FRU Manual Exhibit

UBS CDMA XMI Transceiver at 800MHz

1X UBS Macro BTS FRU

68P09283A64-3

SEP 2007

FOA

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1X UBS Macro BTS FRU

What is covered in this manual?

The 1X Motorola Universal Base Station (UBS) Macro BTS FRU - Software Release 2.20.0.x - manual provides information to disassemble and/or replace the various cards, modules and components of the UBS Macro CDMA Base Transceiver Subsystem (BTS) configured as a "1X Packet BTS" with packet backhaul. Low and mid capacity configurations of single band 800 MHz and 1.9 GHz frames are covered.

Revision history

The following shows the issue status of this manual since it was first released.

Version information

Table 1 Manual version history

Manual issue	Date of issue	Remarks
1	AUG 2007	DRAFT; for SME review
2	SEP 2007	PRELIMINARY; Added issue 1 review comments and Breaker Module Assembly (BMA) replacement section. For SME review and Deployment.
3	SEP 2007	FOA (First Office Application)

Resolution of Service Requests

The following Service Requests are resolved in this document:

Service Request	CMBP Number	Remarks
NA	NA	NA

Incorporation of Change Notices

The following Change Notices (CN) are incorporated in this document:

CN Date	CN Number	Title
NA	NA	NA

General information

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Cross references

References made to external publications are shown in italics. Other cross references, emphasized in blue text in electronic versions, are active links to the references.

This document is divided into numbered chapters that are divided into sections. Sections are not numbered, but are individually named at the top of each page, and are listed in the table of contents.

Text conventions

The following conventions are used in the Motorola cellular infrastructure documents to represent keyboard input text, screen output text, and special key sequences.

Input

Characters typed in at the keyboard are shown like this.
Items of interest within a command appear like this.

Output

Messages, prompts, file listings, directories, utilities, and environmental variables that appear on the screen are shown like this.
Items of interest within a screen display appear like this.

Special key sequences

Special key sequences are represented as follows:

CTRL-c or CTRL+C	Press the **Ctrl** and **C** keys at the same time.
CTRL-SHIFT-c or CTRL+SHIFT+C	Press the **Ctrl**, **Shift**, and **C** keys at the same time.
ALT-f or ALT+F	Press the **Alt** and **F** keys at the same time.
ALT+SHIFT+F11	Press the **Alt**, **Shift** and **F11** keys at the same time.
¦	Press the pipe symbol key.
RETURN or ENTER	Press the **Return** or **Enter** key.

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Motorola appreciates feedback from the users of our documents.

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If you have problems regarding the operation of your equipment, contact the Customer Network Resolution Center (CNRC) for immediate assistance. The 24–hour telephone numbers are listed at https://mynetworksupport.motorola.com. Select **Customer Network Resolution Center contact information**. Alternatively if you do not have access to CNRC or the internet, contact the Local Motorola Office.

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To report a documentation error, call the CNRC (Customer Network Resolution Center) and provide the following information to enable CNRC to open an SR (Service Request):

- The document type
- The document title, part number, and revision character
- The page number with the error
- A detailed description of the error and if possible the proposed solution

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Motorola systems and equipment provide security parameters that can be configured by the operator based on their particular operating environment. Motorola recommends setting and using these parameters following industry recognized security practices. Security aspects to be considered are protecting the confidentiality, integrity, and availability of information and assets. Assets include the ability to communicate, information about the nature of the communications, and information about the parties involved.

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Contact the Customer Network Resolution Center (CNRC) for assistance. The 24–hour telephone numbers are listed at https://mynetworksupport.motorola.com. Select **Customer Network Resolution Center contact information**, from the menu located to the left of the Login box. Alternatively if you do not have access to CNRC or the internet, contact the Local Motorola Office.

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The following describes how warnings and cautions are used in this document and in all documents of this Motorola document set.

Warnings

Warnings precede instructions that contain potentially hazardous situations. Warnings are used to alert the reader to possible hazards that could cause loss of life or physical injury. A warning has the following format:

WARNING

Warning text and consequence for not following the instructions in the warning.

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Cautions precede instructions and are used when there is a possibility of damage to systems, software, or individual items of equipment within a system. However, this damage presents no danger to personnel. A caution has the following format:

CAUTION

Caution text and consequence for not following the instructions in the caution.

Notes

A note means that there is a possibility of an undesirable situation or provides additional information to help the reader understand a topic or concept. A note has the following format:

NOTE

Note text.

Safety

General safety

The following general safety guidelines apply to Motorola equipment:

- The power jack and mating plug of the power cable must meet International Electrotechnical Commission (IEC) safety standards.

NOTE

Refer to *Grounding Guideline for Cellular Radio Installations – 68P81150E62*.

- Power down or unplug the equipment before servicing.
- Using non-Motorola parts for repair could damage the equipment or void warranty. Contact Motorola Warranty and Repair for service and repair instructions.
- Portions of Motorola equipment may be damaged from exposure to electrostatic discharge. Use precautions to prevent damage.

Electromagnetic energy

Relevant standards (USA and EC) applicable when working with RF equipment are:

- *ANSI IEEE C95.1-1991, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.*
- Council recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC) and respective national regulations.
- *Directive 2004/40/EC of the European Parliament and of the Council of 29 April 200*4 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (18th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC).

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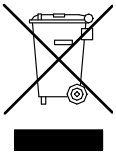

Disposal of Motorola equipment

European Union (EU) Directive 2002/96/EC Waste Electrical and Electronic Equipment (WEEE)

Do not dispose of Motorola equipment in landfill sites. In the EU, Motorola in conjunction with a recycling partner ensures that equipment is collected and recycled according to the requirements of EU environmental law.

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Logo 1 

Logo 2 

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Disclosure table

部件名称	有毒有害物质或元素					
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金属部件	×	○	×	×	○	○
电路模块	×	○	×	×	○	○
电缆及电缆组件	×	○	×	×	○	○
塑料和聚合物部件	○	○	○	○	○	×

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FCC Requirements

Content

This section presents Federal Communication Commissions (FCC) Rules Part 15 requirements and compliance information for the USB CDMA XMI Transceiver at 1.9 GHz.

FCC Part 15 Requirements

Part 15.19a(3) - Information to User

NOTE

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation

Part 15.21 - Information to User

NOTE

Changes or modifications that change the FCC type approved configuration of the equipment could void the user's authority to operate the equipment.

15.105(b) - Information to User

NOTE

This equipment has been tested and found to comply with the limits for a Class B digital device, under Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment OFF and ON, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Chapter
1

Overview

Information Overview

NOTE

- Before replacing components that are not covered in this manual, contact Motorola Customer Network Resolution Center for special instructions that may be involved.
- Many figures in this manual show typical equipment. The actual equipment appearance may vary slightly.

Organization of manual

This manual is divided into the following main parts:

- Chapter 1: Overview, covers:
  - Information Overview
  - UBS Macro BTS FRU Replacement Preview
  - UBS Macro BTS Product Overview
  - UBS Macro BTS Equipment Identification
  - External GPS (E-GPS) Module Equipment Identification
  - Integrated Duplexer RX Filter (IDRF) Equipment Identification
  - Site Span I/O (SSI) Module Equipment Identification
  - Transceiver Module Internal (XMI) Equipment Identification
  - Digital Module Internal (DMI) Equipment Identification
  - Power Distribution Unit (PDU) Equipment Identification
  - RX Splitter Equipment Identification
  - Power Supply Module (PSM) Shelf Equipment Identification
  - Optional RGPS Head Equipment Identification
- Chapter 2: Reference Procedures Performed at BTS Site, covers:
  - Frame Power Down & Power-Up Procedures
- Chapter 3: Reference Procedures Performed at OMCR, covers:
  - Accessing OMCR CLI Window
  - Shut Down Site Signaling Functions for a Packet BTS
  - Restore Site Signaling Operations for a Packet BTS
- Chapters 4 through 12 covers:
  - Motorola Universal Base Station (UBS) Macro BTS FRU Procedures (see next paragraph section)

BTS FRU procedures

The BTS FRU procedures are grouped by major functional areas within the Motorola Universal Base Station (UBS) Macro BTS equipment and presented in the following individual chapters:

- Chapter 4: E-GPS Replacement Procedure
- Chapter 5: IDRF Replacement Procedure

- Chapter 6: SSI Replacement Procedures
  - SSI (Site Span I/O) Module
  - Unbalanced E1 Daughter Card
  - QHSO (Quartz High Stability Oscillator)
- Chapter 7: XMI Replacement Procedures
  - XMI (Transceiver Module Internal) Module
  - XMI Fan Tray Assembly
- Chapter 8: DMI Replacement Procedures
  - DMI (Digital Module Internal) Assembly
  - Modem Boards
- Chapter 9: PDU Replacement Procedures
  - Power Distribution Unit (PDU)
  - Breaker Module Assembly (BMA)
- Chapter 10: PSM Shelf Replacement Procedures
  - –48 V DC Power Supply Module (PSM) Shelf
  - 220 V AC Power Supply Module (PSM) Shelf
  - Power Supply Modules (PSMs)
- Chapter 11: RX Splitter Replacement Procedure
- Chapter 12: RGPS Head Replacement Procedure

Each BTS FRU procedure section contains the following information:

- Description - contains general information about the FRU operation, usage and location in the frame/shelf and so on.
- System impact/considerations - describes how the replacement procedure impacts the system with respect to downtime and so on. It lists specific concerns associated with the replacement of the FRU.
- Required items - lists items that are required to perform the FRU procedure including reference documents (manuals), tools, torque requirements, and replacement unit.
- Prerequisite - highlights actions needed before and after the FRU replacement including: coordinating the replacement procedure with the OMCR operator and so on.
- Replacement procedure - provides detailed procedural steps to remove the failed FRU and install the replacement FRU including: site preparation, equipment disassembly and reassembly, equipment and site operation restoration and so on. When necessary, the procedural steps reference specific procedures to be performed by the OMCR operator.

How to use this manual

All FRU replacement procedures require interaction and two-way communications between the technician at the BTS site and the operator at the OMCR. Each of these individuals will need a copy of this manual.

First determine the FRU to be replaced.

Next, the BTS technician at the site starts performing the replacement procedure for the specific FRU. This procedure will direct the technician when to notify the operator at the OMCR as to what action(s) to take. Often the OMCR operator action is to perform a specific procedure contained in the FRU procedure chapter. When necessary, the specific FRU procedure will direct the operator to notify the BTS technician that certain events have been completed and what action(s) to take.

Depending on the specific FRU being replaced, the replacement procedure will be terminated by either the BTS technician or the OMCR operator. Usually it is terminated by the OMCR operator clearing old alarms and verifying that there are no new related alarms.

Required manuals

The following manuals are referenced in this manual and may be used for additional information regarding replacement procedures.

- *1X UBS Macro BTS Hardware Installation* (68P09283A62) manual.
- *1X UBS Macro BTS Optimization/ATP* (68P09283A63) manual.
- *System Commands Reference* (68P09282A57) manual.

FRU locations

To aid in physically identifying FRUs and locating the major functional areas of the equipment as well as a specific FRU location, refer to the illustrations in the following sections of this chapter:

- UBS Macro BTS Equipment Identification
- External GPS (E-GPS) Equipment Identification
- Integrated Duplexer RX Filter (IDRF) Equipment Identification
- Site Span I/O (SSI) Module Equipment Identification
- Transceiver Module Internal (XMI) Equipment Identification
- Digital Module Internal (DMI) Equipment Identification
- Power Distribution Unit (PDU) Equipment Identification
- RX Splitter Equipment Identification
- Power Supply Module (PSM) Shelf Equipment Identification
- Optional RGPS Head Equipment Identification

Recommended tools

Each BTS FRU procedure specifies the recommended tools that are required during the procedure. These tools along with some other useful tools are included in the following overall tool list:

- Torque driver, capable of 2.3 N-m (20 in-lbs) to 5.6 N-m (50 in-lbs) torque
- T25 TORX bit with 12-in Extension
- T20 TORX bit
- T10 TORX bit
- 19 mm open-end wrench (for N-type connectors)
- Flat blade screwdriver
- Side cutters
- Tie wraps
- Masking tape and marking pen (for making temporary cable markers)
- Removable XMI handle with two M5 screws
- SMA break over wrench - 1.02 N-M (9 in-lb)
- 3/8 inch ratchet
- 3/8 inch drive to 1/4 inch hex adapter
- 19 mm socket
- 10 mm socket
- 9/16 in socket

Abbreviations and Acronyms

Table 1-1 identifies the equipment related abbreviations and acronyms used in this manual.

Table 1-1 Abbreviations and Acronyms

Acronym	Definition
1X	One of two bandwidths currently defined in the IS-2000 CDMA specification, which extends the capability of the IS-95A and B specifications. 1X bandwidth provides wireless packet voice and data transmission capability at up to 144 Kbps.
A	Ampere or Amp
AC	Alternating Current
ACC	Accessory

Continued

Table 1-1 Abbreviations and Acronyms (Continued)

Acronym	Definition
AN	Aggregation Node
ATP	Acceptance Test Plan
AWG	American Wire Gauge
BMA	Breaker Module Assembly
BSI	Baseband Switch Interface
BSS	Base Station System
BSSAN	Base Station System (BSS) Access Network. The BSSAN consists of a Radio Access Network (RAN) and an AN. It may also include a Digital Access and Cross-connect System to support split backhaul and a Selector Distribution Unit (SDU).
BTS	Base Transceiver Station or Base Transceiver Subsystem
CB	Circuit Breaker
CBSC	Centralized Base Station Controller
CCW	Counter Clockwise
CDMA	Code Division Multiple Access
CE	Channel Element
CW	Clockwise
DC	Direct Current
DIV	Diversity
DMI	Digital Module Internal
DMM	Digital Multi-Meter
E-GPS	External-GPS
ESD	Electro-Static Discharge
EV-DO	CDMA 1X Evolution - Data Only
FER	Frame Erasure Rate
FRU	Field Replaceable Unit
FWD	Forward
GND	Ground
GPS	Global Positioning System
HSO	High Stability Oscillator
IDI	Interworking DMI Interconnect
IDRF	Integrated Duplexer RX Filter
I/O	Input/Output
IP	Internet Protocol
IP/OP	Customer Alarm Input/Output

Continued

Table 1-1 Abbreviations and Acronyms (Continued)

Acronym	Definition
IS	Interim Standard
LAN	Local Area Network
LMF	Local Maintenance Facility
LMT	Local Maintenance Terminal
MGB	Master Ground Bar
MMI	Man Machine Interface
MMII	Mobility Manager II
MSC	Mobile Switching Center
MSN	Mobile Switching Network
MSO	Motorola Standard Oscillator or Medium Stability Oscillator
OMC-IP	Operations Maintenance Center - Internet Protocol
OMC-R	Operations Maintenance Center - Radio
PA	Power Amplifier
PBH	Packet Backhaul: IP-based backhaul between the BTS and the network. The UBS Macro BTS is configured for packet backhaul operation.
PC	Power Connector
PDU	Power Distribution Unit
PPS or 1PPS	1 pulse per second
PSM	Power Supply Module
PSTN	Public Switched Telephone Network
QHSO	Quartz High Stability Oscillator
RAN	Radio Access Network
RF	Radio Frequency
RFL	Reflected
RGD	Remote GPS Distribution
RGPS	Remote Global Positioning System
RSSI	Receive Signal Strength Indicator
RU	Rack Unit
RX	Receive or Receiver
SDU	Selection and Distribution Unit
SPROC	Site Processor
SSI	Site Span I/O or Site/Span Interface
TCH	Traffic Channel
TX	Transmit or Transmitter

Continued

Table 1-1 Abbreviations and Acronyms (Continued)

Acronym	Definition
UBS	Motorola Universal Base Station
UNO	Universal Network Operations
V	Volt
VPU	Vocoder Processing Unit
W	Watt
XMI	Transceiver Module Internal

UBS Macro BTS FRU Replacement Preview

Passive and DC operation

Some FRUs are passive and do not have a DC input power source. Some FRUs are **hot swappable** and can be removed/replaced with DC input power applied. Some FRUs require shutdown of DC input power before FRU removal/replacement.

FRU backup

Some FRUs have a backup with fully-automatic switchover upon removal/replacement of the primary.

Service affecting FRUs

FRUs that are service affecting require shutting down signaling to the entire BTS site before the failed FRU can be removed/replaced.

Shutdown and restore signaling

The site shutdown and restore signaling procedure is performed by the OMC operator when replacing certain FRUs.

Site shutdown signaling consists of the following sequence:

- Setup and turn ON Global Service Redirect Message to redirect all subscriber traffic away from the site
- Disable or lock BTS

Site restore signaling consists of the following sequence:

- Enable or unlock BTS
- Reset and turn OFF Global Service Redirect Message

Testing/reoptimization

Some FRUs must be tested and if needed calibrated. Calibration requires that the BTS site be shutdown/out-of-service or as an alternative In-Service Calibration procedure can be used. The In-Service Calibration procedure does not require site outage. In some cases, testing/reoptimization must be performed as part of the FRU replacement procedure. In other cases, testing/reoptimization can be performed at the next maintenance window.

FRU replacement conditions and sequence

Table 1-2 lists each FRU and the conditions and sequence of events required for replacement.

