.

The 80-Watt MCPA used in the BTS-4000 is manufactured by Powerwave Technologies Inc. See Section 1.5.3 for more information on the Powerwave MCPA.

1.5.1 MCPA Rack Configurations

The indoor BTS supports installation of 1 Multi-Carrier High Power Amplifier (MCPA) subrack within the same cabinet as the BPU. An auxiliary cabinet can be used to house 3 additional MCPA subracks. Each subrack can support up to 4 amplifier modules.

The MCPA subracks can be configured to support from 1 to 4 sectors. For an omni-directional system, a single subrack may be used to provide 1, 2, 3, or 4 amplifier modules to support the BTS.

For a dual sector system, one subrack with 1 to 2 amplifiers per sector, or two subracks with 1 to 4 modules per sector may be used. For a three or four sectored system one subrack with one amplifier module per sector can be used or additional subracks can be installed to support from 2 to 4 amplifier modules for each sector.

1.5.1.1 Powerwave MCPA Rack Configurations

The Powerwave MCPA rack is currently available in a 4x4 configuration, which provides 1 to 4 MCPA modules with 'straight-through' RF in/out connections. Each MCPA module

independently amplifies the input signal coming through 4 routes (maximum), and outputs the signal through 4 routes (maximum).

1.5.1.2 Hitachi Kokusai Electric (HKE) MCPA Rack Configurations

There are three configurations available for the Hitachi Kokusai Electric MCPA rack, as shown in Table 1-1.

Table 1-1 Hitachi Kokusai Electric (HKE) MCPA Rack Configurations

Configuration	Description
3x3+1 (Hot Standby)	Provides 1 to 3 MCPA modules for operation, and 1 module for redundancy. Each operating MCPA module independently amplifies the input signal coming through 3 routes (maximum), and outputs the signal through 3 routes (maximum). If one of the operating MCPA modules fails, the redundant module automatically takes its place.
4x4 (Straight-through)	Provides 1 to 4 MCPA modules with 'straight-through' RF in/out connections.
1x1-4 (Smart Splitter/Combiner)	Provides 1 to 4 MCPA modules for operation. Input signals applied through a single route are combined and amplified by the MCPA modules, and output through a single route. If only 1, 2, or 3 of the 4 MCPA modules are installed or operational (e.g. due to a failure), the Splitter and Combiner will be reconfigured automatically to maintain constant gain with reduced maximum power.

Figure 1-10 displays the 3 x 3 +1 configuration.

1.5.1.3 JRC MCPA Rack Configurations

There are two configurations available for the JRC MCPA rack, as shown in Table 1-1.

Table 1-2 JRC MCPA Rack Configurations

Configuration	Description
1x1	Provides 1 to 4 MCPA modules for operation. If omni, the number of MCPA modules depends on the number of channels. For a sectored system, the number of MCPA modules depends on the number of sectors.

Configuration	Description
4x4	Provides 1 to 4 MCPA modules with 'straight-through' RF in/out connections. If omni, the number of MCPA modules depends on the number of channels. For a sectored system, the number of MCPA modules depends on the number of sectors.

Figure 1-14 displays the 4x4 configuration.

1.5.2 Hitachi Kokusai Electric (HKE) MCPA Rack and Modules

Figure 1-10 and Figure 1-11 display the front and rear view of the HKE MCPA Rack and modules.

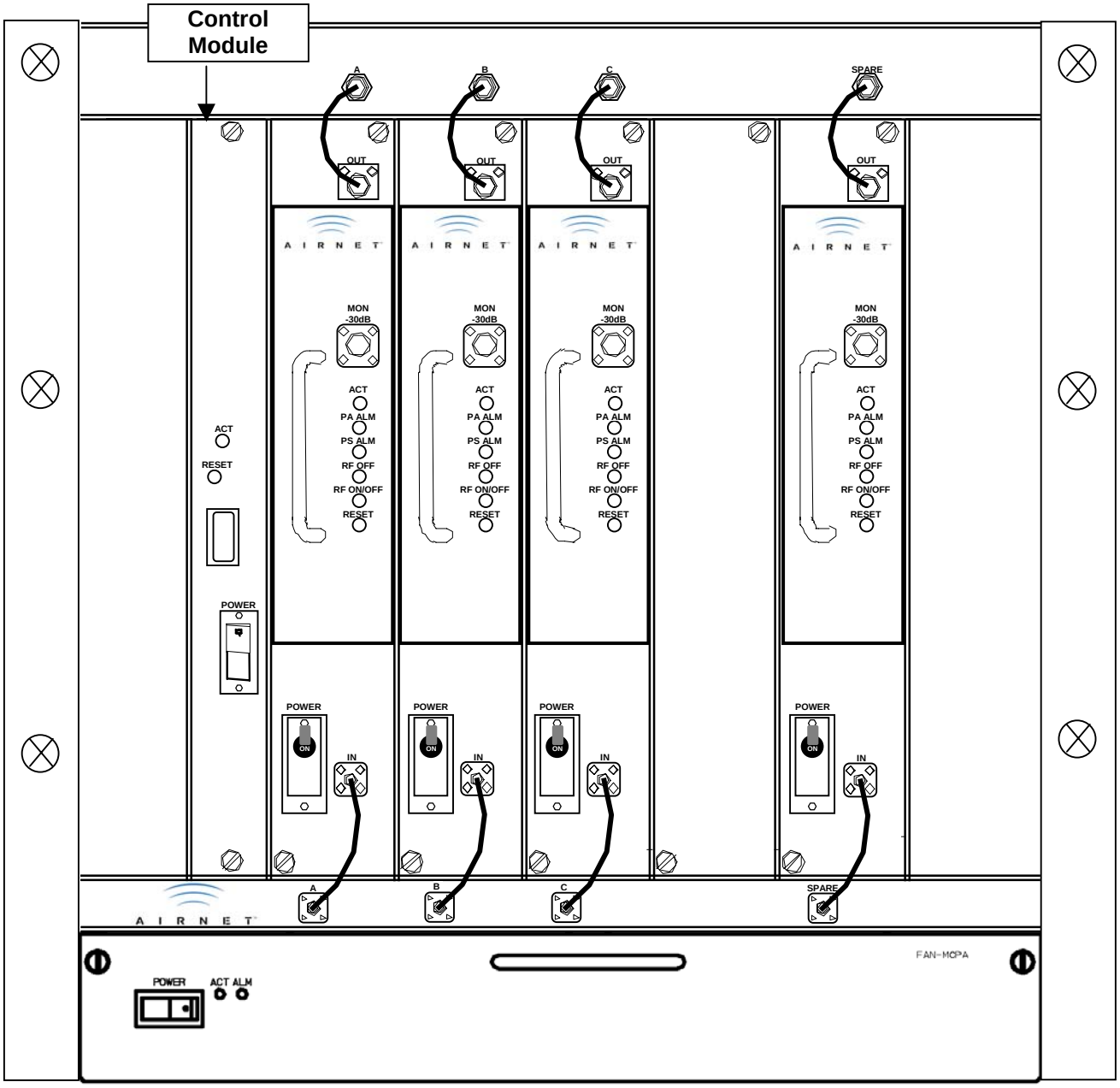


Figure 1-10 Front Panel of Hitachi Kokusai Electric (HKE) MCPA Rack

The control module shown in Figure 1-10 provides the following functions:

- Monitors and controls the product
- Switches control of the RF Input Unit and RF Output Unit
- Exchanges Alarm and Control signals between peripheral equipment
- Provides surge protection
- Provides noise filtering

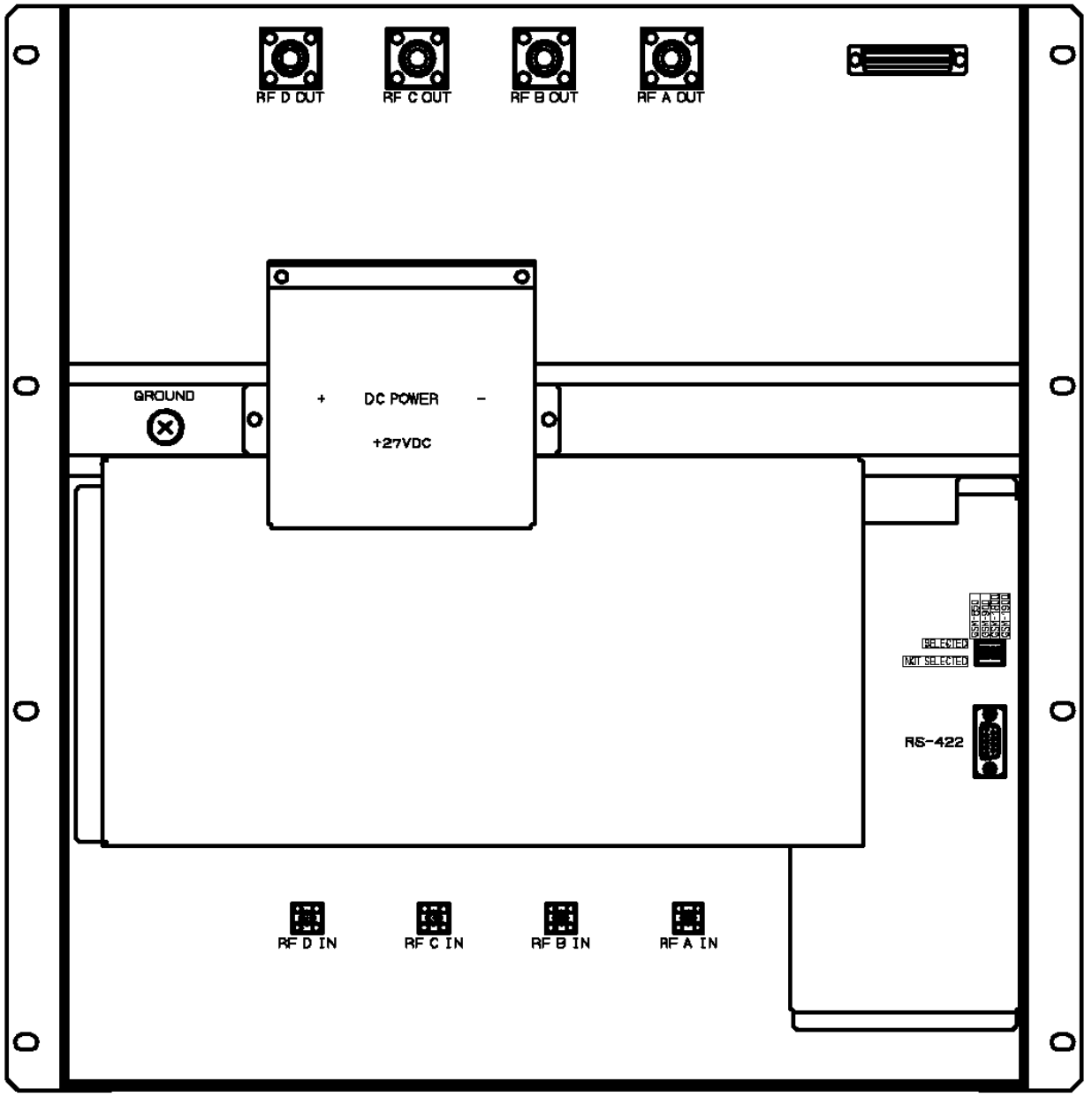


Figure 1-11 Rear Panel of Hitachi Kokusai Electric (HKE) MCPA Rack

1.5.3 Powerwave MCPA Rack and Modules

Figure 1-12 and Figure 1-13 display the front and rear view of the Powerwave MCPA Rack and modules.

Figure 1-12 Front Panel of Powerwave MCPA Rack

Figure 1-13 Rear Panel of Powerwave MCPA Rack

1.5.4 JRC MCPA Rack and Modules

Figure 1-14 and Figure 1-15 display the front and rear view of the JRC MCPA Rack and modules.

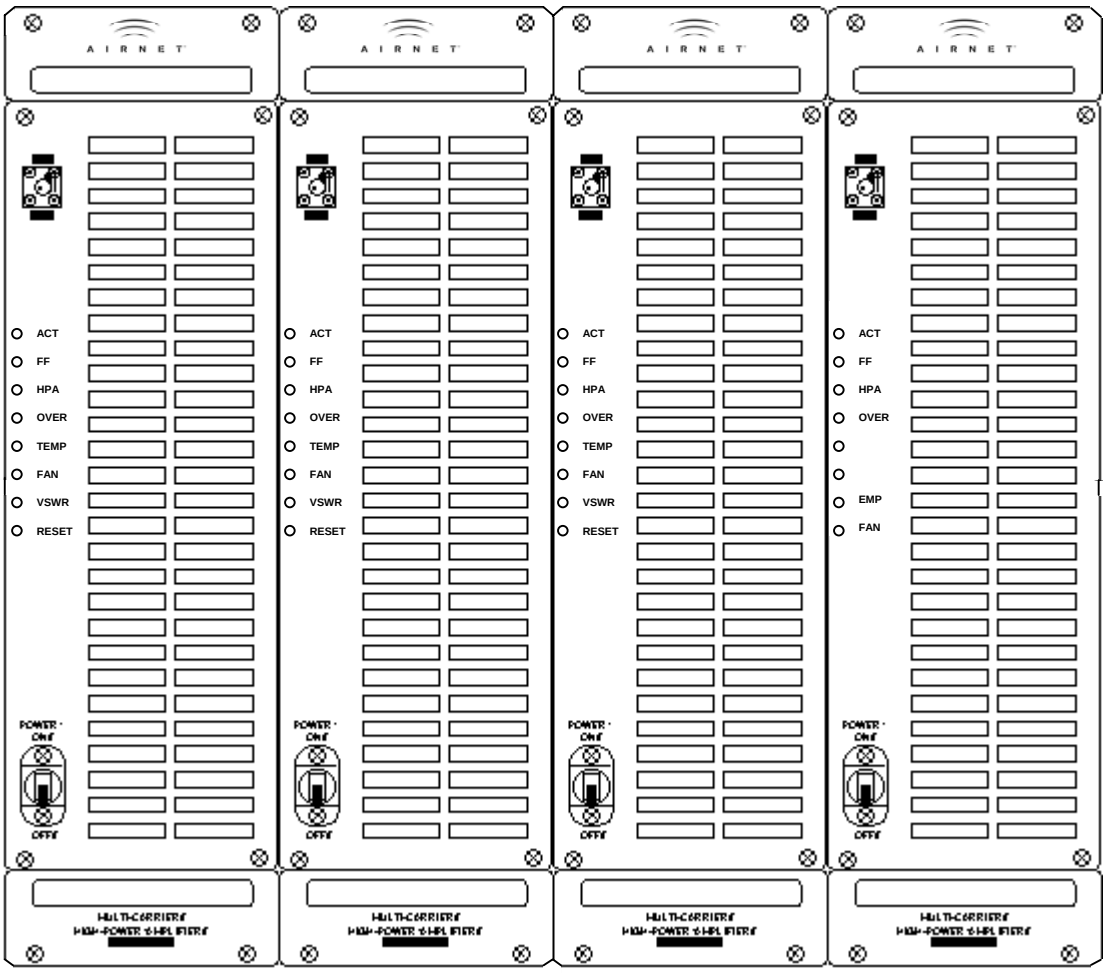


Figure 1-14 Front Panel of JRC MCPA Rack

Figure 1-15 Rear Panel of JRC MCPA Rack

1.6 Broadband Processing Unit

The Broadband Processing Unit (BPU) can contain up to four 3U power supply modules and two 3U GPS modules in the left side of the rack. In the right side of the rack, slots 1 and 2 accommodate two ICE-T boards, while slot 3 hosts an Alarm card. Slots 4, 5, 6, and 7 hold up to 4 of the SuperDSP cards, while Slots 8, 9, 10, and 11 hold up to 4 of the BDX modules. Slot 12 can hold either a 5th BDX module or a Distributed LO module, while Slot 13 can hold either a 6th BDX module or an RF Matrix Card. Refer to Figure 1-16.

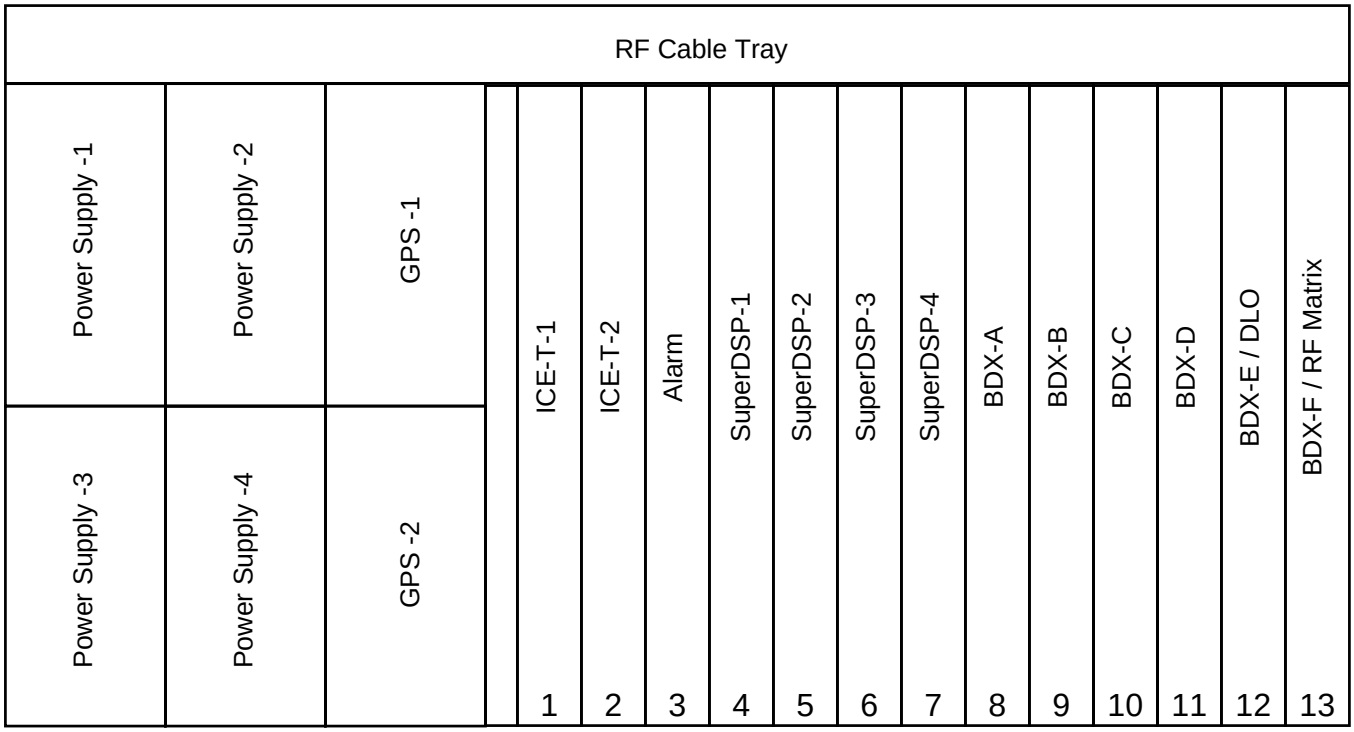


Figure 1-16 Broadband Processing Unit (BPU)

1.6.1 DC Power System

The DC Power System receives +27 VDC power from an external AC/DC Power System and converts it to various voltages used by the cards and modules in the BPU.


Note

Note - The MCPAs do not use the internal DC power system. They connect directly to the +27 VDC output of the AC/DC Power System's +27 VDC power source.

1.6.1.1 Configurations

There is only one type of DC converter module used in the BTS-4000 DC power system: +5V, +12V. Refer to Section 3.4.4 for a view of the DC power converter module and additional information.

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

As shown in Figure 1-16, the BPU rack can hold up to 4 power modules. The number of modules required depends on the configuration of the BPU rack. Refer to Table 1-3 to determine how many DC power supply modules are required.

Table 1-3 DC Power Supply Configuration Table

Number of Cards/Modules Installed in the BPU					Supply Load (A)		Number of DC Power Supply Modules required (add 1 for redundancy)
ICE-T	GPS2	Alarm2	SDSP	BDXMUX 2	5 volt	12 volt	04721-001
1	1	1	1	1	26.8	6.78	1
1	1	1	2	1	37.3	6.78	1
1	1	1	1	2	32.8	11.78	1
1	1	1	2	2	43.3	11.78	2
1	1	1	1	3	38.8	16.78	1
1	1	1	2	3	49.3	16.78	2
1	1	1	1	4	44.8	21.78	2
1	1	1	2	4	55.3	21.78	2
1	1	1	3	4	65.8	21.78	2
1	1	1	3	6	77.8	31.78	2
1	1	1	4	6	88.3	31.78	3
2	2	1	4	6	93.6	32.48	3

04721-001 capacity:	Voltage	Current
	5	40
	12	20

1.6.1.2 Operation

Each power supply module has a power switch on the front panel. In order for the power supply module to operate, the switch must be in the ON position. Each power supply module has two LEDs on the front panel that indicate if the module is operating normally or if the module has failed.

1.6.2 GPS Modules

The GPS (Global Position System) modules supply a 13 MHz sine reference, 1 PPS signal, and time-of-day to the ICE-T card which generates a programmable synthesized clock pulse stream that is used to align and synchronize multiple base stations to the GSM standard (or to other TDMA standards). The timing signals derived from various GPS circuits in base stations located miles apart are typically aligned within 100 nanoseconds of each other.

1.6.3 ICE-T Card

The ICE-T card combines the functions previously provided by the CPU card, Flash Memory card, and Network Interface Controller (T1/E1) card into one.

The CPU functionality of the ICE-T card 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. The base RAM configuration for the CPU functions is 64 MB, upgradeable to 256 MB.

The Flash functionality of the ICE-T card is provided by two separate memory areas. The card contains 128 MB of non-volatile, read/writeable memory on the card to store hardware configuration information. It also contains a compact flash type I header and a 128 MB Type I 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 card provides the T1 or E1 network interface from the BTS to a Base Station Controller (BSC) or other telecommunication network equipment for the transfer of voice and/or data between the mobile subscriber and the public telephone network. This interface is also used for signaling necessary for call processing functions when interfacing to the telecommunication network. The ICE-T card provides one E1 or T1 link to support transport of signaling and traffic data between the BTS and a higher network entity such as a BSC. It also provides an internal interface to the SuperDSP cards for processing of voice and control signals that are transmitted over the air.

The ICE-T card has the following features:

- Configurable for T1 or E1
- Three serial interfaces. Two are accessible from the back panel, and one from the front. The back panel serial interfaces serve dedicated functions. One is for a standard RS-232C connection with the 'test mobile' for adaptive array calibration, and the other is for a standard RS-232C connection with the GPS module. The serial

port on the front panel is used for configuration of the processor's boot source and for T1/E1 diagnostics.

- An Ethernet interface (10/100BaseT) that allows the operator to boot the operating system and load application software from a device on the network.
- The ability to reset the card if the software is not functioning properly.
- On board diagnostic software to check the health status of the processor, memory, interfaces (serial, ethernet, etc.), and T1/E1.
- Alarms to the GUI and via front panel LEDs

1.6.4 Alarm Card

An alarm card is provided within the BPU and is connected to a number of internal monitor points. The alarm card monitors the status of the DC Power System, MCPAs, and other items such as thermal sensors and cooling fans within the BTS. It also can interface to equipment external to the BTS to provide detection and reporting for security monitoring, environmental monitoring and control, AC/DC Power System monitoring, etc. The actual systems externally monitored vary depending on the BTS site configuration.

1.6.5 SuperDSP Card

Up to four SuperDSP cards may be installed within the BTS-4000. The SuperDSP card 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 is received by the SuperDSP as digitally sampled baseband signals. These signals are demodulated and formatted for transfer over the T1 or E1 interface of the telecommunications network. Modulation and data formats are specific to the air-interface protocol of the wireless system. The SuperDSP card uses general-purpose digital signal processors allowing flexibility in the implementation of the protocol for a given application. Each SuperDSP card can process up to 64 traffic channels.


Note

Note - SuperDSP cards cannot be mixed with 64K DSP cards in the same BTS. If this occurs, an error message will be displayed at the OMC-R GUI, and the BTS will be prevented from entering the in-service operational state.

1.6.6 BDX (Broadband Digital Transceiver)

The Broadband Digital Transceiver (BDX) card provides the link between the SuperDSP cards and the desired RF spectrum. In previous BTS models, this function was provided by three components: the BRTs, BCMs, and XMUX cards.

Like the BRTs, the BDX card 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 card 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 SuperDSP while implementing the baseband/broadband conversion process.

On the receive side, the BDX takes the broadband RF signal from the antenna assembly and translates 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 SuperDSP cards.

On the transmit side, the BDX receives multiple modulated baseband signals from the SuperDSP cards and translates each baseband signal to a unique IF frequency that is then mixed up to an RF carrier frequency. The resulting multi-carrier transmit signal is filtered, level adjusted, and output to the MCPA assembly.

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 GPS module. This coherency with GPS references allows close frequency and time alignment between multiple BDX modules (important in Adaptive Array applications).

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

Following is a list of BDX card features:

- Downconverts two low-noise diversity receive RF paths to 12 digitally filtered receive channels.
- Combines and upconverts 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 from DUC is looped back into both DDC RX paths.
- Provides uplink digital loopback, where either DDC RX path may be looped back to the DUC 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 at 91.0 MHz sample rate.
    - 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 GPS-steered 13 MHz reference.

  - Provides twelve pairs of digital downconversion and decimation paths for the A/D data receive paths.
  - Provides twelve digital upconversion 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 to -2 dBm in both RX paths.
- Provides up to 14 dB of static power control (SPC) attenuation with 2 dB steps in the TX path.
- Includes FPGA register based controller for synthesizer programming, AGC control, and alarm monitoring.
- Provides TMA current monitor and alarming for two external tower-mounted low-noise amplifiers.
- Fully synthesized for 200 kHz step increments with 5 MHz or 25 MHz of instantaneous bandwidth.
- Capable of frequency hopping within full 5 MHz or 25 MHz 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 chassis is powered.
- Allows the transmit output level to be adjusted electronically over a 7.5 dB range in 0.5 dB steps to compensate MCPA gain variations.

1.7 BTS Terminal Server

The BTS-4000 contains a terminal server that allows the ICE-T, Alarm, and SDSP cards to have a presence on the Enterprise Network using the terminal server's TCP/IP network address.

The terminal server is wired internally to the CSU/DSU, the BPU Backplane, and the Serial port on the front panel of the BTS-4000, which is used to establish a local connection to the terminal server using a Local Maintenance Terminal (LMT).

Power to the terminal server is provided by the DC power converters in the BPU rack. Internal cabling is routed from the BPU backplane to the Terminal Server.

The current BTS-4000 Terminal Server is the Model ELS-16 II, manufactured by Equinox Systems. As shown in Figure 1-17 and Figure 1-18, the BSC-3500 Terminal Server has 16 RS-232 interfaces and one 10/100baseT Ethernet port. See Table 1-4 for a list of terminal server interfaces and where they connect.

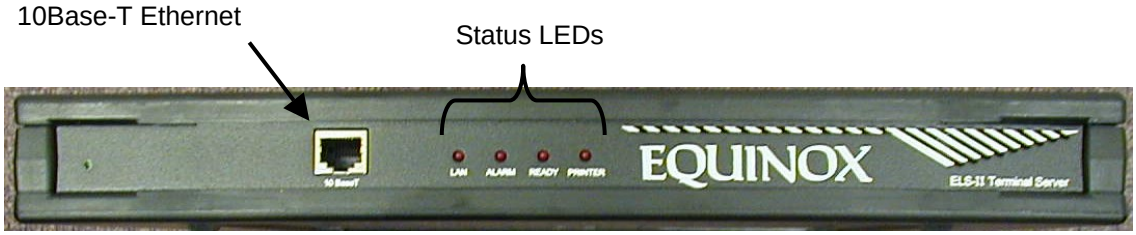


Figure 1-17 Front Panel of BTS-4000 Terminal Server

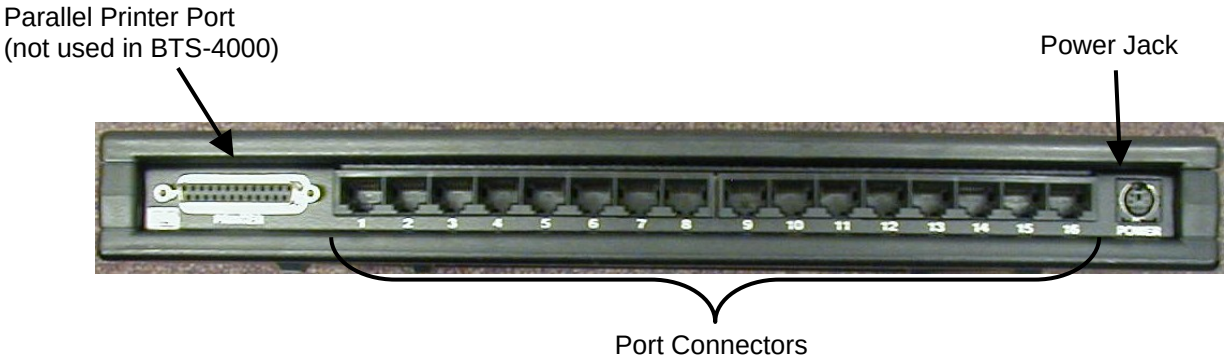


Figure 1-18 Rear Panel of BTS-4000 Terminal Server

Table 1-4 Terminal Server Interface Connections

Terminal Server Interface	Connects to:
Ethernet	CSU/DSU Port 1
Power	DC converter power port on BPU backplane (DB-6 to DB-15)
1-6	RS-232 connector on backplane to ICE-T modules, Alarm module, and SDSP modules.
7	Front Panel Serial Port
8	CSU/DSU Console Port
9-16	Are these used ???

1.8 BTS CSU/DSU Router

The BTS-4000 contains a CSU/DSU Router that provides a CSU/DSU, WAN access router, ethernet hub, and drop and insert port for the BTS.

The CSU/DSU server is wired internally to the Terminal Server, the BPU backplane, and the Ethernet port on the front panel of the BTS-4000, which is used to establish a local connection to the CSU/DSU using a Local Maintenance Terminal (LMT).

The bulk power unit provides +27VDC to the CSU/DSU.

The current BTS-4000 CSU/DSU is the IPExpress MLE-DI router, manufactured by Engage Communications.

See Table 1-5 for a list of CSU/DSU interfaces and where they connect.

Table 1-5 CSU/DSU Interface Connections

CSU/DSU Interface	Connects to:
Console	Terminal Server Port 8
10 BaseT Hub 4	J25 Ethernet port on backplane from ICE-T 1 (???)
10 BaseT Hub 3	J26 Ethernet port on backplane from ICE-T 2 (???)
10 BaseT Hub 2	Front Panel Ethernet
10 BaseT Hub 1	Terminal Server Ethernet
DS1	BPU T1/E1 B
Telco	BSC CSU/DSU
DC Power - CSU GND	Bulk Power Return
DC Power - CSU VDC	27VDC - Bulk Power CSU Breaker
DC Power - CSU FRM	Enclosure Ground Plate

The Console port is used to initially configure the router. Subsequent configurations can be accomplished via a telnet session to the router. The console port is used to communicate with the router locally through the terminal server. Communication to the console port should be set as: 9600 baud, 1 stop bit, no parity, 8 bit fixed.

