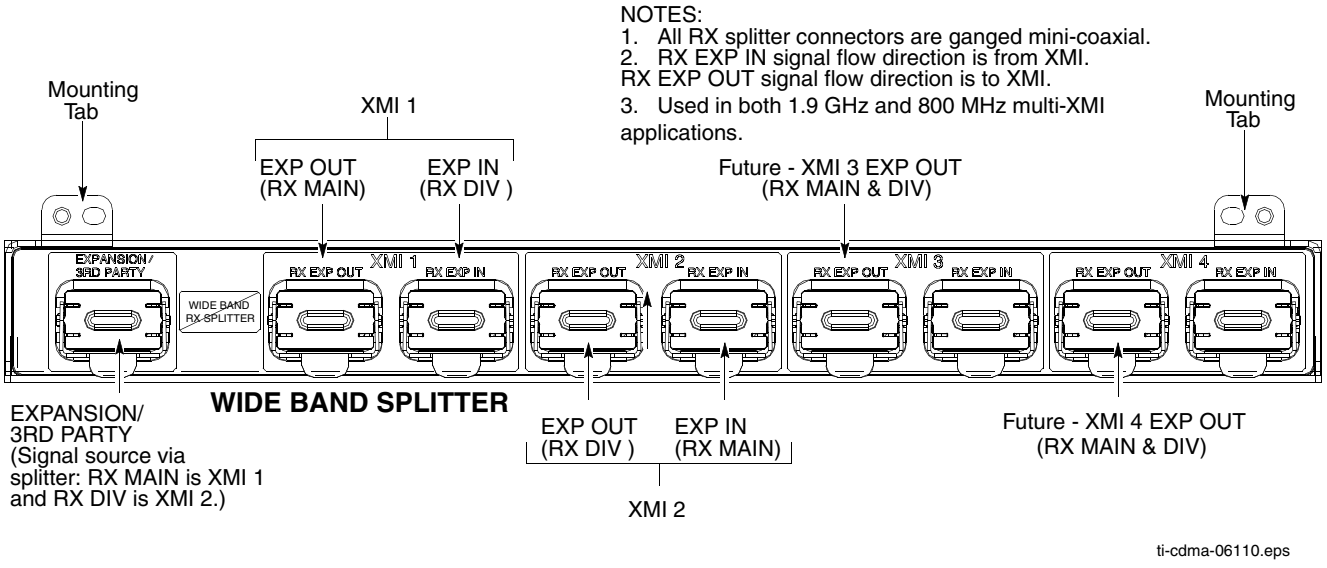
RX Splitter Equipment Identification

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

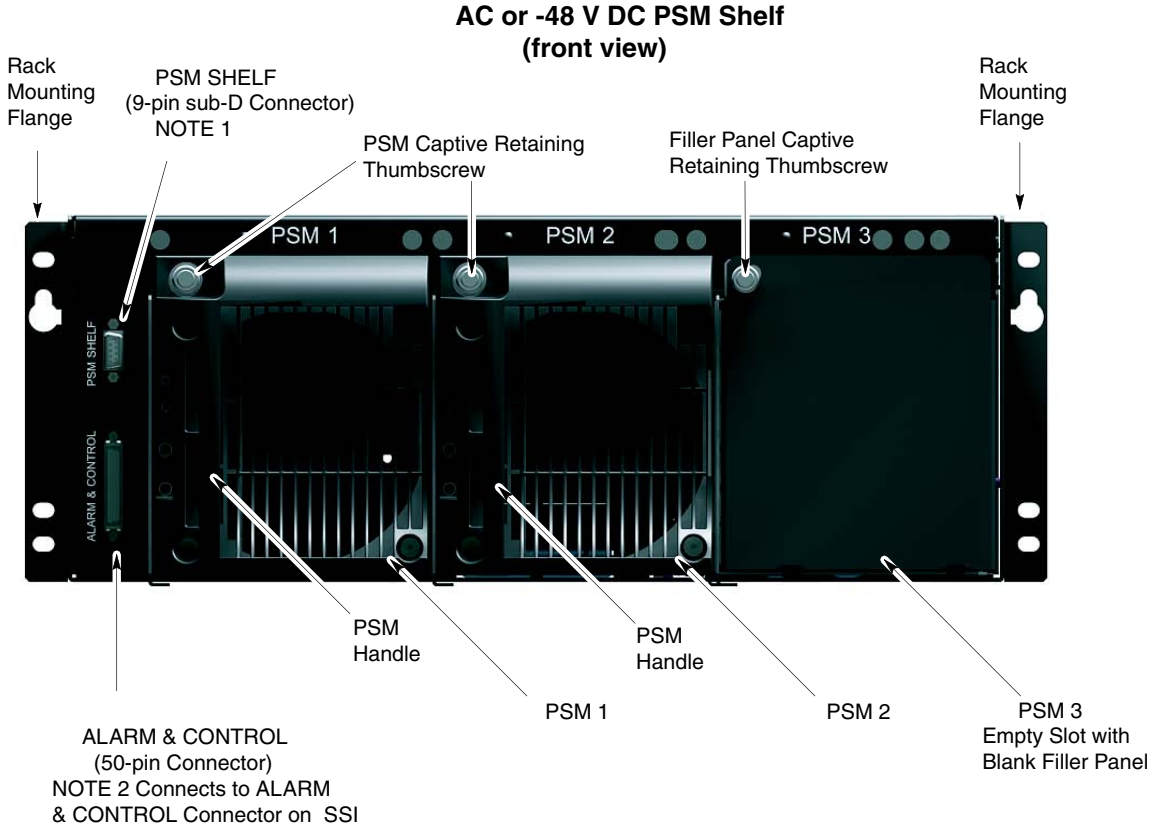