Table 1-2 FRU replacement conditions and sequence

FRU	Location	Replacement conditions and sequence
E-GPS (External-GPS)	UBS Macro frame	The UBS Macro BTS will use one of the following backup sources instead of the E-GPS: • DMI controller board MSO which can maintain system timing synchronization for up to 8 hours. • Optional Quartz High Stability Oscillator (QHSO) which can maintain system timing synchronization for up to 24 hours. FRU is **hot swappable**. • Replace FRU
IDRF (Integrated Duplexer RX Filter)	UBS Macro frame	FRU is passive; handles TX path, and RX path for both main and diversity antennas for a particular sector. **1.** **Lock** XMI **2.** Replace IDRF **3.** **Unlock** XMI **4.** At next maintenance window; TX Path Calibration Audit test affected sector TX path. RSSI test affected sector RX paths
SSI (Site Span I/O) Module	UBS Macro frame	**1.** Shut down signaling to **Site** and then DC input power to **SSI** **2.** Replace FRU **3.** Apply DC input power to **SSI** **4.** Restore signaling to **Site**
Unbalanced E1 Daughter Card	SSI front panel	FRU is passive. **1.** Shut down signaling to **Site** **2.** Replace FRU **3.** Restore signaling to **Site**
QHSO (Quartz High Stability Oscillator)	SSI rear panel	FRU is **hot swappable** and is a system timing synchronization backup for the RGPS head. **1.** Replace FRU

Continued

Table 1-2 FRU replacement conditions and sequence (Continued)

FRU	Location	Replacement conditions and sequence
XMI (Transceiver Module Internal) Module	UBS Macro frame	FRU is non-redundant. **1.** **Lock** XMI **2.** Shutdown DC input power to XMI **3.** Replace XMI **4.** Apply DC input power to XMI **5.** **Unlock** XMI **6.** Shut down signaling to **Site** (for calibration/audit) or set up optional In-Service Calibration procedure **7.** TX Path Calibration Audit test all TX paths. RSSI test all RX paths **8.** Restore signaling to **Site** if In-Service Calibration procedure was not used
XMI Fan Tray Assembly	UBS Macro frame, XMI rear panel	See XMI Module above.
DMI (Digital Module Internal) Assembly	UBS Macro frame	 **NOTE** The DMI assembly is the FRU that can be used to replace a DMI with an internal DMI component failure (including controller board, modem board, fan, or front panel failure). **1.** **Display BTS EID** information to determine model numbers of the failed DMI and its modem board(s). **2.** For a BTS with one DMI, Shut down signaling to **Site**. For a BTS with more than one DMI: c **Status** failed DMI to determine if Site Master or not c If Site Master, **Reset** DMI and then **Lock** DMI c If not Site Master, **Lock** DMI **3.** Shutdown DC input power to DMI **4.** Replace DMI **5.** Apply DC input power to DMI **Continued**

Table 1-2 FRU replacement conditions and sequence (Continued)

FRU	Location	Replacement conditions and sequence
		6. For a BTS with one DMI, Restore signaling to **Site**. For a BTS with more than one DMI, **Unlock** DMI
CDMA 1X Modem Board *- OR -* CDMA EV-DO Modem Board	Inside DMI	FRU is non-redundant. **1.** **Display BTS EID** information to determine model numbers of the failed DMI and its modem board(s). **2.** For a BTS with one DMI, Shut down signaling to **Site**. For a BTS with more than one DMI: c **Status** affected DMI to determine if Site Master or not c If Site Master, **Reset** DMI and then **Lock** DMI c If not Site Master, **Lock** DMI **3.** Shutdown DC input power to DMI **4.** Remove affected DMI assembly from UBS Macro BTS frame **5.** Replace Modem Board **6.** Install affected DMI assembly into UBS Macro BTS frame **7.** Apply DC input power to DMI **8.** For a BTS with one DMI, Restore signaling to **Site**. For a BTS with more than one DMI, **Unlock** DMI
RX Splitter	UBS Macro frame	FRU is passive; handles EXP (expansion) RX main & diversity antenna paths. • **Lock** XMIs • Replace FRU • **Unlock** XMIs • RSSI test affected RX paths at next maintenance window; reoptimize as required
PDU (Power Distribution Unit)	UBS Macro frame	**1.** Shut down signaling to **Site** and then power down the **frame** **2.** Replace FRU **3.** Power up the **frame** **4.** Restore signaling to **Site**

Continued

Table 1-2 FRU replacement conditions and sequence (Continued)

FRU	Location	Replacement conditions and sequence
Breaker Module Assembly (BMA)	UBS Macro frame inside of PDU	**1.** Shut down signaling to **Site** and then power down the **frame** **2.** Replace FRU **3.** Power up the **frame** **4.** Restore signaling to **Site**
–48 V DC PSM (Power Supply Module) Shelf	UBS Macro frame	**1.** Shut down signaling to **Site** and then power down the **frame** **2.** Replace FRU **3.** Power up the **frame** **4.** Restore signaling to **Site**
220 V AC PSM (Power Supply Module) Shelf	UBS Macro frame	**1.** Shut down signaling to **Site** and then power down the **frame** **2.** Replace FRU **3.** Power up the **frame** **4.** Restore signaling to **Site**
–48 V DC or 220 V AC PSM (Power Supply Module)	PSM shelf	FRU is **hot swappable** and **redundant**. **1.** Replace FRU
Optional RGPS (Remote GPS) Head	Pole/mast mounted outdoors	The UBS Macro frame BTS uses one of the following backup sources instead of the RGPS head: • Internal Motorola Standard Oscillator (MSO) which can maintain system timing synchronization for up to 8 hours. • Optional Quartz High Stability Oscillator (QHSO) which can maintain system timing synchronization for up to 24 hours. FRU is **hot swappable**. **1.** Replace FRU

UBS Macro BTS Product Overview

NOTE

The R20 Motorola Universal Base Station (UBS) Macro BTS supports single band 800 MHz or 1.9 GHz RF band, up to two XMIs, up to two DMIs and one SSI. UBS Macro BTS frame configurations with up to four XMIs and up to five DMIs will be available in the future.

Introduction

The Motorola Universal Base Station (UBS) Macro BTS conforms to the TIA/EIA/IS-97E and CDMA2000 for the CDMA Base Station performance specifications. It is a packet BTS that operates in the 800 MHz or 1.9 GHz RF band.

The packet BTS has a packet backhaul network interface that can handle voice and data.

A packet BTS is equipped with IP-packet routing functionality. The packet BTS connects to the Access Network (AN) using span lines. This configuration provides the packet backhaul between the packet BTS and the AN.

UBS Macro BTS Frame Overview

The Motorola Universal Base Station (UBS) Macro BTS along with other external equipment forms a 1X BTS that is part of the Motorola Radio Access Network (RAN).

The UBS Macro BTS is the interface between the Access Node (AN) in the RAN and the Subscriber Units (SUs) that are operating in the UBS Macro BTS RF coverage area.

Control and bearer traffic data, in IP-packets, is exchanged between the UBS Macro BTS and the AN. This IP-packet backhaul interconnection is through T1/E1 span lines or high-speed Ethernet.

Control and bearer traffic data is exchanged between the UBS Macro BTS and the SUs. This interconnection is by means of the CDMA2000 1X air interface.

The UBS Macro BTS air interface supports the following:

- Omni or 3–sector antenna configurations
- Single RF band operation only; 800 MHz or 1.9 GHz RF band
- Up to 120 W of total TX RF power output and up to 30 W TX RF power output per carrier in omni; 20W per sector-carrier in 3 sector
- Dual path, Main and Diversity, RX antennas

The UBS Macro BTS equipment is mounted in a 19–inch rack to form the UBS Macro BTS frame.

UBS Macro BTS frames are configured for either +27 V DC operation, –48 V DC operation, or 220 V AC operation.

UBS Macro BTS frames are also configured for low, mid, or high capacity. Capacity is determined by the quantity of sector carriers and traffic channels supported by the frame. The quantity of sector carriers is a function of the quantity of XMIs. The quantity of traffic channels is a function of the quantity of modems. Because the modems are inside the DMI, the quantity of DMIs is a capacity factor. The capacity of a UBS Macro BTS frame is essentially based on the following:

- low capacity - one XMI and up to two DMIs
- mid capacity - two XMIs and two DMIs
- high capacity - more than two XMIs (four XMIs maximum) and more than two DMIs (five DMIs maximum)

Currently, only low and mid capacity frames are available/supported.

NOTE

High capacity UBS Macro BTS frames will be available in the future.

The currently available UBS Macro BTS frames are shown in Figure 1-1 UBS Macro BTS low-tier/low-capacity frame (1000 mm rack) on page 1-27, Figure 1-2 Low capacity UBS Macro BTS starter frame (1800 mm rack) on page 1-28 and Figure 1-3 UBS Macro BTS mid-capacity frame (1800 mm rack) on page 1-30.

UBS Macro BTS Frame Standard Equipment

All UBS Macro BTS frames, regardless of capacity, are equipped with at least one of each of the following:

- IDRF (Integrated Duplexer RX Filter)
- SSI (Site Span I/O) module
- XMI (Transceiver Module Internal) module
- DMI (Digital Module Internal) module
- PDU (Power Distribution Unit)

The following sections briefly describe the UBS Macro BTS frame standard equipment.

IDRF (Integrated Duplexer RX Filter)

The IDRF is available in either the 800 MHz or 1.9 GHz RF band.

The IDRF includes:

- TX/RX bandpass filters
- Bi-directional TX and RX antenna path couplers.

The IDRF is a passive device requiring no DC input operating power.

The IDRF allows the sector TX and main RX RF carrier signals to share the same antenna. It also allows connection for a sector diversity RX RF antenna. The bi-directional antenna couplers provide forward and reflected signal port connections for antenna signal sampling and signal injection. The coupled ports are typically used for connection to test equipment.

The UBS Macro BTS frame is typically equipped with one IDRF per sector. Figure 1-1 UBS Macro BTS low-tier/low-capacity frame (1000 mm rack) on page 1-27, Figure 1-2 Low capacity UBS Macro BTS starter frame (1800 mm rack) on page 1-28 and Figure 1-3 UBS Macro BTS mid-capacity frame (1800 mm rack) on page 1-30 show the location of the IDRFs within the UBS Macro frame.

Figure 1-5 800 MHz IDRF I/O Details on page 1-32 and Figure 1-6 1.9 GHz IDRF I/O Details on page 1-33 show the locations of IDRF RF I/O port connectors.

SSI (Site Span I/O) module

The SSI provides the interfaces between the UBS Macro BTS frame and the following external interfaces:

- IP-backhaul spans

  The SSI directly supports up to 8 spans of packet backhaul through either balanced T1 or E1 span lines. SSI can also be equipped with an optional unbalanced E1 daughter card that transforms the SSI balanced E1 span line connections to 75-ohm coaxial cable connections.

- IP-backhaul via Ethernet/OTI (Open Transport Interface)

- E-GPS module or RGPS head connects to the SSI RGPS connector. This connector may also be used for the Sync Sharing Input connection from the SYNC SHARING connector of another UBS Macro BTS frame SSI.

- Sync Sharing Output is present at the SSI SYNC SHARING connector. This connector may be used for connection to the RGPS connector of another UBS Macro BTS frame SSI. Chaining the SYNC SHARING connector of one UBS Macro BTS frame to the RGPS connector of another UBS Macro BTS frame and so on provides sharing the GPS sync signal between BTSs.

- Customer inputs/outputs; up to 24 customer defined inputs and up to 8 customer defined outputs

- LMT (Local Maintenance Terminal); like the LMF (Local Maintenance Facility)

The SSI provides interfaces for the following UBS Macro BTS frame equipment:

- SSI DC power input – connects to the (PDU) Power Distribution Unit.

- SSI-to-DMI interface – connects the SSI to up to two DMIs.

- HSO interface (on rear of SSI) – connects to the optional QHSO module.

XMI (Transceiver Module Internal) module

The UBS Macro XMIs are available in either the 800 MHz or 1.9 GHz RF band. The XMI requires +27 V DC input operating power.

The XMI provides both the baseband transceiver and linear power amplifier functionality for the BTS. This functionality is integrated within a single module. The XMI supports either a three sector antenna configuration or an Omni (single sector) antenna configuration.

The XMI receiver is capable of supporting four carriers in the three-sector configuration and eight carriers in the Omni configuration. On the forward link side, XMI can support up to eight carriers in the three-sector configuration.

The XMI supports PA trunking, which enables dynamic TX RF power sharing among all sector-carriers. An advantage of PA trunking is that power can be distributed among sector-carriers with different loads. The built-in redundancy of trunking is also an advantage. If one of the XMIs internal power amplifiers fails, all sector-carriers served by that XMI can still operate at reduced power on the remaining power amplifiers. The XMI will generate a system alarm to alert the operator of the failure condition, but will stay in service.

The XMI provides main and diversity receivers for three sectors. The UBS Macro BTS frame supports soft-fail redundancy at the receiver level. If either the main and diversity receive path fails, the XMI continues to operate with one receive path, but at reduced performance instead of taking the entire XMI out-of-service.

DMI (Digital Module Internal) module

The DMI contains two main components: a controller board and at least one modem board (i.e., 1X CDMA or EV-DO). The controller board provides interfaces for up to two modem boards (i.e., 1X CDMA, EV-DO, or a combination of both). A DMI can be upgraded with a second modem board depending upon the configuration required at the BTS.

In the forward direction (BTS to Mobile), the DMI terminates the backhaul control and bearer connections from the SSI, processes the bearer and control data then routes the baseband data to the XMI for conversion/RF modulation and transmission over the air interface to the subscriber.

In the reverse direction (Mobile to BTS), the XMI receives the subscriber transmission over the air interface. The XMI demodulates the received RF signal and converts it to baseband data. The received baseband data is routed to the DMI for processing and generation to the associated control and bearer data for transmission to the network via the SSI.

External interfaces on the DMI include the following:

- +27 V DC (nominal) power input
- Two SSI interfaces
- Two XMI interfaces

The controller board provides all of the DMI external interfaces as well as interfaces for two modem boards. The controller is made up of the following functions: Site Processor (SPROC), Synchronization, Interworking (protocol termination), DMI baseband processing, XMI interfaces and SSI interface.

The DMI controller board also contains an Oven Controlled Crystal Oscillator (OCXO) that is synchronized to the BTS system timing established/sourced by the E-GPS or Remote GPS (RGPS) head. The OCXO also provides the MSO function. In the event that the GPS system timing signal (i.e., E-GPS or RGPS or sync-sharing) is lost, the DMI controller can select the MSO as a backup synchronization source for maintaining BTS system timing for up to 8 hours

PDU (Power Distribution Unit)

The PDU is the central power distribution point for the UBS Macro BTS frame. It contains input power feeds that connect to the +27 V DC power output of one of the following:

- Optional –48 V DC PSM (Power Supply Module) shelf
- Optional 220 V AC PSM shelf
- Customer supplied external +27 V DC power source

The PDU houses circuit breakers/power connectors for +27 V DC power distribution to each of the following UBS Macro BTS frame subsystems:

- XMIs
- DMIs
- SSIs
- Accessories

The PDU also contains bulk capacitance to stabilize the internal bus voltage to facilitate subsystem hot-swap and absorb surge energy.

UBS Macro BTS Frame Optional Equipment

The UBS Macro BTS frame may be equipped with following optional equipment:

- E-GPS (External GPS) module
- –48 V DC PSM (Power Supply Module) shelf with PSMs
- 220 V AC PSM (Power Supply Module) shelf with PSMs
- QHSO (Quartz High Stability Oscillator) module
- Unbalanced E1 daughter card
- Modem boards

The following sections briefly describe the UBS Macro BTS frame optional equipment.

E-GPS (External GPS) module

The optional E-GPS contains a GPS Receiver (GPSR) that requires connection to an external GPS RF antenna signal. The E-GPS output timing signal is routed to the DMI controller via the SSI.

The E-GPS is the primary source for BTS system timing.

The optional Remote GPS (RGPS) head may be used instead of the E-GPS.

The E-GPS is considered to be local with respect to the UBS Macro BTS frame, while the RGPS head is remotely located with respect to the UBS Macro BTS frame.

–48 V DC PSM (Power Supply Module) shelf with PSMs

The –48 V DC PSM shelf is optional. It is used to convert –48 V DC input power to +27V DC output operating power for distribution to the UBS Macro BTS frame electronics.

The –48 V DC PSM shelf is located at the bottom of the UBS Macro BTS frame. Figure 1-1 UBS Macro BTS low-tier/low-capacity frame (1000 mm rack) on page 1-27, Figure 1-2 Low capacity UBS Macro BTS starter frame (1800 mm rack) on page 1-28 and Figure 1-3 UBS Macro BTS mid-capacity frame (1800 mm rack) on page 1-30 show the location of the –48 V DC PSM shelf within the UBS Macro BTS frame.

The plug-in PSMs provide DC-DC conversion and +27V DC power output capabilities.

Up to three PSMs can be housed in the PSM shelf. A minimum of two PSMs are equipped for redundancy. An empty PSM 3 slot is covered with a filler panel.

220 V AC PSM (Power Supply Module) shelf with PSMs

The 220 V AC PSM shelf is optional. It is used to convert 220 V AC input power to +27V DC output operating power for distribution to the UBS Macro BTS frame electronics.

The 220 V AC PSM shelf is located at the bottom of the UBS Macro BTS frame. Figure 1-1 UBS Macro BTS low-tier/low-capacity frame (1000 mm rack) on page 1-27, Figure 1-2 Low capacity UBS Macro BTS starter frame (1800 mm rack) on page 1-28 and Figure 1-3 UBS Macro BTS mid-capacity frame (1800 mm rack) on page 1-30 show the location of the 220 V AC PSM shelf within the UBS Macro BTS frame.

The plug-in PSMs provide AC-DC conversion and +27V DC power output capabilities.

Up to three PSMs can be housed in the PSM shelf. A minimum of two PSMs are equipped for redundancy. An empty PSM 3 slot is covered with a filler panel.

QHSO (Quartz High Stability Oscillator) module

The QHSO is an upgraded backup synchronization source for maintaining BTS system timing established/sourced by the E-GPS or Remote GPS (RGPS) head. QHSO backup is used instead of the internal DMI controller MSO. The QHSO can maintain BTS system timing for up to 24 hours, as compared to 8 hours provided by the MSO.

The QHSO contains a high stability quartz crystal oscillator.

The optional QHSO is mounted on the SSI rear panel. It plugs directly into the SSI rear panel HSO connector.

Unbalanced E1 daughter card

The optional E1 daughter card is located on the front panel of the SSI.

For E1 daughter card location and connector identification, refer to Figure 1-7 SSI front panel details on page 1-35 .

The E1 daughter card has a 37-pin connector on the bottom of the card. This connector plugs into the SPAN 37-pin connector on the front panel of the SSI.

The E1 daughter card is secured to the SSI front panel via four corner screws.

The E1 daughter card is passive and does not require DC operating power. The circuitry on the E1 daughter card transforms 75–Ohm unbalanced span line I/O to 100–Ohm balanced SSI span line I/O.

The E1 daughter card supports up to eight span lines. It has 16 BNC connectors, 2 per span; RX and TX.

Modem boards

The modem board provides digital modulation/demodulation of the overhead channels and traffic channels that are carried on the TX/RX RF carriers. The UBS Macro modem boards are high density and have at least 256 channel elements that can be allocated to support the desired quantity of overhead and traffic channels.