Figure 1-19 Front Panel of BTS-4000 CSU/DSU Router

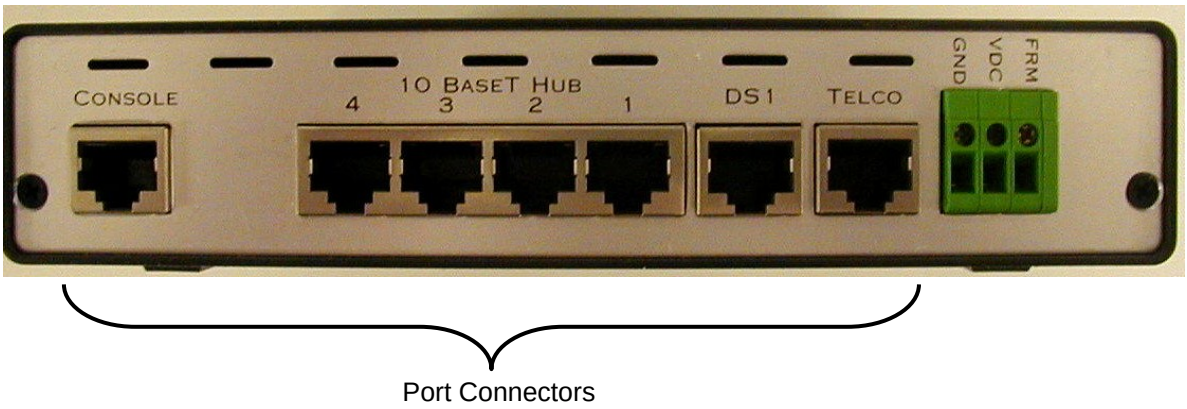


Figure 1-20 Rear Panel of BTS-4000 CSU/DSU Router

2. INSTALLATION

Please read this section

in its entirety

before proceeding

with the installation.

This section is subdivided as follows:

2.1 Site Preparation

This section contains information concerning preparations that need to be completed prior to unpacking and installing BTS equipment.

2.1.1 Environmental Considerations

The BTS should be installed in an environment that meets the specifications in Appendix F.

The environment should also be relatively clean with low dust levels and other air contaminants compatible for the installation of computer equipment.

2.1.2 Choosing an Installation Location

Care should be taken when selecting a site for the installation of the BTS. Fans are located in the cabinets to provide the required airflow. A minimum clearance of 3 feet (91.4 cm) front and back of the BTS is required to allow access to the equipment and to maintain proper airflow.

The height of the indoor cabinet is 6’4" and clearance above the cabinet is necessary for cable installation.


Caution

CAUTION - A minimum clearance of 3 feet (91.4 cm) must be maintained in the front and back of the BTS to allow access to the equipment and to maintain proper airflow.

The BTS requires preparation of the mounting location to secure the BTS to the floor. Referencing Figure 2-1, four mounting holes or studs must be provided in the locations shown in the figure. Installer-supplied ½-inch diameter bolts of sufficient length are to be used to secure the BTS cabinet to the floor or platform. The stud or bolt must not protrude through the mounting brackets of the BTS cabinet more than ½-inch.

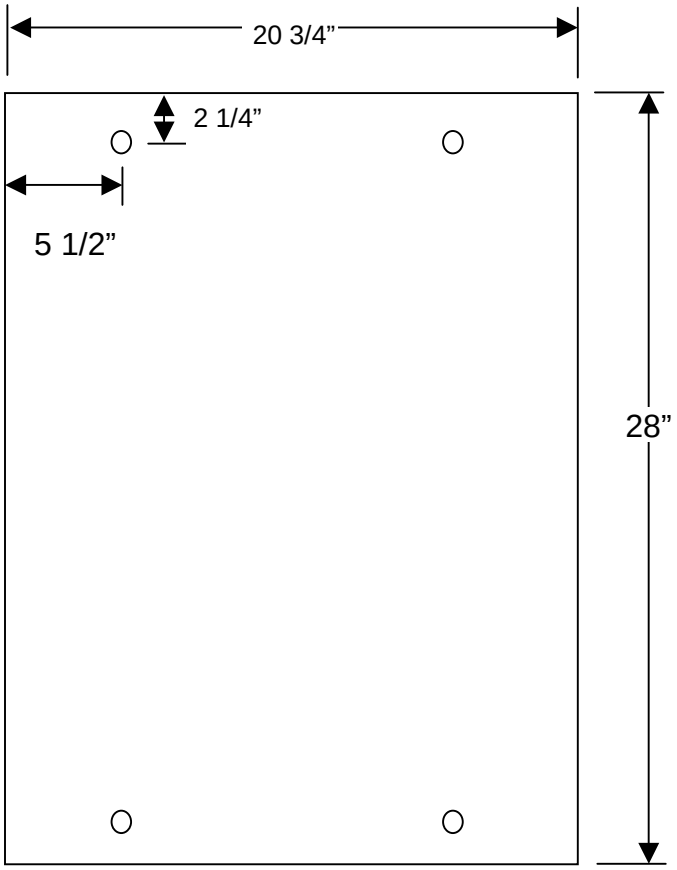


Figure 2-1 BTS Floor Mounting Template Looking Down

2.1.3 Electrical Supply Facilities

Size the power feed into the BTS based on the required amperage in the table below. Choose the appropriate wire gauge for the installation based on this number. Future equipment expansions of the BTS should be evaluated to ensure properly sized power feeds.

Table 2-1 Required Amperage (JRC – GSM-1800 and GSM-1900)

BPU Configuration	1 JRC MCPA	2 JRC MCPAs	3 JRC MCPAs	4 JRC MCPAs
1 Sector	47	69	91	113
2 Sector	54	76	98	120
3 Sector	61	83	105	127
4 Sector	68	90	112	134

Table 2-2 Required Amperage (HKE – GSM-900 only)

No. of HKE MCPAs	No. of Sectors	No. of SuperDSP Cards	Total Current (Amps)
1	1	1	53.4
1	1	2	56.8
1	1	3	60.1
1	1	4	63.4
2	1	1	86.5
2	1	2	89.8
2	1	3	93.2
2	1	4	96.5
2	2	1	99.9
2	2	2	103.3
2	2	3	106.6
2	2	4	109.9
3	3	1	146.4
3	3	2	149.8

No. of HKE MCPAs	No. of Sectors	No. of SuperDSP Cards	Total Current (Amps)
3	3	3	153.1
3	3	4	156.4
3	1	4	129.6
4	4	1	192.9
4	4	2	196.3
4	4	3	199.6
4	4	4	202.9
4	1	4	162.6
4	2	1	166.1
4	2	2	169.4
4	2	3	172.7
4	2	4	176.1
6	3	1	245.6
6	3	2	249.0
6	3	3	252.3
6	3	4	255.6
8	4	1	325.2
8	4	2	328.5
8	4	3	331.9
8	4	4	335.2

Table 2-3 Required Amperage (Powerwave – GSM-900 only)

No. of Powerwave MCPAs	No. of Sectors	No. of SuperDSP Cards	Total Current (Amps)
	1	1	
	1	2	
	1	3	

No. of Powerwave MCPAs	No. of Sectors	No. of SuperDSP Cards	Total Current (Amps)
	1	4	
	1	1	
	1	2	
	1	3	
	1	4	
	2	1	
	2	2	
	2	3	
	2	4	
	3	1	
	3	2	
	3	3	
	3	4	
	1	4	
	4	1	
	4	2	
	4	3	
	4	4	
	1	4	
	2	1	
	2	2	
	2	3	
	2	4	
	3	1	
	3	2	
	3	3	
	3	4	
	4	1	

No. of Powerwave MCPAs	No. of Sectors	No. of SuperDSP Cards	Total Current (Amps)
	4	2	
	4	3	
	4	4	

2.1.4 Telecommunication Network Facilities

The BTS-4000 is designed for physical connection to a Main Distribution Frame (MDF) using standard RJ-45 connections. An MDF is commonly used as the method to provide connections to telecommunications equipment. The MDF is usually comprised of type 66 punch-down blocks.

The T1/E1 connections on the top (I/O) panel on the BTS are used for the physical connections to the MDF.

Facilities providing T1 services between the BTS and other network elements must support Extended Superframe Format (ESF).

CAUTION – The BTS-4000 is not intended for direct connection to the PSTN.

To comply with FCC regulations, each E1/T1 connection to the PSTN requires the use of a CSU/DSU or similar device that is approved for the country where the equipment is being deployed.

2.1.5 Computer Network Connections

The BTS-4000 contains a Terminal Server that provides network access to the serial ports of various components in the BTS for maintenance and diagnostics. These components can be accessed by connecting the computer network to the **ETHERNET** port on the front panel of the BTS-4000.

2.1.6 GPS Antenna Facilities

2.1.6.1 Selecting GPS Antenna Installation site

When planning for the GPS antenna, careful consideration must be given to the location and placement of the antenna site as this can affect the overall performance of the GPS unit. The primary goal is to locate the antenna installation site in a place where it has a clear view of the sky. A secondary goal is to locate the antenna away from radio transmitters that could possibly interfere with the reception of the GPS satellite signals. If several locations are available, select the one with the best view of the sky.

2.1.6.2 Selecting and Routing Cables for the GPS Antenna

The antenna cable supplied with the GPS antenna kit is a 50-foot length of RG-58 with a male TNC connector on each end.

Before selecting cables, measure the distance between the BTS cabinet installation site and the GPS antenna installation site. If the distance is less than 115 feet, then you can use type RG-58 cable. If the distance is greater than 115 feet, then use a cable with lower signal loss such as RG-213 or RG-8.

2.2 Installing BTS Equipment

This section contains the procedures required to unpack, install the BTS equipment, connect power and ground cables, power up the power supply and MCPAs, and complete the computer and telecommunication network connections.

2.2.1 Tools and Materials Required

Refer to Table 2-4 for a list of the tools and materials required for installation.

Table 2-4 Tools and Materials Required for Installation

Standard Tool Kit
Local Maintenance Terminal (LMT), which is a PC terminal with communications software. The communications software should be able to capture the data.
Multimeter
Serial cable (???) AirNet Part Number xxxxx-001
Four ½-inch Diameter mounting studs or bolts to secure BTS to the floor. Length of studs to be determined during installation
#6 ring terminals or tongues
1/8 inch wide Cable Ties
Cable Tie Anchors with (self-adhesive backing)
ESD Strap (provided)

2.2.2 Unpacking and Mounting the BTS Cabinet

BTS components are shipped in wooden crates with their contents specified on packing slips attached to each crate.

Use this procedure to unpack each of the crates.

Typically, BTS components are crated as shown in Table 2-5.

Table 2-5 Typical Packaging of BTS Components

Crate Packing Information	Approximate Weight (lbs.) Including crate
BTS	500
High Power Amplifiers (1 to 4), BPU, GPS Antenna and Antenna Components, Miscellaneous Hardware	290 to 350

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

WARNING - The BTS crates are heavy. Safe lifting techniques involving personnel and/or equipment should be exercised.

2. Place the crate containing the BTS components upright in an area with several feet of clearance on all sides.

3. Remove the fasteners that hold the **top** of the crate to the sides. Remove the top of the crate and set it outside of the work area.

4. Remove the fasteners that hold the **front** of the crate to the sides. Remove the front of the crate and set it outside of the work area.

WARNING –Safe lifting and moving techniques involving personnel and/or equipment should be exercised.

5. Using proper lifting techniques, carefully remove BTS components from the crate and set to the side for later installation.

6. Move remnants of the crate out of work area.

7. Remove the protective urethane bag covering the equipment.

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

9. Repeat steps 1 through 8 to unpack each additional BTS crate.

2.2.3 Mounting the BTS to the Floor

Use this procedure to mount the BTS cabinet to the floor in the site prepared during Site Preparation.

CAUTION - A minimum clearance of 3 feet (91.4 cm) must be maintained in the front and back of the BTS to allow access to the equipment and to maintain proper airflow.

WARNING –Safe lifting and moving techniques involving personnel and/or equipment should be exercised.

1. Using the key provided, unlock the BTS cabinet front door.
2. Remove the cabinet rear panel.
3. Remove the bottom intake plenum (4 screws). See Figure 1-1.
4. Remove the floor of the cabinet (4 screws).
5. Lay the cabinet on its side to access the bottom of the cabinet.
6. Remove the four castors (4 bolts each) and set the cabinet upright.
7. Position the BTS in the mounting location so that mounting holes in the floor align with the four mounting holes in the bottom of the BTS.

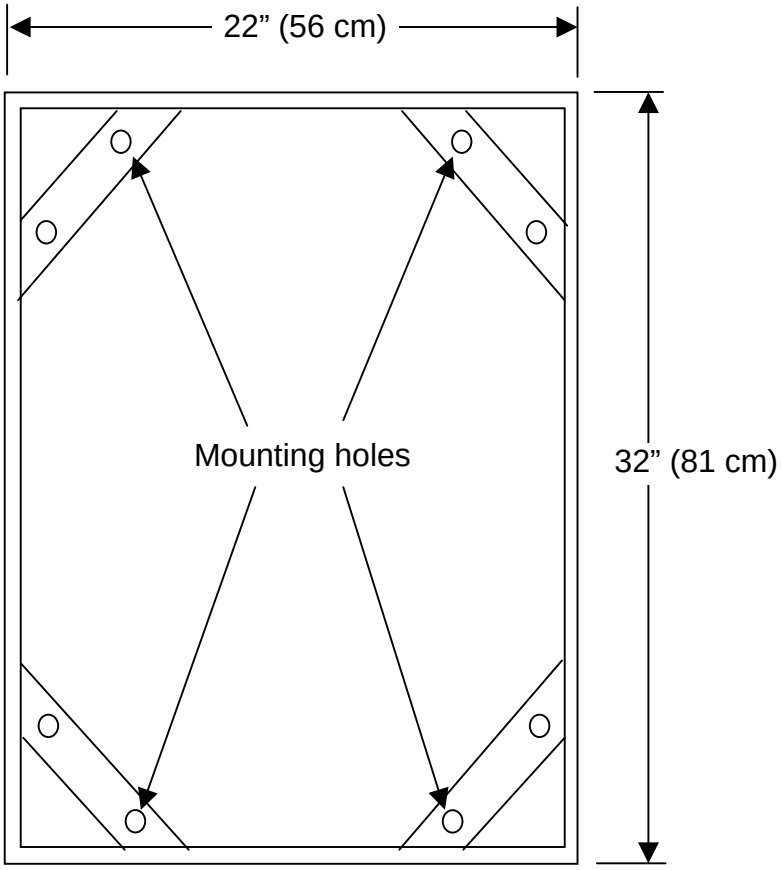


Figure 2-2 Bottom of Cabinet

8. Mount the shelf to the floor using installer-provided bolts and anchors or studs.

9. Reinstall the floor of the cabinet and the intake plenum.

10. Reinstall the rear panel of the cabinet.

11. Completely vacuum and clean all debris from the BTS cabinet.

2.2.4 Grounding and Power

Warning

WARNING - It is important to immediately connect grounding to the cabinet for safety and to provide a ground for antistatic devices.

Warning

WARNING – Always ensure that bulk power is off before connecting or disconnecting external ground wire.

1. Connect the external Ground wire to the ground lug on the top of the cabinet.
2. Remove the clear cover from the DC- and DC+ connectors.
3. Connect the external DC Return wire to the **DC -** connector on the top of the cabinet with a 3/8” lug.
4. Connect the external +DC wire to the **DC +** connector on the top of the cabinet with a 3/8” lug.
5. Install the cover over the DC – and DC + connectors, as shown in Figure 2-3.

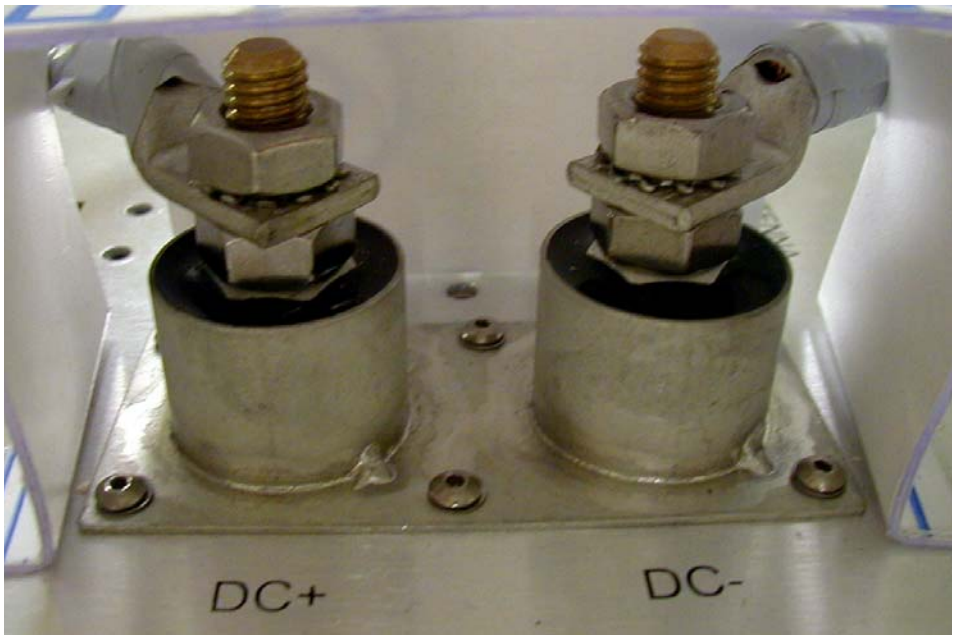


Figure 2-3 DC+ , DC-, and Ground Lugs

2.2.5 Installation of High Power Amplifiers


Caution

CAUTION - Avoid rough handling of High Power Amplifiers. Rough handling could cause misalignment of internal electronics that are preset at the factory.


Caution

CAUTION - Do not install MCPAs with the external, +27 VDC bulk power supply turned on. Ensure that the bulk power supply is off and tagged for the BTS to prevent personnel from accidentally energizing the BTS.

Carefully insert each MCPA and secure with the screws provided.

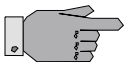
2.2.6 RF Connections

If TMAs are used, continue with paragraph 2.2.6.1 and then proceed to paragraph 2.2.7.

If TMAs are not being used, skip paragraph 2.2.6.1 and go to paragraph 2.2.6.2.

2.2.6.1 With TMAs

This section describes Tower Mounted Amplifier (TMA) power connections to the BTS. The BTS supplies power to external DC injectors that are installed inline with the BTS antenna connectors.


GoTo

GoTo - If TMAs are not used, proceed to paragraph 2.2.6.2.


Caution

CAUTION -The TMA connections are designed for use with TMAs that have been tested with the BTS and are recommended for use by AirNet. Contact AirNet for a list of recommended vendors and equipment. Do not connect equipment to the TMA connections unless approved by AirNet.


Caution

CAUTION -All cables connected to the BTS top panel must be shielded to comply with FCC emission control requirements.

1. For each configured sector, make three cables as shown in Figure 2-4.
2. Connect the cables as shown in Figure 2-4. Also, refer to Figure 1-3.

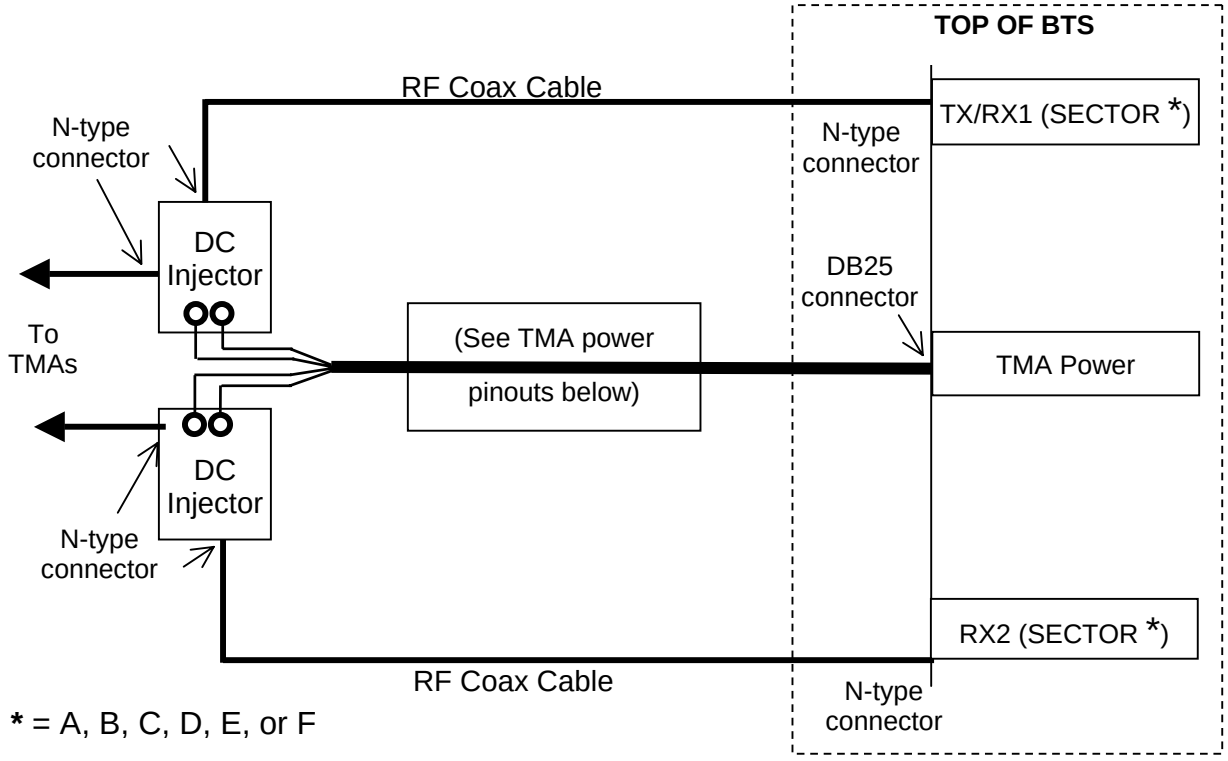


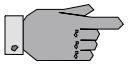
Figure 2-4 RF Connection Cables

DC Injector			DB25 TMA Power	
Sector	**Signal**		**Pin**	**Signal**
A	TX/RX1 POS		1	TMA_PWR_A1
	TX/RX1 GND		2	GND
	RX2 POS		14	TMA_PWR_A2
	RX2 GND		15	GND
B	TX/RX1 POS		4	TMA_PWR_B1
	TX/RX1 GND		5	GND
	RX2 POS		17	TMA_PWR_B2
	RX2 GND		18	GND
C	TX/RX1 POS		7	TMA_PWR_C1
	TX/RX1 GND		8	GND
	RX2 POS		20	TMA_PWR_C2
	RX2 GND		21	GND
D	TX/RX1 POS		10	TMA_PWR_D1
	TX/RX1 GND		11	GND
	RX2 POS		23	TMA_PWR_D2
	RX2 GND		24	GND

DC Injector			DB25 TMA Power	
Sector	**Signal**		**Pin**	**Signal**
E	TX/RX1 POS		3	TMA_PWR_E1
	TX/RX1 GND		6	GND
	RX2 POS		9	TMA_PWR_E2
	RX2 GND		12	GND
F	TX/RX1 POS		13	TMA_PWR_F1
	TX/RX1 GND		16	GND
	RX2 POS		19	TMA_PWR_F2
	RX2 GND		22	GND
			25	GND

2.2.6.2 Without TMAs

This section describes antenna connections when TMAs are not used.


GoTo

GoTo – If TMAs are used, perform the steps in paragraph 2.2.6.1.

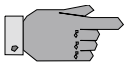

Caution

CAUTION -All cables connected to the BTS must be shielded to comply with FCC emission control requirements.

1. Connect the diversity receive antenna to the appropriate **RX2** connector on the top of the cabinet. See Figure 1-3.

2. Connect the transmit/receive antenna to **TX1/RX1** N-type RF connector on the top of the cabinet. See Figure 1-3.

2.2.7 External Alarm Connections


GoTo

GoTo - If external alarms are not being used, go to Paragraph 2.2.8.

Connect the external alarm cable to the **ALARM** connector (Telco – 50-pin) on the top (I/O) panel of the BTS-4000 cabinet. A pinout for this connector is provided in Appendix B. Alarm Descriptions are provided in Appendix C.

CAUTION -All cables connected to the BTS must be shielded to comply with FCC emission control requirements.

2.2.8 Telecommunications

Note - Typically, only T1/E1-B is used if the BTS is connected to an AirNet BSC for a GSM-1900 application.

CAUTION - If the BTS is being connected to a PSTN, ensure that a CSU is connected between the BTS and the PSTN.

Note - All external cables must be shielded to maintain FCC emission compliance.

1. Connect the T1/E1 interface rack cable to the **T1/E1 B** connector on the top of the cabinet (see Figure 1-3).
2. Repeat, if necessary, for connections to **T1/E1 A**, **T1/E1 C,** and **T1/E1 D**.

2.2.9 Ethernet Connections (Enterprise Network)

If an Ethernet connection is required, connect the Ethernet cable directly to the **TERMINAL SERVER** port on the front panel on the BTS-4000.

Refer to the *AirNet Enterprise Network Field Installation and Maintenance Manual*, PN 05134-001, for detailed instructions to install and configure the ethernet connections (Enterprise Network) feature on the BTS.

2.2.10 GPS Antenna Connections

Bring all the GPS antenna components and mounting kit to the GPS antenna installation site selected during Site Preparation.

GoTo

GoTo - If mounting the GPS antenna flush to the roof of the cell site, go paragraph 2.2.10.2. If mast-head mounting, go to paragraph 2.2.10.1

2.2.10.1 Mast Head Mounting GPS Antenna

Use the following procedure if the GPS antenna is to be mounted on a mast.

1. Feed one end of the antenna cable up through the cone-shaped plastic adapter and mate the connector with the antenna. See Figure 2-5.

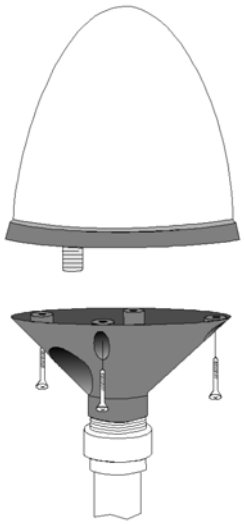


Figure 2-5 Mast Head Mounting GPS Antenna

2. Attach the conical adapter to the antenna using the four, short, self-tapping screws. See Figure 2-5.

3. Screw assembly into a mast having a one inch outer diameter and 14 TPI thread. As an alternative, you can use a threaded metal adapter to reduce down to a 5/8 inch diameter mast and 11 TPI thread.

4. Connect the GPS antenna to one of the TNC-type **GPS ANT** connectors on the top panel of the BTS cabinet. See Figure 1-3.

5. Repeat steps 1-4 if installing two mast-head GPS antennas.

2.2.10.2 Flush Mounting GPS Antenna

Use the following procedure if the GPS antenna is to be flush mounted.

1. Feed the antenna cable up through a clearance hole in the flat mounting surface and

up through the rubber sealing gasket. See Figure 2-6.

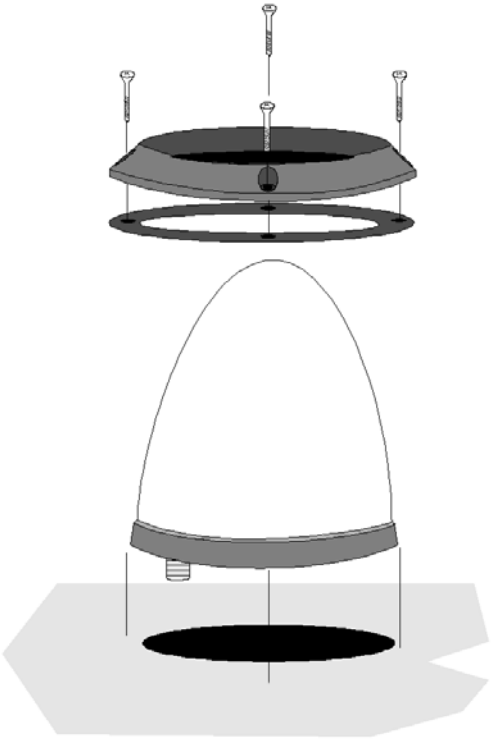


Figure 2-6 Flush Mounting GPS Antenna

2. Connect the cable to the antenna and place the antenna flat on the mounting surface.

3. Drop the plastic retainer ring over the antenna and secure it and the antenna with the four, long, self-tapping screws or other suitable hardware.

4. Connect the GPS antenna to one of the TNC-type **GPS ANT** connectors on the top panel of the BTS cabinet. See Figure 1-3.

5. Repeat steps 1-4 if installing two flush-mount GPS antennas.

2.3 Clean Up

After the ground and power leads have been connected to the BTS cabinet, and the MCPA modules and DC/DC Chassis Power Supply have been completely installed, the BTS is ready for the System Test. However, before proceeding, complete the following:

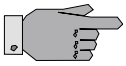
1. Pick up any packing or wire debris left around the work site and dispose of any packing material or wire that will not be re-used.

2. Sweep or vacuum the site floor.

3. Remove packing material from the site.


Caution

CAUTION - Do not apply power to the BTS at this time.


GoTo

GoTo - Continue the installation - go to Section 2.4.

2.4 System Test

This section describes the procedures for installation test of the BTS. During this procedure, the installer will be asked to verify the proper indications on the LMT or OMC-R screen. If the proper indications do not appear on the screen, the installer should stop the test and contact the AirNet CRC.


Caution

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

1. Connect a Local Maintenance Terminal (LMT) to the BTS as described in Section 3.3.

2. Enable the logging file on the LMT.

3. Ensure that the MCPAs are turned OFF.

4. Turn on the BTS Bulk Power Supply and verify that the "DC Output Voltage" LEDs are illuminated. If not illuminated, contact the AirNet CRC for assistance.


Caution

CAUTION -Transmit Antenna or dummy load must be connected to BTS TX1/RX1 RF connection or damage to the MCPA will result.

5. Place the ON/OFF switch on each MCPA in the ON position.

6. Verify that the error LEDs on the MCPAs are not illuminated. If any are, refer to Section 3 for troubleshooting information.

7. Measure the DC Voltage at the input to the BTS cabinet. If necessary, adjust the bulk power source to achieve +27 VDC ± 0.5 V to the BTS.

8. On the LMT, log in as **`crc`**

Type **`R0btsdir.ksh`** and press **<ENTER>**.

Enter the password **`airnet`**.