There are two types of UBS Macro modem boards available. These are as follows:

- 1X CDMA modem board
- EV-DO modem board

The modem boards are located inside the DMI. A DMI can be equipped with up to two modem boards maximum. These modem boards can be either 1X CDMA modem, EV-DO modem, or one of each.

UBS Macro BTS Frame Optional External Equipment

The RGPS (Remote GPS) head is optional external equipment for the UBS Macro BTS frame.

The following section briefly describes the RGPS head.

RGPS (Remote GPS) head

The optional RGPS head contains a GPS antenna GPS Receiver (GPSR) and built-in GPS RF antenna. The RGPS head output timing signal is routed to the DMI controller via the SSI.

The RGPS head is the primary source for BTS system timing.

UBS Macro BTS FRU List

NOTE

Before replacing components that are not covered in this manual, contact Motorola Customer Network Resolution Center for special instructions that may be involved.

Each BTS FRU procedure specifies the required FRU(s) along with its model/part number. Table 1-3 lists all the supported UBS Macro BTS FRUs.

Table 1-3 UBS Macro BTS FRUs

FRU item	Motorola Model/Part number (unless specified otherwise)
E-GPS	STTG4052
IDRF, China Full Band 800 MHz	STFN4009
IDRF, India Full Band 800 MHz	STFN4010
IDRF, US Full Band 800 MHz	STFN4015
IDRF, US A-band 800 MHz	STFN4016
IDRF, US B-band 800 MHz	STFN4017
IDRF, 1.9 GHz	STFG4055
SSI	STLN6390
Unbalanced E1 Daughter Card	STLN6327
QHSO	SGLA4017
XMI, 800 MHz; with removable handle attached	SGTF4194
XMI, 1.9 GHz; with removable handle attached	STWG4000
XMI Fan Tray Assembly; with five 27 V DC fans	STLN6404

NOTE

All models of DMI assemblies include: DMI chassis with controller board, fans and front panel.

DMI assembly with one 1X CDMA modem board	STLN6681
DMI assembly with one EV-DO modem board	STLN6682
DMI assembly with two 1X CDMA modem boards	STLN6683
DMI assembly with one 1X CDMA modem board and one EV-DO modem board	STLN6684
DMI assembly with two EV-DO modem boards	STLN6679
DMI assembly without modem boards	STLN6325
CDMA 1X Modem Board	SGLN6336
EV-DO Modem Board	SGLN6494
RX Splitter, wide band (800 MHz through 2.1 GHz RF bands)	STRG4029
PDU	STPN4038
90A BMA for XMIs	STLN4093
20A BMA for DMIs and SSIs	STLN6472

Continued

Table 1-3 UBS Macro BTS FRUs (Continued)

FRU item	Motorola Model/Part number (unless specified otherwise)
10A BMA for ACCs	STLN6475
–48 V DC PSM Shelf; without PSMs	STHN4089
220 V AC PSM Shelf; without PSMs	STHN4092
–48 V DC PSM	STPN4037
220 V AC PSM	STPN4036
Optional RGPS Head	STLN6594

UBS Macro BTS Equipment Identification

Low and mid capacity UBS Macro BTS Frames

All Motorola Universal Base Station (UBS) Macro BTS frames are configured for either 800 MHz or 1.9 GHz RF band operation.

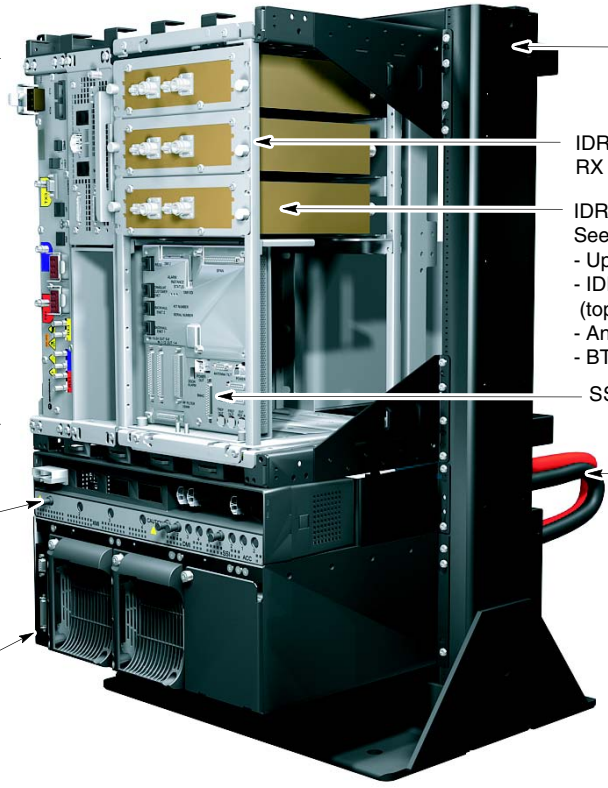
For software release 2.20.0.x, only low and mid capacity UBS Macro BTS frames are available. There are two versions low capacity UBS Macro BTS frames:

- UBS Macro BTS frame/short rack (see Figure 1-1)
- UBS Macro BTS starter frame/tall rack (see Figure 1-2)

The starter frame/tall rack can be easily expanded with equipment in the future to become a mid or high capacity frame.

The frame/short rack cannot be easily expanded. Equipment expansion of this frame/short rack would require equipment disassembly and then reassembly similar to that of the starter frame in a taller rack. Typically the frame/short rack equipment configuration is used because there is no plan for frame expansion.

Figure 1-1 UBS Macro BTS low-tier/low-capacity frame (1000 mm rack)



NOTES:
1. Interconnect cabling not shown for clarity.
2. 800 MHz equipment shown; 1.9 GHz similar.
3. 800 MHz XMI is 86 mm wide. 1.9 GHz XMI is 106.3 mm wide.
4. PSM shelf is optional and used instead of +27 V DC power Input.
5. PSM shelf is either -48 V DC or AC.
6. Only -48 V DC PSMs can be used in -48 V DC PSM shelf. Only AC PSMs can be used in AC PSM shelf.

ti-cdma-05993.eps

Figure 1-2 Low capacity UBS Macro BTS starter frame (1800 mm rack)

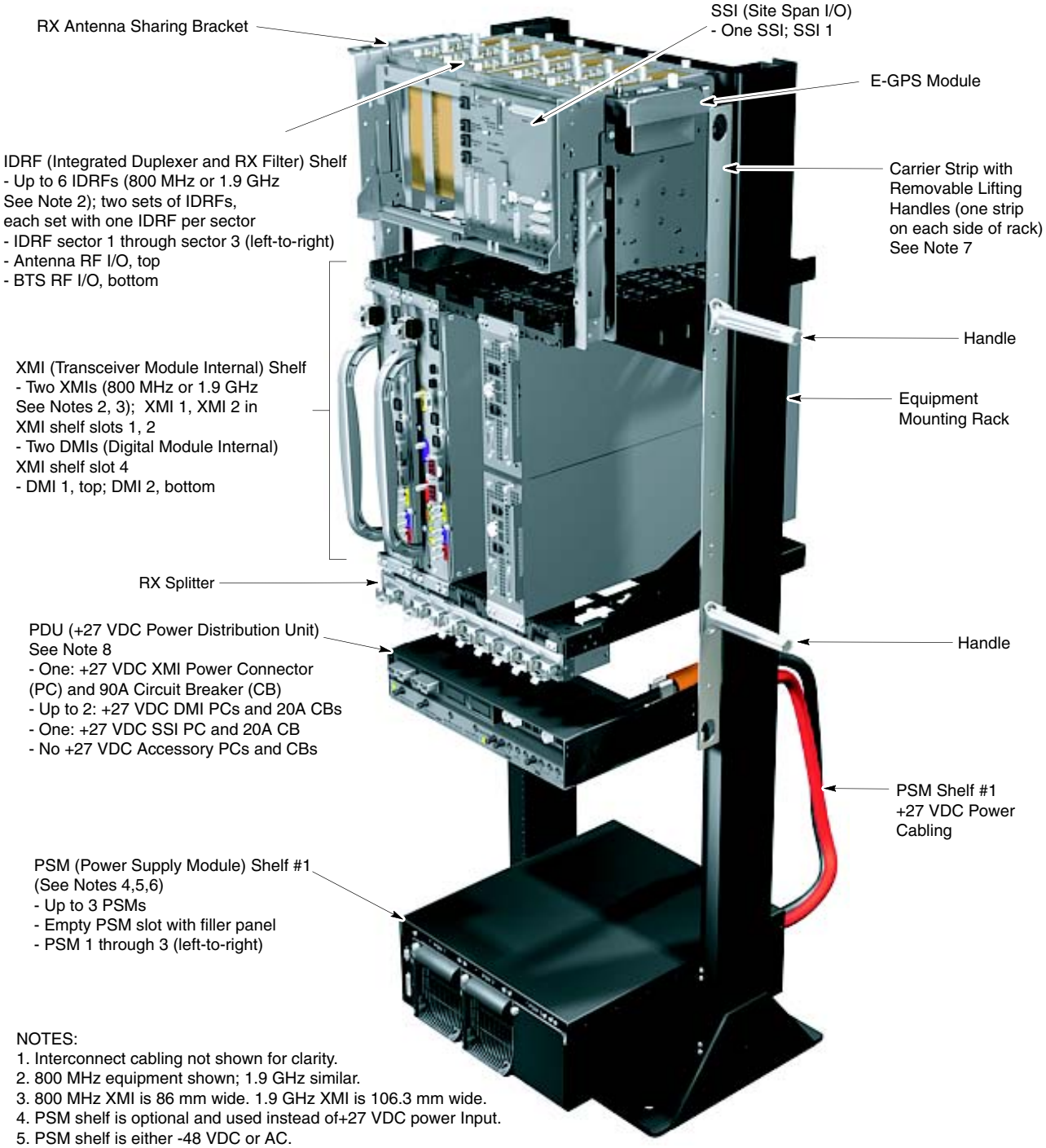
ti-cdma-05994.eps

NOTES:
1. Interconnect cabling not shown for clarity.
2. 800 MHz equipment shown; 1.9 GHz similar.
3. 800 MHz XMI is 86 mm wide. 1.9 GHz XMI is 106.3 mm wide.
4. PSM shelf is optional and used instead of+27 VDC power Input.
5. PSM shelf is either -48 VDC or AC.
6. Only -48 VDC PSMs can be used in -48 VDC PSM shelf. Only AC PSMS can be used in AC PSM shelf.
7. Carrier strips are removable.
8. PDU may be moved down 6 rack units to ease future expansion.

A typical mid capacity frame is shown in Figure 1-3.

The mid capacity frame is essentially a starter frame/tall rack that is already expanded to mid capacity. The mid capacity frame can be expanded with equipment in the future to become a high capacity frame.

Figure 1-3 UBS Macro BTS mid-capacity frame (1800 mm rack)



NOTES:
1. Interconnect cabling not shown for clarity.
2. 800 MHz equipment shown; 1.9 GHz similar.
3. 800 MHz XMI is 86 mm wide. 1.9 GHz XMI is 106.3 mm wide.
4. PSM shelf is optional and used instead of+27 VDC power Input.
5. PSM shelf is either -48 VDC or AC.
6. Only -48 VDC PSMs can be used in -48 VDC PSM shelf. Only AC PSMS can be used in AC PSM shelf.
7. Carrier strips are removable.
8. PDU may be moved down 6 rack units to ease future expansion.

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External GPS (E-GPS) Equipment Identification

E-GPS I/O Details

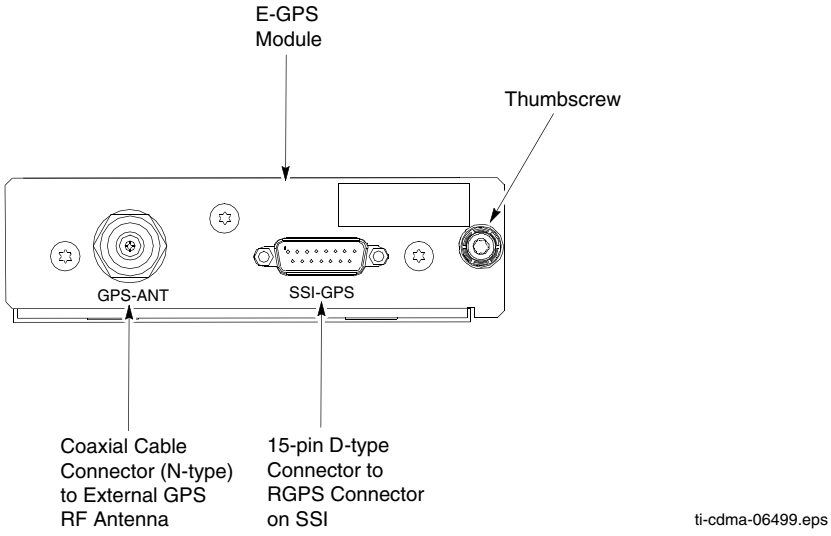
The UBS Macro BTS frame is equipped with an E-GPS module. The E-GPS module contains a GPS receiver (GPSR).

The E-GPS module connects to an external GPS RF antenna. It also connects to the SSI. The SSI and its associated DMI cabling routes the E-GPS module GPSR output signals to the controller board inside of the DMI. .

The E-GPS module operates from DC input power provided by the SSI connection.

See Figure 1-4 for E-GPS module I/O connectors location and details.

Figure 1-4 E-GPS I/O Details



Integrated Duplexer RX Filter (IDRF) Equipment Identification

IDRF I/O Details

The UBS Macro BTS antenna I/O equipment consists of the IDRF (Integrated Duplexer and RX Filter) with dual directional couplers for each antenna port.

The UBS Macro BTS frame is equipped with one IDRF per sector antenna.

The IDRFs are passive devices and therefore do not require DC input power for operation.

The BTS Antennas connect to the front of the IDRF while the BTS frame equipment connects to the rear of the IDRF.

RF test equipment can be connected to the directional couplers located on the front of the IDRF. These ports allow RF signal monitoring of the antenna paths as well as RF signal injection into the BTS equipment antenna paths.

See the applicable Figure 1-5 or Figure 1-6 for IDRF I/O connectors location and details.

Figure 1-5 800 MHz IDRF I/O Details

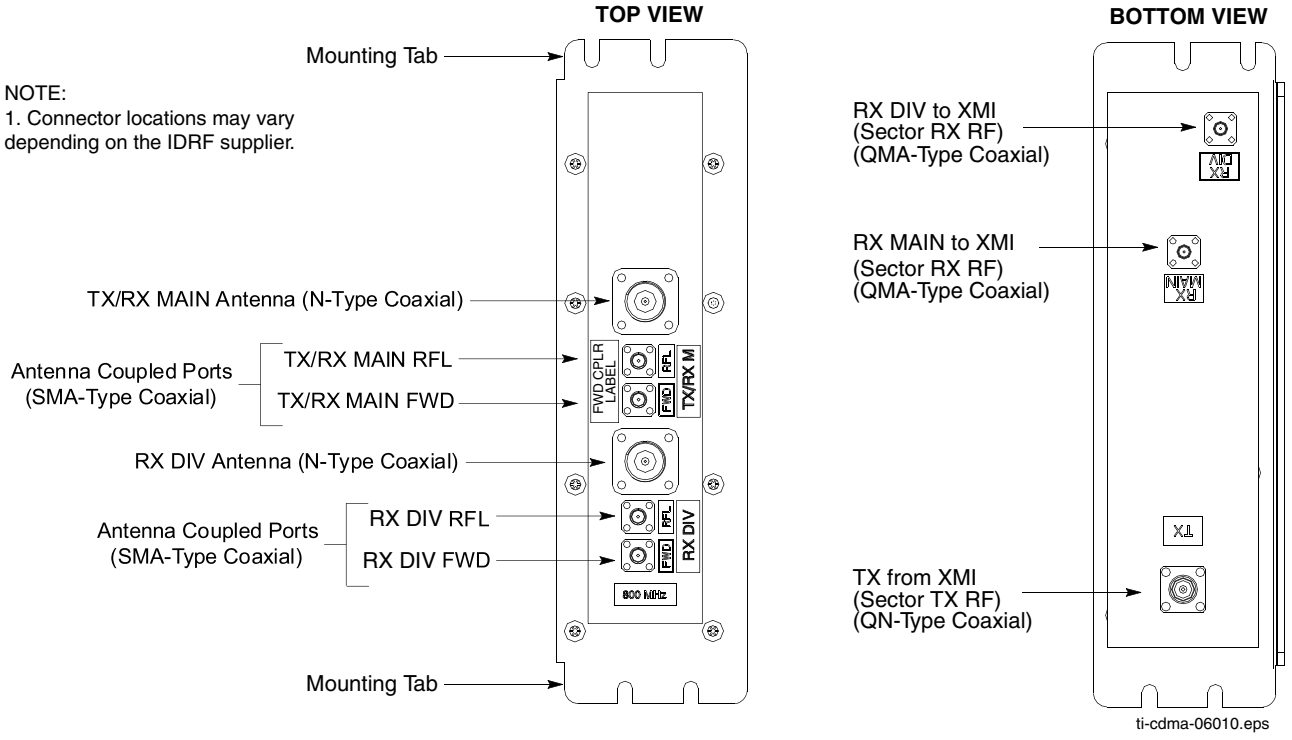
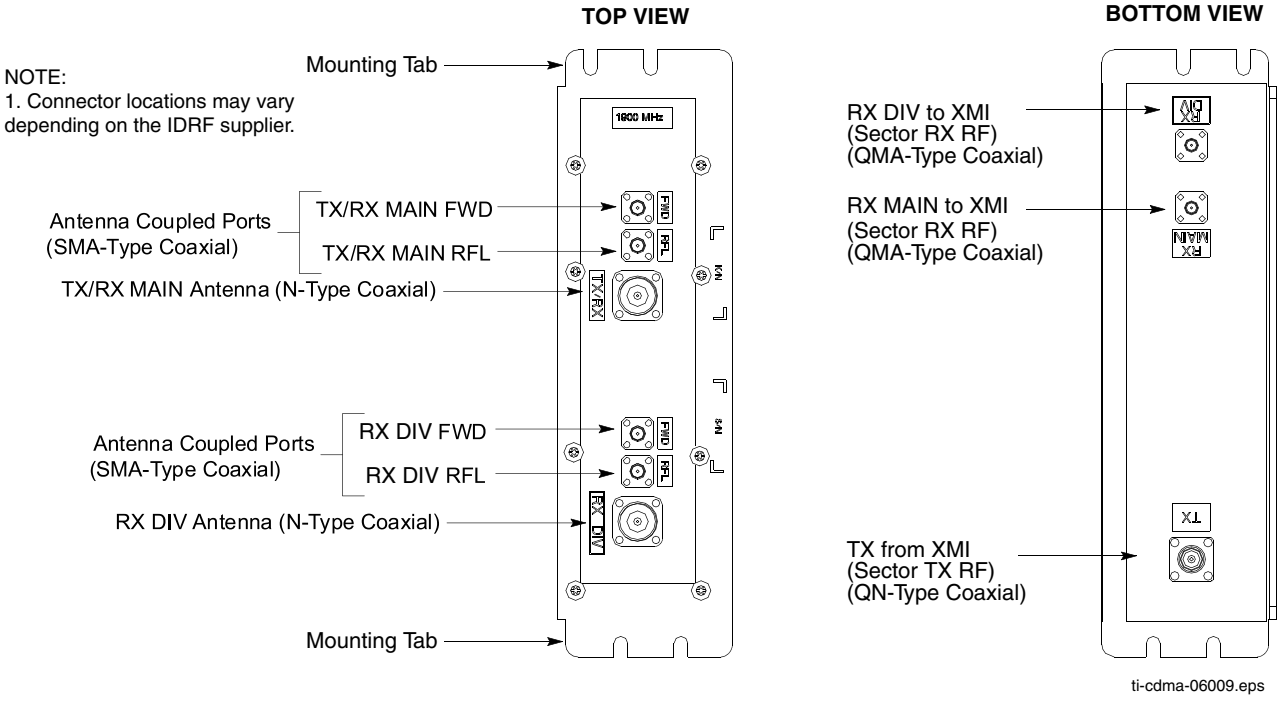


Figure 1-6 1.9 GHz IDRF I/O Details

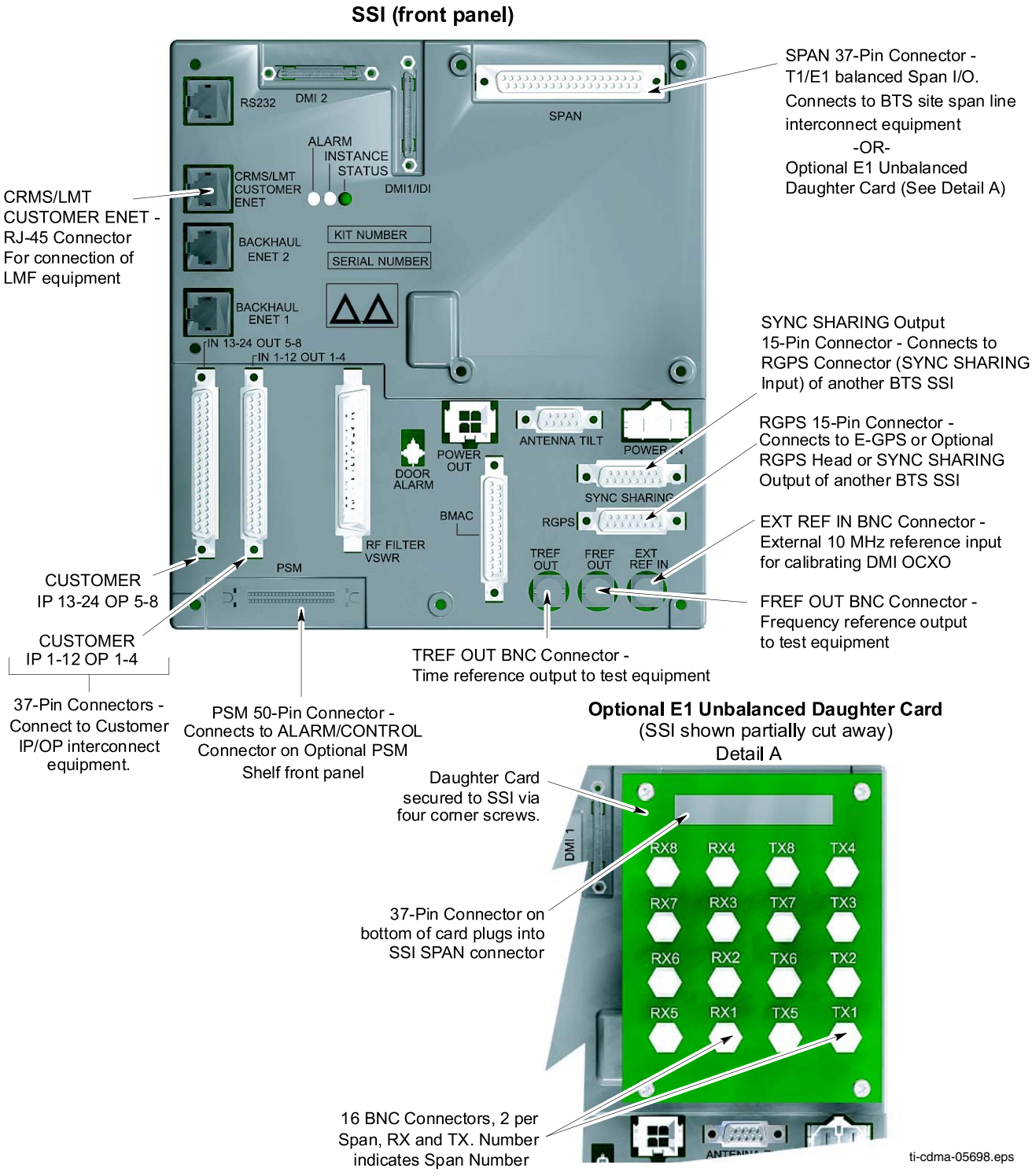


Site Span I/O (SSI) Module Equipment Identification

SSI I/O Details

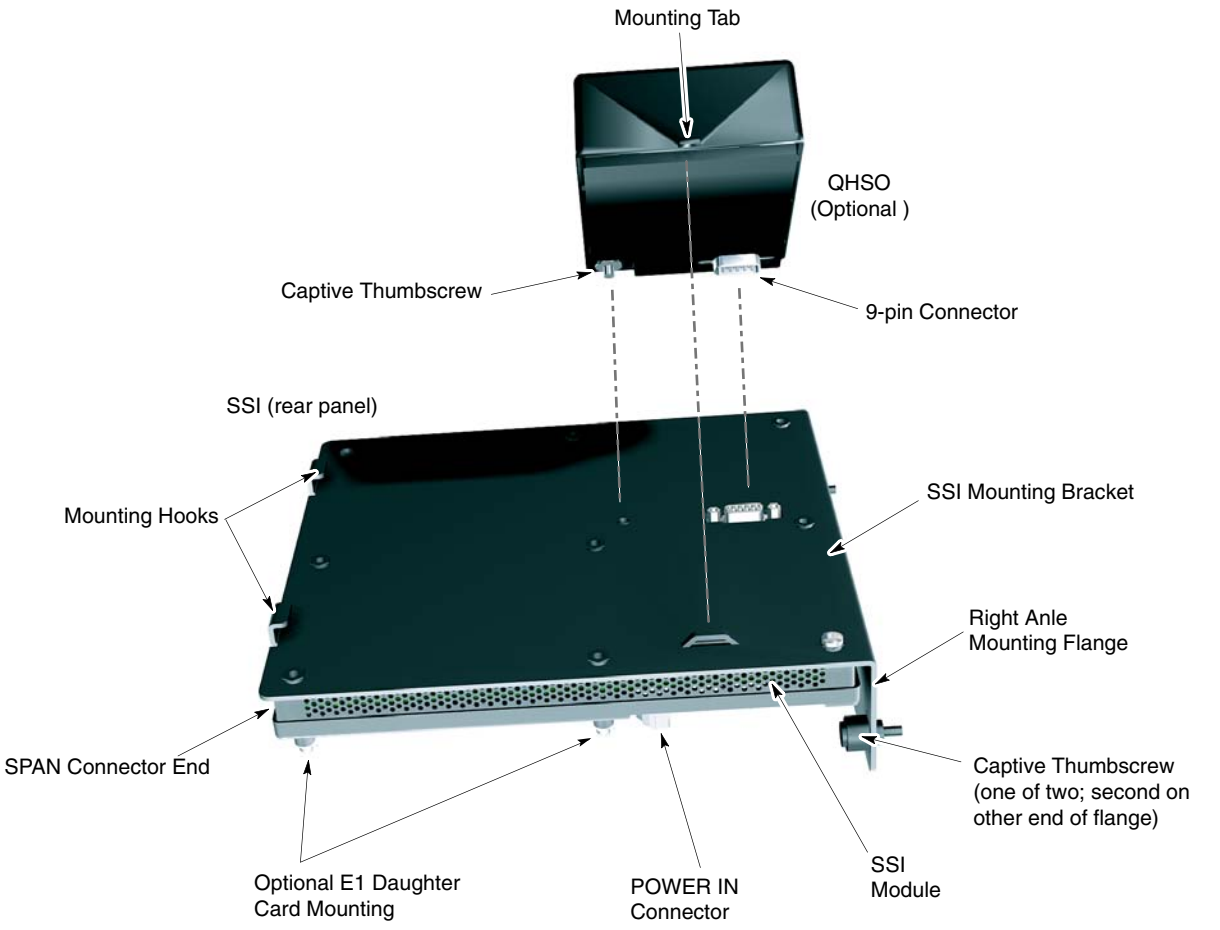
See Figure 1-7 for SSI front panel I/O connectors location and details.

Figure 1-7 SSI front panel details



See Figure 1-8 for SSI rear panel I/O connector location and details.

Figure 1-8 SSI rear panel details



Transceiver Module Internal (XMI) Equipment Identification

XMI I/O Details

Figure 1-9 shows I/O connectors on the front panel of the UBS Macro BTS 800 MHz XMI. Figure 1-10 shows I/O connectors on the front panel of the UBS Macro BTS 1.9 GHz XMI. The top-to-bottom positioning of the XMI shown in the figures is the same as when it is installed in the rack. These figures show connector/port locations, connector types and brief cabling details.

Figure 1-9 800 MHz XMI Module Front Panel I/O Detail

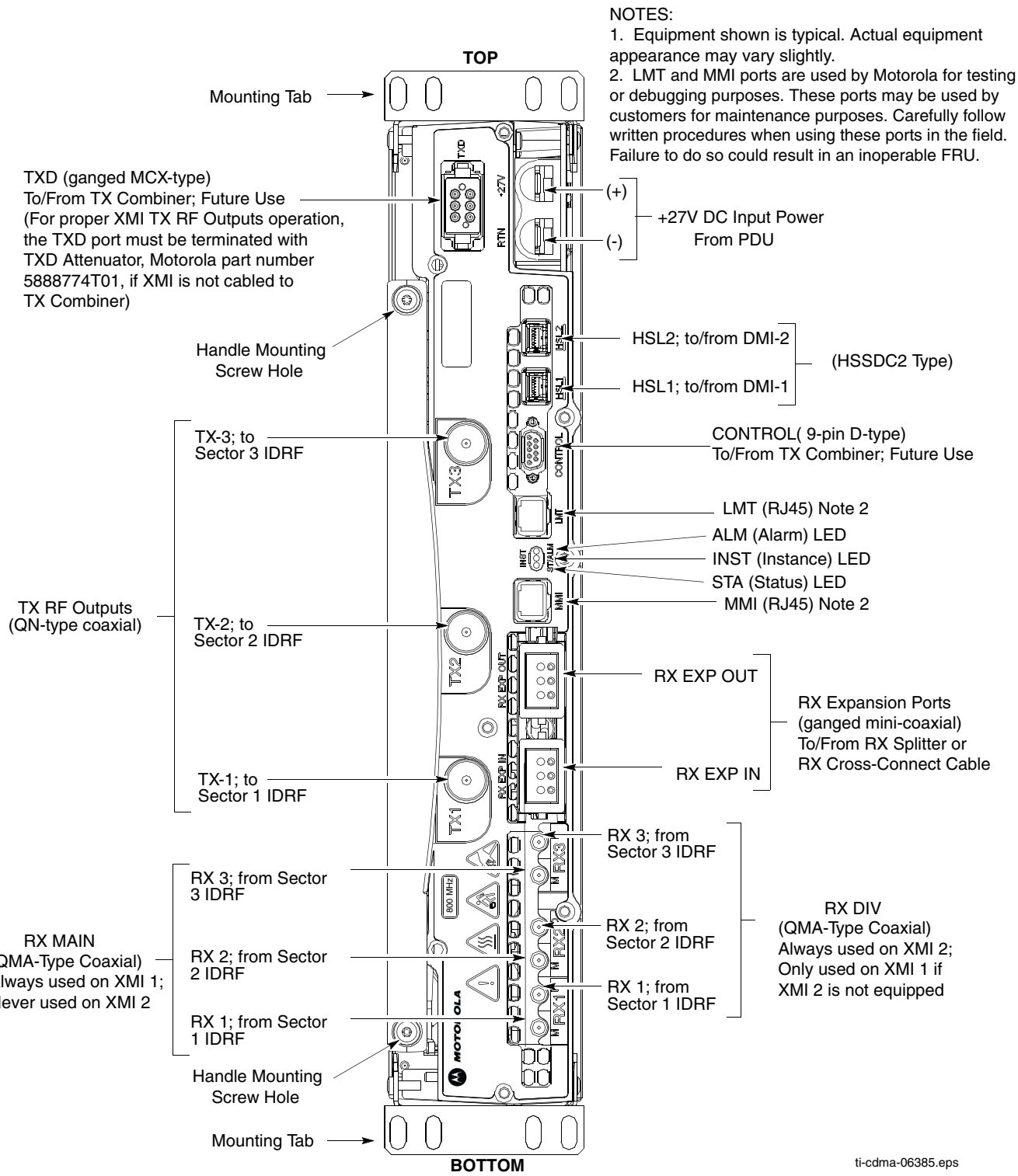
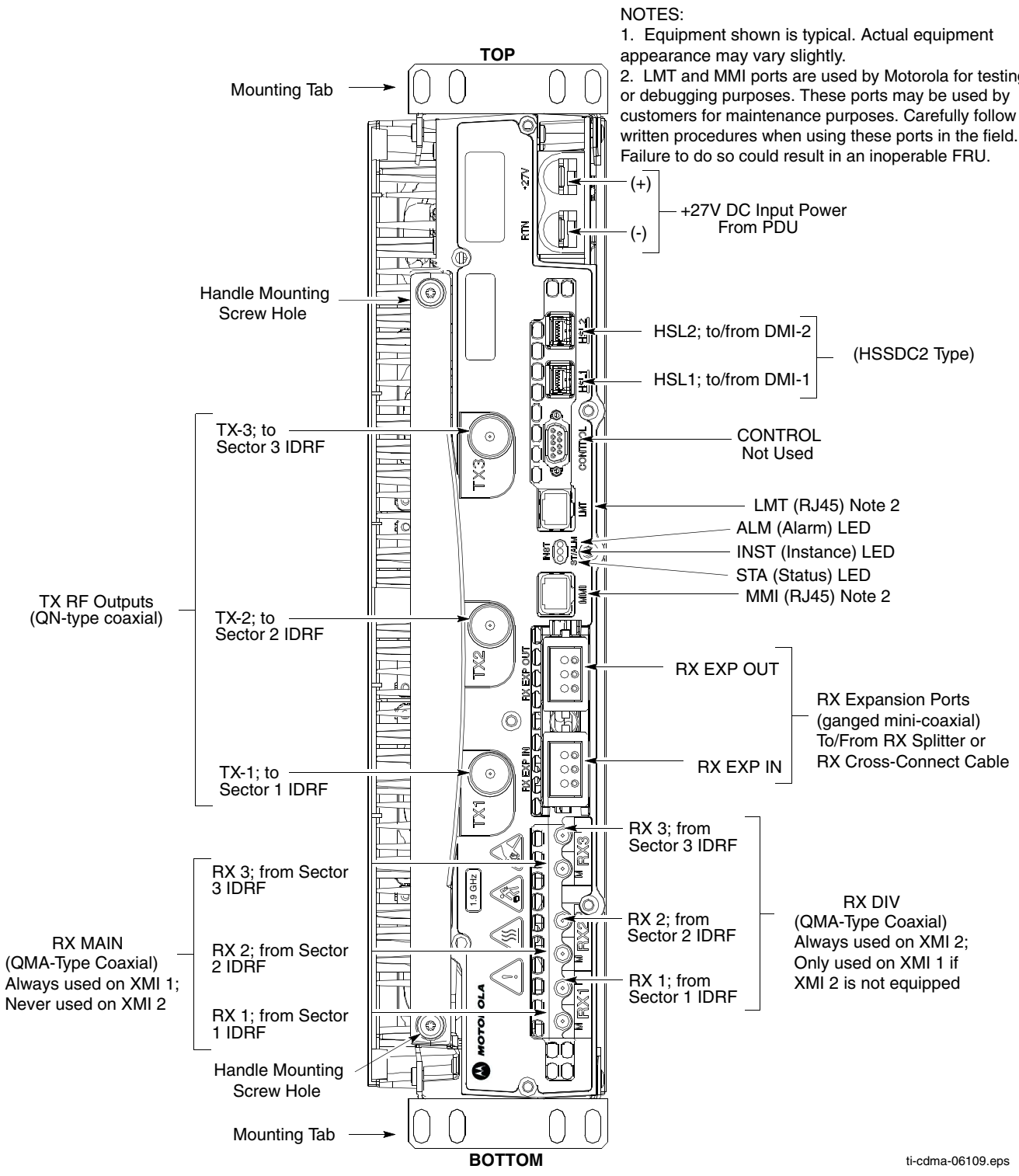