9. At the prompt, type **`p`** as shown, and press **<ENTER>**.

```
[VxWorks Boot]: p
```

10. Verify that the boot parameters appear as follows (press **<ENTER>** to scroll):

```
boot device              :scsi=4,0
processor number         :0
```

```
host name                    :logging PC name
file name                    :SD4a:vxworks
inet on ethernet             :10.10.xxx.201:ffffff00
host inet                    :10.10.xxx.100
user(u)                      :crc
flags(f)                     :0x0
target name(tn)              :(card name)bts
startup script               :.
other                        :ln
```

If parameters are not correct, type new information and press **<ENTER>.** The correction will not show. To view the parameters for corrections, type **c** and press **<ENTER>**.

11. At the prompt, type `@` as shown, and press **<ENTER>**.

`[VxWorks Boot]: @`

The BTS will boot and load the application code.

At the prompt, type **`<btsdiag`** as shown, and press <**ENTER**>.

`->` **`<btsDiag`**

12. The diagnostics program will run for approximately 25 to 35 minutes.

13. Disable logging on PC.

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

15. Verify that diagnostics program completed with no errors by reviewing log file.

16. Change the startup script to **`start.bts`** and reboot.

17. Once the BTS is done booting, on the LMT type **`gpsreset`** and press **<ENTER>**. This resets the GPS module(s), and the following information is displayed:

```
AirNet BTS->gpsreset
gpsreset
GPS Module will be reset.
GPS Module reset. BTS is rebooting NOW.
***** Reboot requested. *****
***** Restart type = 2 *****
```

18. Disconnect the serial cable from the BTS.

19. When the BTS restarts, telnet to the BTS-4000 terminal server using the OMC-R, and ensure that each ICE-T, Alarm, SuperDSP, and BDX card can be accessed via the network.

a. Open a "command session" or "xterm" window on the OMC-R workstation using the window functions of the workstation's operating system, as shown in Figure 2-7.

Figure 2-7 Logging on to the OMC-R via Terminal Server

b. Type the telnet command to connect to the BTS terminal server:

>**telnet xxx<CR>**

where "**xxx**" is the customer's system designation of the terminal service established during system installation. The following response should appear on the command window:

connected to xxx

c. Type the port number corresponding to the BTS card (ICE-T, Alarm, SuperDSP, or BDX) that is connected to the port on the terminal server:

> **x<CR>**

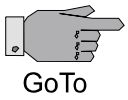
where "**x**" is the port number to which the card is connected. Pressing **<CR>** one more time displays a prompt from the card.

20. Terminate the Telnet session.

21. Close the front door of the BTS and lock the door. Place the key in a secure location.

. Caution

CAUTION - Back panels must be installed before operation of equipment begins, to comply with FCC emission control requirements.



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

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

BTS Installation Quick Checklist

FAX a copy of this completed form to the AirNet Customer Response Center at 1-321-676-6734

Customer name _____

Site name _____ **Date** _____

Inspection Item	Done (Init)
Cabinet secured to floor.	
Circuit card retaining bar in place and tightened down.	
MCPA module screws tightened down.	
Transmit Gain Adjustment Performed (added pad value noted below)	
DC Voltage checked.	
DC power cables firmly connected and polarity marked.	
DC power cables tied off and neatly bundled with no chafe points.	
All cabinet ground cables connected to ground window, bend radii > 6 inches.	
All grounds acceptable per AirNet Grounding Guidelines document.	
Coax grounds acceptable.	
Outdoor RF connections sealed with weather-tight tape or cold shrink.	
RF line lightning protectors installed and grounded.	
Lightning protectors on all lines coming into BTS.	
Lightning protection installed on AC line.	
BTS doors installed/closed and secured.	
Antenna sweep performed, VSWR < 1.5:1	
Place a voice call on each configured Traffic Channel.	

Value of SMA RF Attenuator Pads added per Transmit Gain Adjustment:

_____ dB

Installer _____

Date _____

2.5 Software Installation/Reinstallation

Initial installation of software will be provided on a flash memory card. Subsequent releases may be downloaded from the OMC-R (provided that the system is running Release 3.3 or higher software), or it may be provided on a flash memory card.

2.5.1 Software Installation via Software Download

See Section 6, *Software Download*, in the GSM BSS Operator's Manual.

2.5.2 Software Installation via Flash Memory on the ICE-T Card

The following steps should be performed to install software residing on a flash memory card.

1. Perform the BTS Shutdown procedure in Section 3.2.1.

2. Turn off power to the BTS.

3. Ensure you are wearing the ESD wrist strap.

4. Remove the ICE-T card from the BTS-4000.

5. Remove the flash memory card from the ICE-T card.

6. Insert the flash memory card containing the desired software release.

7. Reinstall the ICE-T card.

8. Restart the BTS using the BTS Restart procedure in Section 3.2.2.

9. Begin using the new software.

STOP – The software installation/reinstallation procedure is complete.

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3. REPAIR

3.1 Fault Indications

Typically, the first indication that there may be a problem with the BTS is an event message on the BSS Operator's OMC-R workstation. Event messages are categorized into four severity levels as listed below:

Critical -	These events indicate a complete failure has occurred or is imminent.
Major Severity -	These events indicate that there has been a significant loss of functionality, performance, or capacity. The system remains operational with degraded performance.
Minor Severity -	These events indicate a minor loss of functionality, performance, or capacity
Informational -	Information events do not indicate any alarms or abnormal operation within the system. These events provide general status information to the OMC-R operator or signify a nominal condition that has occurred.

If the operator is not able to correct a problem from the OMC-R, maintenance personnel will be required to troubleshoot and repair the problem on site.

On site, a field replaceable unit (FRU) in the BTS may also provide some indication of a fault. In this case, refer to the FRU in Section 3.4 for information regarding the interpretation of the particular indicator.

3.2 BTS Shutdown and Restart


Caution

CAUTION – Do not select **Recovery Sequence** from the *Network Configuration* screen during a BTS reboot. Wait for the BTS to complete its reboot process. If you need to lock/unlock a cell, modify the Admin state of the cell. Timeslots for the RF channels of a given ARFCN should be either all unlocked or locked.

3.2.1 BTS Shutdown Procedure

Perform the following procedure before removing or replacing hardware or when a power cycle is necessary. This procedure minimizes the possibility of flash corruption.

Initial condition(s):

- BTS is running with a flash memory card in the ICE-T card.

1. Modify the boot parameters on the BTS using the **bootChange** command.

- Remove the Startup Script by entering **.** (a period).

2. "Soft" reset the BTS using one of the following methods.

- At the BTS console, enter **reboot** . This is the fastest reboot mechanism.
- At the BTS console, enter **CTRL x** .
- Manually reset the ICE-T card.

3. After the VxWorks prompt appears, the BTS may be powered off.

3.2.2 BTS Restart Procedure

1. Ensure all BCCH TCHs and all configured AirSites are unlocked at boot up.

2. To minimize impact on a BTS with multiple configured (but off the air) AirSites, leave the RF channels for the AirSites unlocked and lock the admin state. AirSites that are not in service must be locked after reboot.

3. Power up the BTS.

4. Modify the boot parameters on the BTS using the **bootChange** command.

- Specify the Startup Script as **start.bts** .

5. "Soft" reset the BTS using one of the following methods.

- At the BTS console, enter **reboot** . This is the fastest reboot mechanism.
- At the BTS console, enter **CTRL x** .
- Manually reset the primary ICE-T card.

3.3 Connecting a Local Maintenance Terminal (LMT)

A laptop computer with terminal communication software (such as HyperTerminal) can be connected to the BTS to determine the status of the equipment and run diagnostics at the site of the BTS. Use the following procedure to connect a LMT to the BTS.

1. Using an RS232 cable, AirNet P/N ?????-001, connect a PC with a Terminal Emulator program (such as HyperTerminal) to the RS-232 connector on the front panel of the ICE-T card.

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. The *AirNet BTS->* prompt will appear. You are now able to monitor API messages or enter API commands to the system.

3.4 Field Replaceable Units (FRUs)

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 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.

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 (1-888-8AIRNET or 1-888-824-7638) if packing materials are needed.

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

Table 3-1 Field Replaceable Units

Name / Description	Part Number
Alarm Module	02349
BDX (850 MHz) with 5 MHz IF Bandwidth	05010
BDX (850 MHz) with 25 MHz IF Bandwidth	05634
BDX (900 MHz) with 5 MHz IF Bandwidth	05015
BDX (1800 MHz) with 5 MHz IF Bandwidth	05020
BDX (1900 MHz) with 5 MHz IF Bandwidth	05025
BDX (1900 MHz) with 25 MHz IF Bandwidth	05635
DC/DC Converter Module (5V,12V)	04721
DC Injector, GSM-850 and E-GSM-900	04566
DC Injector, GSM-1800	02855
DC Injector, GSM-1900	01648
Fan Tray, Upper	05219
Fan Tray, Lower	05216
GPS Module	05483
ICE-T Module	03970
MCPA Module, HKE 60W E-GSM-900 (925-960 MHz)	04406
MCPA Module, Powerwave 80W E-GSM-900 (925-960 MHz)	05667
MCPA Module, JRC 40W GSM-1800 (1805-1825 MHz)	03743

Name / Description	Part Number
MCPA Module, JRC 40W GSM-1800 (1820-1840 MHz)	03744
MCPA Module, JRC 40W GSM-1800 (1835-1855 MHz)	03745
MCPA Module, JRC 40W GSM-1800 (1850-1870 MHz)	03746
MCPA Module, JRC 40W GSM-1800 (1865-1885 MHz)	03747
MCPA Module, JRC 40W (GSM-1900 C&F Band)	02321
MCPA Module, JRC 40W (GSM-1900 E&B Band)	02629
MCPA Module, JRC 40W (GSM-1900 A&D Band)	02630
RF Filter, Whole Band, GSM-850	05659
RF Filter, Whole Band, GSM-900	05657
RF Filter, Whole Band, GSM-1800	05658
RF Filter, Whole Band, GSM-1900	05656
SuperDSP Module	03406
Are these FRUs: ???	
Terminal Server	05440
CSU/DSU - E1	05082
CSU/DSU - T1	05081

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.

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3.4.1 Alarm Card

3.4.1.1 Front Panel

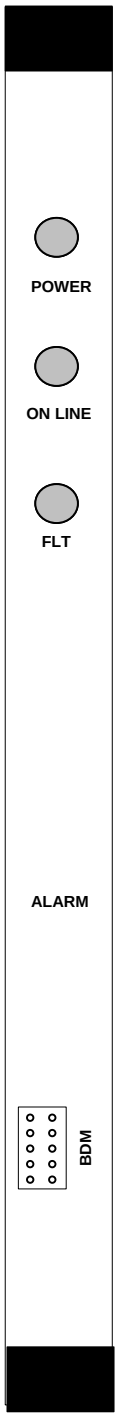

Figure 3-1 Front Panel of Alarm Card

3.4.1.2 Connectors/LEDs

Table 3-2 Alarm Card Connector/LED Table

LED Name	Description
POWER	Indicates all required voltages are present.
ONLINE	If the embedded processor is reset or crashes, this LED is automatically turned off. This LED is controlled by the embedded processor.
FLT	This LED indicates that a BTS internal or external alarm exists. If the embedded processor is reset or crashes, this LED is automatically turned on. This LED is software-controlled.
BDM	For development use only.

3.4.1.3 Side View

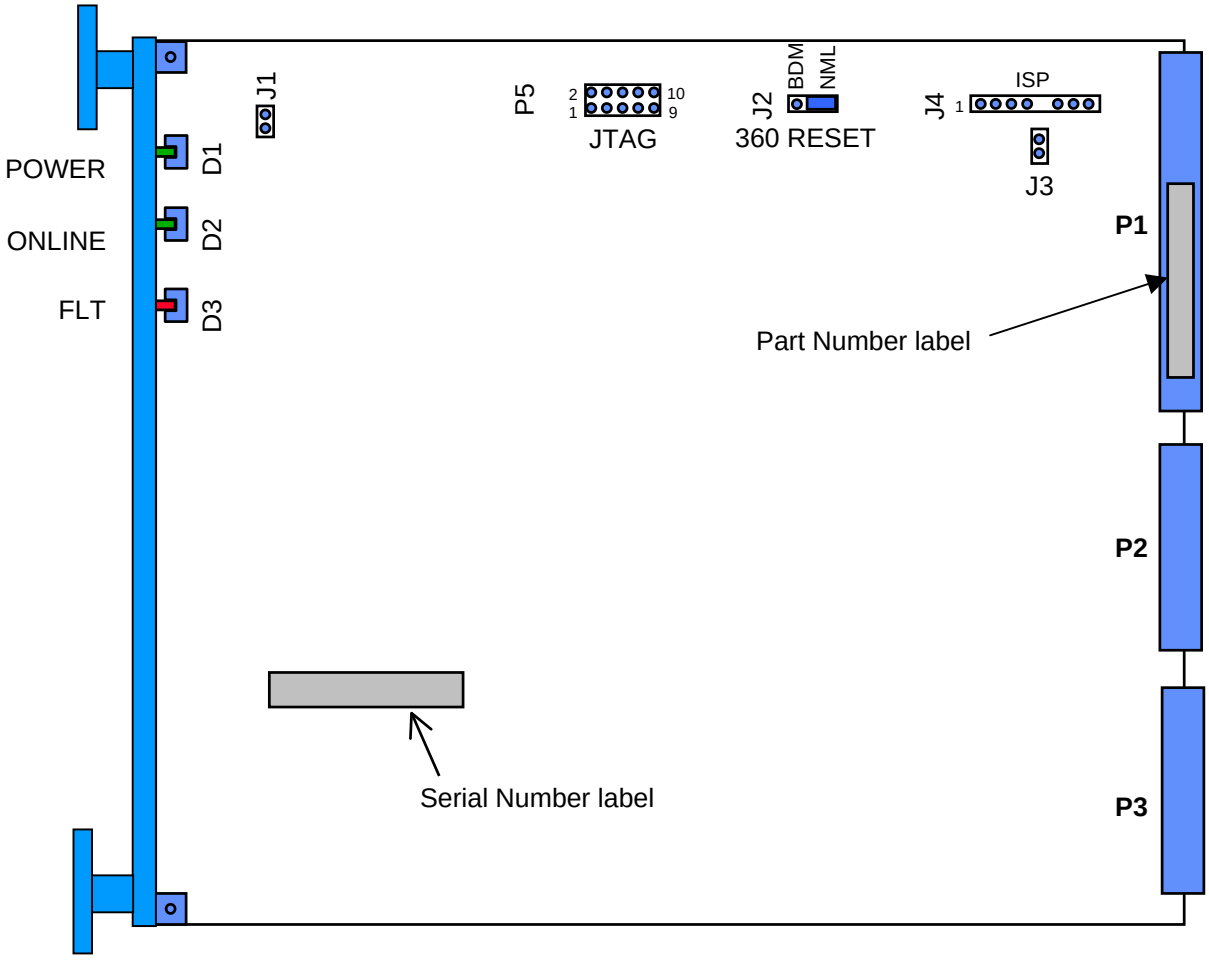

Figure 3-2 Side View of Alarm Card

3.4.1.4 Configuration

Table 3-3 Alarm Card J1 Jumper Connections

Jumper	Setting
J1	No Jumper
J2	Jumper pins 2 & 3
J3	No Jumper

3.4.1.5 Replacement

1. Shut down the BTS-4000 using the procedure in Section 3.2.1.

2. Turn off power to the BTS.

3. Ensure you are wearing the ESD wrist strap.

4. Push the handles away to release the Alarm card.

5. Carefully remove the Alarm card from the BPU.

6. Verify that the jumpers on the replacement Alarm card are installed according to Table 3-3.

7. Install the replacement Alarm card into the appropriate slot in the BPU.

8. Push the handles toward the Alarm card to secure it.

9. Turn on power to the BTS.

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3.4.2 BDX (Broadband Digital Transceiver) Card

3.4.2.1 Figure

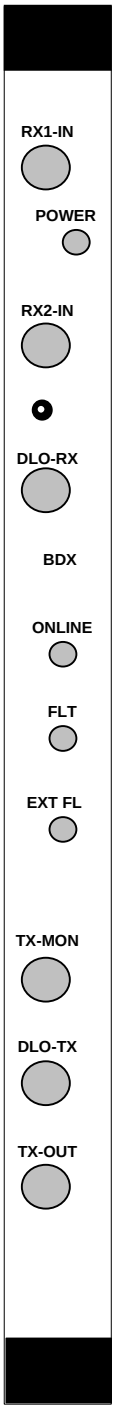


Figure 3-3 Front Panel of BDX Card

3.4.2.2 Front Panel Interfaces

Table 3-4 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
DLO-TX	J4	Tx Ext LO	RF - 50 Ohm	In	Duplexed RF and IF Transmit Local Oscillators
DX-MON	J5	Tx Ext Loopback	RF - 50 Ohm	In	-30 dB Coupled Transmit after MCPA
TX-OUT	J6	Tx RF	RF - 50 Ohm	Out	RF Output of Transmit, 869 - 1990 MHz

3.4.2.3 LEDs

Table 3-5 BDX LED Table

LED Name	Description
POWER	Green LED. If illuminated, indicates that all power supplies are functional.
ONLINE	Green LED. If illuminated, indicates that BDX firmware is downloaded and operational.
FAULT	Red LED. If illuminated, indicates an internal alarm, such as PLL lock.
EXT FAULT	Red LED. If illuminated, indicates an external alarm, such as TMA failure or TMA DC power overcurrent.

3.4.2.4 Side View

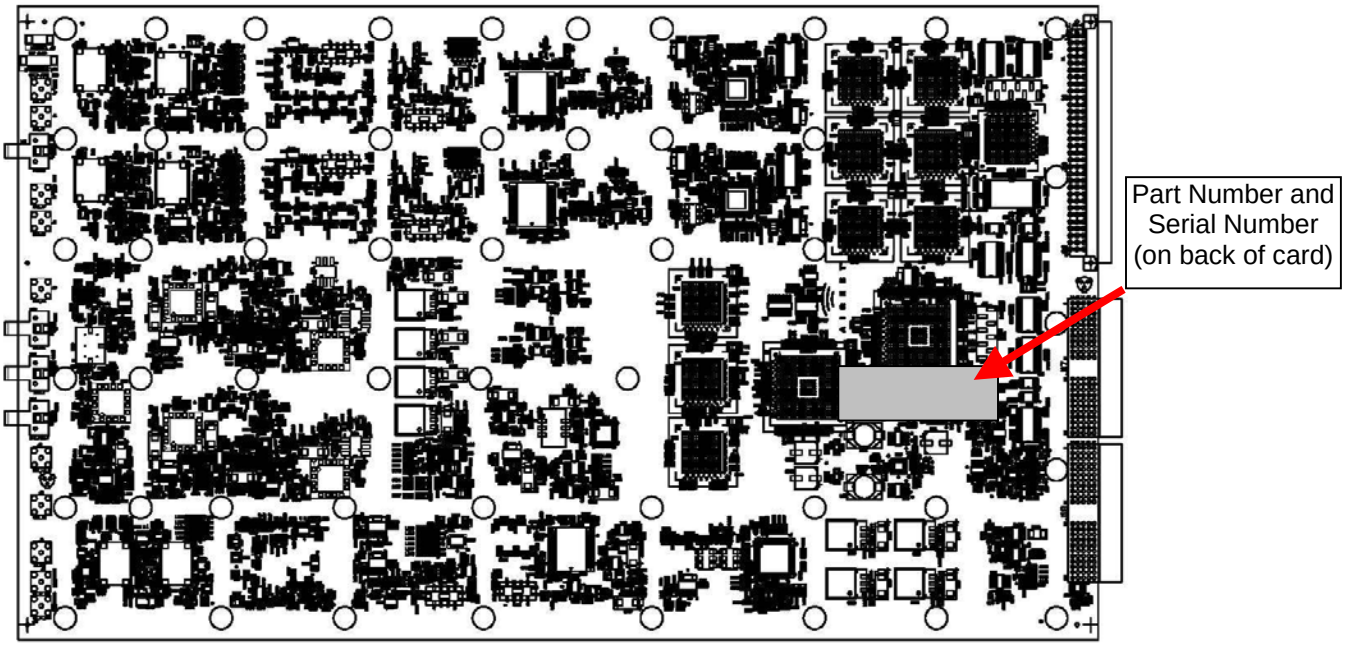


Figure 3-4 Side View of BDX Card

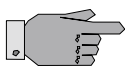
3.4.2.5 Configuration

No configuration is required on the BDX card.

3.4.2.6 Replacement

The BDX card can be hot-swapped while the BTS chassis is powered on.

1. Push the handles away to release the BDX card.
2. Carefully remove the BDX card from the BPU.
3. Install the replacement BDX card into the appropriate slot in the BPU.
4. Push the handles toward the BDX card to secure it.



GoTo - Proceed to the Transmit Gain Adjustment Procedure in Section 5. The Transmit Gain Adjustment procedure must be performed when replacing or adding any element in the Transmit path, including MCPA modules, BDX cards, or any Tx cables.

3.4.3 CSU/DSU

3.4.3.1 Front Panel

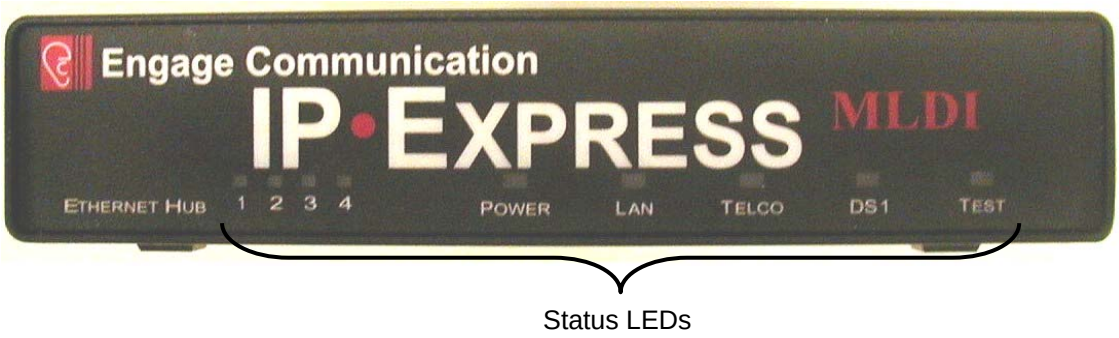


Figure 3-5 Front Panel of BTS-4000 CSU/DSU Router

3.4.3.2 Rear Panel

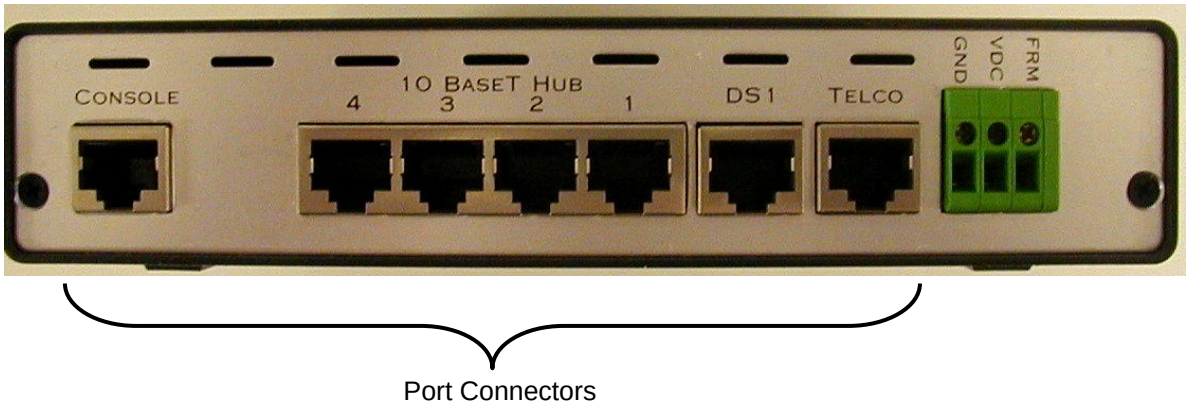


Figure 3-6 Rear Panel of BTS-4000 CSU/DSU Router

3.4.3.3 LEDs

As shown in the front panel view in Figure 3-5, there are five LEDs that provide the status of the Power, LAN, serial WAN, and Telco ports. Table 3-6 describes the function of each LED.

Table 3-6 CSU/DSU Router LEDs

LED Name	Description
POWER	Normally green. At startup it briefly turns amber as internal memory devices are loaded.
LAN	Flashes green each time a packet is transmitted out the Ethernet port.
TELCO and DS1	If no valid data is received on the active port, the LED is solid red If the router detects reception of its own serial link HELLO packet, such as occurs in a loopback condition, the LED turns amber. When the router receives HELLO packets from a remote router, the TELCO LED turns green and remains green as long as a remote packet is received every 30 seconds. If remote packets are interrupted for more than 30 seconds, the TELCO LED returns to red.
ETHERNET HUB	Indicate activity on the 4 BTS CSU/DSU Router hub ports.

3.4.3.4 Replacement

1. Disconnect all cables from the CSU/DSU. You will need a small screwdriver to remove the power cables.

2. Remove the CSU/DSU from the rack.

3. Install the replacement CSU/DSU.

4. Connect the cables to the replacement CSU/DSU.

3.4.4 DC/DC Converter Module

3.4.4.1 Front Panel

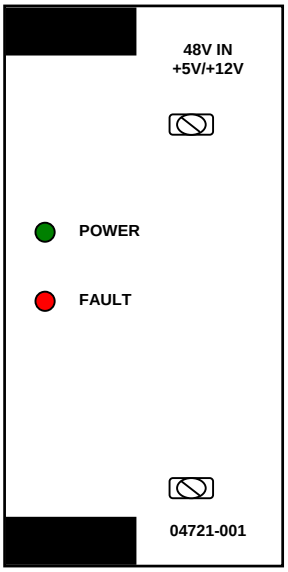


Figure 3-7 Front Panel of +5V/+12V DC/DC Converter Module

3.4.4.2 LEDs

Table 3-7 DC/DC Converter Module LEDs

LED Name	Description
Power LED	If illuminated indicates the module is operating normally. Input power is applied to the module. If not illuminated, something is wrong with the input power.
Fault LED	If illuminated indicates the module has failed. The module is not capable of providing one or more of its voltage rails. This LED will be illuminated when the module provides an alarm output.

3.4.4.3 Side View

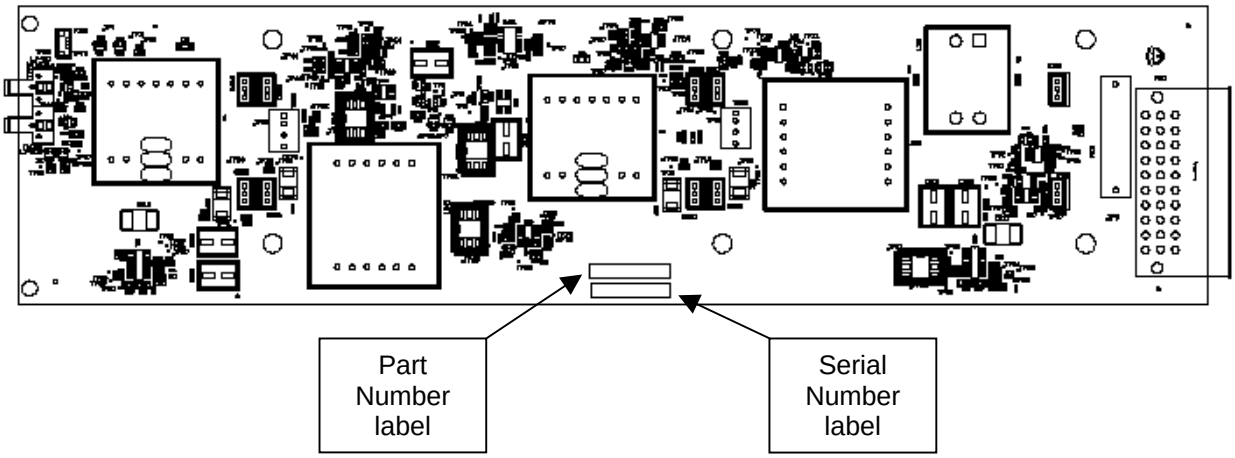


Figure 3-8 Side View of DC/DC Converter Module

3.4.4.4 Configuration

No configuration is required for the DC/DC power modules.

3.4.4.5 Replacement

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


Note

Note - If the DC/DC converter modules are in a redundant configuration the modules may be hot-swapped.

1. Shut down the BTS-4000 using the procedure in Section 3.2.1.
2. Turn off power to the BTS.
3. Ensure you are wearing the ESD wrist strap.
4. Push the handles away from the BPU to release the DC/DC power module.
5. Carefully remove the power module from the BPU.
6. Install the replacement power module into the appropriate slot in the BPU.
7. Push the handles toward the power module to secure it.

8. Turn on power to the BTS.

3.4.5 GPS Module

3.4.5.1 Front Panel

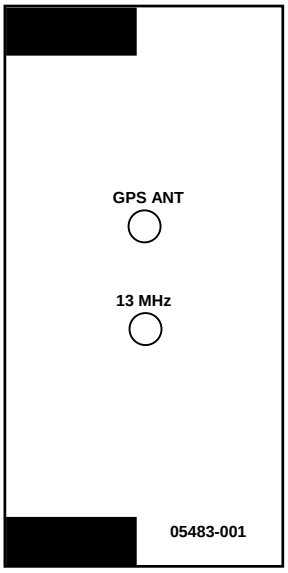


Figure 3-9 Front Panel of GPS Module

3.4.5.2 Interface Connectors

Table 3-8 GPS Module Connectors

LED Name	Meaning
GPS ANT	GPS Active Antenna connector. 50 Ohm.
13 MHz	13 MHz Sine Output connector. 50 Ohm

3.4.5.3 Side View

Figure 3-10 Side View of GPS Module

3.4.5.4 Configuration

Any configuration required ???

Table 3-9 GPS Module Jumper Settings

Jumper	Description	Setting

3.4.5.5 Replacement

1. Shut down the BTS-4000 using the procedure in Section 3.2.1.

2. Turn off power to the BTS.

3. Ensure you are wearing the ESD wrist strap.

4. Push the handles away from the BPU to release the GPS module.

5. Carefully remove the GPS module from the BPU.

6. **any jumpers to check ???**.

7. Install the replacement GPS module into the appropriate slot in the BPU.

8. Push the handles toward the GPS module to secure it.

9. Once the BTS is done booting, connect an LMT to the BTS using the procedure in Section 3.3.

10. On the LMT,type **`gpsreset`** and press <**`Enter`**>. This resets the GPS module(s), and the following information is displayed:

```
AirNet BTS->gpsreset
gpsreset
GPS Module will be reset.
GPS Module reset. BTS is rebooting NOW.
***** Reboot requested. *****
***** Restart type = 2 *****
```

11. Disconnect the LMT from the BTS.

12. Turn on power to the BTS.

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3.4.6 ICE-T Card

3.4.6.1 Front Panel

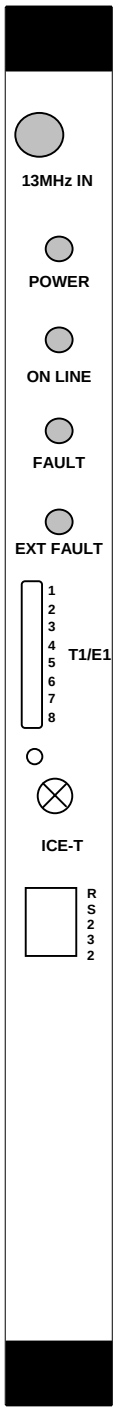

Figure 3-11 Front Panel of ICE-T Card

3.4.6.2 Connectors/LEDs

Table 3-10 ICE-T Card Connector/LED Table

LED Name	Description
13MHz	13 MHz Sine input
Power	Green LED. If illuminated, indicates that all power supplies are functional.
On-Line	Green LED. If illuminated, indicates that the ICE-T card is online and operational.
Fault	Red LED. If illuminated, indicates an internal alarm, such as ???
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 MCPA or the RS-232 to the Adaptive Array Test Mobile (if installed) 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 card. If the ICE-T card is the VME system controller, this will also reset the VMEBus.
RS-232	Serial console.