Figure 1-10 1.9 GHz XMI Module Front Panel I/O Detail

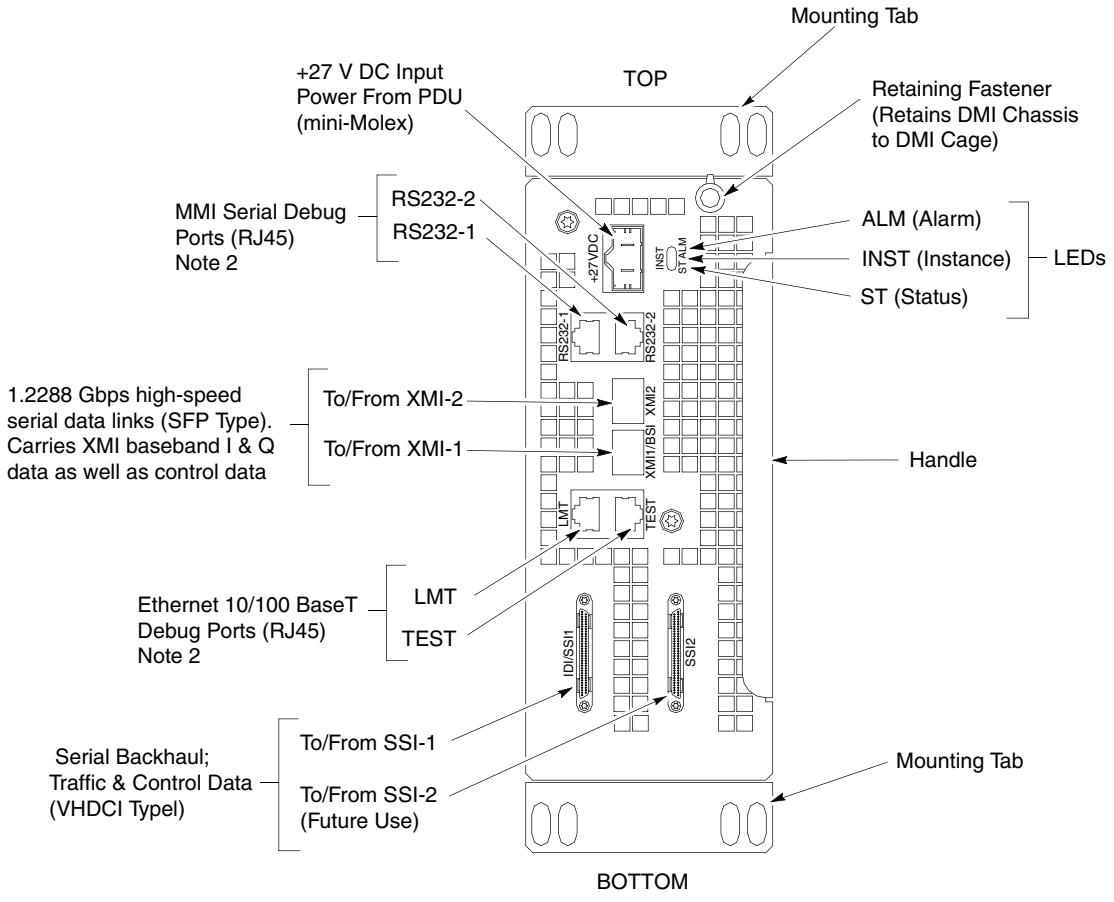


Digital Module Internal (DMI) Equipment Identification

DMI I/O Panel

Figure 1-11 shows I/O connectors on the front panel of the UBS Macro BTS DMI. The top-to-bottom positioning of the DMI shown in the figure is the same as when it is installed in the rack. This figure shows connector/port locations, connector types and brief cabling details.

Figure 1-11 DMI Module Front Panel Detail



NOTES:
1. Equipment shown is typical. The actual equipment appearance may vary slightly.
2. The debug ports are intended to be used primarily for testing or debugging purposes by Motorola. These ports may be used in the field for maintenance purposes by customers. Carefully follow written procedures when using these ports in the field. Failure to do so could result in an inoperable FRU.

ti-cdma-05912.eps

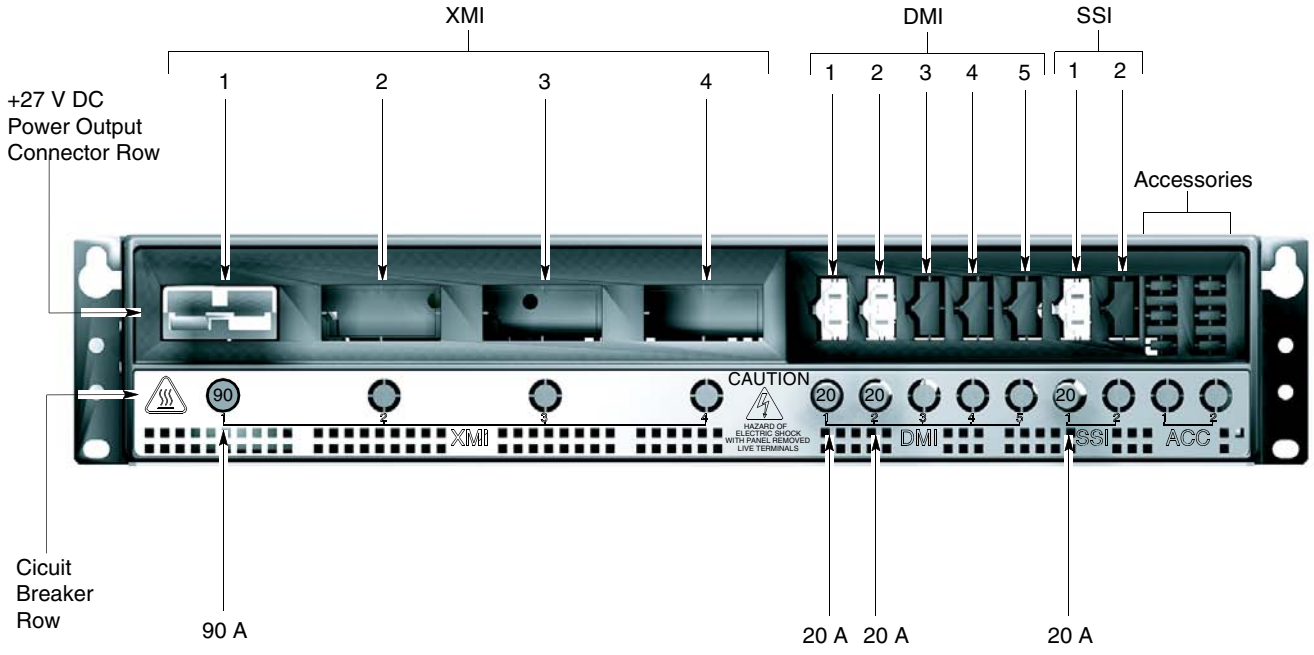
Power Distribution Unit (PDU) Equipment Identification

PDU I/O Panels

Figure 1-12 shows I/O connectors on the front panel of the UBS Macro BTS PDU. This figure shows connector and circuit breaker locations and usage details.

Figure 1-13 shows I/O cable and connectors on the rear panel of the UBS Macro BTS PDU. This figure shows cable/connector locations and brief cabling details.

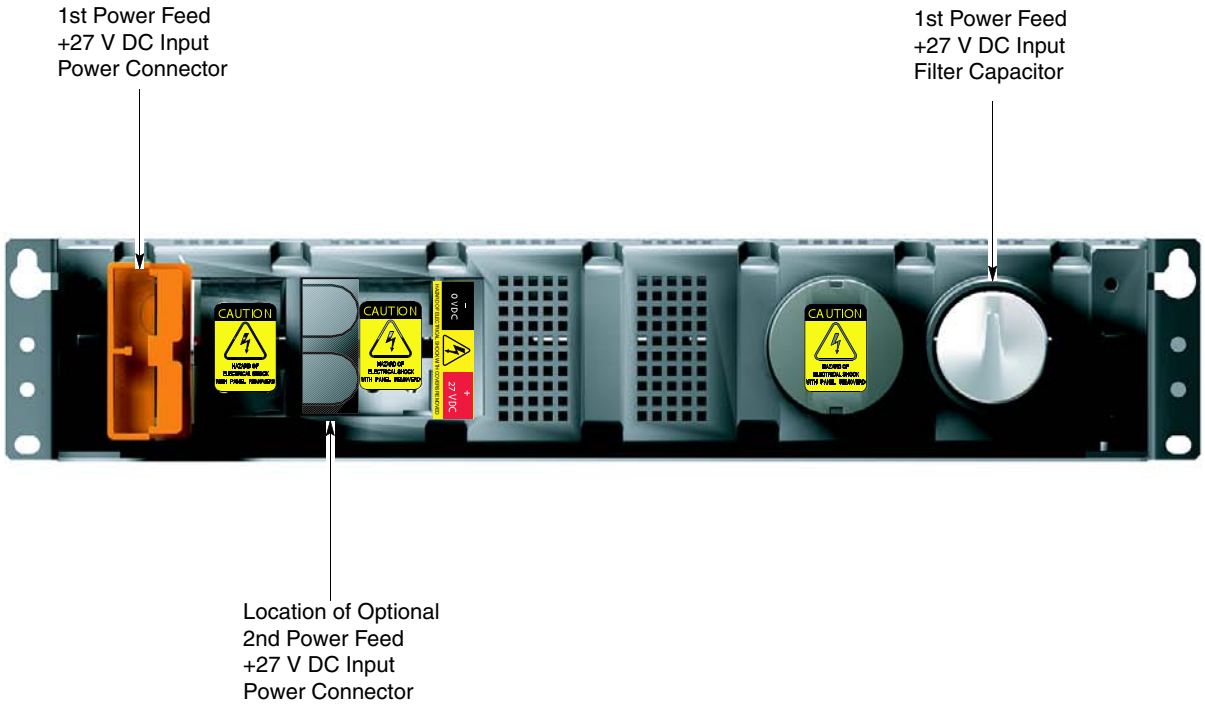
Figure 1-12 PDU front panel detail



NOTES:
1. Equipment shown is typical. The actual equipment appearance may vary slightly.
2. The power output connector and associated circuit breaker are an intergral unit.
   The power output connector is always positioned directly above the associated circuit breaker.
3. Usually only power output connectors and circuit breakers are populated when the associated XMI, DMI, SSI or ACC is equipped. The actual equipage is customer dependent.

ti-cdma-05913.eps

Figure 1-13 PDU rear panel detail



NOTES:
1. Equipment shown is typical. The actual equipment appearance may vary slightly.
2. The optional 2nd power feed input connector is populated when more than 2 XMIs are equipped.

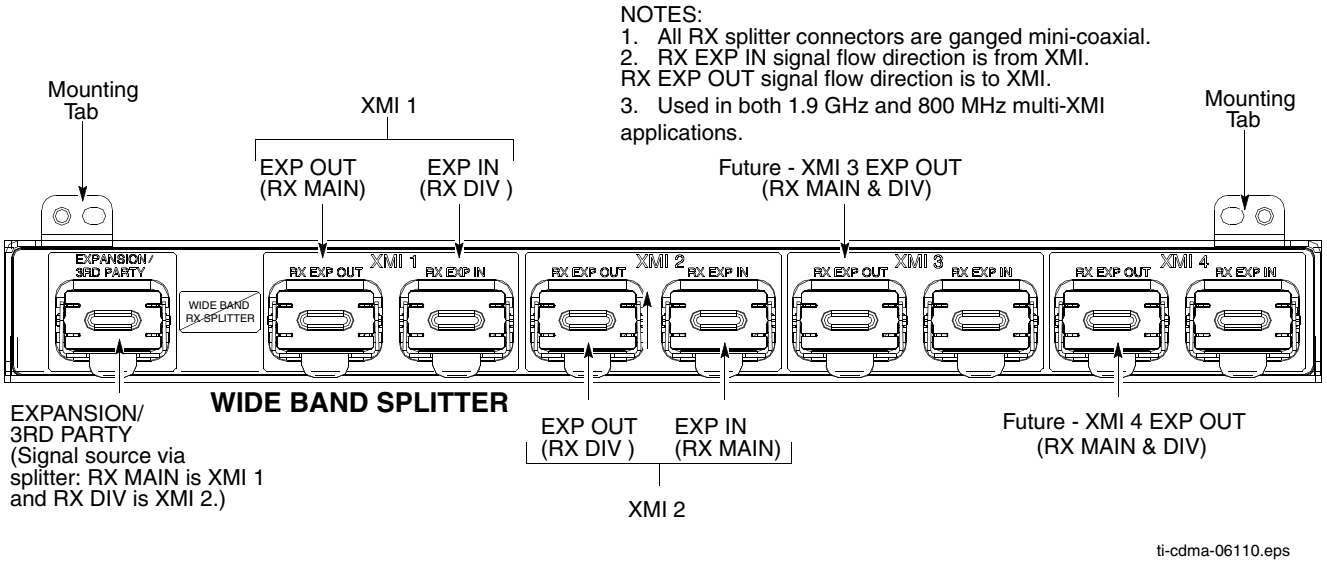
ti-cdma-05914.eps

RX Splitter Equipment Identification

RX Splitter I/O Panel

Figure 1-14 shows the wide band (800 MHz-to-2.1 GHz) RX splitter I/O panel.

Figure 1-14 RX splitter front panel detail



Power Supply Module (PSM) Shelf Equipment Identification

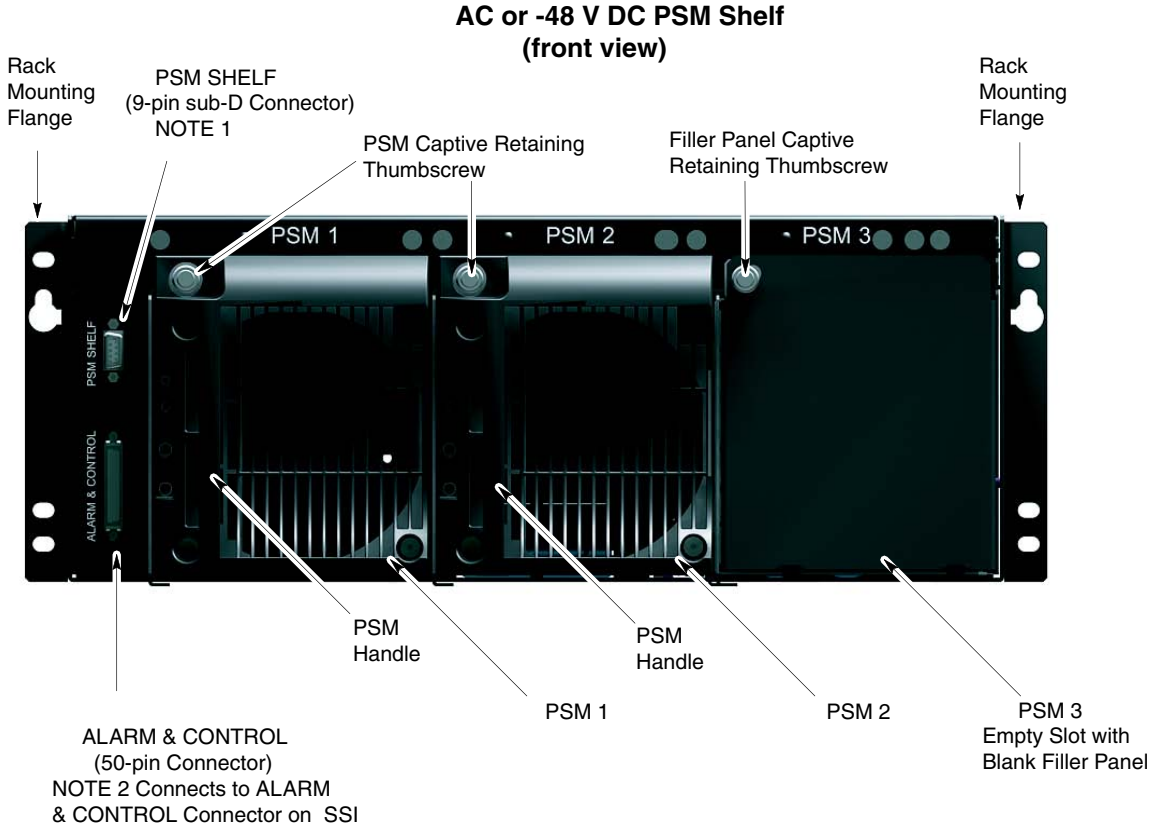
PSM I/O Panels

Figure 1-15 shows I/O connectors and PSM slot locations on the front panel of the UBS Macro BTS –48 V DC and 220 V AC PSM shelves. This figure also briefly describes connector usage. A PSM will be used in PSM 3 slot when more +27 V DC output power is needed to support additional equipment.

Figure 1-16 shows I/O cable and connector locations on the rear panel of the UBS Macro BTS —48 V DC PSM shelf. This figure also briefly describes cable and connector usage.

Figure 1-17 shows I/O cable, connector and terminal locations on the rear panel of the UBS Macro BTS 220 V AC PSM shelf. This figure also briefly describes cable and connector usage.