3.4.6.3 Side View

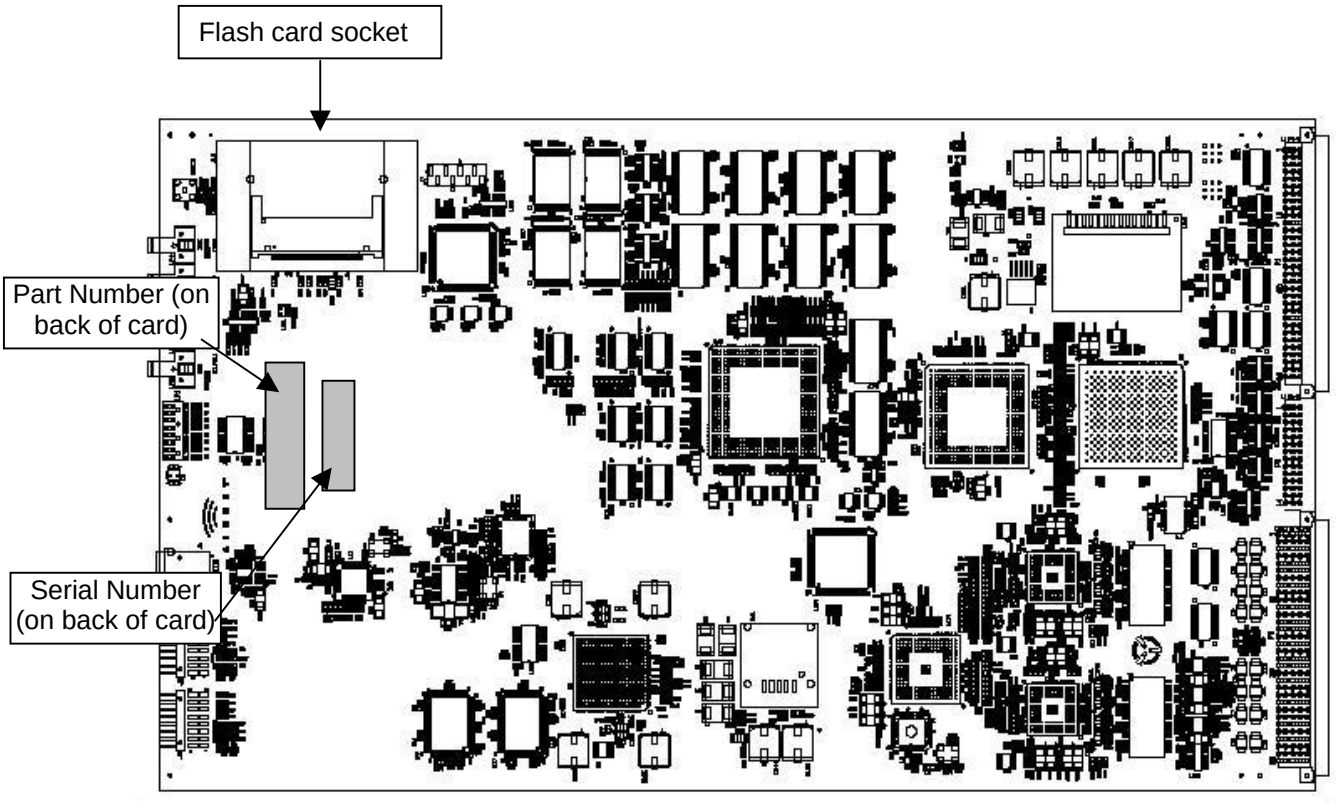

Figure 3-12 Side View of ICE-T Card

3.4.6.4 Configuration

No configuration is necessary on the ICE-T card.

3.4.6.5 Replacement

1. Shut down the BTS-4000 using the procedure in Section 3.2.1.

2. Turn off power to the BTS.

3. Ensure you are wearing the ESD wrist strap.

4. Push the handles away to release the ICE-T card.

5. Carefully remove the ICE-T card from the BPU.

6. Install the replacement ICE-T card into the appropriate slot in the BPU.

7. Push the handles toward the card to secure it.

8. Turn on power to the BTS.

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3.4.7 HKE MCPA Rack/Modules

3.4.7.1 Front Panel of Hitachi Kokusai Electric (HKE) MCPA Rack

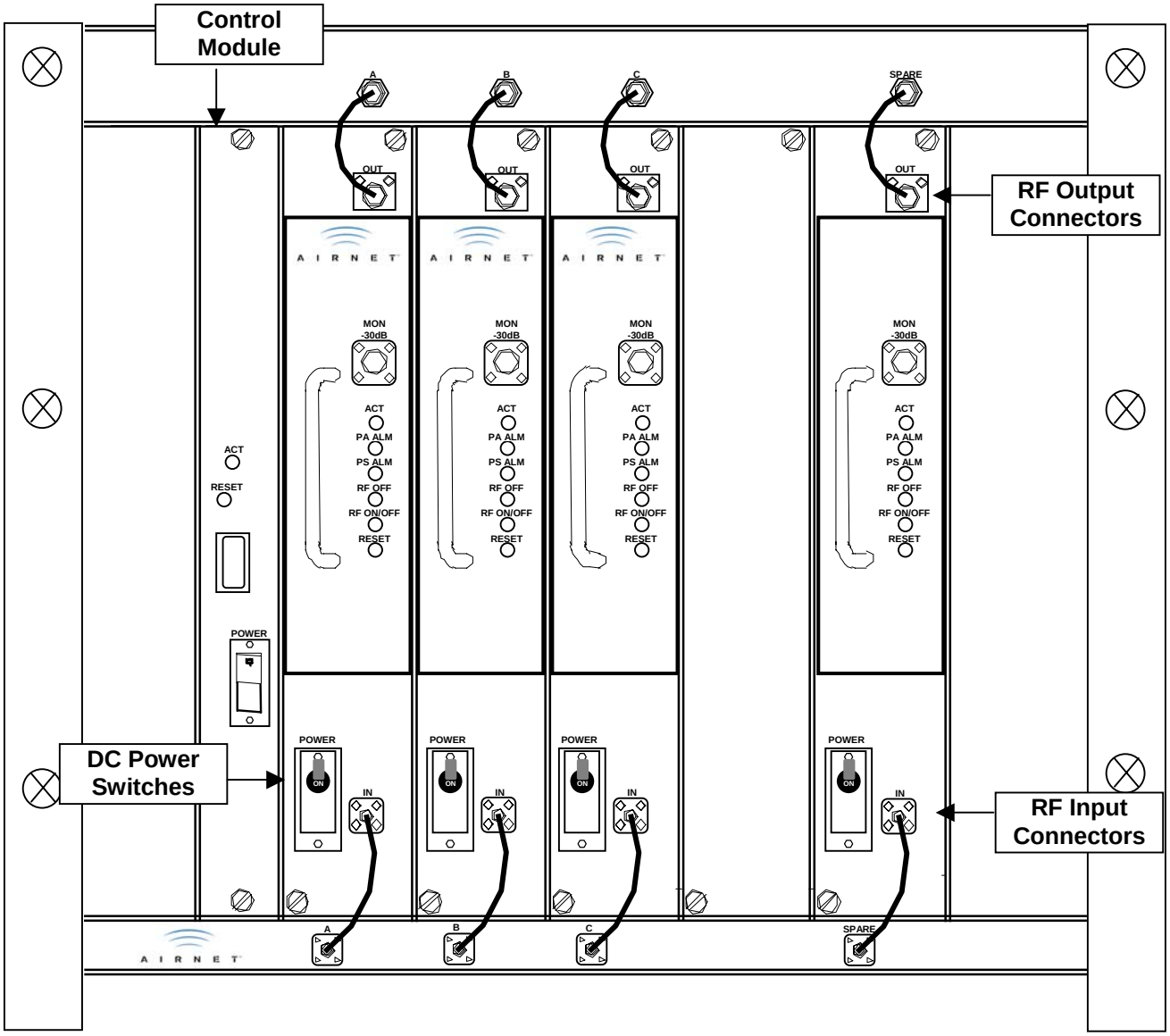


Figure 3-13 Front Panel of Hitachi Kokusai Electric (HKE) MCPA Rack

3.4.7.2 Rear Panel of Hitachi Kokusai Electric (HKE) MCPA Rack

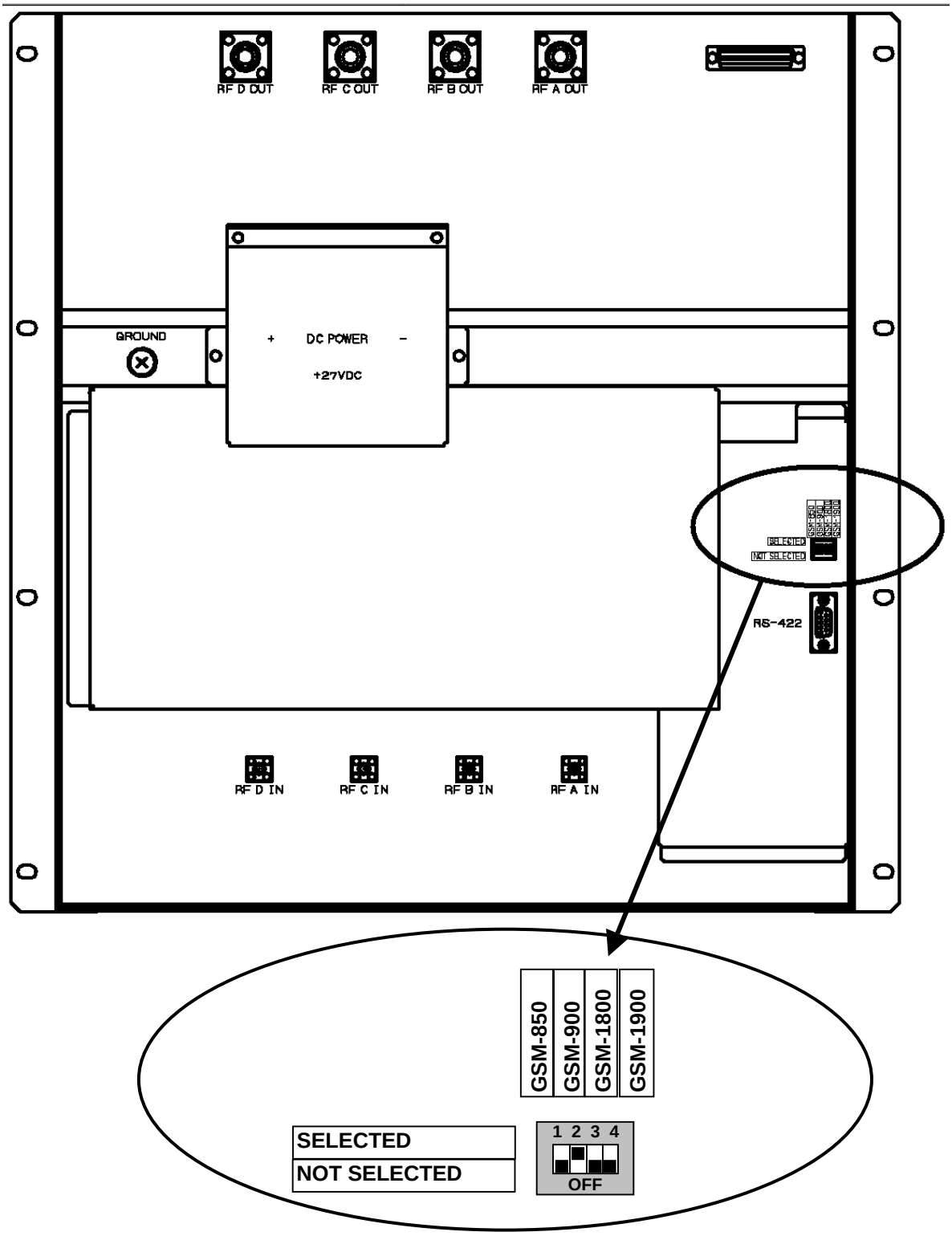


Figure 3-14 Rear Panel of Hitachi Kokusai Electric (HKE) MCPA Rack

3.4.7.3 Front Panel of HKE MCPA Module

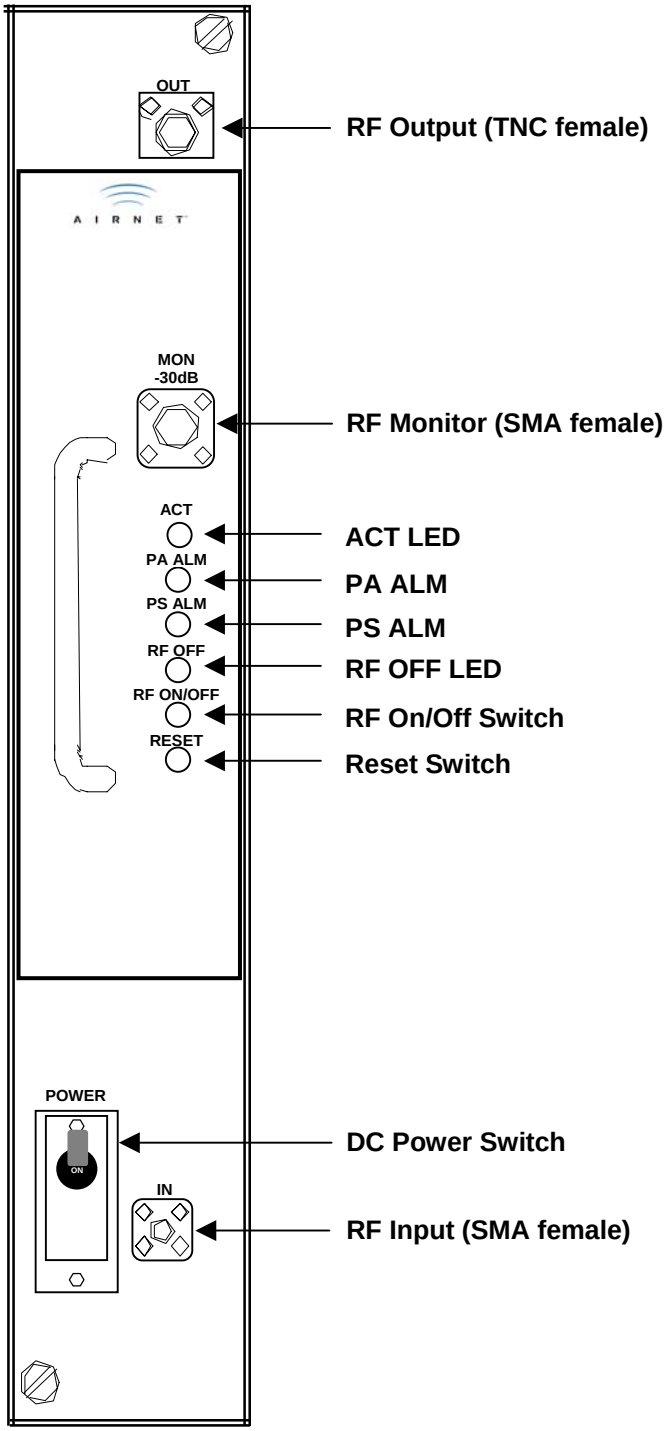


Figure 3-15 Front Panel of Hitachi Kokusai Electric (HKE) MCPA Module

3.4.7.4 Hitachi Kokusai Electric (HKE) MCPA LEDs

Table 3-11 Hitachi Kokusai Electric (HKE) MCPA LED Table

LED Name	Color	Description
ACT	Green	Normally illuminated (green) LED indicates that the module is enabled and proper DC voltage is applied. Blinks when the Rack type setting switch and MCPA mode installed/uninstalled setting switch are not set properly.
PA ALM	Red	This LED will be illuminated when; (1) the distortion compensation circuit does not work normally (2) the amplification circuit does not work normally and the gain becomes beside the reference value (3) the input signal exceeds the prescribed value (4) the rise of the temperature inside MCPA module is likely to damage the circuit (5) the VSWR is abnormal (6) the external power supply is abnormal.
PS ALM	Red	This LED will shine when the PS inside MCPA module is abnormal. This LED will blink in case that the frequency band setting switch provided on RACK-MCPA is not set correctly, or the MCPA module whose frequency band is different from the expected one is slotted.
RF OFF	Red	This LED will illuminate when RF is disabled.
RF ON/OFF	N/A	On/Off button.
RESET	N/A	Reset button. Both hardware and software are initialized after a module is reset.
(status LEDs)	Green	Located on RF Input units, under each MCPA module. When the control module is installed and operating properly, and the corresponding module is powered, this LED is illuminated.
(status LEDs)	Green	Located on RF Output units, above each MCPA module. When the control module is installed and operating properly, and the corresponding module is powered, this LED is illuminated.

3.4.7.5 RF Output Connectors

The RF output connectors output the GSM transmit signal amplified by the MCPA module to peripheral equipment.

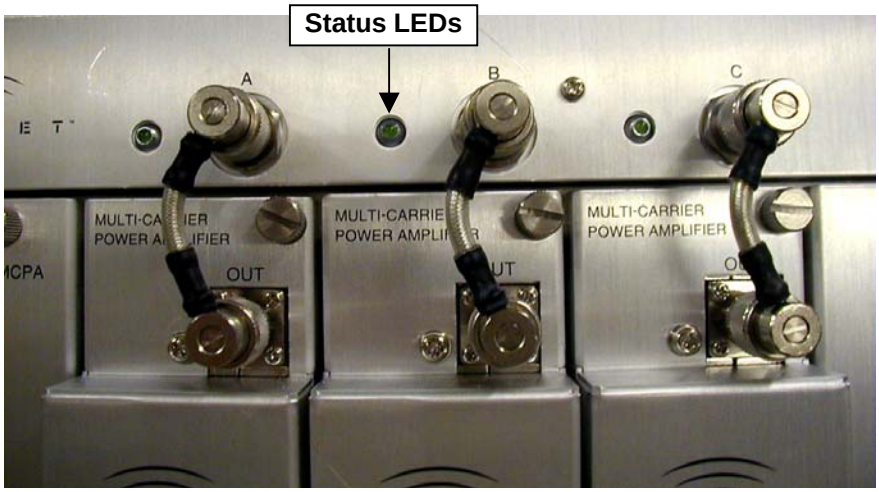


Figure 3-16 Hitachi Kokusai Electric (HKE) MCPAs RF Output Connectors

3.4.7.6 RF Input Connectors

The RF input connectors output the GSM transmit signal from peripheral equipment to the MCPA module.

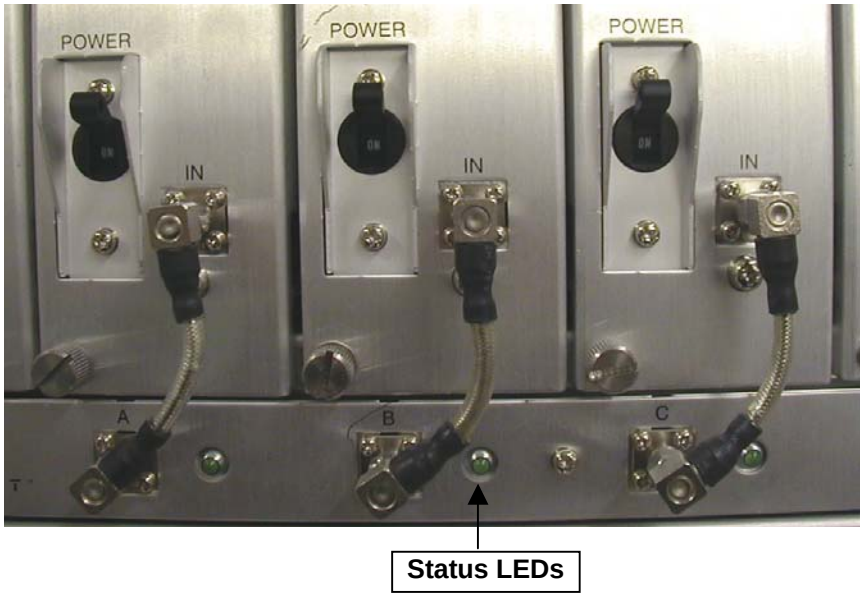


Figure 3-17 Hitachi Kokusai Electric (HKE) MCPAs RF Input Connectors

3.4.7.7 Configuration

No configuration is necessary when replacing a Hitachi Kokusai Electric (HKE) MCPA Module.

3.4.7.8 Replacement

IMPORTANT! The Transmit Gain Adjustment procedure must be performed when replacing or adding any element in the Tx path, including MCPA modules, BDX cards, or any Tx cables. This procedure directs the user to the Transmit Gain Adjustment Procedure in Section 5 after installing the replacement MCPA modules.


Caution

CAUTION – Each Hitachi Kokusai Electric MCPA module weighs approx. 21.7 lbs (8.1kg), so please be careful when handling.


Caution

CAUTION – Power OFF the MCPA Fan module and confirm the complete stop of fan rotation before installing or removing an MCPA module, otherwise the sharp edge of the FAN unit may cause injury.


Note

Note - If you are increasing capacity (adding MCPA modules), use the MCPA upgrade procedure in Section 4.2 instead.

Refer to Figure 3-22 when performing the following steps:

1. Ensure that the power switch on the front panel of the Hitachi Kokusai Electric (HKE) MCPA module is in the OFF position.
2. Remove the RF input and RF output cables.
3. Remove the screws at the top and bottom of the front panel of the MCPA module.
4. Carefully remove the MCPA.
5. Insert the replacement MCPA module into the appropriate slot on the MCPA rack.
6. Tighten the screws on the front panel of the module.
7. Reconnect the RF input and RF output cables to the correct Input / Output connectors.

8. Tighten the RF input and RF output connectors in equal torque at both sides of the cable.

The TNC Female connector of the RF Output Cable should be tightened to 0.5 to 0.7 N·m, and the SMA Female connector of the RF Input Cable should be tightened to 0.6 to 1.0 N·m.

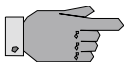
9. Power on the MCPA fan tray.

10. Power on the MCPA module.

11. Confirm that the RF OFF LED (red) is illuminated.

12. Press the RF ON/OFF button to enable RF.

13. Confirm that the ACT LED on the module is illuminated and the RF OFF LED (red) is not illuminated.


GoTo

GoTo - Proceed to the Transmit Gain Adjustment Procedure in Section 5. The Transmit Gain Adjustment procedure must be performed when replacing or adding any element in the Transmit path, including MCPA modules, BDX cards, or any Tx cables.

3.4.8 HKE MCPA Rack - Fan Tray

3.4.8.1 Front Panel

Figure 3-18 Front Panel of Hitachi Kokusai Electric (HKE) MCPA Rack Fan Tray

3.4.8.2 Fan Tray Removal

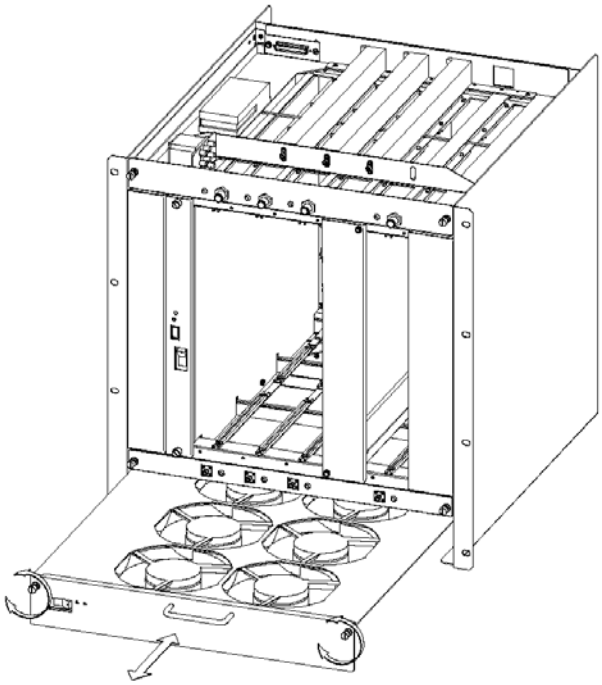


Figure 3-19 Hitachi Kokusai Electric MCPA Fan Tray (Removed from Rack)

3.4.8.3 Hitachi Kokusai Electric (HKE) MCPA LEDs

Table 3-12 Hitachi Kokusai Electric (HKE) MCPA Fan Tray LEDs

LED Name	Description
ACT	Normally illuminated (green) LED indicates that power is supplied and fans are operating properly.
ALM	Red LED – indicates that a fan alarm signal has been transmitted. An alarm signal is sent when the rotation speed of any of the Fan units drops below 80%.

3.4.8.4 Replacement

1. Power OFF the HKE MCPA FAN module.

2. Remove the screws on the front panel and replace the FAN module.

3. Tighten screws.

4. Power ON the Fan module and confirm that the ACT LED (green) is illuminated.

3.4.9 JRC MCPA Rack/Modules

3.4.9.1 JRC MCPA Rack Front Panel

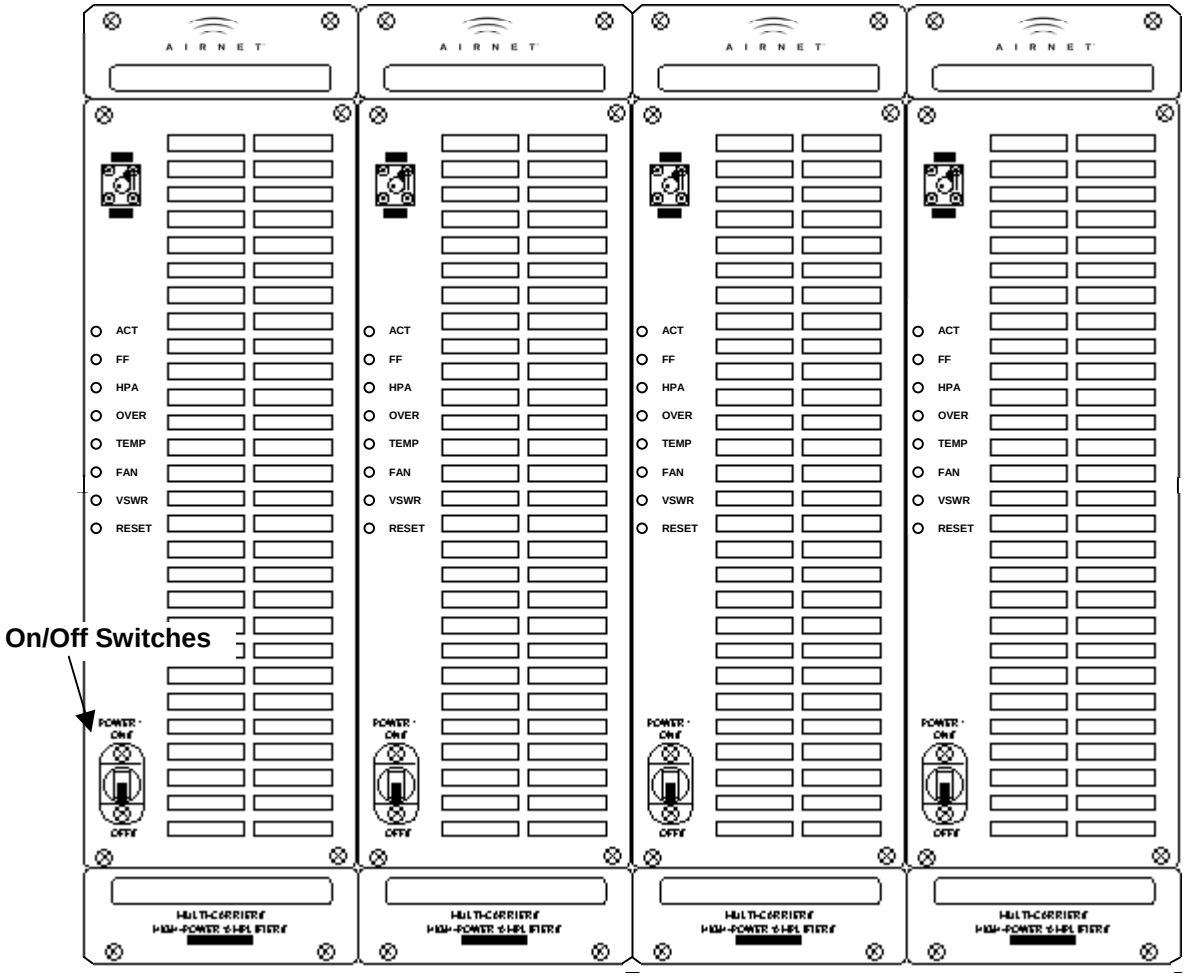


Figure 3-20 Front Panel of Japan Radio Corporation (JRC) MCPA Rack

3.4.9.2 Japan Radio Corporation (JRC) MCPA LEDs

Table 3-13 Japan Radio Corporation (JRC) MCPA LED Table

LED Name	Description
ACT	Normally illuminated (green) LED indicates that the module is enabled and proper DC voltage is applied.
FF	Feed Forward IMD cancellation circuitry fault.
HPA	Indicates that the MCPA main amplifier has failed.
OVER	Indicates MCPA is being over-driven and output power is exceeding 50W.
TEMP	Indicates MCPA heat sink temperature exceeds 80°C.
FAN	Indicates one or more of the fans have failed.
VSWR	Indicates that the reflected power detected at the Module output is 20W on the 40W module or 12.5W on the 25W module (VSWR = 5.8:1).
RESET	MCPA is being reset.

3.4.9.3 Japan Radio Corporation (JRC) MCPA Rear Panel

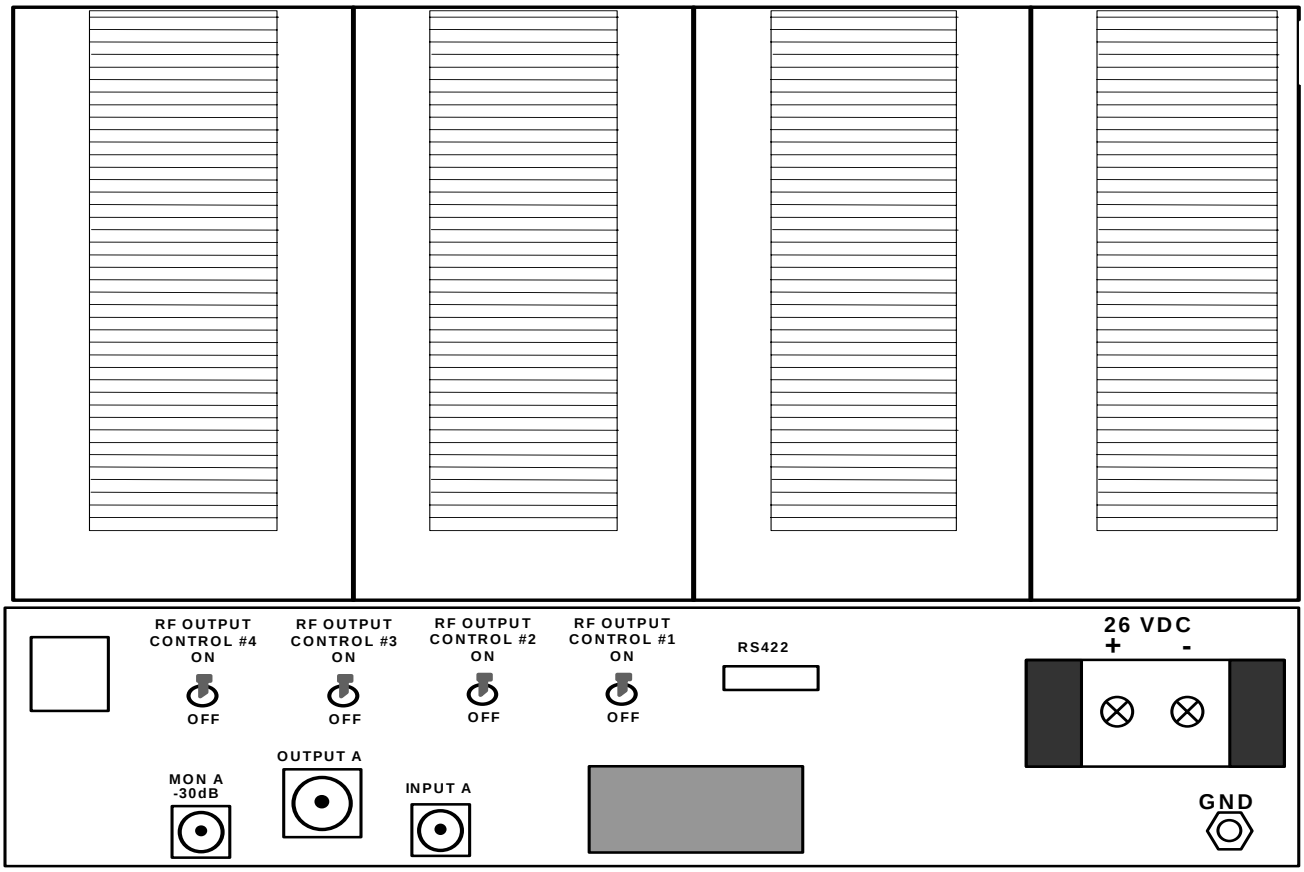


Figure 3-21 Rear Panel of Japan Radio Corporation (JRC) MCPA Rack

3.4.9.4 Configuration

No configuration is necessary when replacing a Japan Radio Corporation (JRC) MCPA module.

3.4.9.5 Replacement

IMPORTANT! The Transmit Gain Adjustment procedure must be performed when replacing or adding any element in the Tx path, including MCPA modules, BDX cards, or any Tx cables. This procedure directs the user to the Transmit Gain Adjustment Procedure in Section 5 after installing the replacement MCPA modules.

CAUTION – Each JRC MCPA module weighs approx. 20 lbs (9.08 kg), so please be careful when handling.

Note - If you are increasing capacity (adding MCPA modules), use the MCPA upgrade procedure in Section 4.2 instead.

Refer to Figure 3-20 and **Figure 3-18** when performing the following steps:

1. Power off the MCPA fan tray.

2. Ensure that the On/Off switch on the front panel of the MCPA module is in the OFF position.

3. Remove the screws at the top and bottom of the front panel of the MCPA module.

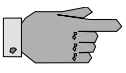
4. Carefully remove the MCPA.

5. Insert the replacement MCPA module into the appropriate slot on the MCPA rack.

6. Tighten the screws on the front panel of the module.

7. Power on the MCPA fan tray.

8. Confirm that the ACT LED is illuminated.



GoTo - Proceed to the Transmit Gain Adjustment Procedure in Section 5. The Transmit Gain Adjustment procedure must be performed when replacing or adding any element in the Transmit path, including MCPA modules, BDX cards, or any Tx cables.

3.4.10 Powerwave MCPA Rack/Modules

3.4.10.1 Front Panel of Powerwave MCPA Rack

Figure 3-22 Front Panel of Powerwave MCPA Rack

3.4.10.2 Powerwave MCPA LEDs

Table 3-14 Powerwave LED Table

Location	Color	Description
MCPA Module Front Panel LED	Green (blinking)	RF Enabled, No Alarm Status
	Green (solid)	RF Disabled, No Alarm Status
	Yellow (blinking)	VSWR Alarm Status
	Yellow (solid)	Initialization & Optimization
	Red (blinking)	RF Enabled, Alarm Status
	Red (solid)	RF Disabled, Shutdown Status
MCPA Rack Front Panel LED	Green (solid)	RF is enabled, Proper DC Power is Applied
	Yellow (solid)	Minor Alarm
	Red (solid)	Major Alarm - Fan Failure
		Major Alarm - Communication Failure
		Major Alarm - Excess RF Input Power
		Major Alarm - DC Power Alarm

3.4.10.3 Rear Panel of Powerwave MCPA Rack

Figure 3-23 Rear Panel of Powerwave MCPA Rack

3.4.10.4 Configuration

No configuration is necessary when replacing a Powerwave MCPA Module.

3.4.10.5 Replacement

IMPORTANT! The Transmit Gain Adjustment procedure must be performed when replacing or adding any element in the Tx path, including MCPA modules, BDX cards, or any Tx cables. This procedure directs the user to the Transmit Gain Adjustment Procedure in Section 5 after installing the replacement MCPA modules.

CAUTION – Each Powerwave MCPA module weighs approx. xx.x lbs (x.xkg), so please be careful when handling.

CAUTION – Power OFF the MCPA Fan module and confirm the complete stop of fan rotation before installing or removing an MCPA module, otherwise the sharp edge of the FAN unit may cause injury.

Note - If you are increasing capacity (adding MCPA modules), use the MCPA upgrade procedure in Section 4.2 instead.

Refer to Figure 3-22 when performing the following steps:

1. Power off the MCPA fan tray.

2. Ensure that the On/Off switch on the front panel of the MCPA module is in the OFF position.

3. Remove the screws at the top and bottom of the front panel of the MCPA module.

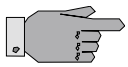
4. Carefully remove the MCPA.

5. Insert the replacement MCPA module into the appropriate slot on the MCPA rack.

6. Tighten the screws on the front panel of the module.

7. Power on the MCPA fan tray.

8. Confirm that the <Power ???> LED is illuminated.



GoTo - Proceed to the Transmit Gain Adjustment Procedure in Section 5. The Transmit Gain Adjustment procedure must be performed when replacing or adding any element in the Transmit path, including MCPA modules, BDX cards, or any Tx cables.

3.4.11 RF Filter

3.4.11.1 Configuration

There is no configuration required for the RF Filter, however ensure that the correct band filter is being installed.

3.4.11.2 Replacement

CAUTION – When reconnecting the RF filter or cable, do not use more than 6"lb torque on the small connectors and finger-tighten the knurled connector. Over tightening can damage the connectors and cause VSWR alarms. Also, ensure that the bend radius of the cable is not less than 1". Excessive bend to the cable may cause VSWR alarms, although the cable will not show a problem when disconnected and tested.

1. Shut down the BTS-4000 using the procedure in Section 3.2.1.

2. Turn off power to the BTS.

3. Ensure you are wearing the ESD wrist strap.

4. Carefully remove the RF Filter from the BTS-4000.

5. Install the replacement RF Filter.

6. Turn on power to the BTS.

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3.4.12 SuperDSP Card

3.4.12.1 Front Panel

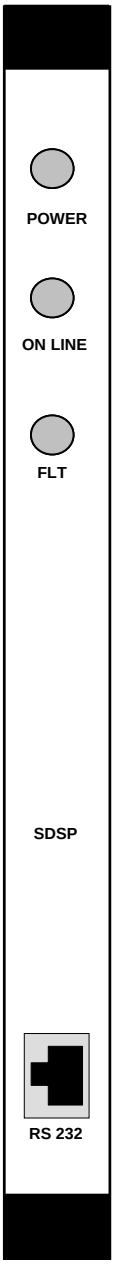


Figure 3-24 Front Panel of SuperDSP Card

3.4.12.2 SuperDSP Card Front Panel Connectors/LEDs

Table 3-15 SuperDSP Card Connector/LED Table

Connector/LED Name	Description
POWER	Indicates all required voltages are present.
ONLINE	If the embedded processor is reset or crashes, this LED is automatically turned off. This LED is controlled by the embedded processor.
FLT	This LED indicates that a BTS 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)

3.4.12.3 Side View

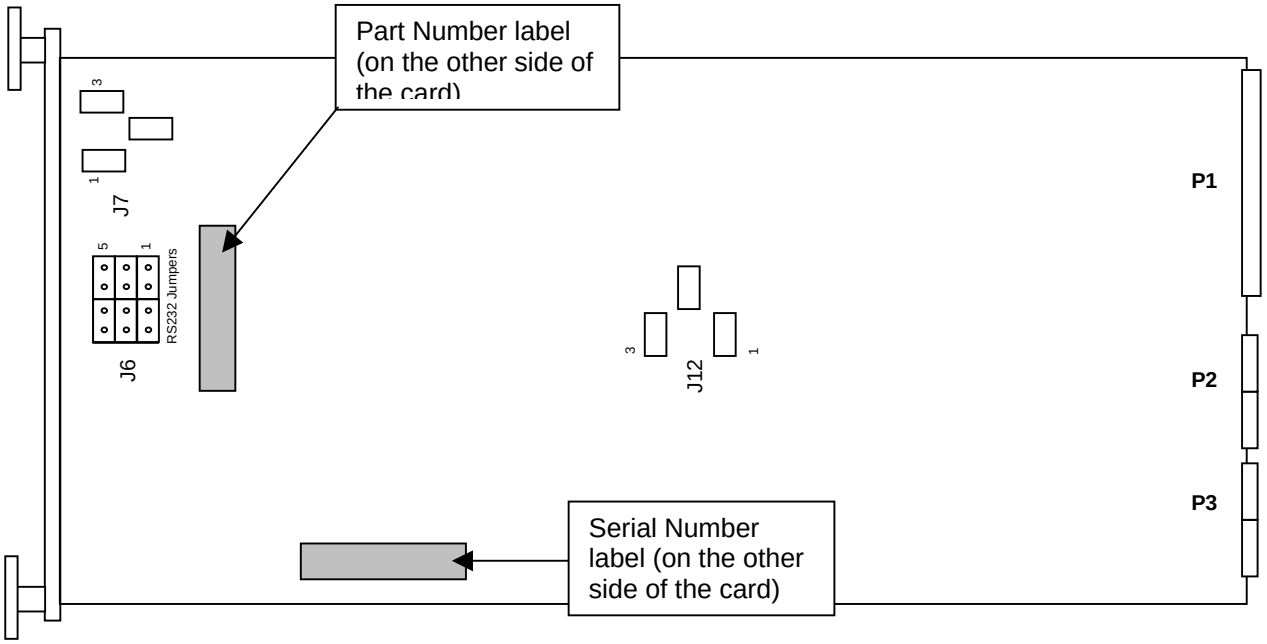


Figure 3-25 Side View of SuperDSP Card

3.4.12.4 Configuration

Table 3-16 SuperDSP Card Jumper Settings

Jumper	Description	Settings
J6	RS232 Jumper block	Set RS232 to backplane (default) by installing shunts on pins 1-3 and 2-4 Set RS-232 to Top Front Panel RJ-45 (J4) by installing shunts on pins 3-5 and 4-6
J7	JTAGB Jumper block	Install a jumper shunt on pins 2-3
J12	MPC Clock Select Jumper Block	Install a jumper shunt on pins 2-3


Note

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

3.4.12.5 Replacement


Note

Note - If you are increasing capacity rather than replacing cards, use the SuperDSP upgrade procedure in Section 4.1 instead.


Note

Note - SuperDSP cards cannot be mixed with 64K DSP cards in the same BTS. If this occurs, an error message will be displayed at the OMC-R GUI, and the BTS will be prevented from entering the in-service operational state.

1. Shut down the BTS-4000 using the procedure in Section 3.2.1.
2. Turn off power to the BTS.
3. Ensure you are wearing the ESD wrist strap.
4. Disconnect the RS-232 cable from the front panel of the SuperDSP card.
5. Push the handles away from the BPU to release the SuperDSP card.

6. Carefully remove the SuperDSP card from the BPU.

7. Verify that the jumpers on the replacement SuperDSP card are installed according to Table 3-16.

8. Install the replacement SuperDSP card into the appropriate slot in the BPU.

9. Push the handles toward the SuperDSP card to secure it.

10. Reconnect the RS-232 cable to the front panel of the card.

11. Turn on power to the BTS.

3.4.13 Terminal Server

3.4.13.1 Front Panel

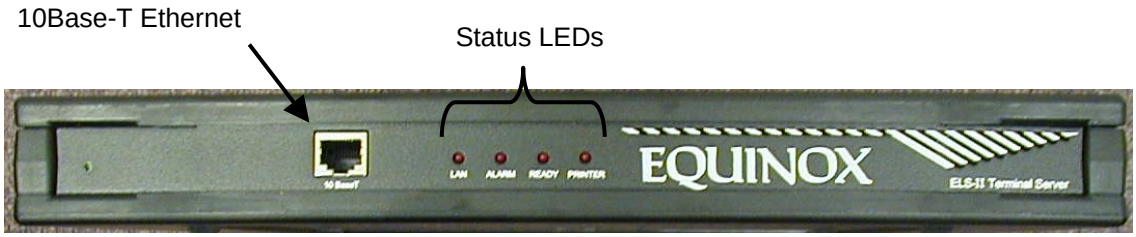


Figure 3-26 Front Panel of BTS Terminal Server

3.4.13.2 Rear Panel

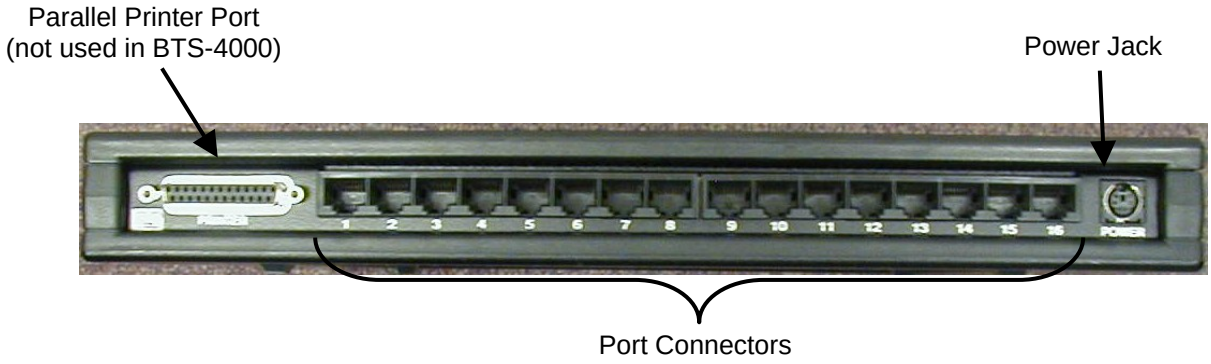


Figure 3-27 Rear Panel of BTS Terminal Server

3.4.13.3 LEDs

Table 3-17 Terminal Server LEDs

LED Name	Description
LAN	Blinks when the server receives or sends messages to or from the network. The LED should blink periodically on lightly used networks. On very busy networks, the light may appear to stay on continuously.
ALARM	Light displays solid when a software or hardware failure is encountered. The ALARM LED is cleared automatically when the error condition is corrected.

LED Name	Description
READY	Red LED. Blinks several times at power up and then displays solid to indicate the unit is plugged in and receiving power. If the READY LED is off, there is no power to the unit or a hardware problem. If the READY LED blinks continuously, there is a hardware problem with the unit.
PRINTER	Displays solid when the printer port is in use. The printer port is not used in the BTS-4000.

3.4.13.4 Replacement

1. Disconnect all cables from the Terminal Server.

2. Remove the Terminal Server from the rack.

3. Install the replacement Terminal Server.

4. Connect the cables to the replacement Terminal Server.

4. UPGRADES

4.1 Adding SuperDSP Cards

SuperDSP Cards are added in order to increase the number of traffic channels available. This increase in channel capacity is purchased from AirNet.

From one to four SuperDSP cards may be installed within the BTS. Each SuperDSP card can process up to 24 voice or control channels (24, 48, 72, or 96 channels).

4.1.1.1 Figure

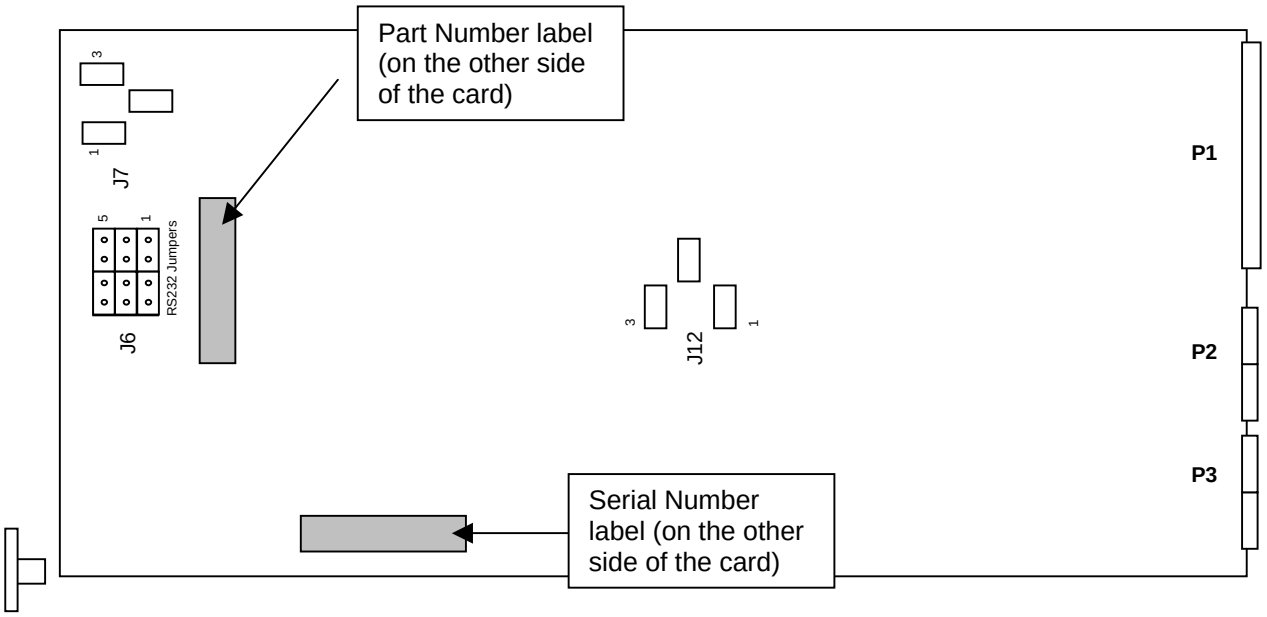


Figure 4-1 SuperDSP Card

4.1.1.2 Configuration

Table 4-1 SuperDSP Card Jumper Settings

Jumper	Description	Settings
J6	RS232 Jumper block	Set RS232 to backplane (default) by installing shunts on pins 1-3 and 2-4 Set RS-232 to Top Front Panel RJ-45 (J4) by installing shunts on pins 3-5 and 4-6
J7	JTAGB Jumper block	Install a jumper shunt on pins 2-3
J12	MPC Clock Select Jumper Block	Install a jumper shunt on pins 2-3


Note

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

4.1.1.3 Installation

1. Perform the BTS Shutdown procedure in Section 3.2.1.

2. Turn off power to the BTS.

3. Ensure you are wearing the ESD wrist strap.

4. Verify that the jumpers on the new SuperDSP Card are installed according to Table 3-16.

5. Install the new SuperDSP Cards, starting from the leftmost slot. SuperDSP Cards will be in slot 4 for 24 channels; slots 4 and 5 for 48 channels; slots 4, 5, and 6 for 72 channels; and slots 4-7 for 96 channels.

6. Remove the ICE-T card from the BTS-4000.

7. Remove the flash memory module from the ICE-T card.

8. Install the flash memory module that was received for the increased capacity.

9. Reinstall the ICE-T card.

10. Restart the BTS using the BTS Restart procedure in Section 3.2.2.

11. Begin using the new software.

4.1.2 Adding BDX Cards

The BDX for Sector A resides in the leftmost BDX slot (slot 8). Additional BDX cards are populated from left to right as the number of sectors increases from 1 to 4.

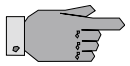
1. Shut down the BTS-4000 using the procedure in Section 3.2.1.

2. Push the handles away from the card to release the BDX card. See Figure 1-16.

3. Carefully, remove the BDX card from the BPU.

4. Install the replacement BDX card into the appropriate slot in the BPU.

5. Push the handles toward the BDX card to secure it. See Figure 1-16.



GoTo - Proceed to the Transmit Gain Adjustment Procedure in Section 5. The Transmit Gain Adjustment procedure must be performed when replacing or adding any element in the Transmit path, including MCPA modules, BDX cards, or any Tx cables.

4.1.3 Adding ICE-T Cards

The ICE-T card for Sector A resides in the leftmost ICE-T slot (slot 1). An additional ICE-T cards must be installed in Slot 2 when upgrading to more than X sectors (???).

1. Carefully insert the ICE-T cards into the BPU rack. See Figure 1-16.

fill this in (???)

4.2 Adding MCPA Modules

The BTS can accommodate up to 4 MCPA Modules. The number of modules needed will depend on the number of channels (and, therefore, number of SuperDSP cards) used. Figure 1-10 and Figure 1-14 display the MCPAs used in the BTS-4000.


Caution

CAUTION - Avoid rough handling of MCPAs. Rough handling could cause misalignment of internal electronics that are preset at the factory.

IMPORTANT! The Transmit Gain Adjustment procedure must be performed when replacing or adding any element in the Transmit path, including MCPA modules, BDX cards, or any Tx cables. This procedure directs the user to the Transmit Gain Adjustment Procedure in Section 5 after installing the replacement MCPA modules.

4.2.1.1 MCPA Replacement


Caution

CAUTION –Kokusai MCPA modules weigh approx. 21.7 lbs (8.1kg), and JRC MCPA modules weigh approx.20 lbs (9.08 kg), so please be careful when handling.


Caution

CAUTION – Power OFF the MCPA Fan module and confirm the complete stop of fan rotation before installing or removing an MCPA module, otherwise the sharp edge of the FAN unit may cause injury.

1. Open the front and rear doors of the BTS-4000.
2. If this procedure is being performed on a Kokusai MCPA module, power off the HKE MCPA fan tray.
3. Ensure that the power switch on the front panel of the MCPA module you are adding is in the OFF position.
4. Remove the screws at the top and bottom of the blank panel where the MCPA module will be installed, and then remove the blank panel.
5. Insert the MCPA module into the slot.
6. Tighten the screws on the front panel of the module.

7. If this is an HKE MCPA module, do the following:

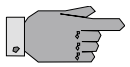
a. Connect the RF input and RF output cables to the correct Input / Output connectors.

b. Tighten the RF input and RF output connectors in equal torque at both sides of the cable. The TNC Female connector of the RF Output Cable should be tightened to 0.5 to 0.7 N·m, and the SMA Female connector of the RF Input Cable should be tightened to 0.6 to 1.0 N·m.

c. Power on the MCPA fan tray.

8. Set the On/Off switch on the front panel of the MCPA module to the ON position.

9. Confirm that the ACT LED is illuminated.



GoTo - Proceed to the Transmit Gain Adjustment Procedure in Section 5. The Transmit Gain Adjustment procedure must be performed when replacing or adding any element in the Transmit path, including MCPA modules, BDX cards, or any Tx cables.

5. TRANSMIT GAIN ADJUSTMENT

This adjustment procedure is performed at the factory. This procedure should only need to be performed during the initial installation, when modifying the transmit power per RF carrier, or when replacing or adding any element in the transmit path, such as MCPA modules, BDX cards, or any transmit cables.

5.1 Tools and Materials Required

Table 5-1 provides a list of tools and materials required when performing procedures contained in this manual.

Table 5-1 Tools and Materials Required for Adjustment

Coaxial cable with an assortment of connectors (N and SMA)
Spectrum Analyzer - Advantest Model R3131, Hewlett Packard Model HP8561E, or equivalent.


Note

Note - During the adjustment procedure, tag any cables that must be disconnected to perform procedural steps. This process will ensure accurate reconnection when the procedure is complete.

5.2 Procedure

1. Obtain the ARFCN number that contains the BCCH from the operator at the GUI.

2. Using the GUI console, obtain the BS_TX_PWR_MAX setting for the BCCH. This setting is located in the *Handover and Power Control Configuration* screen. To access this screen, click the **Handover and Power Control** button on the *Cell Configuration* screen.

3. Open the rear door of the BTS-4000.

4. Using a calibrated test cable, connect a spectrum analyzer to the TX Monitor port of the sector being monitored, as shown in Figure 5-1.

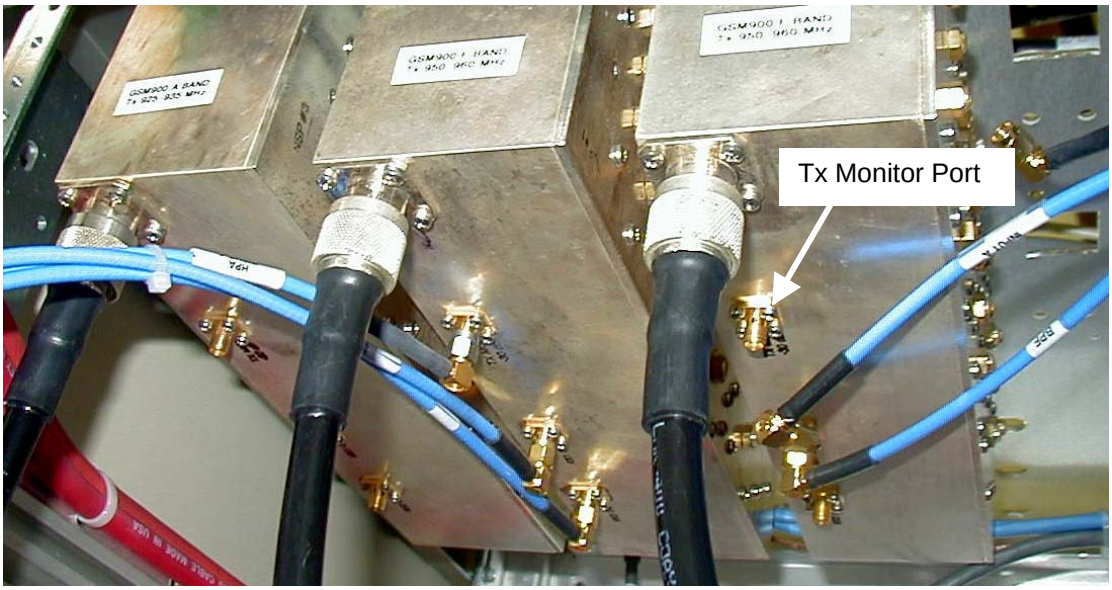


Figure 5-1 RF Filter Tx Monitor Port

The coupling value at the Tx Monitor port is **-30 dB ±0.5 dB**. Be sure to include this offset, plus the loss for the test cable, in the Reference Level Offset setting on the spectrum analyzer.

5. Refer to Table 5-2 and 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 RF Filters coupled port, plus 2 dB for every BS_TX_PWR_MAX setting from Step 2, plus 8 dB for measuring in 30 kHz plus test cable loss. Example: For a measurement with BS_TX_PWR_MAX = 1 and a 6' test cable, the Ref Level Offset would be approximately 30+2+8+1.5 = 41.5 dB.
RBW	30 kHz (See Note below)
VBW	10 kHz
Ref Level	+45 dBm
Sweep	Auto
Video Average	On (100 samples)

Note

Note - This measurement must be taken in a 30 kHz RBW in case an alternate channel local carrier is nearby the BCCH, which would then give an artificially high reading if 300 kHz were used.

6. If the BTS is not turned on, turn on the circuit breakers. The BTS will boot up and receive the MIB download, activating the BCCH channel.

7. After the BTS has booted, verify that the BCCH is at the correct frequency by observing the spectrum analyzer and correlating the center frequency with the ARFCN obtained in step 1.

Refer to Appendix E to obtain the BTS transmit frequency.

8. Use the spectrum analyzer's **Marker** in **Peak** mode, and measure the RF output power in dBm at the RF Filters -30 dB TX Monitor port. Since the Tx Monitor port on the Tx Filter is inclusive of the MCPA to Filter coax and the Filter loss, it should be **+43.0 dBm ±0.5 dB.**

9. if the level measured at the RF Filter TX Monitor Output is too high or too low, connect a local maintenance terminal to the BTS as described in Section 3.3, and then use the **settxlevel** command to obtain the correct power level.

The **settxlevel** command is used by manufacturing and in the field to adjust the BDX transmit level to match the gain of the HPA and other components in the transmit path. The default level is 4.0 dB of attenuation, but the setting can be adjusted from 0 dB to 15.5 dB in 0.5 dB steps. The new transmit level attenuation takes effect immediately and is stored in BDX flash, so it stays in effect after reboots.

The syntax for the **settxlevel** command is shown below:

```
settxlevel <board num>, <attenuation in dB>
     board num = BDX board number (0 to 3)
     attenuation = Amount that the BDX attenuates the transmit path
                   (from 0.0 to 15.5 dB in 0.5 dB steps, 4.0 dB is
                   the default in BDX)
```


Note

Note - The attenuation level is in dB and must have one digit after the decimal point (i.e., 5 must be entered as 5.0)..

Following is an example of how the **settxlevel** command would be used if the BTS output were 1 dB too hot:

```
AirNet BTS->settxlevel 0,5.0
settxlevel 0,4.0
Writing Flash BDX Transmit RF level to  5.0
Current BDX Transmit RF level is  4.0
Setting BDX Transmit RF level to  5.0
Successfully wrote RF Tx Attenuation 5.0 to flash value = 0
AirNet BTS->
```

10. Repeat Step 9 until the BCCH is **+43.0 dBm ±0.5 dB**.

11. Record the final Tx output level of the control channel.

12. If this is a Sectored system, repeat Steps 4 through 11 for each sector.

Stop – This adjustment procedure is complete.