Figure 1-15 –48 V DC and 220 V AC PSM shelves front panel detail



NOTES:
1. The PSM SHELF connector is only used when the UBS Macro frame is equipped with two optional AC or -48 V DC PSM shelves. In this case, the PSM SHELF connectors on the two PSM shelves are interconnected.
2. The ALARM & CONTROL connector connects to ALARM & CONTROL connector on the SSI. If the UBS Macro frame is equipped with two optional AC or -48 V DC PSM shelves, only one shelf has this connector cabled.

ti-cdma-05915.eps

Figure 1-16 –48 V DC PSM shelf rear panel detail

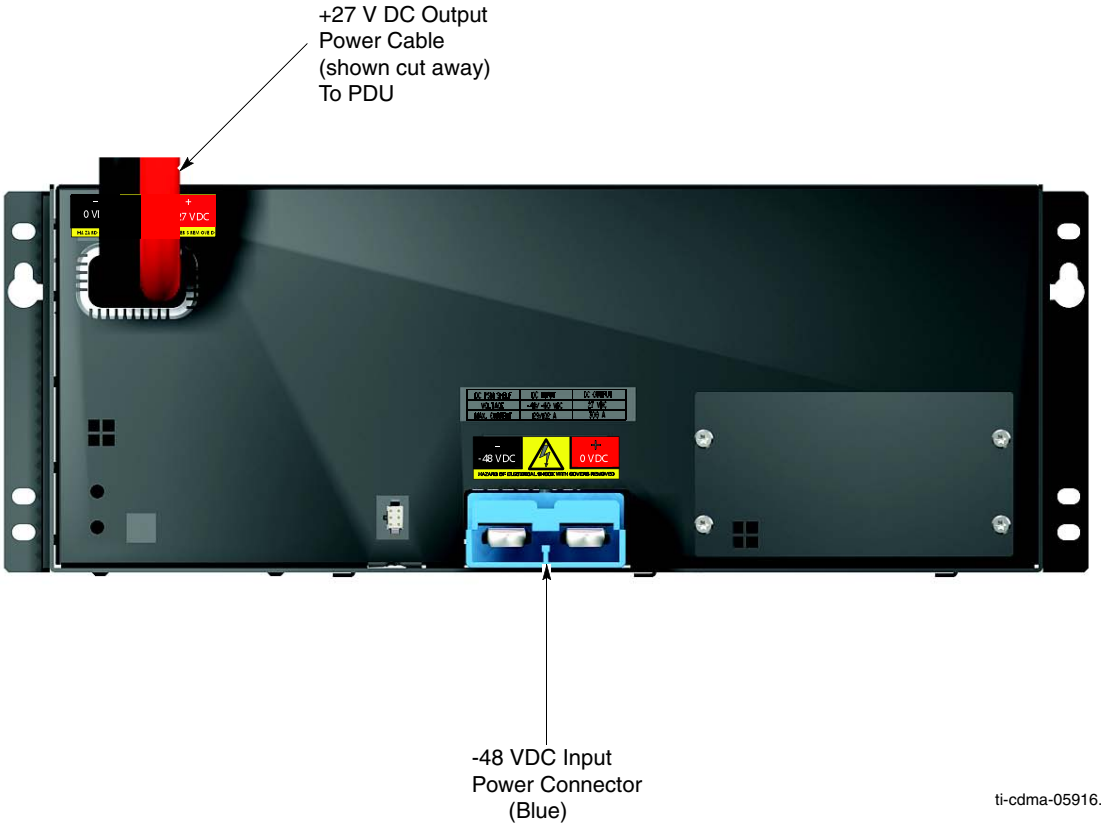
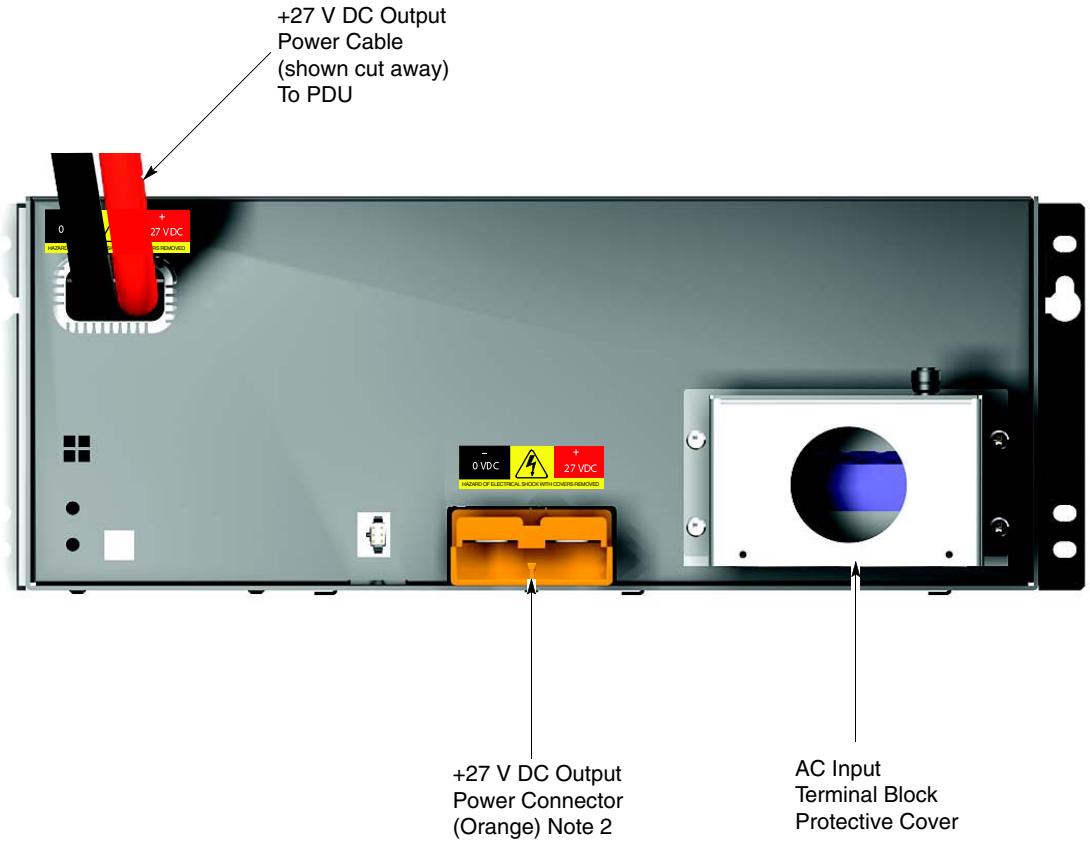


Figure 1-17 220 V AC PSM shelf rear panel detail



NOTES:
1. Equipment shown is typical. The actual equipment appearance may vary slightly.
2. The +27 V DC Output connector may be connected to back-up batteries, but usage is optional.

ti-cdma-05917.eps

Optional RGPS Head Equipment Identification

The information in this section of the manual will aid in identifying the optional RGPS head equipment.

Any of the following RGPS heads may be used with the UBS Macro BTS:

- STLN6594 (Motorola part number)
- 0186012H04 (Motorola part number)

The STLN6594 RGPS head is recommended and ships with the UBS Macro BTS when the optional RGPS head is ordered.

The 0186012H04 RGPS head is an alternate and may be in use in the field as a replacement spare.

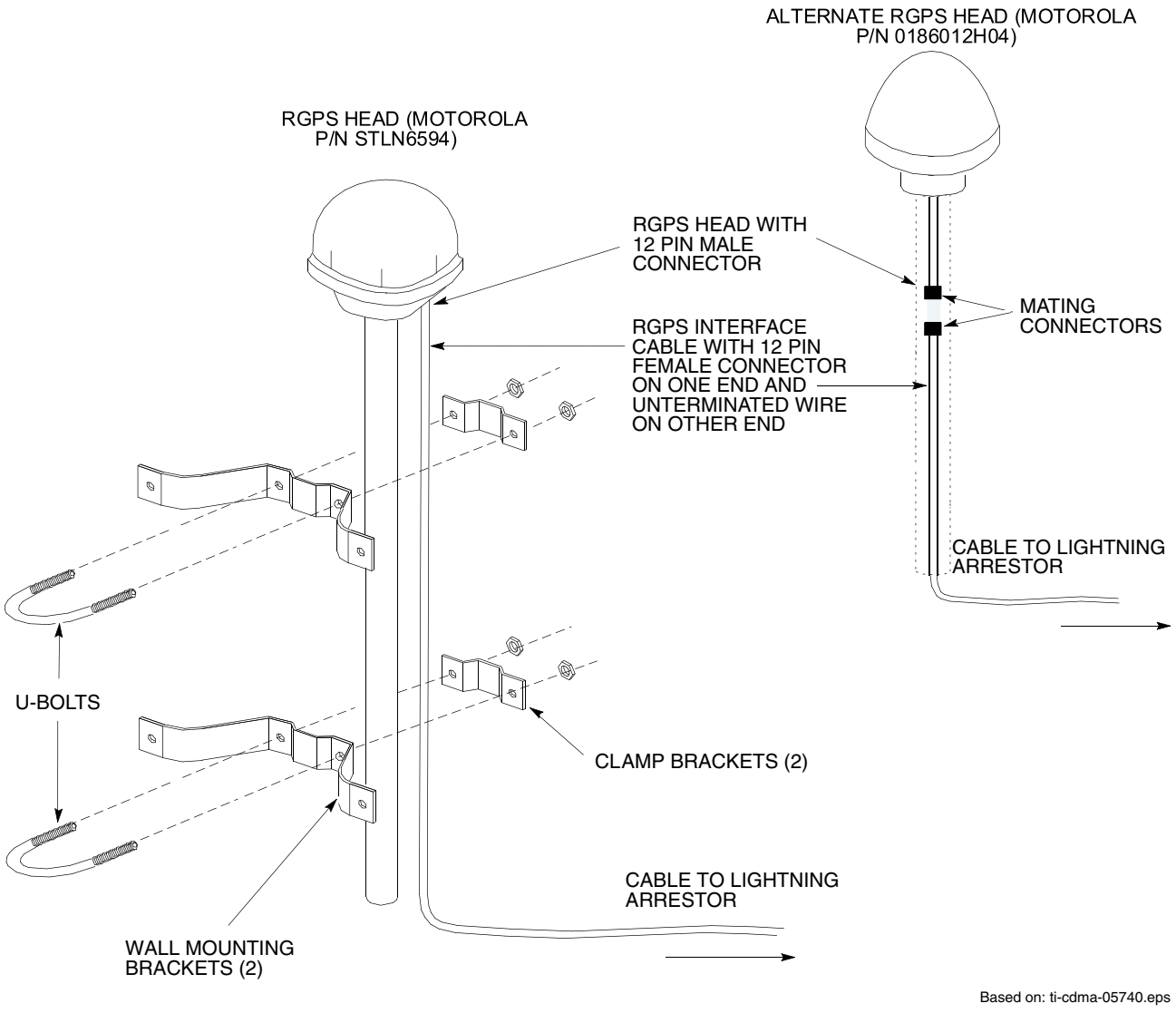
NOTE

Motorola recommends that the STLN6594 RGPS head be used as a replacement spare.

RGPS Head Mounting Method

The RGPS head is mounted outdoors on a pole. The pole is typically mounted to a wall. See Figure 1-18 for details.

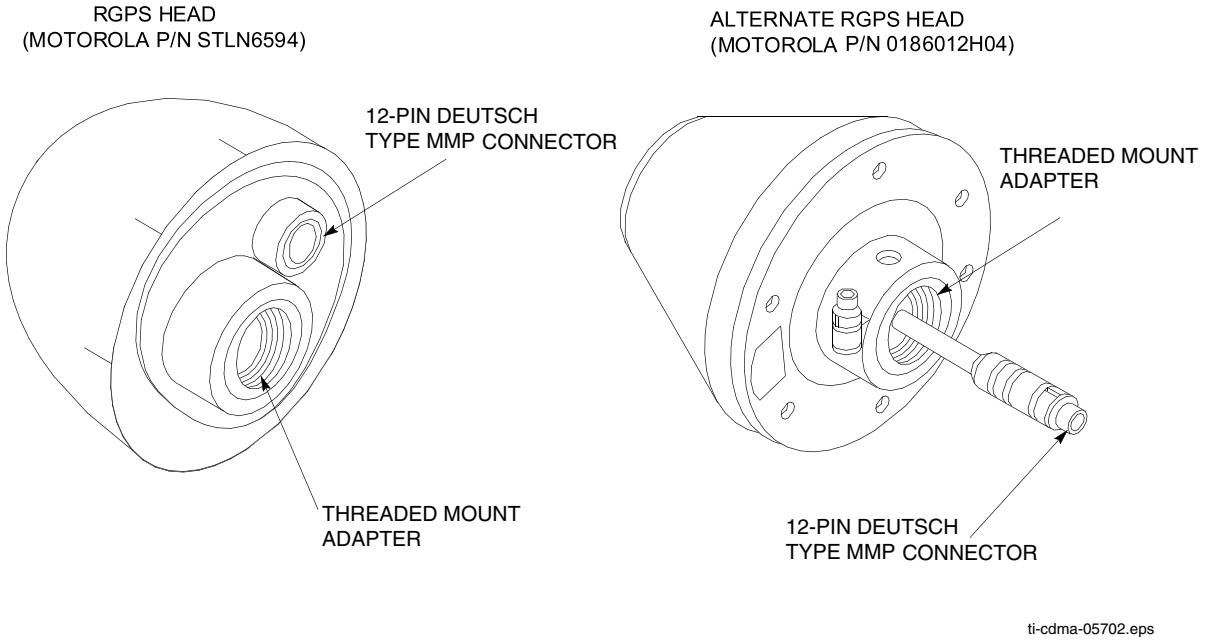
Figure 1-18 RGPS Head Mounting Details



RGPS Head Details

The STLN6594 and 0186012H04 RGPS heads have similar connectors and threaded pole mount adapters, but the implementation and location of these items varies between the two heads (see Figure 1-19).

Figure 1-19 RGPS Head Equipment



Chapter

2

Reference Procedures Performed At BTS Site

Reference Procedures Performed at BTS Site

Introduction

The procedures in this chapter are referenced during various FRU replacement procedures and are performed by the technician at the BTS site. These reference procedures include the following:

- Frame power down and power-up sequence

Frame Power Down & Power-Up Procedures

Powering Down the Frame

NOTE

Prior to powering down the frame, perform the steps in Procedure 3-2 Shutdown site signaling functions procedure for a packet BTS on page 3-5 .

Power down the frame by performing the steps in Procedure 2-1.

Procedure 2-1 Powering Down the Frame

AT THE BTS SITE	
1	Set all PDU DC circuit breakers to **OFF** (pulled out) in the following sequence (see Figure 1-12 PDU front panel detail on page 1-42): • XMI 1 through XMI 4 (up to four breakers) • DMI 1 through DMI 5 (up to five breakers) • SSI 1 through SSI 2 (up to two breakers) • ACC 1 through ACC 2 (up to two accessory breakers)
2	If the BTS site is equipped with backup batteries, set all battery circuit breakers to the **OFF** position.
3	For a +27 V DC powered UBS Macro frame, set the facility circuit breaker controlling external +27 V DC power to the frame to the **OFF** position. For a — 48 V DC powered UBS Macro frame, set the facility circuit breaker controlling external 48 V DC power to the PSM to the **OFF** position. For an AC powered UBS Macro frame, set the facility circuit breaker controlling external AC power to the PSM to the **OFF** position.

Power-up the Frame

Power-up the frame by performing the steps in Procedure 2-2.

Procedure 2-2 Powering Up the Frame

AT THE BTS SITE	
1	For a +27 V DC powered UBS Macro frame, set the facility circuit breaker controlling external +27 V DC power to the frame to the **ON** position. For a — 48 V DC powered UBS Macro frame, set the facility circuit breaker controlling external 48 V DC power to the PSM to the **ON** position. For an AC powered UBS Macro frame, set the facility circuit breaker controlling external AC power to the PSM to the **ON** position.
2	On the PDU, set the SSI circuit breakers to the **ON** position.
3	Check that the STATUS LED on the front panel of the each SSI is lighted.
4	 **NOTE** For BTSs with more than one DMI, during troubleshooting or for forcing one DMI to synchronize code and data with the other DMI, it may be desired to bring up a particular DMI as the site master. In this case, power up the DMI that should be site master first, wait 1 minute, and then power up the other DMI that should be non-site master. The non-site master DMI will synchronize its code load and base file with the site master DMI. On the PDU, set the DMI circuit breakers for all of the equipped DMIs to the **ON** position. Circuit breakers for any DMIs that are not equipped, should be set to the **OFF** position.
5	Check that the ST LED on the front panel of each DMI is lighted.
6	Confirm that the DMI fans are on and operating by listening for fan motor hum and feeling that air is being exhausted from the rear of the DMIs.
7	On the PDU, set the XMI circuit breakers to the **ON** position. There may be up to four XMI circuit breakers; XMI 1 through XMI 4. Circuit breakers for any XMIs that are not equipped, should be set to the **OFF** position.
8	Check that the ST/ALM LED on the front panel of each the XMI is lighted. Confirm that the XMI fans are on and operating by listening for fan motor hum and feeling that air is being exhausted from the rear of the XMI.
9	On the PDU, set the ACC circuit breakers to the **ON** position only if there are accessories connected to the PDU otherwise set these breakers to the **OFF** position.
10	If the BTS site is equipped with backup batteries, set all battery circuit breakers to the **ON** position.

NOTE

After powering up the frame, perform the steps in Procedure 3-3 Restore site signaling operations procedure for a packet BTS on page 3-10.

Chapter

3

Reference Procedures Performed At OMCR

Reference procedures performed at OMCR

Introduction

The procedures in this chapter are referenced during various FRU replacement procedures and are performed by the OMCR operator. These reference procedures include the following:

- Accessing OMCR CLI window
- Packet BTS shutdown and restore procedures for BTS site

Accessing OMCR CLI window

Accessing OMCR CLI window

Many of the FRU procedures require the OMCR operator to manipulate BTS logical devices. This is achieved using UNO or the OMCR (Operations and Maintenance Center - Radio) Command Line Interface (CLI).

The operator enters commands using UNO or OMCR CLI.

NOTE

The command dependent replacement procedures cannot be performed, if there are any issues affecting the UNO or the OMCR CLI operations.

OMCR CLI access procedure

The following procedure is performed by the OMCR operator at the OMCR terminal.

Procedure 3-1 Login and access alarm window procedure

1	Login to the OMCR by entering the user name.
2	Enter the password at the system prompt.
3	Type CLI at the system prompt to open an OMCR CLI window.
4	Open an UNO Alarm Manager (AM) window by performing the following: **1.** Login to UNO as **unoadmin** **2.** Set the env variable DISPLAY to the IP address of the port where UNO windows should be run. **3.** Type **uno &**. The main UNO window that was set previously should appear on the display. **4.** Choose icon alarm manager from the main uno window and set the appropriate filter – *OR* – choose Command Center icon -> BTSSDevices -> right click on wanted bts icon and choose AlarmManager (filter will be set for selected bts alarms).
5	Verify that the filter display is set to the BTS-# where the work is being performed. This ensures that any BTS-# alarms, encountered while installing the hardware, can be observed and rectified.

Packet BTS shutdown procedures

Shutdown site signaling functions for a packet BTS

If a complete site shutdown is required to support maintenance or upgrade operations, follow Procedure 3-2 to disable the packet BTS site.

CAUTION

This site shutdown procedure takes the target BTS out-of-service (OOS) but does not affect other BTSs. To minimize system impact, it may be advisable (but not necessary) to perform this procedure during a maintenance window.

NOTE

- The **EDIT BTS REDIRECT** or **REDIRECT2** command does NOT affect calls in progress and does NOT move these calls to another BTS. The command prevents future calls from being originated on the targeted BTS and also redirects subscribers to another site/carrier. If active call processing is still taking place in the target BTS, wait for any active calls to terminate before locking/disabling the BTS resources.
- Refer to the *System Commands Reference* manual for a complete explanation of OMCR commands.