6. PERIODIC MAINTENANCE

6.1 Monthly Maintenance

The following items will be checked during monthly maintenance:

- RF VSWR Measurement
- Tx Gain Check
- TMA Check
- Power Checks
- Battery Check
- Grounding System
- AC Settings
- Air Filter
- Miscellaneous Checks
- Ability to make a test call on the local cell.

6.1.1 RF VSWR Measurement

Antenna System

1. Power down the BTS-4000 and MCPAs.

2. Starting with Sector A, disconnect the Tx/Rx1 and Rx2 Antenna coax cables from the top (I/O) panel on the BTS-4000.

3. Using a calibrated VSWR measurement instrument, sweep each coax over the entire Tx frequency band for the applicable standard. The transmit band frequencies for reference are:

- E-GSM-900 (GSM) Tx: 925-960 MHz
- GSM-1800 (DCS) Tx: 1805-1880 MHz
- GSM-1900 (PCS) Tx: 1930-1990 MHz

4. Record antenna system VSWR for TxRx1 antenna. VSWR should not exceed 1.5:1 in the Tx band.

5. Record antenna system VSWR for Rx2 antenna. VSWR should not exceed 1.5:1 in the Tx band.


Note

Note – Sweeping Rx2 over the Tx band is a good idea since it may reveal an antenna problem and since sometimes, the coaxial cables are intentionally swapped during maintenance or troubleshooting.

6. Reconnect the Tx/Rx1 and Rx2 Antenna coax cables to the top (I/O) panel on the BTS-4000.

7. Repeat steps 1-6 for each Sector.

Antenna System and BTS together (through the RF Filter)

8. Connect the VSWR measurement instrument to the coax from each MCPA module and sweep the coax filter and antenna. VSWR should not exceed 1.5:1.


Note

Note – Do not sweep across the Rx Band when sweeping from the MCPA output. The cavity filter will not pass the Rx signal, so only Tx passband results are valid.

9. Record the VSWR for both BTS and antenna system TxRx1 antenna.

10. Power up and reboot the system.

6.1.2 Tx Gain Check

11. Perform the Transmit Gain Adjustment procedure in Section 5.

12. Record final Tx output level of the Control Channel.

6.1.3 TMA Check

The following steps provide instructions to check BTS TMAs for correct operating mode, DC Current Draw, TMA Gain, and DC Injector voltage. These tests should be performed on both Rx1 and Rx2 TMAs. The TMA power source is integrated in the BDX cards (???).

TMA Operating Mode and DC Current Draw

13. Connect a Local Maintenance Terminal (LMT) to the BTS as described in Section 3.3.

14. Type the ***rfStuff*** API command to return the operating mode and current draw of each TMA. Following are examples of the displayed output:

TMM 0 TMA A tmaState: 4 (TMA_MODULE_NORMAL)
TMM 0 TMA B tmaState: 4 (TMA_MODULE_NORMAL)

TMM 0 TMA A current: 1025
TMM 0 TMA B current: 1055

The table below describes the TMA states.

Table 6-1 TMA States

State	Operating Mode	Description
0	Module Detect	Initial TMA state if TMA type is specified in License, but no status has been sent yet from TMM (on BDX card) to API.
1	Low Current	Indicates current is < 50 mA, TMA may be disconnected
2	High Current	Indicates current is > 150 mA. TMAs shut of by TMM (on BDX card)
3	Soft Current	Indicates a redundant path failed in TMA. Current pulses between 90 and 300 mA every 4 seconds. Replace TMA
4	Normal	Normal TMA state, indicates current is within allowable limits (50-150 mA).

15. Multiply the TMA current draw returned by *rfStuff* by 0.1 for actual current in milliamps. Nominal TMA current draw is 90 mA ± 40 mA.


Note

Note – Sometimes **rfStuff** will return a value of 0 for the TMA current. This is caused by an A/D timing condition in the TMM (on the BDX card). Repeating **rfStuff** will eventually return a non-zero value for TMA current which will be correct, but still need to be multiplied by 0.1. In the example in step 15, the currents would be 102.5 and 105.5 mA, respectively.

TMA Gain Check

In normal operation, the TMA provides +12 dB of gain. However, if the DC power is removed, the TMA provides an insertion loss of 2 dB, thus yielding a net gain change of about 14 dB.

16. Check the gain of each TMA by setting up a CW signal generator at +10 dBm or higher to radiate up to the BTS antennas at a mid-band receive frequency. (A coax cable connected to the signal generator and stripped back a few inches to expose the center conductor will act as a reasonable “antenna”).


Note

Note – If a signal generator is not available, an AirSite Uplink Backhaul may be used if the AirSite is put in loopback mode.

17. Use a spectrum analyzer in Video Average mode (100 samples) and monitor the test uplink signal on the RF Filters Rx1 and Rx2 SMA connectors ***one at a time*** to not drop the call.

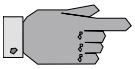
CAUTION – When reconnecting the RF filter or cable, do not use more than 6"lb torque on the small connectors and finger-tighten the knurled connector. Over tightening can damage the connectors and cause VSWR alarms. Also, ensure that the bend radius of the cable is not less than 1". Excessive bend to the cable may cause VSWR alarms, although the cable will not show a problem when disconnected and tested.

18. Observe a gain delta of 12.5 to 14 dB on the spectrum analyzer while enabling and disabling each TMA via the following API commands:

Turn both TMAs Off: *tmmConfigUpdate x,1,0* (x = the sector # 0,1,2 or 3)
Turn both TMAs On: *tmmConfigUpdate x,1,1* (x = the sector # 0,1,2 or 3)

19. Record TMA 1 and TMA 2 Gain.

20. If both TMAs passed the gain check, disconnect the LMT from the ICE-T card.



GoTo – If both TMAs passed the Gain check, go to the **Battery Check** subsection (Step 23).

TMA/DC Injector Voltage

If one or both of the TMAs failed the Gain check, perform steps 21 and 22 to see if the DC voltage is making it out of the DC Injectors.

The DC Injector provides DC voltage to the TMAs between +11 V to +12 V.

21. Remove the cover plate on the DC Injector and using a voltmeter, verify that the voltage can be controlled on and off by sending the appropriate API command:

Turn both TMAs Off: *tmmConfigUpdate x,1,0* (x = the sector # 0,1,2 or 3)
Turn both TMAs On: *tmmConfigUpdate x,1,1* (x = the sector # 0,1,2 or 3)

22. After the Gain check, use the *rfStuff* API commands again and verify that both TMAs are on and pulling nominal current.

6.1.4 Battery Check

23. With the BTS normally powered on, turn off the main breaker switch in the end compartment fuse box.

24. Verify that the BTS remains powered on while using only the batteries.

25. Confirm that the battery voltage is at least 25 Volts. If a battery string is below the minimum specified operational voltage for the BTS (21 VDC), check for a faulty battery.

26. Turn the main breaker switch back on.

6.1.5 Miscellaneous Checks

27. Visually verify that there are no Alarm indicators on the DC Power Supply modules, GPS modules, and the MCPA(s), ICE-T, Alarm, SuperDSP, and BDX cards.

28. Visually inspect all top panel I/O connectors are attached securely.

29. Ensure that all accessible RF connectors are tight.

30. Check the cell site grounding system and verify the integrity of the site grounding cable. Inspect external ground connection for corrosion and tightness.

31. Measure and record the resistance from the BTS to earth ground. It should be approximately 2/10 Ω.

6.1.6 Make Test Call

32. At the completion of all activities, make a test call on the local cell.

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Serial # _____

Site			
Date/Time			
Service Engineer			
Filters cleaned ® or replaced ®			
TMA #1 current reading			
TMA #2 current reading			
MCPA alarms status (OK or module 1, 2, or 3)			
MCPA output power (dBm)			
Surge protectors checked (Y or N)			
Ground connection inspected (Y or N)			
Internal cabinet temp (F)			
Last known precipitation			
Measurement method			
Test equipment used			
Test call successful (Y or N)			
AirSite uplink measured power:			
AirSite Name/Serial #			
Corrective actions taken			

Serial # _____

Site			
Date/Time			
Service Engineer			
Filters cleaned (C) or replaced (R)			
TMA #1 current reading			
TMA #2 current reading			
MCPA alarms status (OK or module 1, 2, or 3)			
MCPA output power (dBm)			
Surge protectors checked (Y or N)			
Ground connection inspected (Y or N)			
Internal cabinet temp (F)			
Last known precipitation			
Measurement method			
Test equipment used			
Test call successful (Y or N)			
AirSite uplink measured power:			
AirSite Name/Serial #			
Corrective actions taken			

Serial # _____

Site			
Date/Time			
Service Engineer			
Filters cleaned (C) or replaced (R)			
TMA #1 current reading			
TMA #2 current reading			
MCPA alarms status (OK or module 1, 2, or 3)			
MCPA output power (dBm)			
Surge protectors checked (Y or N)			
Ground connection inspected (Y or N)			
Internal cabinet temp (F)			
Last known precipitation			
Measurement method			
Test equipment used			
Test call successful (Y or N)			
AirSite uplink measured power:			
AirSite Name/Serial #			
Corrective actions taken			

Serial # _____

Site			
Date/Time			
Service Engineer			
Filters cleaned (C) or replaced (R)			
TMA #1 current reading			
TMA #2 current reading			
MCPA alarms status (OK or module 1, 2, or 3)			
MCPA output power (dBm)			
Surge protectors checked (Y or N)			
Ground connection inspected (Y or N)			
Internal cabinet temp (F)			
Last known precipitation			
Measurement method			
Test equipment used			
Test call successful (Y or N)			
AirSite uplink measured power:			
AirSite Name/Serial #			
Corrective actions taken			

7. TECHNICAL SUPPORT

AirNet provides several support services that cover all aspects of BSS equipment, from initial system planning through deployment and operation. Once a system is in operation and has been conditionally accepted, the AirNet Customer Response Center (CRC) is available and responsible for answering technical questions or addressing technical problems.

Access to the CRC is typically available to AirNet customers for one year from the original date of purchase of the AirNet BSS equipment. Access to the CRC may be extended beyond the one-year period by purchasing a maintenance agreement from AirNet. In addition to extending access to the AirNet CRC, the maintenance agreement may also include software upgrades[1] for purchased AirNet products as well as participation in the Depot Maintenance Program. Contact the AirNet Sales Department for more information on purchasing a maintenance agreement[2].

7.1 Customer Response Center

Answers to specific technical questions may not be available in the user documentation due to the complexity of wireless systems. If this is the case, customers may contact the AirNet Customer Response Center to ask a technical question, report a problem and even suggest product enhancements.

The Customer Response Center should also be contacted in for major upgrades to network components, including major database changes, frequency plan modifications, and upgrades to the MSC. When advance notice of major upgrades is received, the Customer Response Center can assist this activity by providing an analysis of potential impacts to BSS performance or quickly responding if problems should arise.

When a message or call from a customer is received, an incident report will be generated and a tracking number assigned. The tracking number should be referenced regarding any questions or information related to the initial incident report with the CRC.

When contacting the CRC, the following information should be provided:

- Customer's Company Name
- Person's name contacting the CRC
- Customer email address, phone number, and/or fax number[3]
- Incident Type: technical question, product defect, or suggested enhancement
- AirNet product - for the question, incident, or suggested enhancement.
- Detailed description of the question, incident, or suggested enhancement.

[1] Upgrades for certain software features (e.g. data and fax features) may include an additional charge.
[2] Terms of a maintenance agreement may vary from customer to customer. Conditions included in this document are subject to change without notice, but are specified in the maintenance agreement.
[3] A response is typically sent using the same method the message was received unless otherwise requested by the customer.

If the contact is regarding a technical problem, the following additional information should be provided:

- Time and date of the incident.
- Software release of the product in question.
- Any steps taken that may have caused the incident or that may be used to reproduce the incident.
- The severity level for the incident based on the following guidelines:
  - Critical - System does not function or critical aspects of the system are not controllable.
  - High - System functions; however, invoking certain functions may cause the system to crash or cause some dangerous results.
  - Medium - System functions and is fairly stable. A work-around may have been determined to temporarily mitigate the problem, or there may be missing non-critical functionality with otherwise stable operation.
  - Low - System is useable and stable. There is a minor performance or design issue that should be addressed.

When the CRC is contacted for a problem, the problem will be quickly analyzed. If possible, a temporary fix may be suggested to mitigate the problem until a final solution can be incorporated. Once the customer is fully satisfied that the issue in the original incident report has been fully addressed, the incident report will be closed.

As part of a maintenance agreement for customer access the CRC, the customer may agree to provide remote access for CRC personnel at AirNet's facilities to the customers BSS equipment. Remote access by CRC personnel to customer's equipment is typically at the discretion and control of the customer. However, by providing remote access, AirNet technical personnel may more quickly resolve technical issues that can arise.

7.2 Contacting the Customer Response Center

There are several options for getting questions answered, having a specific problem addressed, or suggesting a product enhancement.

7.2.1 Electronic Mail

The Customer Response Center can be contacted via email at the following Internet address:

AirNetCRC@airnetcom.com

When sending the CRC an email message, please include the information specified in Section 7.1. An acknowledgment of your email message will be sent within one business day.

7.2.2 FAX

If email is not available, then the Customer Response Center can be contacted via fax at the following fax number:

1-321-676-6734

As with email, please include the information requested in Section 7.1. Please allow one business day for an acknowledgement of your fax to be returned.

7.2.3 Phone

The CRC may be contacted by phone for any issues, 24 hours a day, 7 days a week, through the CRC 1-888 number:

1-888-8AIRNET or 1-888-824-7638

The information listed in Section 7.1 should be provided when a CRC representative is contacted.

The 1-888 number should be used for all critical issues rather than the main AirNet business number, email, or fax. This ensures a prompt response.

Note - The CRC 1-888 number should be used for all critical issues to ensure a prompt response.

7.3 Product Change Requests

If the CRC is contacted concerning a problem or a product enhancement, a Product Change Request (PCR) may be generated. PCRs are generated for issues that must be addressed in the design of the product. For critical items, the PCR may be addressed in the next maintenance ("Point") release. For extremely critical items, the PCR may be addressed in an interim "quick" patch release that specifically addresses the problem. Enhancements are typically addressed in future major software releases. The specific software release that addresses a PCR is at the discretion of AirNet.

After the cause of a problem has been found, the method and time frame for addressing the PCR is determined by AirNet based on customer need, the PCR criticality, and whether an adequate workaround is available to address the problem.

If a PCR is generated due to a customer issue, the PCR number will be cross-referenced to the original incident tracking number. The customer will be informed of the PCR number and the time frame for its resolution.

When the PCR has been addressed and thoroughly tested, the software incorporating the PCR will be released and automatically sent to the customers covered under the software maintenance program. In many cases, AirNet personnel will assist in the installation of the new software release.

Please note that known problems are documented as PCRs in the product release notice associated with the software release installed in the system. The product release notice should be referenced to avoid actions that could cause unstable operation for known problems or to invoke corrective actions for problems that may have already occurred.


Note

Note - Known problems addressed by PCRs are documented in the Product Release Notice for the software release installed on AirNet BSS equipment.

7.3.1 Returning Material

If a problem that may have occurred has been determined to be a faulty module within BSS equipment, then the module can be returned for repair or replacement. If the module is under warranty, there is no charge for the replacement module.

To return a module, the CRC must be contacted for an RMA number. This RMA number should be referenced for all correspondence concerning the return. In addition, an RMA form must be filled out describing the problem with the returned module, and it must be returned with the faulty module. To help expedite replacement of the faulty module, please fax or email a copy of the RMA form to the CRC prior to returning the item.

The RMA process and a sample copy of the RMA form are available in Field Bulletin 01-14A (see Appendix F of this manual). If you need a copy of the RMA form, please request one when contacting the CRC for an RMA number.


Note

Note - The process for returning items to AirNet must be followed carefully to avoid delays for replacing faulty modules.

Once the faulty item is received by the CRC, it is examined and verified to be faulty. A replacement module will be sent back to the customer. If the item is no longer covered under warranty, the customer will be contacted to determine if he wishes to purchase a replacement part. The customer may also receive a Corrective Action Report (CAR) that explains the problem found and any action that may be necessary by the customer to avoid a reoccurrence.

Note

Note - AirNet recommends the purchase of spares for AirNet BSS equipment to minimize downtime of BSS equipment.

A summary of the process for returning items to AirNet is shown in Figure 7-1.

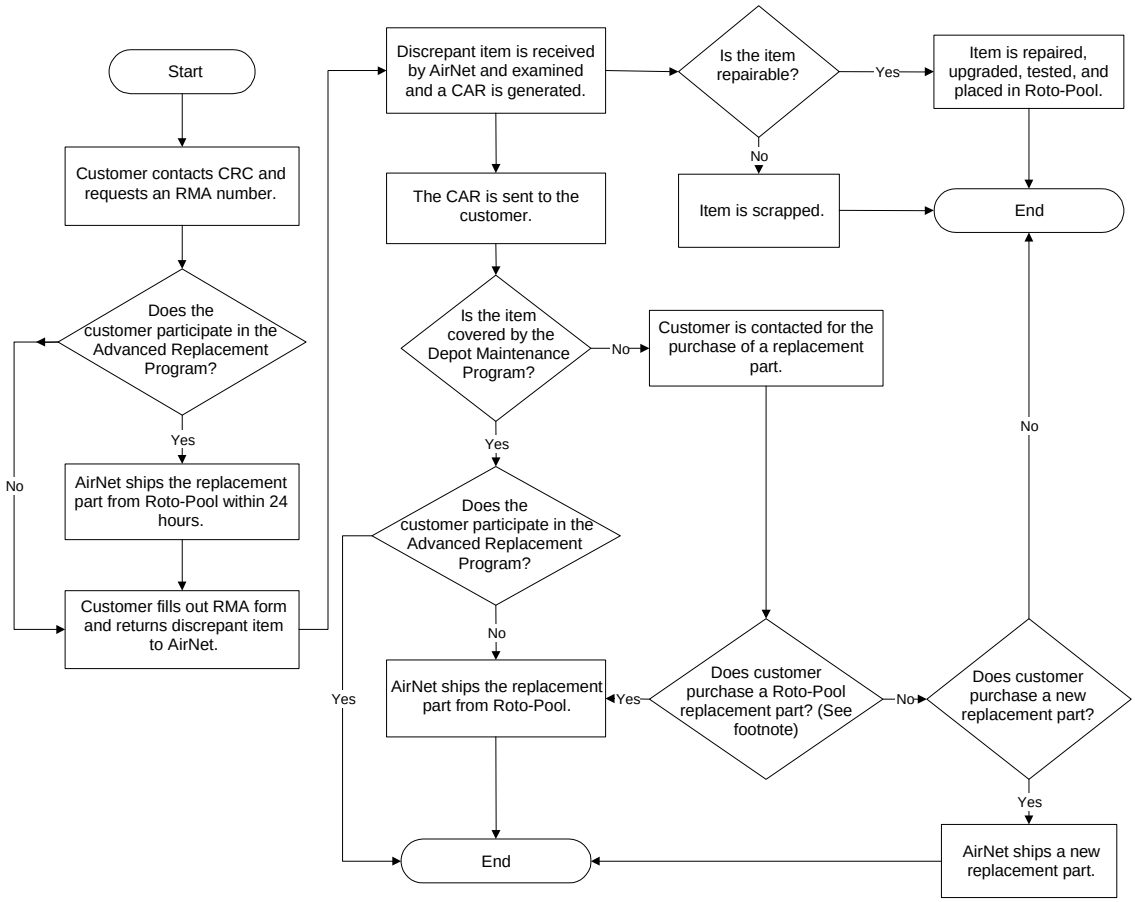


Figure 7-1 Material Return Process[4]

7.3.2 Advanced Replacement Program

At an additional cost, customers may participate in the AirNet Advanced Replacement Program. Under this program, a replacement module will be sent within 24 hours of contacting the CRC and obtaining an RMA number. The faulty item must still be returned, but AirNet will not wait to receive the faulty item to send its replacement. Contact the CRC or the AirNet Sales Department for more information on the Advanced Replacement Program.

[4] Items may be purchased from Roto-Pool only if sufficient quantities of Roto-Pool items exist.


Note

Note - Failure to return defective items or for failures caused by events not covered by the warranty can result in the customer being invoiced for items shipped under the Advanced Replacement Program. Review the maintenance agreement for specific terms of the agreement.

7.3.3 Roto-Pool System

When a replacement part is sent to a customer, it may or may not be the repaired faulty module that was received from the customer. AirNet uses a "roto-pool" system for replacement modules. If a faulty item that is received by AirNet is repairable, it will be re-stocked in our "roto-stock" system once repaired. The module will also be upgraded to the latest revision. AirNet ships replacement parts from the roto-pool. The replacement item is typically shipped before the faulty returned item is repaired. The roto-pool system allows faster return of replacement parts.

Replacement parts are fully tested before being placed in the roto-pool. Roto-pool items also carry a full AirNet warranty from the date of original purchase of the module.

7.4 Software Maintenance Program

Purchases of new base station systems typically include the AirNet software maintenance program for a period of one year from purchase of the system. The maintenance program includes software upgrades[5] during the program period. The software maintenance program can be purchased beyond the first year. Contact the AirNet Sales Department or the CRC for more information on the software maintenance program.

7.5 Depot Maintenance Program

BSS hardware typically includes a one-year warranty from the date of purchase. The depot maintenance program may be purchased to extend the warranty of hardware components beyond the first year. Additionally, the Advance Replacement Program may be included for hardware covered under warranty. Contact the AirNet Sales Department or the CRC for more information about extending the warranty under the Depot Maintenance Program or about the Advanced Replacement Program.

[5] Upgrades for certain software features (e.g. data and fax features) may include an additional charge.

Appendix A – Acronyms

Abis	Refers to the BSC-BTS data link
ACM	Analog Converter Module
ARFCN	Absolute Radio Frequency Channel Number
BCCH	Broadcast Control Channel
BCM	Broadband Converter Module
BDX	Broadband Digital Transceiver
BRT	Broadband RF Transceiver
BSC	Base Station Controller
BSS	Base Station System
BTS	Broadband Transceiver System or Base Transceiver System
CIC	Circuit Identification Code
CPU	Central Processing Unit
CSU	Channel Service Unit
DAS	Digital AirSite® (AirSite-3000)
DCrA	Dynamic (RF) Carrier Assignment
DSP	Digital Signal Processor
DSU	Data Service Unit
EMI	Electromagnetic Interference
GPS	Global Positioning System
HPA	High Power Amplifier
ICE-T	Integrated CPU, T1/E1, and Flash Module
LRU	Line Replaceable Unit
LO	Local Oscillator
LMT	Local Maintenance Terminal
MCPA	Multicarrier (High) Power Amplifier
MIB	Management Information Base
MS	Mobile Station
MSC	Mobile Switching Center
OMC-R	Operations Maintenance Center – Radio

OOS Out of Service

RF Radio Frequency

SCPA Single Carrier Power Amplifier

TCAP Triple Capacity Digital AirSite®

TDMA Time Division Multiple Access

TRAU Transcoder and Rate Adaption Unit

XMUX Transmultiplexer

Appendix B - Connector Pinouts

This appendix contains connector pinouts for the following BTS interface connectors:

Ethernet Port (front of Cabinet)

The **ETHERNET** port (see Figure 1-9) is located on the front panel of the BTS cabinet. It is wired internally to port 7 on the CSU/DSU.

The Ethernet port is an 8-pin, RJ-45 style connector. The pinouts of the Ethernet port are shown in the following table:

Table B-1 RJ-45 Ethernet Port

RJ-45 at CSU port 7 Pin #	Front Panel RJ-45 Ethernet Port Pin #	Wire Color	Signal
1	**1**	Yellow	TX_RING
2	**2**	Black	TX -
3	**3**	Red	RX +
4	**4**	---	No connection
5	**5**	---	No connection
6	**6**	Green	RX -
7	**7**		No connection
8	**8**		No connection

Serial Port (front of Cabinet)

The **SERIAL** port (see Figure 1-9) is located on the front panel of the BTS cabinet. It provides RS-232 signals from the two ICE-T cards, the four SuperDSP cards, and the Alarm card, and is wired internally to port 9 on the terminal server.

The Serial port is a 9-pin, RS-232 style connector. The pinouts of the serial port are displayed in Table B-2:

Table B-2 Serial Port Pinouts

RJ-45 at Terminal Server port 9 Pin #	Front Panel DB-9 Serial Port Pin #	Wire Color	Signal
1	**---**	---	No connection
2	**---**	---	No connection
3	**3**	Red	RX
4	**5**	Black	GND
5	**2**	Green	TX
6	**---**	---	No connection
7	**---**	---	No connection
8	**---**	---	No connection

ALARM Connector Pinouts

The **ALARM** connector (see Figure 1-3) is located on the top of the BTS cabinet. It provides an external port for cabling the external (user) alarms to the punch down block.

The Alarm connector is a 50-pin TELCO style connector. Pinouts for the **ALARM** connector are listed in Table B-3.

Table B-3 ALARM Connector Pinouts

Pin	Function	Color	Pin	Function	Color
1	Relay Output 0	WHT/BLU	26	GND	BLU/WHT
2	Relay Output 1	WHT/ORN	27	GND	ORN/WHT
3	Relay Output 2	WHT/GRN	28	GND	GRN/WHT
4	Relay Output 3	WHT/BRN	29	GND	BRN/WHT
5	Relay Output 4	WHT/GRY	30	GND	GRY/WHT
6	Relay Output 5	RED/BLU	31	GND	BLU/RED
7	Relay Output 6	RED/ORN	32	GND	ORN/RED
8		RED/GRN	33	GND	GRN/RED

Pin	Function	Color	Pin	Function	Color
9	------	RED/BRN	34	GND	BRN/RED
10	Relay Input 15	RED/GRY	35	GND	GRY/RED
11	Relay Input 14	BLK/BLU	36	GND	BLU/BLK
12	Relay Input 13	BLK/ORN	37	GND	ORN/BLK
13	Relay Input 12	BLK/GRN	38	GND	GRN/BLK
14	Relay Input 11	BLK/BRN	39	GND	BRN/BLK
15	Relay Input 10	BLK/GRY	40	GND	GRY/BLK
16	Relay Input 9	YEL/BLU	41	GND	BLU/YEL
17	Relay Input 8	YEL/ORN	42	GND	ORN/YEL
18	Relay Input 7	YEL/GRN	43	GND	GRN/YEL
19	Relay Input 6	YEL/BRN	44	GND	BRN/YEL
20	Relay Input 5	YEL/GRY	45	GND	GRY/YEL
21	Relay Input 4	PUR/BLU	46	GND	BLU/PUR
22	Relay Input 3	PUR/ORN	47	GND	ORN/PUR
23	Relay Input 2	PUR/GRN	48	GND	GRN/PUR
24	Relay Input 1	PUR/BRN	49	GND	BRN/PUR
25	Relay Input 0	PUR/GRY	50	GND	GRY/PUR

CAL ANT Connector Pinouts

The **CAL ANT** connector (see Figure 1-3) is located on the top of the BTS cabinet. It provides an external port to connect a test mobile for Adaptive Array. The CAL ANT connector is not used in the present software release. Pinouts for this connector will be added to the manual at a later date.

TMA Power Connector Pinouts

The **TMA POWER** connector (see Figure 1-3) is located on the top of the BTS cabinet. It provides an external port for cabling from the BDX cards to the Tower Mounted Amplifiers.

Pinouts for the 25-pin TMA POWER connector are listed in Table B-4.

Table B-4 TMA Power Connector Pinouts

Pin	Wire Color	Function
1	Black	TMA_PWR_A1
2	White	GND
3	Red	TMA_PWR_E1
4	Green	TMA_PWR_B1
5	Orange	GND
6	Blue	GND
7	White/Black	TMA_PWR_C1
8	Red/Black	GND
9	Green/Black	TMA_PWR_E2
10	Orange/Black	TMA_PWR_D1
11	Blue/Black	GND
12	Black/White	GND
13	Red/White	TMA_PWR_F1
14	Green/White	TMA_PWR_A2
15	Blue/White	GND
16	Black/Red	GND
17	White/Red	TMA_PWR_B2
18	Orange/Red	GND
19	Blue/Red	TMA_PWR_F2
20	Red/Green	TMA_PWR_C2
21	Orange/Green	GND
22	Black/White/Red	GND
23	White/Black/Red	TMA_PWR_D2
24	Red/Black/White	GND
25	Green/Black/White	GND

GPS Antenna Connector Pinouts

The **GPS ANT** connectors (see Figure 1-3) are located on the top of the BTS cabinet. They provide external connection points for the RF coaxial cables from both GPS modules.

Pinouts for the **GPS ANT** connectors are listed in Tables B-5 and B-6.

Table B-5 GPS ANT 1 Connector Pinouts

Pin	Function
1	+12VDC
2	GND
3	1PPS_GPS1
4	ICET1Tx_GPS1RX (RS232)
5	GPS1TX_ICET1RX (RS232)
6	GPS1_TYPE0
7	GND
8	GPS1_TYPE1
9	GND

Table B-6 GPS ANT 2 Connector Pinouts

Pin	Function
1	+12VDC
2	GND
3	1PPS_GPS2
4	ICET2Tx_GPS2RX (RS232)
5	GPS2TX_ICET2RX (RS232)
6	GPS2_TYPE0
7	GND
8	GPS2_TYPE1
9	GND

T1/E1 Interface Connector Pinouts

The **T1/E1** connectors (**T1/E1 A, T1/E1 B, T1/E1 C,** and **T1/E1 D**) are located on the top of the BTS cabinet, as shown in Figure 1-3. They provide external connection points for the ICE-T card(s).

The T1/E1 connectors are 8-pin, RJ-45 style connectors. Pinouts for the T1/E1 connectors are listed in Tables B-7 through B-10.

Table B-7 Connector T1/E1 A Pinouts

PIN	FUNCTION	T1/E1	PIN	FUNCTION	T1/E1
1	Rx Ring	A	5	Tx Tip	A
2	Rx Tip	A	6	Rx Tip	C
3	Rx Ring	C	7	Tx Ring	C
4	Tx Ring	A	8	Tx Tip	C

Table B-8 Connector T1/E1 B Pinouts

PIN	FUNCTION	T1/E1	PIN	FUNCTION	T1/E1
1	Rx Ring	B	5	Tx Tip	B
2	Rx Tip	B	6	Rx Tip	D
3	Rx Ring	D	7	Tx Ring	D
4	Tx Ring	B	8	Tx Tip	D

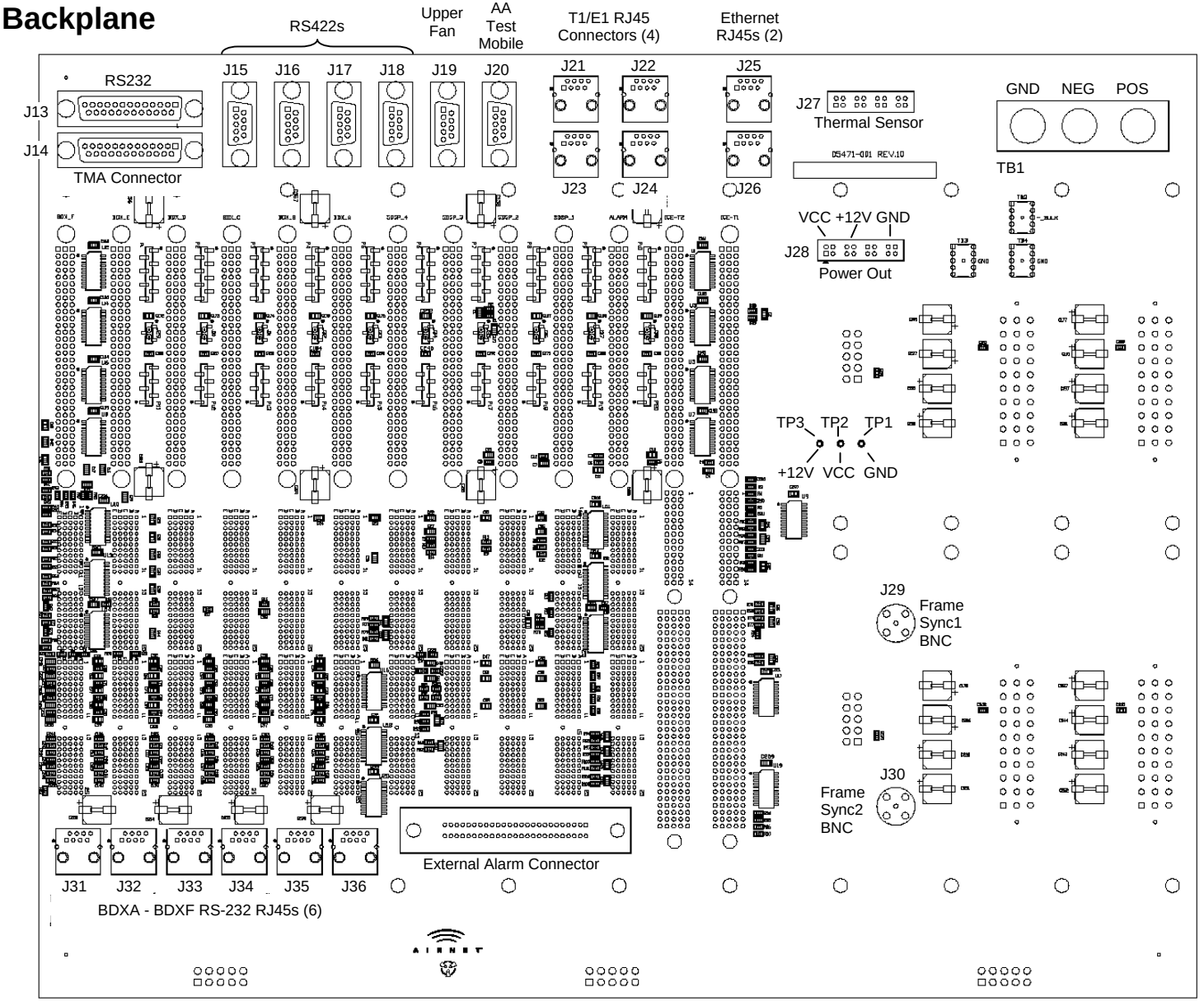
Table B-9 Connector T1/E1 C Pinouts

PIN	FUNCTION	T1/E1	PIN	FUNCTION	T1/E1
1	Rx Ring	E	5	Tx Tip	E
2	Rx Tip	E	6	Rx Tip	G
3	Rx Ring	G	7	Tx Ring	G
4	Tx Ring	E	8	Tx Tip	G

Table B-10 Connector T1/E1 D Pinouts

PIN	FUNCTION	T1/E1	PIN	FUNCTION	T1/E1
1	Rx Ring	F	5	Tx Tip	F
2	Rx Tip	F	6	Rx Tip	H
3	Rx Ring	H	7	Tx Ring	H
4	Tx Ring	F	8	Tx Tip	H

BPU Backplane



Power Out Test Connectors (on Backplane)

The **Power Out** connector, J28, on the BPU backplane (see page B-7) provides +5 V and +12 V power out. In the present BTS-4000 configuration, the cable from the Power Out connector to the Terminal Server power port contains a small inverter to pass -12 V to the Terminal Server. The pinout of the Power Out connector is as follows:

+5 VDC (VCC) on Pins 1, 1A, 1B, and 1C

+12 VDC on Pins 2, 2A, 2B, and 2C

GND on Pins 4, 4A, 4B, and 4C

TP1, 2, and 3 on the backplane provide test points for the +5 and +12 VDC power to the modules in the BPU rack. The test points are as follows:

TP1 - GND on Pins 4, 4A, 4B, and 4C

TP2 - +5 VDC (VCC) on Pins 1, 1A, 1B, and 1C

TP3 - +12 VDC on Pins 2, 2A, 2B, and 2C

Frame Sync1 and 2

The Frame Sync 1 and 2 BNC female connectors, J29 and J30, are used to test the Frame Sync signals from both ICE-T modules. See page B-7 for the location of these connectors.

Adaptive Array Test Mobile

The Adaptive Array Test Mobile DB-9 connector, J20, contains an RS-232 signal, +12 VDC Power, and an 'Ignition' signal (Relay out from the Alarm Card signal R_OUT7). It is wired internally to the Test Mobile connector on the top (I/O) panel of the BTS-4000. See page B-7 for the location of connector J20.

Pinouts for the **Adaptive Array Test Mobile** connector are listed in Tables B-x.

Table B-x Adaptive Array Test Mobile Connector Pinouts

Pin	Function
1	+12 VDC
3	AATM_TXD
5	AATM_RXD
7	IGNITION (R_OUT7)
8	GND
9	GND

RS-232 Connectors for BDX Test

Connectors J31-J36 on the backplane contain RS-232 (test) signals from the BDX modules. See page B-7 for the location of these connectors.

The pinouts for these RJ-45 connectors are as follows:

Table B-x RS-232 Connectors for BDX Test Pinouts

Pin	Function
3	BDX_RX
5	BDX_TX
7	GND

RS-422

Connectors J15-J18 on the backplane contain RS-422 signals and MCPA reset signals that route to the MCPA rack. See page B-7 for the location of these connectors.

RS-422A (J15) contains signals from the Master ICE-T card (either ICE-T-1 or ICE-T-2 slave tri-stated) with provisions on the backplane to add jumpers (zero Ohm resistors) to select the Alarm card as a source for the RS-422A signal (both ICE-T-1 and ICE-T-2 tri-stated).

RS-422B, RS-422C, and RS-422D (J16-J18) contain RS-422 signals and MCPA reset signals from the alarm card.

The pinouts for the four DB-9 RS-422 connectors are as follows:

Table B-x RS-422 Connector Pinouts

Pin	Function
1	RS-422-RXD-
2	RS-422-RXD+
3	RS-422-TXD-
4	RS-422-TXD+
9	D_OUT

Ethernet

Connectors J25 and J26 on the backplane contain ethernet signals from ICE-T-1 and ICE-T-2. See page B-7 for the location of these connectors.

The pinouts for J25 and J26 are as follows:

Table B-x Ethernet Connector Pinouts

Pin	Function
1	ETHERNET_TX+
2	ETHERNET_TX-
3	ETHERNET_RX+
4	ETHERNET_TERM1
5	ETHERNET_TERM2
6	ETHERNET_RX-
7	ETHERNET_TERM3
8	ETHERNET_TERM4
9	ETHERNET_TX+

Upper Fan

Connector J19 on the backplane provides signals from the upper fan tray. See page B-7 for the location of connector J19.

The pinouts for J19 are as follows:

Table B-x Upper Fan Connector Pinouts

Pin	Function
1, 3, 5	+_BULK
2, 4, 9	-_BULK
6	FAN_ALARM_TOP1
7	FAN_ALARM_TOP2
8	FAN_ALARM_TOP3

Thermal

Connector J27 on the backplane provides an input point for thermal signals. The Thermal Sensor is mounted on the back of the plenum, via cable PN 05179-001. See page B-7 for the location of connector J27.

The pinouts for J27 are as follows:

Table B-x Thermal Connector Pinouts

Pin	Function
1	VCC (+5 VDC)
2	D_IN8 (Major Alarm)
3	D_IN9 (Minor Alarm)
4	GND

Appendix C - External Alarms

Alarm Descriptions

The PCU (Power Control Unit) provides three summary alarms to the BTS via Alarm card RELAY_IN3, RELAY_IN4, and RELAY_IN5. The alarms map into the three summary signals differently.

The BTS alarms are recognized by the AirNet Operations and Maintenance Center - Radio (OMC-R).

Following are descriptions of the BTS alarms:

AC/DC (Bulk) Power Supply Alarm #1

This fault indicates when the input voltage at the BPU from the AC/DC (Bulk) Power Supply is not operating within the proper operating range. Improper operation or failure of the BTS may result. The following conditions are mapped to this alarm:

- Battery failure
- Symmetry failure
- High Temp (battery compartment)

Battery Breaker Open and Symmetry Failure are non-critical alarms.

The normal state is HIGH. The alarm state is LOW.

AC/DC (Bulk) Power Supply Alarm #2

This fault indicates when the input voltage at the BPU from the AC/DC (Bulk) Power Supply is not operating within the proper operating range. Improper operation or failure of the BTS may result. The following conditions are mapped to this alarm:

- -48 V Module Failure
- Battery Disconnection

The normal state is HIGH. The alarm state is LOW.

AC/DC (Bulk) Power Supply Alarm #3

This fault indicates when the input voltage at the BPU from the AC/DC (Bulk) Power Supply is not operating within the proper operating range. Improper operation or failure of the BTS may result. The following conditions are mapped to this alarm:

- High Voltage 48 V
- Module Alarm
- Battery Fuse
- Distribution Breaker Open
- AC Failure
- Load Capacity >80%

The normal state is HIGH. The alarm state is LOW.

Security Alarm

This fault indicates when a door or access panel to the BTS and associated cell site equipment is open.

The normal state is HIGH. The alarm state is LOW.

Emergency Monitoring System (EMS) Alarm #1

This alarm is defined by the customer. It may be used for fire detection, environmental control failure, etc.

The normal state is HIGH. The alarm state is LOW.

Emergency Monitoring System (EMS) Alarm #2

This alarm is defined by the customer. It may be used for fire detection, environmental control failure, etc.

The normal state is HIGH. The alarm state is LOW.

Environment Alarm

This alarm indicates when the cell site environmental control system (air conditioning or heating) has failed.

The normal state is HIGH. The alarm state is LOW.

Antenna Beacon Fault

This alarm indicates when the FAA warning beacon at the top of the antenna mast has failed.

The normal state is LOW. The alarm state is HIGH.

To bypass this alarm when there is no beacon is connected, jumper the appropriate pins on the **ALARM** connector. See Table C-1.

Table C-1 External Alarm Mapping for BTS-4000 IE with Eldec PCU running 1.xx.02 Software

AC/DC Alarm #	Alarm #1	Alarm #2	Alarm #3
Eldec Relay #	4	1 & 5 [6]	2 & 3 [7]
Alarm Card Relay #	Relay_In_4	Relay_In_5	Relay_In_3
Alarm Condition			
Low Voltage +27 V		X	
High Voltage +27 V			X
Module Alarm			X
Battery Breaker			X
Distribution Breaker			X
Mains Failure			X
High Temperature	X		
Over Capacity (85%)			X
Battery Failure	X		
Symmetry Failure	X		
Battery Disconnection		X	
-48 V Fault		X	

[6] The TB11 Relay #1 and the TB71 Relay are wired or'd together. TB71 provides the –48 V fault signal.
[7] TB11 Relays 2 and 3 are wired or'd together.

Summary

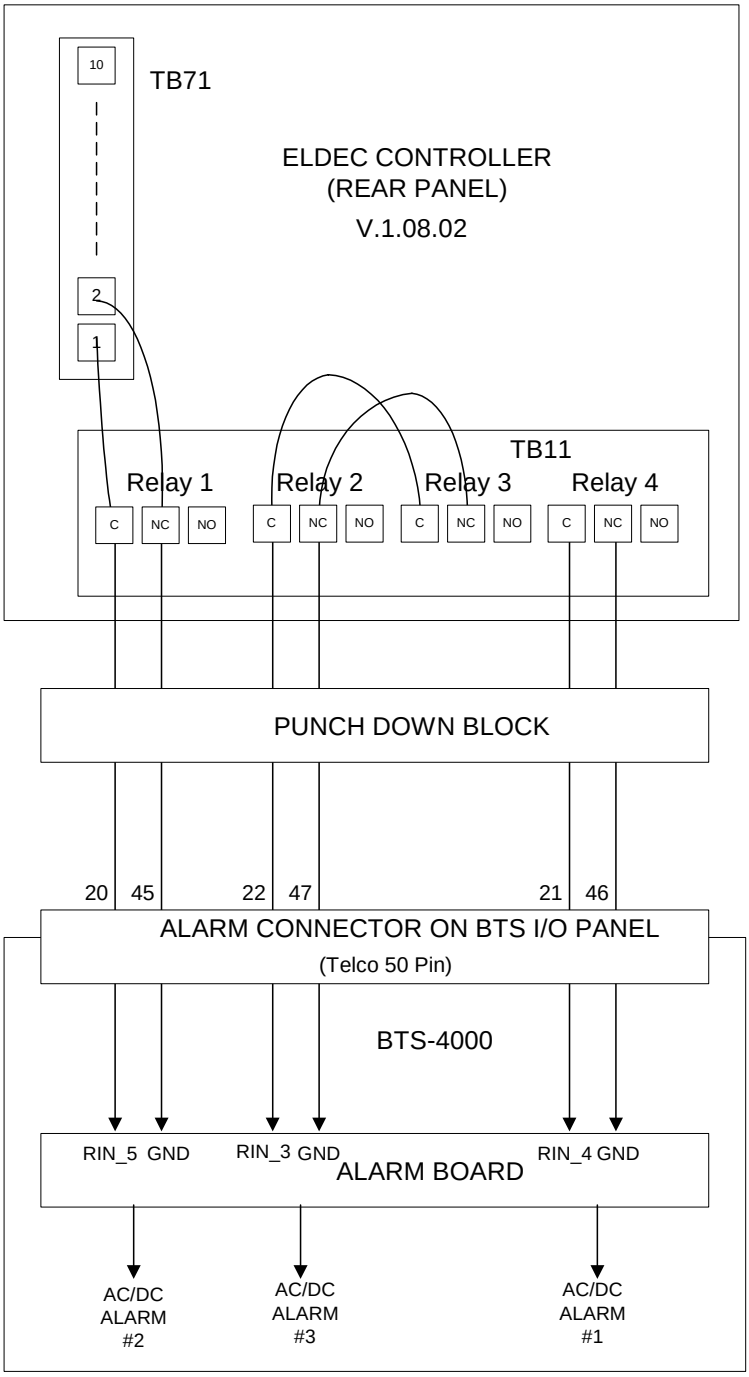
External alarm data is summarized in the tables below.

Table C-2 Alarm Connector Data Summary

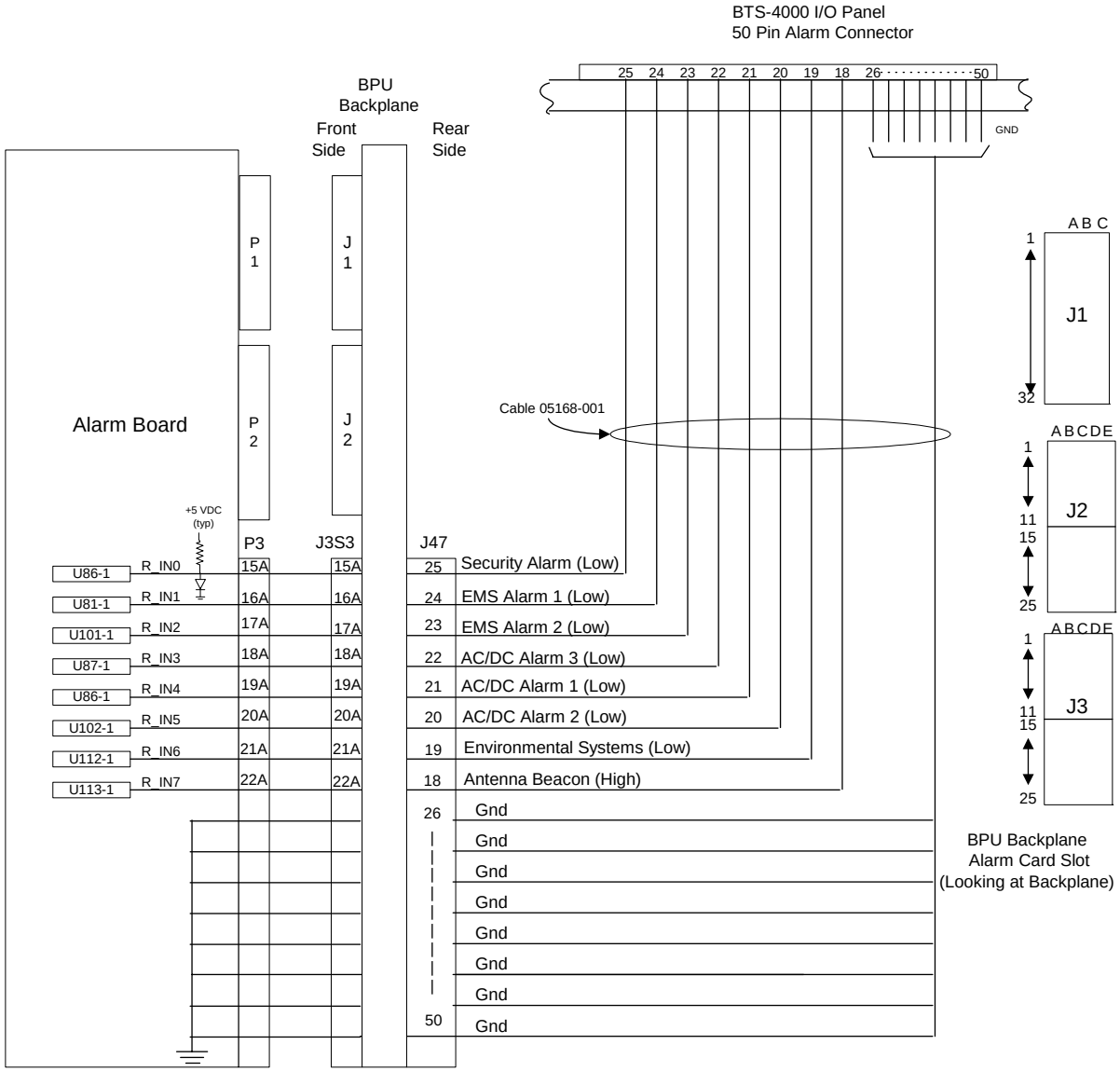
Connector	Pins #	Alarm Name/Description	Normal State (High/Low)	Alarm State (High/Low)
ALARM	18 and 43	Antenna Beacon Fault	Low	High
ALARM	19 and 44	Environmental Alarm	High	Low
ALARM	20 and 45	AC/DC Power Supply Alarm #2	High	Low
ALARM	21 and 46	AC/DC Power Supply Alarm #1	High	Low
ALARM	22 and 47	AC/DC Power Supply Alarm #3	High	Low
ALARM	23 and 48	EMS Alarm 2	High	Low
ALARM	24 and 49	EMS Alarm 1	High	Low
ALARM	25 and 50	Security Alarm	High	Low

BTS-4000 External Alarms Wiring Diagrams

Alarm Connector (50-Pin) to ELDEC Controller



External Alarms Wiring Diagram – 50-Pin Telco Alarm Connector



Appendix D - dBm-to-Watts Conversion Table

dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts
20.0	0.100	25.0	0.316	30.0	1.00	35.0	3.16	40.0	10.00	45.0	31.62	50.0	100.00	55.0	316.23	60.0	1000.00
20.1	0.102	25.1	0.324	30.1	1.02	35.1	3.24	40.1	10.23	45.1	32.36	50.1	102.33	55.1	323.59	60.1	1023.29
20.2	0.105	25.2	0.331	30.2	1.05	35.2	3.31	40.2	10.47	45.2	33.11	50.2	104.71	55.2	331.13	60.2	1047.13
20.3	0.107	25.3	0.339	30.3	1.07	35.3	3.39	40.3	10.72	45.3	33.88	50.3	107.15	55.3	338.84	60.3	1071.52
20.4	0.110	25.4	0.347	30.4	1.10	35.4	3.47	40.4	10.96	45.4	34.67	50.4	109.65	55.4	346.74	60.4	1096.48
20.5	0.112	25.5	0.355	30.5	1.12	35.5	3.55	40.5	11.22	45.5	35.48	50.5	112.20	55.5	354.81	60.5	1122.02
20.6	0.115	25.6	0.363	30.6	1.15	35.6	3.63	40.6	11.48	45.6	36.31	50.6	114.82	55.6	363.08	60.6	1148.15
20.7	0.117	25.7	0.372	30.7	1.17	35.7	3.72	40.7	11.75	45.7	37.15	50.7	117.49	55.7	371.54	60.7	1174.90
20.8	0.120	25.8	0.380	30.8	1.20	35.8	3.80	40.8	12.02	45.8	38.02	50.8	120.23	55.8	380.19	60.8	1202.26
20.9	0.123	25.9	0.389	30.9	1.23	35.9	3.89	40.9	12.30	45.9	38.90	50.9	123.03	55.9	389.05	60.9	1230.27
21.0	0.126	26.0	0.398	31.0	1.26	36.0	3.98	41.0	12.59	46.0	39.81	51.0	125.89	56.0	398.11	61.0	1258.93
21.1	0.129	26.1	0.407	31.1	1.29	36.1	4.07	41.1	12.88	46.1	40.74	51.1	128.82	56.1	407.38	61.1	1288.25
21.2	0.132	26.2	0.417	31.2	1.32	36.2	4.17	41.2	13.18	46.2	41.69	51.2	131.83	56.2	416.87	61.2	1318.26
21.3	0.135	26.3	0.427	31.3	1.35	36.3	4.27	41.3	13.49	46.3	42.66	51.3	134.90	56.3	426.58	61.3	1348.96
21.4	0.138	26.4	0.437	31.4	1.38	36.4	4.37	41.4	13.80	46.4	43.65	51.4	138.04	56.4	436.52	61.4	1380.38
21.5	0.141	26.5	0.447	31.5	1.41	36.5	4.47	41.5	14.13	46.5	44.67	51.5	141.25	56.5	446.68	61.5	1412.54
21.6	0.145	26.6	0.457	31.6	1.45	36.6	4.57	41.6	14.45	46.6	45.71	51.6	144.54	56.6	457.09	61.6	1445.44
21.7	0.148	26.7	0.468	31.7	1.48	36.7	4.68	41.7	14.79	46.7	46.77	51.7	147.91	56.7	467.74	61.7	1479.11
21.8	0.151	26.8	0.479	31.8	1.51	36.8	4.79	41.8	15.14	46.8	47.86	51.8	151.36	56.8	478.63	61.8	1513.56
21.9	0.155	26.9	0.490	31.9	1.55	36.9	4.90	41.9	15.49	46.9	48.98	51.9	154.88	56.9	489.78	61.9	1548.82
22.0	0.158	27.0	0.501	32.0	1.58	37.0	5.01	42.0	15.85	47.0	50.12	52.0	158.49	57.0	501.19	62.0	1584.89
22.1	0.162	27.1	0.513	32.1	1.62	37.1	5.13	42.1	16.22	47.1	51.29	52.1	162.18	57.1	512.86	62.1	1621.81
22.2	0.166	27.2	0.525	32.2	1.66	37.2	5.25	42.2	16.60	47.2	52.48	52.2	165.96	57.2	524.81	62.2	1659.59
22.3	0.170	27.3	0.537	32.3	1.70	37.3	5.37	42.3	16.98	47.3	53.70	52.3	169.82	57.3	537.03	62.3	1698.24
22.4	0.174	27.4	0.550	32.4	1.74	37.4	5.50	42.4	17.38	47.4	54.95	52.4	173.78	57.4	549.54	62.4	1737.80
22.5	0.178	27.5	0.562	32.5	1.78	37.5	5.62	42.5	17.78	47.5	56.23	52.5	177.83	57.5	562.34	62.5	1778.28
22.6	0.182	27.6	0.575	32.6	1.82	37.6	5.75	42.6	18.20	47.6	57.54	52.6	181.97	57.6	575.44	62.6	1819.70
22.7	0.186	27.7	0.589	32.7	1.86	37.7	5.89	42.7	18.62	47.7	58.88	52.7	186.21	57.7	588.84	62.7	1862.09
22.8	0.191	27.8	0.603	32.8	1.91	37.8	6.03	42.8	19.05	47.8	60.26	52.8	190.55	57.8	602.56	62.8	1905.46
22.9	0.195	27.9	0.617	32.9	1.95	37.9	6.17	42.9	19.50	47.9	61.66	52.9	194.98	57.9	616.60	62.9	1949.84
23.0	0.200	28.0	0.631	33.0	2.00	38.0	6.31	43.0	19.95	48.0	63.10	53.0	199.53	58.0	630.96	63.0	1995.26
23.1	0.204	28.1	0.646	33.1	2.04	38.1	6.46	43.1	20.42	48.1	64.57	53.1	204.17	58.1	645.65	63.1	2041.74
23.2	0.209	28.2	0.661	33.2	2.09	38.2	6.61	43.2	20.89	48.2	66.07	53.2	208.93	58.2	660.69	63.2	2089.30
23.3	0.214	28.3	0.676	33.3	2.14	38.3	6.76	43.3	21.38	48.3	67.61	53.3	213.80	58.3	676.08	63.3	2137.96
23.4	0.219	28.4	0.692	33.4	2.19	38.4	6.92	43.4	21.88	48.4	69.18	53.4	218.78	58.4	691.83	63.4	2187.76
23.5	0.224	28.5	0.708	33.5	2.24	38.5	7.08	43.5	22.39	48.5	70.79	53.5	223.87	58.5	707.95	63.5	2238.72
23.6	0.229	28.6	0.724	33.6	2.29	38.6	7.24	43.6	22.91	48.6	72.44	53.6	229.09	58.6	724.44	63.6	2290.87
23.7	0.234	28.7	0.741	33.7	2.34	38.7	7.41	43.7	23.44	48.7	74.13	53.7	234.42	58.7	741.31	63.7	2344.23
23.8	0.240	28.8	0.759	33.8	2.40	38.8	7.59	43.8	23.99	48.8	75.86	53.8	239.88	58.8	758.58	63.8	2398.83
23.9	0.245	28.9	0.776	33.9	2.45	38.9	7.76	43.9	24.55	48.9	77.62	53.9	245.47	58.9	776.25	63.9	2454.71

dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts
24.0	0.251	29.0	0.794	34.0	2.51	39.0	7.94	44.0	25.12	49.0	79.43	54.0	251.19	59.0	794.33	64.0	2511.89
24.1	0.257	29.1	0.813	34.1	2.57	39.1	8.13	44.1	25.70	49.1	81.28	54.1	257.04	59.1	812.83	64.1	2570.40
24.2	0.263	29.2	0.832	34.2	2.63	39.2	8.32	44.2	26.30	49.2	83.18	54.2	263.03	59.2	831.76	64.2	2630.27
24.3	0.269	29.3	0.851	34.3	2.69	39.3	8.51	44.3	26.92	49.3	85.11	54.3	269.15	59.3	851.14	64.3	2691.53
24.4	0.275	29.4	0.871	34.4	2.75	39.4	8.71	44.4	27.54	49.4	87.10	54.4	275.42	59.4	870.96	64.4	2754.23
24.5	0.282	29.5	0.891	34.5	2.82	39.5	8.91	44.5	28.18	49.5	89.13	54.5	281.84	59.5	891.25	64.5	2818.38
24.6	0.288	29.6	0.912	34.6	2.88	39.6	9.12	44.6	28.84	49.6	91.20	54.6	288.40	59.6	912.01	64.6	2884.03
24.7	0.295	29.7	0.933	34.7	2.95	39.7	9.33	44.7	29.51	49.7	93.33	54.7	295.12	59.7	933.25	64.7	2951.21
24.8	0.302	29.8	0.955	34.8	3.02	39.8	9.55	44.8	30.20	49.8	95.50	54.8	302.00	59.8	954.99	64.8	3019.95
24.9	0.309	29.9	0.977	34.9	3.09	39.9	9.77	44.9	30.90	49.9	97.72	54.9	309.03	59.9	977.24	64.9	3090.30

Appendix E - ARFCN Frequencies

E-1. GSM-1900 ARFCN Frequencies

This subsection includes the following GSM-1900 ARFCN tables:

Table E-1 GSM-1900 A-Band ARFCN - Frequency (in MHz)

ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT
512	1850.2000	1930.2000	537	1855.2000	1935.2000	562	1860.2000	1940.2000
513	1850.4000	1930.4000	538	1855.4000	1935.4000	563	1860.4000	1940.4000
514	1850.6000	1930.6000	539	1855.6000	1935.6000	564	1860.6000	1940.6000
515	1850.8000	1930.8000	540	1855.8000	1935.8000	565	1860.8000	1940.8000
516	1851.0000	1931.0000	541	1856.0000	1936.0000	566	1861.0000	1941.0000
517	1851.2000	1931.2000	542	1856.2000	1936.2000	567	1861.2000	1941.2000
518	1851.4000	1931.4000	543	1856.4000	1936.4000	568	1861.4000	1941.4000
519	1851.6000	1931.6000	544	1856.6000	1936.6000	569	1861.6000	1941.6000
520	1851.8000	1931.8000	545	1856.8000	1936.8000	570	1861.8000	1941.8000
521	1852.0000	1932.0000	546	1857.0000	1937.0000	571	1862.0000	1942.0000
522	1852.2000	1932.2000	547	1857.2000	1937.2000	572	1862.2000	1942.2000
523	1852.4000	1932.4000	548	1857.4000	1937.4000	573	1862.4000	1942.4000
524	1852.6000	1932.6000	549	1857.6000	1937.6000	574	1862.6000	1942.6000
525	1852.8000	1932.8000	550	1857.8000	1937.8000	575	1862.8000	1942.8000
526	1853.0000	1933.0000	551	1858.0000	1938.0000	576	1863.0000	1943.0000
527	1853.2000	1933.2000	552	1858.2000	1938.2000	577	1863.2000	1943.2000
528	1853.4000	1933.4000	553	1858.4000	1938.4000	578	1863.4000	1943.4000
529	1853.6000	1933.6000	554	1858.6000	1938.6000	579	1863.6000	1943.6000
530	1853.8000	1933.8000	555	1858.8000	1938.8000	580	1863.8000	1943.8000
531	1854.0000	1934.0000	556	1859.0000	1939.0000	581	1864.0000	1944.0000
532	1854.2000	1934.2000	557	1859.2000	1939.2000	582	1864.2000	1944.2000
533	1854.4000	1934.4000	558	1859.4000	1939.4000	583	1864.4000	1944.4000
534	1854.6000	1934.6000	559	1859.6000	1939.6000	584	1864.6000	1944.6000
535	1854.8000	1934.8000	560	1859.8000	1939.8000	585	1864.8000	1944.8000
536	1855.0000	1935.0000	561	1860.0000	1940.0000	586	1865.0000	1945.0000