Procedure 3-2 Shutdown site signaling functions procedure for a packet BTS

At the OMCR	
1	Open a CLI window. Refer to Accessing OMCR CLI window on page 3-3.
2	**NOTE** • The recommended shutdown technique is to redirect subscribers to another site/carrier and then wait for any active calls to terminate before locking/disabling the BTS. • **REDIRECT** prevents future calls from being originated on the targeted resource. Perform **one** of the following: • To redirect subscribers and then wait for any active calls to terminate before disabling the BTS, go to step 3. • To lock/disable the BTS when there is **no concern** for redirecting subscribers and waiting for any active calls to terminate, perform step 23 through step 26 **only**.
3	**NOTE** The **REDIRECT** command is used to invoke the **REDIRECT2** command which is then used to redirect subscribers to a different CDMA carrier frequency. **REDIRECT2** is the preferred command if an alternate CDMA carrier is available. Enter the following command at the prompt to display the status of the BTS signaling redirect parameters for all carriers equipped for the BTS: `omc-000000>DISPLAY BTS-<bts#> REDIRECT`
4	Record the values shown in the system display response resulting from performing step 3. **NOTE** These values are needed to answer the prompts for the **EDIT BTS REDIRECT** command when restoring signaling operations at the end of the maintenance or upgrade procedure.

Continued

Procedure 3-2 Shutdown site signaling functions procedure for a packet BTS (Continued)

5

NOTE

This step edits the **REDIRECT** parameters so that the Global Service Redirect Message to be broadcast on the paging channel redirects all subscribers away from the BTS and onto a different BTS or system.

Enter the following command at the prompt:

`omc-000000>`**`EDIT BTS-<bts#> REDIRECT!`**

The system prompts to enter each command parameter value one at a time. Answer the prompts in the following order with the entries shown:

`<accolc0>` enter **Y**, `<accolc1>` enter **Y**, . . . `<accolc15>` enter **Y**
(All Access Overload Classes **must** be set to yes to ensure that all subscribers are redirected.)

`<returniffail>` enter **N**
(**Must** be set to no to ensure that subscribers do not return if redirect is unsuccessful.)

`<recordtype>` enter **1** or **2**
(A value of 2 will invoke `REDIRECT2` which is used to redirect subscribers to a CDMA channel at a neighbor site.

`<expectedsid>` enter **13**
(Use the Area ID the subscriber units should expect to find on the system where they are being redirected. This example uses 13. The valid range is 0–32767; the default is 0.)

`<ignorecdma>` enter **Y**

`<sysordering>` enter **CUSTOM**
(The system acquisition ordering value tells the mobiles the order to use when attempting to obtain service on the different analog systems. Valid values are:

- CUSTOM — use custom system selection
- AONLY — try the A system only
- BONLY — use the B system only
- AFIRST — try the A system first. If unsuccessful, try the B system
- BFIRST — try the B system first. If unsuccessful, try the A system
- AORB — try A or B. If unsuccessful, try the alternative system

CUSTOM is the default.)
`<rotatetimer>` enter **4**
(Call processing continuously rotates in circular right-shifts, the Y/N values of Access Overload Class Redirect Flags 0 to 9. Values are shifted one flag at the end of the timer period; then timer restarts. Valid values are 0–255; 4 is the default.)

Continued

Procedure 3-2 Shutdown site signaling functions procedure for a packet BTS (Continued)

6	After all parameters are entered, the system displays the command to be sent and the prompt below. Verify the command syntax is correct. `omc-000000>Accept [yes/no]?`
7	At the prompt shown in step 6, enter **Y** to accept the command or **N** to go bottom and enter the correct value(s).
8	Enter the following command at the prompt to display the status of the signaling **REDIRECT** parameters to verify that the applicable BTS is ready for global redirect: `omc-000000>`**`DISPLAY BTS-<bts#> REDIRECT`**
9	Ensure that the values in the system display response match the values input in step 5.
10	Enter the following command at the prompt to display the status of the BTS signaling redirect parameters for all carriers equipped for the BTS: `omc-000000>`**`DISPLAY BTS-<bts#> REDIRECT2`**
11	Record the values shown in the system display response resulting from step 10. **NOTE** These values are used to answer the prompts for the **EDIT BTS REDIRECT2** command when restoring signaling operations at the end of the replacement procedure.

12	**NOTE**
	
	This step edits the **REDIRECT2** parameters so that the Global Service Redirect Message to be broadcast on the paging channel redirects all subscribers away from the BTS with the failed equipment and onto a CDMA channel at a neighbor site.
	
	Enter the following command at the prompt:
	
	`omc-000000>`**`EDIT BTS-<bts#> REDIRECT2!`**
	
	The system prompts to enter each command parameter value one at a time. Answer the prompts in the following order:
	
	`expecting an integer number (from 0 to 65535)`
	`<EXPNID= ?>`

Continued

Procedure 3-2 Shutdown site signaling functions procedure for a packet BTS (Continued)

(Use the Network ID the subscriber units should expect to find on the system they are being redirected to.)

```
expecting an integer number (from 0 to 2047)
<chan1= ?>, <chan2= ?> . . . <chan15= ?>
```

(A list of CDMA channels for neighbor sites that the subscriber units can use for redirection.)

```
expecting an enumerated value:
CDMA1900  CDMA2100  CDMA800  CDMA900  JAPANCDMA
<BANDCLASS= ?>
```

(Use CDMA1900 for 1900 MHz systems, CDMA2100 for 2100 MHz systems, and CDMA800 for 800 MHz systems. This example uses 1900 MHz.)

13 After all parameters are entered, the system displays the command to be sent and the prompt below. Verify the command syntax is correct.

```
omc-000000>Accept [yes/no]
```

14 At the prompt shown in step 13, enter **Y** to accept the command or **N** to go bottom and enter the correct value(s).

15 Enter the following command at the prompt to display the status of the BTS signaling **REDIRECT2** parameters to verify that the BTS is ready for maintenance:

```
omc-000000>DISPLAY BTS-<bts#> REDIRECT2
```

16 Ensure that the values in the system display response match the values input in step 12.

17 Enter the following command at the prompt to display the existing congestion control parameters for all carriers equipped for the BTS:

```
omc-000000>DISPLAY BTS-<bts#> CONGESTCONF
```

18

NOTE

This step edits the value of the Global Service Redirection Flag (**GLOBALREDIRECT**) in the congestion control parameters so that the Global Service Redirect Message is broadcast on all of the sector paging channels at the BTS.

Enter the following command at the prompt using the applicable BTS number:

```
omc-000000>EDIT BTS-<bts#> CONGESTCONF!
```

Continued

Procedure 3-2 Shutdown site signaling functions procedure for a packet BTS (Continued)

19	The system prompts to enter each control parameter value one at a time. Skip through the prompts until reaching the following, and enter the parameter shown: `<globalredirect>`**ENABLE** (This will force the Global Service Redirect Message to be broadcast on all of the sector paging channels at the BTS.)
20	When the system displays the values of the control parameters and the following prompt, verify that only the **GLOBALREDIRECT** value changed. `omc-000000>Accept [yes/no]?`
21	If only the **GLOBALREDIRECT** value changed, enter **Y** to accept the change. (When the change is accepted, the Global Service Redirection Message is sent over the sector paging channels. All subscribers are redirected away from the BTS and onto a different system or CDMA carrier channel. This effectively shuts down the BTS.)
22	Verify that the **CONGESTCONF** Global Redirect is enabled for each carrier at the BTS by entering the following command at the prompt: `omc-000000>`**DISPLAY BTS-<bts#> CONGESTCONF**
23	Enter the following command at the prompt to display the status of all devices at the BTS: `omc-000000>`**DISPLAY BTS-<bts#> STATUS**
24	Record all devices that are listed as `OOS_AUTOMATIC` in the response to step 23. **NOTE** This information will be used for later reference when restoring site signaling operations.
25	Wait for three minutes to allow any active calls to terminate then go the next step.
26	Lock/disable the BTS by entering **either** of the following commands at the prompt: • `omc-000000>`**DISABLE BTS-<bts#> UNC** • `omc-000000>`**LOCK BTS-<bts#>**

Packet BTS start-up procedures

Restore site signaling operations for a packet BTS

Restore site signaling operations according to Procedure 3-3.

Procedure 3-3 Restore site signaling operations procedure for a packet BTS

At the OMCR	
1	Open a CLI window. Refer to Accessing OMCR CLI window on page 3-3.
2	Unlock/enable the BTS by entering **either** of the following commands at the prompt: • omc-000000>**ENABLE BTS-<bts#> UNC** • omc-000000>**UNLOCK BTS-<bts#>**
3	Verify that the system automatically returns a Network Element State Change Event message for the BTS. These messages show the old and new states for the devices. The new state should be UNLOCKED/ENABLED/ACTIVE.
4	Display the status of all devices at the BTS by entering the following command at the prompt: omc-000000>**DISPLAY BTS-<bts#> STATUS**
5	Examine the response to make sure there are not more OOS_AUTOMATIC devices than were recorded in step 24 of Procedure 3-2. **NOTE** Devices that were previously OOS_AUTOMATIC may now be INS.
6	Perform **one** of the following depending on redirection actions taken in Procedure 3-2: • If subscribers **were not** redirected according to the steps in Procedure 3-2, stop here. • If subscribers **were** redirected according to Procedure 3-2, perform the remaining steps of this table.
7	Enter the following command at the prompt to display the congestion control parameters for all carriers equipped for the BTS: omc-000000>**DISPLAY BTS-<bts#> CONGESTCONF**

Continued

Procedure 3-3 Restore site signaling operations procedure for a packet BTS (Continued)

8	 **NOTE** This step edits the value of the Global Service Redirection Flag (**GLOBALREDIRECT**) in the congestion control parameters so that the Global Service Redirect Message is only broadcast on the sector paging channel when there is traffic congestion in the sector Enter the following command at the prompt using the applicable BTS number: omc-000000>**EDIT BTS-<bts#> CONGESTCONF !**
9	The system prompts to enter each control parameter value one at a time. Skip through the prompts until reaching the following, and enter the parameter shown: <globalredirect>**DISABLE** (This will revert the Global Service Redirect Message to congestion control.)
10	When the system displays the values of the control parameters and the following prompt, verify that only the **GLOBALREDIRECT** value changed. omc-000000>Accept [yes/no]?
11	If only the **GLOBALREDIRECT** value changed, enter **Y** to accept the change. (Now the Global Service Redirection Message will only be sent over the sector paging channels when there is traffic congestion in the sector.)
12	Verify that the **CONGESTCONF globalredirect** is disabled for each carrier at the BTS by entering the following command at the prompt: omc-000000>**DISPLAY BTS-<bts#> CONGESTCONF**
13	Display the status of the signaling **REDIRECT** parameters for all carriers equipped for the applicable BTS by entering the following command at the prompt: omc-000000>**DISPLAY BTS-<bts#> REDIRECT**
14	Examine the values in the system display response to be sure they match the values input in step 5 of Procedure 3-2.

Continued

Procedure 3-3 Restore site signaling operations procedure for a packet BTS (Continued)

15	 **NOTE** In this step, use the values recorded in step 4 of Procedure 3-2 to answer the prompts for the **EDIT BTS REDIRECT** command, **except** for <recordtype>, enter **2**. Restore the values of all **REDIRECT** parameters by entering the following command at the prompt: omc-000000>**EDIT BTS-<bts#> REDIRECT !** The system prompts to enter each command parameter one at a time. Answer the prompt in the following order:  **NOTE** The following specified values are consistent with the original example. Actual values may vary. <accolc0> enter **N**, <accolc1> enter **N**, . . . <accolc15> enter **N** <returniffail> enter **N** <recordtype> enter **2** <expectedsid> enter **0** <ignorecdma> enter **N** <sysordering> enter **CUSTOM** <rotatetimer> enter **4**
16	After all parameters are entered, the system displays the command to be sent and the prompt below. Verify the command syntax is correct. omc-000000>Accept [yes/no]?
17	At the prompt shown in step 16, enter **Y** to accept the command or **N** to go bottom and enter the correct value(s).
18	Enter the following command at the prompt to display the status of the signaling **REDIRECT** parameters: omc-000000>**DISPLAY BTS-<bts#> REDIRECT**
19	Ensure that the values in the system display response matches with the values input by the operator in step 15.

Chapter

4

E-GPS (External-GPS) Replacement Procedures

E-GPS (External-GPS)

E-GPS Description

The E-GPS is located in the UBS Macro BTS frame and is mounted at the very top of the frame.

The E-GPS may be used instead of the optional Remote GPS (RGPS) head.

The E-GPS contains a GPS Receiver (GPSR) that requires connection to an external GPS RF antenna signal. The E-GPS is considered to be local with respect to the UBS Macro BTS frame, while the RGPS head is remotely located with respect to the UBS Macro BTS frame.

All cable connections to the E-GPS are made on the E-GPS front panel (see Figure 1-4 E-GPS I/O Details on page 1-31).

The E-GPS **SSI-GPS** connector is cabled to the SSI **RGPS** connector. This connection allows the UBS Macro BTS frame to supply DC power to the E-GPS. In addition, control/data signals are exchanged between the DMI controller and the E-GPS via this connection.

The E-GPS **GPS-ANT** connector is cabled to the external GPS RF antenna cable connector. This coaxial cable connection allows the E-GPS to receive RF signals from GPS satellites as well as supply DC power to the GPS RF antenna preamplifiers.

The E-GPS receiver successfully tracks and acquires GPS satellites. The receiver detects GPS RF signals and extracts a 1 Pulse Per Second (1PPS) timing signal. This 1PPS signal is applied to the DMI controller via the **SSI-GPS** connector. The DMI controller contains an internal Motorola Stability Oscillator (MSO) that is synchronized to the 1PPS timing signal and locked to the GPS time base. If satellite tracking is lost or if the E-GPS fails, the MSO free runs, but can maintain system timing for up to 8 hours.

If the UBS Macro BTS frame is equipped with an optional Quartz High Stability Oscillator (QHSO), the DMI controller selects the QHSO as the backup synchronization source instead of the MSO. The QHSO can maintain system timing for up to 24 hours.

System Impact/Considerations

NOTE

Performing this replacement procedure should not require BTS downtime or impact call processing because of MSO or QHSO backup. However E-GPS downtime will occur. And alarms will be reported.

NOTE

A failed E-GPS should be replaced immediately after failure detection and within the applicable MSO/QHSO backup time period (i.e., up to 8 hours MSO and up to 24 hours QHSO).

NOTE

After the replacement E-GPS is re-connected and powered up, it may take up to 30 minutes for the replacement E-GPS to successfully track and acquire satellites.

Table 4-1 FRU Replacement Conditions

FRU	Ref Designator	What to Shut Down...
E-GPS	E-GPS	Nothing; FRU is hot swappable and BTS system timing is backed up by either MSO (for up to 8 hours) or QHSO (for up to 24 hours).

Required Items

Documents

- *1X UBS Macro BTS Optimization/ATP manual*

Tools

- T25 TORX bit
- Torque driver

Torque Requirements

- M5 thumbscrew - 4.77 N-m (42 in-lb)

Replacement Unit

- E-GPS (Motorola model STTG4052)

Prerequisite

Before You Begin

Before you begin, record the pertinent information in the following table (see Table 4-2):

Table 4-2 Item Number Replacement List

Item	Number
BTS number	
Failed E-GPS number	

E-GPS Replacement Procedure

Perform the steps in Procedure 4-1to replace the E-GPS.

Procedure 4-1 E-GPS Replacement Procedure

AT THE BTS SITE	
1	Disconnect all cables from the E-GPS front panel. If desired, tag all cables prior to disconnecting them. Move cables out of the way.
2	Using a T25 TORX bit and driver, loosen the thumbscrew on the module front panel. Using your thumb and finger, completely loosen the captive thumbscrew.
3	Pull up on the thumbscrew to start removing the module. Then grasp the module front panel and pull the module completely out of the E-GPS mounting bracket.
4	With the replacement module properly positioned in front of the E-GPS mounting bracket, align the module bottom side rails with the guide channels of the mounting bracket. Slide the module completely into the mounting bracket.
5	Align the module thumbscrew with the threaded hole in the mounting bracket. Using a T25 TORX bit and driver, tighten the thumbscrew to 4.77 N-m (42 in-lb).
6	Reconnect all cables to the E-GPS front panel.  **NOTE** After the replacement E-GPS is re-connected and powered up, it may take up to 30 minutes for the replacement E-GPS to successfully track and acquire satellites.
7	 **NOTE** If optimization is to be performed at this time, see **Optimization Required** following this table.

Optimization Required

Consult the *1X UBS Macro BTS Optimization/ATP manual* for the following optimization/test instructions:

- Timing Initialization/Verification
- BTS Device Database Audit
- BTS Device Database Update

Chapter

5

IDRF Replacement Procedure

IDRF (Integrated Duplexer RX Filter)

IDRF Description

The IDRF is available in either the 800 MHz or 1.9 GHz RF band.

The IDRF (Integrated Duplexer RX Filter) includes:

- TX/RX bandpass filters
- Bi-directional TX and RX antenna path couplers.

The IDRF is a passive device requiring no DC input operating power.

The IDRF allows the sector TX and main RX RF carrier signals to share the same antenna. It also allows connection for a sector diversity RX RF antenna. The bi-directional antenna couplers provide forward and reflected signal port connections for antenna signal sampling and signal injection. The coupled ports are typically used for connection to test equipment.

The UBS Macro BTS frame is typically equipped with one IDRF per sector. Figure 1-2 Low capacity UBS Macro BTS starter frame (1800 mm rack) on page 1-28 and Figure 1-3 UBS Macro BTS mid-capacity frame (1800 mm rack) on page 1-30 show the location of the IDRFs within the UBS Macro frame.

Figure 1-5 800 MHz IDRF I/O Details on page 1-32 and Figure 1-6 1.9 GHz IDRF I/O Details on page 1-33 show the locations of IDRF RF I/O port connectors.

System Impact/Considerations

NOTE

Performing this replacement procedure will cause downtime for all XMIs which will suspend all call processing for the BTS.

The removal of a failed IDRF requires that all XMIs be dekeyed.

All of the XMIs will be disabled/locked to ensure that the transmitters are dekeyed. This will interrupt all TX RF sector carriers.

Removal of the IDRF interrupts the associated sector TX/RX antenna paths.