Table E-4 GSM-1900 D-Band ARFCN - Frequency (in MHz)

ARFCN			ARFCN			ARFCN		
587	1865.2000	1945.2000	596	1867.0000	1947.0000	605	1868.8000	1948.8000
588	1865.4000	1945.4000	597	1867.2000	1947.2000	606	1869.0000	1949.0000
589	1865.6000	1945.6000	598	1867.4000	1947.4000	607	1869.2000	1949.2000
590	1865.8000	1945.8000	599	1867.6000	1947.6000	608	1869.4000	1949.4000
591	1866.0000	1946.0000	600	1867.8000	1947.8000	609	1869.6000	1949.6000
592	1866.2000	1946.2000	601	1868.0000	1948.0000	610	1869.8000	1949.8000
593	1866.4000	1946.4000	602	1868.2000	1948.2000	611	1870.0000	1950.0000
594	1866.6000	1946.6000	603	1868.4000	1948.4000			
595	1866.8000	1946.8000	604	1868.6000	1948.6000			

Table E-2 GSM-1900 B-Band ARFCN - Frequency (in MHz)

ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT
612	1870.2000	1950.2000	637	1875.2000	1955.2000	662	1880.2000	1960.2000
613	1870.4000	1950.4000	638	1875.4000	1955.4000	663	1880.4000	1960.4000
614	1870.6000	1950.6000	639	1875.6000	1955.6000	664	1880.6000	1960.6000
615	1870.8000	1950.8000	640	1875.8000	1955.8000	665	1880.8000	1960.8000
616	1871.0000	1951.0000	641	1876.0000	1956.0000	666	1881.0000	1961.0000
617	1871.2000	1951.2000	642	1876.2000	1956.2000	667	1881.2000	1961.2000
618	1871.4000	1951.4000	643	1876.4000	1956.4000	668	1881.4000	1961.4000
619	1871.6000	1951.6000	644	1876.6000	1956.6000	669	1881.6000	1961.6000
620	1871.8000	1951.8000	645	1876.8000	1956.8000	670	1881.8000	1961.8000
621	1872.0000	1952.0000	646	1877.0000	1957.0000	671	1882.0000	1962.0000
622	1872.2000	1952.2000	647	1877.2000	1957.2000	672	1882.2000	1962.2000
623	1872.4000	1952.4000	648	1877.4000	1957.4000	673	1882.4000	1962.4000
624	1872.6000	1952.6000	649	1877.6000	1957.6000	674	1882.6000	1962.6000
625	1872.8000	1952.8000	650	1877.8000	1957.8000	675	1882.8000	1962.8000
626	1873.0000	1953.0000	651	1878.0000	1958.0000	676	1883.0000	1963.0000
627	1873.2000	1953.2000	652	1878.2000	1958.2000	677	1883.2000	1963.2000
628	1873.4000	1953.4000	653	1878.4000	1958.4000	678	1883.4000	1963.4000
629	1873.6000	1953.6000	654	1878.6000	1958.6000	679	1883.6000	1963.6000
630	1873.8000	1953.8000	655	1878.8000	1958.8000	680	1883.8000	1963.8000
631	1874.0000	1954.0000	656	1879.0000	1959.0000	681	1884.0000	1964.0000
632	1874.2000	1954.2000	657	1879.2000	1959.2000	682	1884.2000	1964.2000
633	1874.4000	1954.4000	658	1879.4000	1959.4000	683	1884.4000	1964.4000
634	1874.6000	1954.6000	659	1879.6000	1959.6000	684	1884.6000	1964.6000
635	1874.8000	1954.8000	660	1879.8000	1959.8000	685	1884.8000	1964.8000
636	1875.0000	1955.0000	661	1880.0000	1960.0000	686	1885.0000	1965.0000

Table E-5 GSM-1900 E-Band ARFCN - Frequency (in MHz)

ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT
687	1885.2000	1965.2000	696	1887.0000	1967.0000	705	1888.8000	1968.8000
688	1885.4000	1965.4000	697	1887.2000	1967.2000	706	1889.0000	1969.0000
689	1885.6000	1965.6000	698	1887.4000	1967.4000	707	1889.2000	1969.2000
690	1885.8000	1965.8000	699	1887.6000	1967.6000	708	1889.4000	1969.4000
691	1886.0000	1966.0000	700	1887.8000	1967.8000	709	1889.6000	1969.6000
692	1886.2000	1966.2000	701	1888.0000	1968.0000	710	1889.8000	1969.8000
693	1886.4000	1966.4000	702	1888.2000	1968.2000	711	1890.0000	1970.0000
694	1886.6000	1966.6000	703	1888.4000	1968.4000			
695	1886.8000	1966.8000	704	1888.6000	1968.6000			

Table E-6 GSM-1900 F-Band ARFCN - Frequency (in MHz)

ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT
712	1890.2000	1970.2000	721	1892.0000	1972.0000	730	1893.8000	1973.8000
713	1890.4000	1970.4000	722	1892.2000	1972.2000	731	1894.0000	1974.0000
714	1890.6000	1970.6000	723	1892.4000	1972.4000	732	1894.2000	1974.2000
715	1890.8000	1970.8000	724	1892.6000	1972.6000	733	1894.4000	1974.4000
716	1891.0000	1971.0000	725	1892.8000	1972.8000	734	1894.6000	1974.6000
717	1891.2000	1971.2000	726	1893.0000	1973.0000	735	1894.8000	1974.8000
718	1891.4000	1971.4000	727	1893.2000	1973.2000	736	1895.0000	1975.0000
719	1891.6000	1971.6000	728	1893.4000	1973.4000			
720	1891.8000	1971.8000	729	1893.6000	1973.6000			

Table E-3 GSM-1900 C-Band ARFCN - Frequency (in MHz)

ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT
737	1895.2000	1975.2000	762	1900.2000	1980.2000	787	1905.2000	1985.2000
738	1895.4000	1975.4000	763	1900.4000	1980.4000	788	1905.4000	1985.4000
739	1895.6000	1975.6000	764	1900.6000	1980.6000	789	1905.6000	1985.6000
740	1895.8000	1975.8000	765	1900.8000	1980.8000	790	1905.8000	1985.8000
741	1896.0000	1976.0000	766	1901.0000	1981.0000	791	1906.0000	1986.0000
742	1896.2000	1976.2000	767	1901.2000	1981.2000	792	1906.2000	1986.2000
743	1896.4000	1976.4000	768	1901.4000	1981.4000	793	1906.4000	1986.4000
744	1896.6000	1976.6000	769	1901.6000	1981.6000	794	1906.6000	1986.6000
745	1896.8000	1976.8000	770	1901.8000	1981.8000	795	1906.8000	1986.8000
746	1897.0000	1977.0000	771	1902.0000	1982.0000	796	1907.0000	1987.0000
747	1897.2000	1977.2000	772	1902.2000	1982.2000	797	1907.2000	1987.2000
748	1897.4000	1977.4000	773	1902.4000	1982.4000	798	1907.4000	1987.4000
749	1897.6000	1977.6000	774	1902.6000	1982.6000	799	1907.6000	1987.6000
750	1897.8000	1977.8000	775	1902.8000	1982.8000	800	1907.8000	1987.8000
751	1898.0000	1978.0000	776	1903.0000	1983.0000	801	1908.0000	1988.0000

ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT	ARFCN	RECEIVE	TRANSMIT
752	1898.2000	1978.2000	777	1903.2000	1983.2000	802	1908.2000	1988.2000
753	1898.4000	1978.4000	778	1903.4000	1983.4000	803	1908.4000	1988.4000
754	1898.6000	1978.6000	779	1903.6000	1983.6000	804	1908.6000	1988.6000
755	1898.8000	1978.8000	780	1903.8000	1983.8000	805	1908.8000	1988.8000
756	1899.0000	1979.0000	781	1904.0000	1984.0000	806	1909.0000	1989.0000
757	1899.2000	1979.2000	782	1904.2000	1984.2000	807	1909.2000	1989.2000
758	1899.4000	1979.4000	783	1904.4000	1984.4000	808	1909.4000	1989.4000
759	1899.6000	1979.6000	784	1904.6000	1984.6000	809	1909.6000	1989.6000
760	1899.8000	1979.8000	785	1904.8000	1984.8000	810	1909.8000	1989.8000
761	1900.0000	1980.0000	786	1905.0000	1985.0000			

E-2. E-GSM-900 ARFCN Frequencies (in MHz)

ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK
0	890.000	935.000	30	896.000	941.000	60	902.000	947.000
1	890.200	935.200	31	896.200	941.200	61	902.200	947.200
2	890.400	935.400	32	896.400	941.400	62	902.400	947.400
3	890.600	935.600	33	896.600	941.600	63	902.600	947.600
4	890.800	935.800	34	896.800	941.800	64	902.800	947.800
5	891.000	936.000	35	897.000	942.000	65	903.000	948.000
6	891.200	936.200	36	897.200	942.200	66	903.200	948.200
7	891.400	936.400	37	897.400	942.400	67	903.400	948.400
8	891.600	936.600	38	897.600	942.600	68	903.600	948.600
9	891.800	936.800	39	897.800	942.800	69	903.800	948.800
10	892.000	937.000	40	898.000	943.000	70	904.000	949.000
11	892.200	937.200	41	898.200	943.200	71	904.200	949.200
12	892.400	937.400	42	898.400	943.400	72	904.400	949.400
13	892.600	937.600	43	898.600	943.600	73	904.600	949.600
14	892.800	937.800	44	898.800	943.800	74	904.800	949.800
15	893.000	938.000	45	899.000	944.000	75	905.000	950.000
16	893.200	938.200	46	899.200	944.200	76	905.200	950.200
17	893.400	938.400	47	899.400	944.400	77	905.400	950.400
18	893.600	938.600	48	899.600	944.600	78	905.600	950.600
19	893.800	938.800	49	899.800	944.800	79	905.800	950.800
20	894.000	939.000	50	900.000	945.000	80	906.000	951.000
21	894.200	939.200	51	900.200	945.200	81	906.200	951.200
22	894.400	939.400	52	900.400	945.400	82	906.400	951.400
23	894.600	939.600	53	900.600	945.600	83	906.600	951.600
24	894.800	939.800	54	900.800	945.800	84	906.800	951.800
25	895.000	940.000	55	901.000	946.000	85	907.000	952.000
26	895.200	940.200	56	901.200	946.200	86	907.200	952.200
27	895.400	940.400	57	901.400	946.400	87	907.400	952.400
28	895.600	940.600	58	901.600	946.600	88	907.600	952.600
29	895.800	940.800	59	901.800	946.800	89	907.800	952.800
						90	908.000	953.000

ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK
91	908.200	953.200	103	910.600	955.600	115	913.000	958.000
92	908.400	953.400	104	910.800	955.800	116	913.200	958.200
93	908.600	953.600	105	911.000	956.000	117	913.400	958.400
94	908.800	953.800	106	911.200	956.200	118	913.600	958.600
95	909.000	954.000	107	911.400	956.400	119	913.800	958.800
96	909.200	954.200	108	911.600	956.600	120	914.000	959.000
97	909.400	954.400	109	911.800	956.800	121	914.200	959.200
98	909.600	954.600	110	912.000	957.000	122	914.400	959.400
99	909.800	954.800	111	912.200	957.200	123	914.600	959.600
100	910.000	955.000	112	912.400	957.400	124	914.800	959.800
101	910.200	955.200	113	912.600	957.600			
102	910.400	955.400	114	912.800	957.800			

ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK
975	880.200	925.200	992	883.600	928.600	1009	887.000	932.000
976	880.400	925.400	993	883.800	928.800	1010	887.200	932.200
977	880.600	925.600	994	884.000	929.000	1011	887.400	932.400
978	800.800	925.800	995	884.200	929.200	1012	887.600	932.600
979	801.000	926.000	996	884.400	929.400	1013	887.800	932.800
980	881.200	926.200	997	884.600	929.600	1014	888.000	933.000
981	881.400	926.400	998	884.800	929.800	1015	888.200	933.200
982	881.600	926.600	999	885.000	930.000	1016	888.400	933.400
983	881.800	926.800	1000	885.200	930.200	1017	888.600	933.600
984	882.000	926.000	1001	885.400	930.400	1018	888.800	933.800
985	882.200	927.200	1002	885.600	930.600	1019	889.000	934.000
986	882.400	927.400	1003	805.800	930.800	1020	889.200	934.200
987	882.600	927.600	1004	886.000	931.000	1021	889.400	934.400
988	882.800	927.800	1005	886.200	931.200	1022	889.600	934.600
989	883.000	928.000	1006	886.400	931.400	1023	889.800	934.800
990	883.200	928.200	1007	886.600	931.600			
991	883.400	928.400	1008	886.800	931.800			

E-3. GSM-850 ARFCN Frequencies (in MHz)

Table E-7 GSM-850 A-Band ARFCN - Frequency (in MHz)

ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK
128	824.200	869.200	146	827.800	872.800	164	831.400	876.400
129	824.400	869.400	147	828.000	873.000	165	831.600	876.600
130	824.600	869.600	148	828.200	873.200	166	831.800	876.800
131	824.800	869.800	149	828.400	873.400	167	832.000	877.000
132	825.000	870.000	150	828.600	873.600	168	832.200	877.200
133	825.200	870.200	151	828.800	873.800	169	832.400	877.400
134	825.400	870.400	152	829.000	874.000	170	832.600	877.600
135	825.600	870.600	153	829.200	874.200	171	832.800	877.800
136	825.800	870.800	154	829.400	874.400	172	833.000	878.000
137	826.000	871.000	155	829.600	874.600	173	833.200	878.200
138	826.200	871.200	156	829.800	874.800	174	833.400	878.400
139	826.400	871.400	157	830.000	875.000	175	833.600	878.600
140	826.600	871.600	158	830.200	875.200	176	833.800	878.800
141	826.800	871.800	159	830.400	875.400	177	834.000	879.000
142	827.000	872.000	160	830.600	875.600	178	834.200	879.200
143	827.200	872.200	161	830.800	875.800	179	834.400	879.400
144	827.400	872.400	162	831.000	876.000	180	834.600	879.600
145	827.600	872.600	163	831.200	876.200	181	834.800	879.800

Table E-8 GSM-850 B-Band ARFCN - Frequency (in MHz)

ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK
183	835.200	880.200	199	838.400	883.400	215	842.600	886.600
184	835.400	880.400	200	838.600	883.600	216	842.800	886.800
185	835.600	880.600	201	838.800	883.800	217	843.000	887.000
186	835.800	880.800	202	839.000	884.000	218	843.200	887.200
187	836.000	881.000	203	839.200	884.200	219	843.400	887.400
188	836.200	881.200	204	839.400	884.400	220	843.600	887.600
189	836.400	881.400	205	839.600	884.600	221	843.800	887.800
190	836.600	881.600	206	839.800	884.800	222	844.000	888.000
191	836.800	881.800	207	840.000	885.000	223	844.200	888.200
192	837.000	882.000	208	841.200	885.200	224	844.400	888.400
193	837.200	882.200	209	841.400	885.400	225	844.600	888.600
194	837.400	882.400	210	841.600	885.600	226	844.800	888.800
195	837.600	882.600	211	841.800	885.800	227	845.000	889.000
196	837.800	882.800	212	842.000	886.000	228	845.200	889.200
197	838.000	883.000	213	842.200	886.200	229	845.400	889.400
198	838.200	883.200	214	842.400	886.400	230	845.600	889.600
						231	845.800	889.800

Table E-9 GSM-850 A'-Band ARFCN - Frequency (in MHz)

ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK
233	845.200	890.200	235	845.600	890.600	237	846.000	891.000
234	845.400	890.400	236	845.800	890.800	238	846.200	891.200
						239	846.400	891.400

Table E-10 GSM-850 B'-Band ARFCN - Frequency (in MHz)

ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK
240	846.600	891.600	244	847.400	892.400	248	848.200	893.200
241	846.800	891.800	245	847.600	892.600	249	848.400	893.400
242	847.000	892.000	246	847.800	892.800	250	848.600	894.600
243	847.200	892.200	247	848.000	893.000	251	848.800	895.800

E-4. GSM-1800 ARFCN Frequencies (in MHz)

ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK
512	1710.200	1805.200	552	1718.200	1813.200	592	1726.200	1821.200
513	1710.400	1805.400	553	1718.400	1813.400	593	1726.400	1821.400
514	1710.600	1805.600	554	1718.600	1813.600	594	1726.600	1821.600
515	1710.800	1805.800	555	1718.800	1813.800	595	1726.800	1821.800
516	1711.000	1805.000	556	1719.000	1814.000	596	1727.000	1822.000
517	1711.200	1805.200	557	1719.200	1814.200	597	1727.200	1822.200
518	1711.400	1805.400	558	1719.400	1814.400	598	1727.400	1822.400
519	1711.600	1805.600	559	1719.600	1814.600	599	1727.600	1822.600
520	1711.800	1805.800	560	1719.800	1814.800	600	1727.800	1822.800
521	1712.000	1805.000	561	1720.000	1815.000	601	1728.000	1823.000
522	1712.200	1805.200	562	1720.200	1815.200	602	1728.200	1823.200
523	1712.400	1805.400	563	1720.400	1815.400	603	1728.400	1823.400
524	1712.600	1805.600	564	1720.600	1815.600	604	1728.600	1823.600
525	1712.800	1805.800	565	1720.800	1815.800	605	1728.800	1823.800
526	1713.000	1805.000	566	1721.000	1816.000	606	1729.000	1824.000
527	1713.200	1805.200	567	1721.200	1816.200	607	1729.200	1824.200
528	1713.400	1805.400	568	1721.400	1816.400	608	1729.400	1824.400
529	1713.600	1805.600	569	1721.600	1816.600	609	1729.600	1824.600
530	1713.800	1805.800	570	1721.800	1816.800	610	1729.800	1824.800
531	1714.000	1805.000	571	1722.000	1817.000	611	1730.000	1825.000
532	1714.200	1805.200	572	1722.200	1817.200	612	1730.200	1825.200
533	1714.400	1805.400	573	1722.400	1817.400	613	1730.400	1825.400
534	1714.600	1805.600	574	1722.600	1817.600	614	1730.600	1825.600
535	1714.800	1805.800	575	1722.800	1817.800	615	1730.800	1825.800
536	1715.000	1805.000	576	1723.000	1818.000	616	1731.000	1826.000
537	1715.200	1805.200	577	1723.200	1818.200	617	1731.200	1826.200
538	1715.400	1805.400	578	1723.400	1818.400	618	1731.400	1826.400
539	1715.600	1805.600	579	1723.600	1818.600	619	1731.600	1826.600
540	1715.800	1805.800	580	1723.800	1818.800	620	1731.800	1826.800
541	1716.000	1805.000	581	1724.000	1819.000	621	1732.000	1827.000
542	1716.200	1805.200	582	1724.200	1819.200	622	1732.200	1827.200
543	1716.400	1805.400	583	1724.400	1819.400	623	1732.400	1827.400
544	1716.600	1805.600	584	1724.600	1819.600	624	1732.600	1827.600
545	1716.800	1805.800	585	1724.800	1819.800	625	1732.800	1827.800
546	1717.000	1805.000	586	1725.000	1820.000	626	1733.000	1828.000
547	1717.200	1805.200	587	1725.200	1820.200	627	1733.200	1828.200
548	1717.400	1805.400	588	1725.400	1820.400	628	1733.400	1828.400
549	1717.600	1805.600	589	1725.600	1820.600	629	1733.600	1828.600
550	1717.800	1805.800	590	1725.800	1820.800	630	1733.800	1828.800
551	1718.000	1813.000	591	1726.000	1821.000	631	1734.000	1829.000

ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK
632	1734.200	1829.200	675	1742.800	1837.800	718	1751.400	1846.400
633	1734.400	1829.400	676	1743.000	1838.000	719	1751.600	1846.600
634	1734.600	1829.600	677	1743.200	1838.200	720	1751.800	1846.800
635	1734.800	1829.800	678	1743.400	1838.400	721	1752.000	1847.000
636	1735.000	1830.000	679	1743.600	1838.600	722	1752.200	1847.200
637	1735.200	1830.200	680	1743.800	1838.800	723	1752.400	1847.400
638	1735.400	1830.400	681	1744.000	1839.000	724	1752.600	1847.600
639	1735.600	1830.600	682	1744.200	1839.200	725	1752.800	1847.800
640	1735.800	1830.800	683	1744.400	1839.400	726	1753.000	1848.000
641	1736.000	1831.000	684	1744.600	1839.600	727	1753.200	1848.200
642	1736.200	1831.200	685	1744.800	1839.800	728	1753.400	1848.400
643	1736.400	1831.400	686	1745.000	1840.000	729	1753.600	1848.600
644	1736.600	1831.600	687	1745.200	1840.200	730	1753.800	1848.800
645	1736.800	1831.800	688	1745.400	1840.400	731	1754.000	1849.000
646	1737.000	1832.000	689	1745.600	1840.600	732	1754.200	1849.200
647	1737.200	1832.200	690	1745.800	1840.800	733	1754.400	1849.400
648	1737.400	1832.400	691	1746.000	1841.000	734	1754.600	1849.600
649	1737.600	1832.600	692	1746.200	1841.200	735	1754.800	1849.800
650	1737.800	1832.800	693	1746.400	1841.400	736	1755.000	1850.000
651	1738.000	1833.000	694	1746.600	1841.600	737	1755.200	1850.200
652	1738.200	1833.200	695	1746.800	1841.800	738	1755.400	1850.400
653	1738.400	1833.400	696	1747.000	1842.000	739	1755.600	1850.600
654	1738.600	1833.600	697	1747.200	1842.200	740	1755.800	1850.800
655	1738.800	1833.800	698	1747.400	1842.400	741	1756.000	1851.000
656	1739.000	1834.000	699	1747.600	1842.600	742	1756.200	1851.200
657	1739.200	1834.200	700	1747.800	1842.800	743	1756.400	1851.400
658	1739.400	1834.400	701	1748.000	1843.000	744	1756.600	1851.600
659	1739.600	1834.600	702	1748.200	1843.200	745	1756.800	1851.800
660	1739.800	1834.800	703	1748.400	1843.400	746	1757.000	1852.000
661	1740.000	1835.000	704	1748.600	1843.600	747	1757.200	1852.200
662	1740.200	1835.200	705	1748.800	1843.800	748	1757.400	1852.400
663	1740.400	1835.400	706	1749.000	1844.000	749	1757.600	1852.600
664	1740.600	1835.600	707	1749.200	1844.200	750	1757.800	1852.800
665	1740.800	1835.800	708	1749.400	1844.400	751	1758.000	1853.000
666	1741.000	1836.000	709	1749.600	1844.600	752	1758.200	1853.200
667	1741.200	1836.200	710	1749.800	1844.800	753	1758.400	1829.400
668	1741.400	1836.400	711	1750.000	1845.000	754	1758.600	1829.600
669	1741.600	1836.600	712	1750.200	1845.200	755	1758.800	1829.800
670	1741.800	1836.800	713	1750.400	1845.400	756	1759.000	1830.000
671	1742.000	1837.000	714	1750.600	1845.600	757	1759.200	1830.200
672	1742.200	1837.200	715	1750.800	1845.800	758	1759.400	1830.400
673	1742.400	1837.400	716	1751.000	1846.000	759	1759.600	1830.600
674	1742.600	1837.600	717	1751.200	1846.200	760	1759.800	1830.800

ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK	ARFCN	UPLINK	DOWNLINK
761	1760.000	1831.000	803	1768.400	1863.400	845	1776.800	1871.800
762	1760.200	1831.200	804	1768.600	1863.600	846	1777.000	1872.000
763	1760.400	1831.400	805	1768.800	1863.800	847	1777.200	1872.200
764	1760.600	1831.600	806	1769.000	1864.000	848	1777.400	1872.400
765	1760.800	1831.800	807	1769.200	1864.200	849	1777.600	1872.600
766	1761.000	1832.000	808	1769.400	1864.400	850	1777.800	1872.800
767	1761.200	1832.200	809	1769.600	1864.600	851	1778.000	1873.000
768	1761.400	1832.400	810	1769.800	1864.800	852	1778.200	1873.200
769	1761.600	1832.600	811	1770.000	1865.000	853	1778.400	1873.400
770	1761.800	1832.800	812	1770.200	1865.200	854	1778.600	1873.600
771	1762.000	1833.000	813	1770.400	1865.400	855	1778.800	1873.800
772	1762.200	1833.200	814	1770.600	1865.600	856	1779.000	1874.000
773	1762.400	1833.400	815	1770.800	1865.800	857	1779.200	1874.200
774	1762.600	1833.600	816	1771.000	1866.000	858	1779.400	1874.400
775	1762.800	1833.800	817	1771.200	1866.200	859	1779.600	1874.600
776	1763.000	1834.000	818	1771.400	1866.400	860	1779.800	1874.800
777	1763.200	1834.200	819	1771.600	1866.600	861	1780.000	1875.000
778	1763.400	1834.400	820	1771.800	1866.800	862	1780.200	1875.200
779	1763.600	1834.600	821	1772.000	1867.000	863	1780.400	1875.400
780	1763.800	1834.800	822	1772.200	1867.200	864	1780.600	1875.600
781	1764.000	1835.000	823	1772.400	1867.400	865	1780.800	1875.800
782	1764.200	1835.200	824	1772.600	1867.600	866	1781.000	1876.000
783	1764.400	1835.400	825	1772.800	1867.800	867	1781.200	1876.200
784	1764.600	1835.600	826	1773.000	1868.000	868	1781.400	1876.400
785	1764.800	1835.800	827	1773.200	1868.200	869	1781.600	1876.600
786	1765.000	1836.000	828	1773.400	1868.400	870	1781.800	1876.800
787	1765.200	1836.200	829	1773.600	1868.600	871	1782.000	1877.000
788	1765.400	1836.400	830	1773.800	1868.800	872	1782.200	1877.200
789	1765.600	1836.600	831	1774.000	1869.000	873	1782.400	1877.400
790	1765.800	1836.800	832	1774.200	1869.200	874	1782.600	1877.600
791	1766.000	1837.000	834	1774.600	1869.600	875	1782.800	1877.800
793	1766.400	1861.400	835	1774.800	1869.800	876	1783.000	1878.000
794	1766.600	1861.600	836	1775.000	1870.000	877	1783.200	1878.200
795	1766.800	1861.800	837	1775.200	1870.200	878	1783.400	1878.400
796	1767.000	1862.000	838	1775.400	1870.400	879	1783.600	1878.600
797	1767.200	1862.200	839	1775.600	1871.600	880	1783.800	1878.800
798	1767.400	1862.400	840	1775.800	1871.800	881	1784.000	1879.000
799	1767.600	1862.600	841	1776.000	1871.000	882	1784.200	1879.200
800	1767.800	1862.800	842	1776.200	1871.200	883	1784.400	1879.400
801	1768.000	1863.000	843	1776.400	1871.400	884	1784.600	1879.600
802	1768.200	1863.200	844	1776.600	1871.600	885	1784.800	1879.800

Appendix F – Technical Specifications

AirNet® BTS-4000 Technical Specifications

Compliance	
Safety:	UL 1950, ETL Listed
EMC:	FCC Part 15, Class A
Type Approval:	FCC Part 22[8] (850 MHz) FCC Part 24 (1,900 MHz)
Telephone Network Connection:	FCC Part 68 [9]

Environmental	
Ambient Temperature (Operating)	
Indoor Unit:	0° C to +40° C (32° F to +104° F)
Ambient Temperature (Storage)	
Indoor Unit:	-40° C to +85° C (-40° F to +185° F)
Maximum Temperature Variation:	8.3° C per hour (14.94° F per hour)
Recommended Air Conditioning	15,000 BTUs (min)
Relative Humidity (Operating)	
Indoor Unit:	15% to 95%, non-condensing
Relative Humidity (Storage)	
Indoor Unit:	5% to 95%, non-condensing
Elevation (Operating)	
Indoor Unit:	-60 to 3962.4 meters (-200 to 13000 feet) above sea level
Elevation (Storage)	
Indoor Unit:	-60 to 12192 meters (-200 to 40000 feet) above sea level

Power	
Indoor BTS-4000 Power Requirements:	
Nominal Input Voltage:	+27VDC
Input Voltage Range:	+22VDC to +30 VDC
Power Consumption:[10]	1300 W (Min.) 2510 W (Typical), 8286 W (Max.)

[8] Per FCC regulations, the 850MHz version of AirNet's BTS cannot be offered for sale or lease or advertised for sale or lease in the U.S. until type approved, type accepted or otherwise certified.

[9] Requires Channel Service Unit (CSU) for connection to public telephone networks.

[10] Power requirements vary depending upon configuration.

Input Current:	346 AMP (Max.) Varies depending on the number of sectors and the number of MCPA modules.
Suggested Over-current Protection:	1 breaker rated at 75 AMP (Min.) 3 breakers rated at 150 AMP (Max.)

RF	
Number of RF Carriers:	1 to 12 TRXs
Sectorization:	Omni, 2-Sector, 3-Sector
Channel Bandwidth:	200 kHz
Air Interface:	GSM-850[11], E-GSM-900, GSM-1800, or GSM-1900
AdaptaCell® Mobile RF Performance	
Receive Sensitivity: [12]	-109 dBm
Max Transmit Power per RF Carrier: [13]	40 to 60 Watts
TMA Support	Yes

Physical	
Dimensions	
Indoor BTS:	196 cm H x 56 cm W x 81 cm D (77” H x 22” W x 32” D)
Weight (Indoor):	Approximately 750 lbs. (340.5 kgs) when fully-configured
External Connections	
Ethernet (front of cabinet)	1 RJ-45 8-pin, Female
Serial (front of cabinet)	1 Serial 9-pin, Female
Serial (front of ICE-T card)	1 RJ-45 8-pin, Female
RF:	(4 per sector) N-Type, Female (TX/RX1) (4 per sector) N-Type, Female (RX2 Only)
T1/E1 Connectors:	4 RJ-45, 8-pin, Female
GPS, Indoor BTS:	2 TNC, Female
TMA Power: [14]	1 per sector, 25-pin, Female
CAL ANT (for Test Mobile):	Not currently used
Alarms, Indoor BTS:	1 Telco 50-pin, Female
Power/Ground: [15]	2 Terminal Block or Lugs

[11] Per FCC regulations, the 850MHz version of AirNet’s BTS cannot be offered for sale or lease or advertised for sale or lease in the U.S. until type approved, type accepted or otherwise certified.
[12] At antenna side of integrated RF filter/duplexer.
[13] Higher transmit power per carrier limits number of carriers transmitted.
[14] Indoor BTS only. This is an internal connection on the outdoor BTS.
[15] Connections within internal power panel for outdoor BTS.

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BTS-4000 Indoor Equipment
Installation and Maintenance Manual (P/N 05605-001)

It is important to us that this documentation meets your needs. If you have any comments or suggestions, please fill out this form and mail it to AirNet, as shown on the other side. We value your input and appreciate your time in providing us with this feedback.

Name Company Name

Address

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