Alarms will be reported during the replacement procedure.

After replacing an IDRF, the associated sector RX/TX paths must be optimized following the procedure listed in the *1X UBS Macro BTS Optimization/ATP* manual.

Table 5-1 IDRF Replacement Conditions

FRU	Ref Designator	What to Shut Down...
Integrated Duplexer RX Filter	IDRF 1, 2, 3 (TX/RX main antenna & RX diversity; sectors 1, 2, 3)	From the OMCR, lock all XMIs.

Required Items

Documents

- *1X UBS Macro BTS Optimization/ATP* manual.

Tools

- T25 TORX bit
- Torque driver
- 19 mm open-end wrench (for N-type connectors)
- SMA break over wrench - 1.02 N-M (9 in-lb)

Torque Requirements

- M5 mounting screws - 4.77 N-m (42 in-lb)

Replacement Unit

- China Full Band 800 MHz IDRF (Motorola model STFN4009)
- India Full Band 800 MHz IDRF (Motorola model STFN4010)
- US Full Band 800 MHz IDRF (Motorola model STFN4015)
- US A-band 800 MHz IDRF (Motorola model STFN4016)
- US B-band 800 MHz IDRF (Motorola model STFN4017)
- 1.9 GHz IDRF (Motorola model STFG4055)

Prerequisite

NOTE

Coordinate this repair task with the OMCR operator.

Before You Begin

Record the pertinent information in Table 5-2.

Table 5-2 Item Number Replacement List

Item	Number
BTS	
Failed IDRF number	

IDRF Replacement Procedure

NOTE

This procedure requires working on or around circuitry extremely sensitive to ESD. Wear a conductive, high impedance wrist strap during the procedure.

Follow appropriate safety measures.

Perform the procedures in Procedure 5-1 to replace a failed IDRF.

Procedure 5-1 Replacing an IDRF

AT THE OMCR	
1	Open a CLI window. Refer to Accessing OMCR CLI window on page 3-3.
2	It will be helpful if the OMC-R operator executes “ENABLE EVENTS" command at the CLI session of the OMC-R to monitor alarms. This command is optional and may not be useful if executed during a high CPU utilization time.

Continued

Procedure 5-1 Replacing an IDRF (Continued)

NOTE

The OMCR operator must lock all XMIs before the failed IDRF can be removed.

3	Lock each XMI by entering the following command at the prompt: omc-000000>**LOCK XMI-<bts#>-<xmi#> UNC**
4	Display the status of each XMI, by entering the following command at the prompt: omc-000000>**DISPLAY BTS-<bts#> STATUS** Verify that each XMI is in an OOS_MANUAL state.
AT THE BTS SITE	
5	Working at the top front of the UBS Macro BTS frame, tag and disconnect all cables from the front of failed IDRF. Move cables out of the way.
6	Using a T25 TORX driver, remove the four screws that secure the IDRF to the IDRF shelf. There is one screw at each corner of the IDRF mounting plate.
7	Grasp the IDRF. Lift it up and out of the of the IDRF shelf.
8	Disconnect all cables from the bottom of the failed IDRF.
9	Reconnect all cables to the bottom of the replacement IDRF.
10	Position the replacement IDRF in the proper orientation and insert it into the IDRF shelf.
11	Secure the replacement IDRF to the IDRF shelf with the four mounting screws. Using a T25 TORX driver, tighten the mounting screws to 4.77 N-m (42 in-lb).
12	Reconnect all cables to the replacement IDRF.
13	This completes the physical installation of the FRU. If optimization is to be performed at this time, see **Optimization required** following this table.
AT THE OMCR	
14	Unlock each XMI by entering the following command at the prompt: omc-000000>**UNLOCK XMI-<bts#>-<xmi#> UNC**
15	Display the status of each XMI by entering the following command at the prompt: omc-000000>**DISPLAY BTS-<bts#> STATUS** Verify that each XMI is in an INS_ACTIVE state.
16	From the OMCR, monitor the Alarm Manager. Verify that old alarms are cleared and no new alarms are reported.

Optimization Required

Perform the following BTS Optimization/ATP procedures for the affected sector:

- TX Path Calibration Audit
- RSSI Test (FER Test is optional)

Refer to the *1X UBS Macro BTS Optimization/ATP* manual.

Chapter

6

SSI Replacement Procedures

SSI (Site Span I/O) Module

SSI Description

The first instance of the SSI is located in the right, front side of the IDRF shelf of the UBS Macro BTS Frame. For SSI location, refer to the applicable Figure 1-1 UBS Macro BTS low-tier/low-capacity frame (1000 mm rack) on page 1-27 through Figure 1-3 UBS Macro BTS mid-capacity frame (1800 mm rack) on page 1-30.

For SSI connector identification, refer to Figure 1-7 SSI front panel details on page 1-35 and Figure 1-8 SSI rear panel details on page 1-36.

The SSI housing has a built-in mounting mechanism (see Figure 1-8 SSI rear panel details on page 1-36). This mounting mechanism allows the SSI to be mounted in the appropriate shelf. One end of the SSI housing has two hooks that engage with two slots on the appropriate shelf. The opposite end of the SSI housing has a right angle flange with two thumbscrews that secure the SSI to the appropriate shelf.

The SSI operates from +27 V DC power supplied from a PDU **SSI** power connector that is cabled to the POWER IN connector on the front of the SSI. A PDU **SSI** 20A circuit breaker controls DC input power for the SSI.

The SSI contains I/O interface circuitry between the DMI and ancillary/external electronic equipment. The specific equipment I/O and SSI connectors are as follows:

- E-GPS module I/O or RGPS head I/O or GPS Synch Sharing Input — RGPS 15-pin connector (DC operating power to the E-GPS module/RGPS head is provided via this connector).
- Buffered BTS system time synchronize signal output for daisy chaining multiple frames at a BTS site to a common synchronization source — SYNC SHARING 15-pin connector.
- External 10 MHz frequency reference input — EXT REF IN BNC connector.
- Frequency reference output to test equipment — FREF OUT BNC connector.
- Time reference output to test equipment — TREF OUT BNC connector.
- ALARM/CONTROL Connector on Optional PSM Shelf — PSM 50-pin connector.
- Customer alarm input/output devices (up to 24 inputs & up to 8 outputs) — CUSTOMER IP 1-12 OP 1-4 and CUSTOMER IP 13-24 OP 5-8 two 37-pin connectors.
- 10/100 BaseT Ethernet serial data for connection of LMF or other equipment — CRMS/LMT CUSTOMER ENET RJ-45 connector.
- IP-packet backhaul, using one of the following connection methods:
  - Span I/O for T1/E1 balanced — SPAN 37-pin connector.
  - Optional Span I/O for E1 unbalanced daughter card to SPAN 37-pin connector — 16 BNC connectors, 2 per Span, RX and TX.
  - Open Transport Interface (OTI) — two, BACKHAUL ENET, 10/100 BaseT Ethernet RJ-45 connectors.
- QHSO module I/O — HSO 9-pin connector (DC operating power to the QHSO is provided via this connector).

System impact/considerations

NOTE

Performing this replacement procedure will cause BTS downtime and impact call processing.

The SSI is non-redundant. Alarms will be generated during the SSI replacement procedure.

The SSI is not hot swappable.

SSI removal requires powering off the SSI and disconnecting all of its cables. Operation of the following will be interrupted:

- E-GPS or RGPS whichever is applicable.
- QHSO
- ALARM/CONTROL for the optional PSM shelf
- LMF
- Customer alarm input/output devices
- IP-packet backhaul

The DMI controller will switchover to the DMI MSO as a backup reference source.

Call traffic processing through the site will be interrupted by the SSI replacement procedure.

Alarms will be reported.

Table 6-1 SSI Replacement Conditions

FRU	Ref Designator	What to Shutdown...
Site Span I/O Module	SSI	Shutdown site signaling functions and DC operating power to the SSI.

SSI LEDs

The following bi-color LED indicators are located on the SSI front panel by the DMI and RJ-45 connectors (see):

- ALARM
- INSTANCE
- STATUS

Table 6-2 shows the possible states for the SSI front panel LEDs and the corresponding indication.

Table 6-2 SSI LEDs States and Indications

ALARM LED State	INSTANCE LED State	STATUS LED State	Indication
Off	Off	Off	No DC Power to FRU
On	Orange	On	LED Indicator Test (temporary; 0.5 sec to 1 sec)
On	N/A	Off	FRU Failure
Off	N/A	N/A	No FRU Failure

Continued

Table 6-2 SSI LEDs States and Indications (Continued)

ALARM LED State	INSTANCE LED State	STATUS LED State	Indication
Flashing (1.5 sec-On/1 sec-Off)	N/A	N/A	Partial (soft) FRU Failure
N/A	N/A	Flashing (250 ms-On/250 ms-Off)	FRU Booting up (not active)
N/A	N/A	On	FRU Active
N/A	Green Flashing (0.5 sec-On/0.5 sec-Off cycle count) followed by 3 sec-Off	N/A	Instance Indicator and No FRU Cabling Connection Errors Detected. Cycle count equals FRU type instance; where: 1 flash = 1st instance, 2 flashes = 2nd instance, 3 flashes = 3rd instance, so on and so forth.
N/A	Red	N/A	FRU Cabling Connection Error Detected
N/A = LED state is Not Applicable to indication			

Required items

Documents

- *1X UBS Macro BTS Optimization/ATP* manual.

Tools

- Torque driver
- T25 TORX driver
- T20 TORX driver

Torque requirements

- SSI mounting bracket thumbscrews, optional E1 daughter card mounting screws, and optional QHSO thumbscrew – 2.37 N-m (21 in-lb)

Replacement unit

- SSI (Motorola model STLN6390)

Prerequisite

NOTE

Coordinate this repair task with the OMCR operator.

Before you begin

Before you begin, enter the information into the following replacement list table.

Table 6-3 Item Number Replacement List

Item	Number
BTS number	
Failed SSI number	

SSI replacement procedure

CAUTION

This procedure requires working on or around circuitry which is extremely sensitive to ESD. Wear a conductive, high impedance wrist strap during the procedure. Use appropriate safety measures.

NOTE

For frames with more than one DMI — during the time that the SSI is powered off or not connected to the DMIs, the DMIs will be rebooting continuously to try to re-establish communication with the SSI. To minimize the number of reboots that could eventually cause the DMIs to swap partitions to an older code load (i.e., 10 reboots), perform the "AT THE BTS SITE" portions of Procedure 6-1 and then Procedure 6-2 within 5 minutes. If this is not possible, it is recommended to power off all DMIs when the SSI is powered off. Then, power the DMIs back up after the new SSI is powered up.

To replace the SSI perform Procedure 6-1 and then Procedure 6-2.

Procedure 6-1 Removing the failed SSI

AT THE OMCR	
1	Shut down site signaling functions according to Procedure 3-2 Shutdown site signaling functions procedure for a packet BTS on page 3-5.
AT THE BTS SITE	
2	Power down the SSI by setting the corresponding PDU **SSI** 20A circuit breaker to the off position (pulled out).  **CAUTION** Make sure the PDU SSI circuit breaker is set to OFF.
	 **NOTE** You will be disconnecting multiple cables from connectors. If necessary, use masking tape and a marker and temporarily tag each cable as to the proper connector before disconnection.
3	Disconnect all of the cables connected to the SSI front panel connectors.
4	Use a T25 TORX bit/driver to completely loosen the two captive thumbscrews on the SSI bracket right angle flange. Disengage the thumbscrews from the mounting shelf.
5	Grasp the SSI bracket right angle flange. Slide the SSI toward the middle of the mounting shelf until the SSI bracket hooks are disengaged from the two slots on the shelf. Pull the SSI out of the shelf.
6	If the SSI is equipped with an optional E1 daughter card. Transfer the E1 daughter card from the failed SSI to the replacement SSI by performing step 3 through step 7 in Procedure 6-3 Replacing the E1 daughter card on page 6-11.
7	If the SSI is equipped with an optional QHSO. Transfer the QHSO from the failed SSI to the replacement SSI by performing step 5 through step 10 in Procedure 6-4 Replacing the QHSO on page 6-15.

Procedure 6-2 Installing the replacement SSI

AT THE BTS SITE	
1	Properly position the SSI so that the two hooks on the SSI bracket are engaged in the two slots on the mounting shelf.
2	Engage the two captive thumbscrews, on the SSI bracket right angle flange, into the mounting shelf.

Continued

Procedure 6-2 Installing the replacement SSI (Continued)

3	Using a T25 TORX bit and torque driver, tighten the thumbscrews to 2.37 N-m (21 in-lb).
4	Reconnect all of the cables to the corresponding connectors on the SSI front panel.
5	Power up the SSI by setting the corresponding PDU **SSI** 20A circuit breaker to the on position (pushed in).
AT THE OMCR	
6	Restore site signaling operations according to Procedure 3-3 Restore site signaling operations procedure for a packet BTS on page 3-10.

Optimization Required

After replacement of the SSI, perform the following BTS Optimization/ATP procedures:

- BTS Device Database Audit
- BTS Device Database Update
- Alarm Verification

Refer to the *1X UBS Macro BTS Optimization/ATP* manual for the optimization procedures.

Unbalanced E1 Daughter Card

Unbalanced E1 Daughter Card Description

The optional E1 daughter card is located on the front panel of the SSI.

For E1 daughter card location and connector identification, refer to Figure 1-7 SSI front panel details on page 1-35 .

The E1 daughter card has a 37-pin connector on the bottom of the card. This connector plugs into the SPAN 37-pin connector on the front panel of the SSI.

The E1 daughter card is secured to the SSI front panel via four corner screws.

The E1 daughter card is passive and does not require DC operating power. The circuitry on the E1 daughter card transforms 75–Ohm unbalanced span line I/O to 100–Ohm balanced SSI span line I/O.

The E1 daughter card supports up to eight span lines. It has 16 BNC connectors, 2 per span; RX and TX.

System impact/considerations

NOTE

Performing this replacement procedure will cause BTS downtime and impact call processing.

The E1 daughter card is non-redundant. Alarms will be generated during the E1 daughter card replacement procedure.

The E1 daughter card is hot swappable.

Call traffic processing through the site will be interrupted by the E1 daughter card replacement procedure.

Table 6-4 E1 Daughter Card Replacement Conditions

FRU	Ref Designator	What to Shutdown...
Unbalanced E1 Daughter Card	E1 Daughter Card	Shutdown site signaling functions.

Required items

Documents

- *1X UBS Macro BTS Optimization/ATP* manual.

Tools

- Torque driver
- T20 TORX driver

Torque requirements

- E1 daughter card mounting screws, 2.37 N-m (21 in-lb)

Replacement unit

- Unbalanced E1 daughter card (Motorola model STLN6327)

Prerequisite

NOTE

Coordinate this repair task with the OMCR operator.

Before you begin

Before you begin, enter the information into the following replacement list table.

Table 6-5 Item Number Replacement List

Item	Number
BTS number	
Failed E1 daughter card number	

E1 daughter card replacement procedure

CAUTION

This procedure requires working on or around circuitry which is extremely sensitive to ESD. Wear a conductive, high impedance wrist strap during the procedure. Use appropriate safety measures.

To replace the E1 daughter card perform the steps in Procedure 6-3.

Procedure 6-3 Replacing the E1 daughter card

AT THE OMCR	
1	Shut down site signaling functions according to Procedure 3-2 Shutdown site signaling functions procedure for a packet BTS on page 3-5.
AT THE BTS SITE	
	NOTE You will be disconnecting multiple cables from connectors. If necessary, use masking tape and a marker and temporarily tag each cable as to the proper connector before disconnection.
2	Disconnect all of the cables connected to the E1 daughter card front panel connectors.
3	Use a T20 TORX bit/driver to completely loosen and remove the four corner screws that secure the E1 daughter card to the SSI front panel.
4	Grasp the E1 daughter card. Pull the E1 daughter card away from the SSI until the 37–pin connectors disengage. Remove the E1 daughter card.
5	Position the replacement E1 daughter card so that the 37–pin connector on the bottom of the card can connect to the SPAN 37–pin connector on the SSI front panel. Push the E1 daughter card onto the SSI until the 37–pin connectors are fully engage.
6	Insert the four corner screws that secure the E1 daughter card to the SSI front panel.
7	Using a T20 TORX bit and torque driver, tighten the four corner screws to 2.37 N-m (21 in-lb).
8	Reconnect all of the cables to the corresponding connectors on the E1 daughter card front panel.

Continued

Procedure 6-3 Replacing the E1 daughter card (Continued)

NOTE

There is no optimization required for E1 daughter card replacement.

AT THE OMCR

9	Restore site signaling operations according to Procedure 3-3 Restore site signaling operations procedure for a packet BTS on page 3-10.

QHSO (Quartz High Stability Oscillator)

QHSO Description

The optional QHSO is located on the SSI rear panel (see Figure 1-8 SSI rear panel details on page 1-36).

The QHSO is an upgraded backup synchronization source for maintaining BTS system timing established/sourced by the E-GPS or Remote GPS (RGPS) head. QHSO backup is used instead of the internal DMI controller Motorola Stability Oscillator (MSO). The QHSO can maintain BTS system timing for up to 24 hours, as compared to 8 hours provided by the MSO.

The QHSO contains a high stability quartz crystal oscillator.

The QHSO has a 9–pin D-connector that connects to the HSO 9-pin connector on the SSI rear panel. This connection allows the SSI to supply DC power to the QHSO. In addition, control/data signals are exchanged between the DMI controller and QHSO through this connection. DC power, control and timing information for QHSO operation is in the one connector between the QHSO and SSI.

When the UBS Macro BTS frame is equipped with the optional Quartz High Stability Oscillator (QHSO), the DMI controller selects the QHSO as the backup synchronization source instead of the MSO. The QHSO can maintain system timing for up to 24 hours.

System impact/considerations

NOTE

Performing this replacement procedure should not require BTS down time or impact call processing because BTS system timing is being sourced by E-GPS or an RGPS head. However, QHSO down time occurs and alarms are reported.

The QHSO is backed up by the MSO on the DMI controller board. Alarms will be generated during the QHSO replacement procedure.

Call traffic processing through the BTS frame will not be interrupted by the QHSO replacement procedure.

The QHSO is hot swappable.

SSI DC operating power will not be shutdown and SSI cables will not be disconnected during the QHSO replacement procedure.