PSM I/O Panels

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

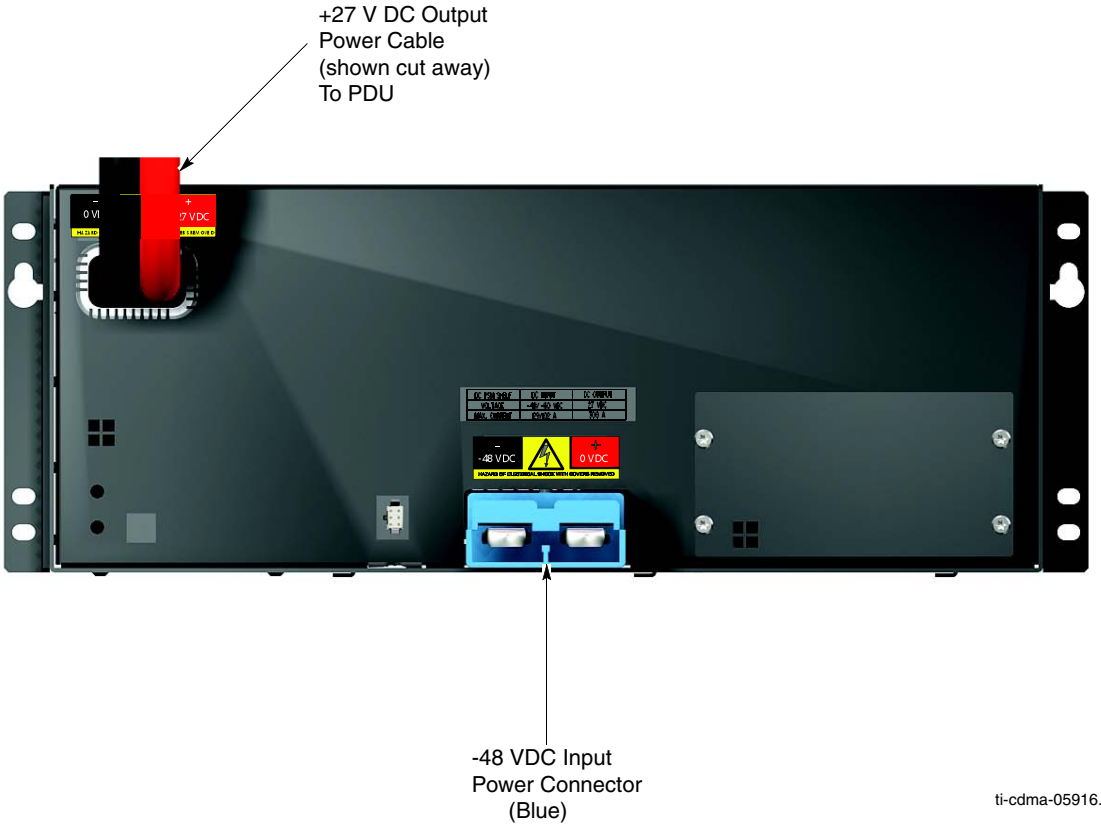
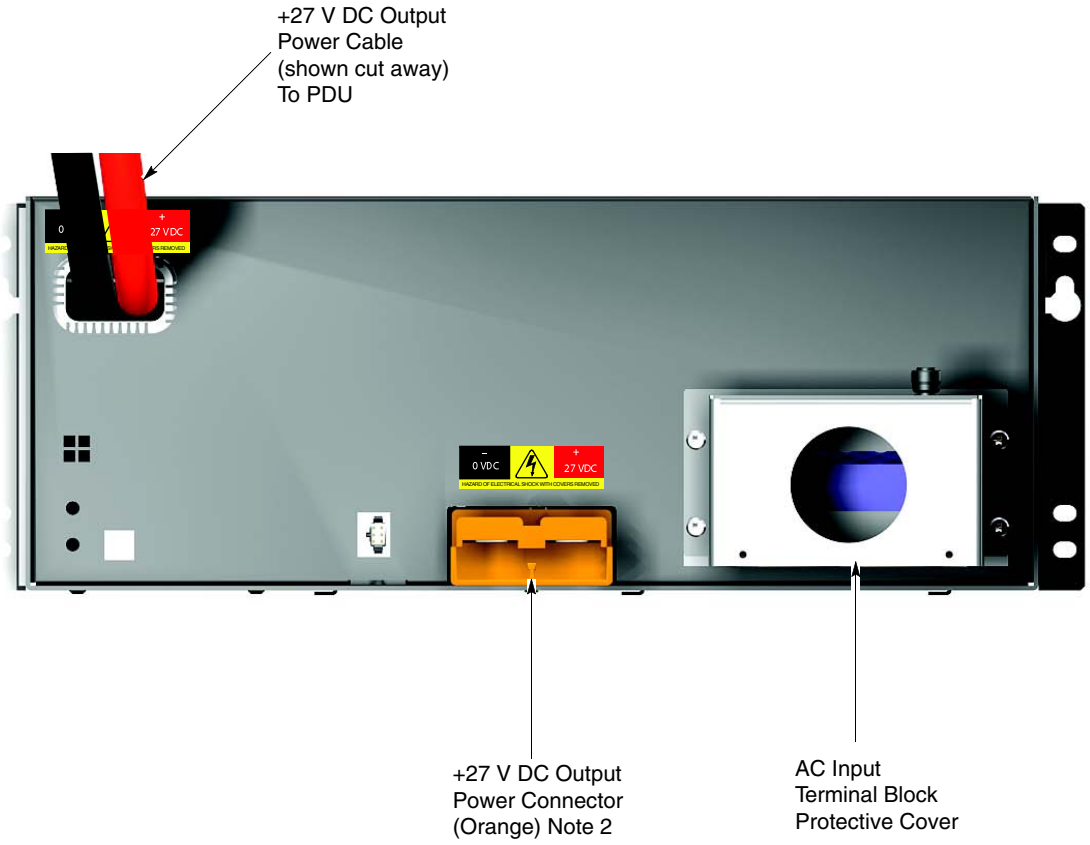


Figure 1-17 220 V AC PSM shelf rear panel detail



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.

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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.

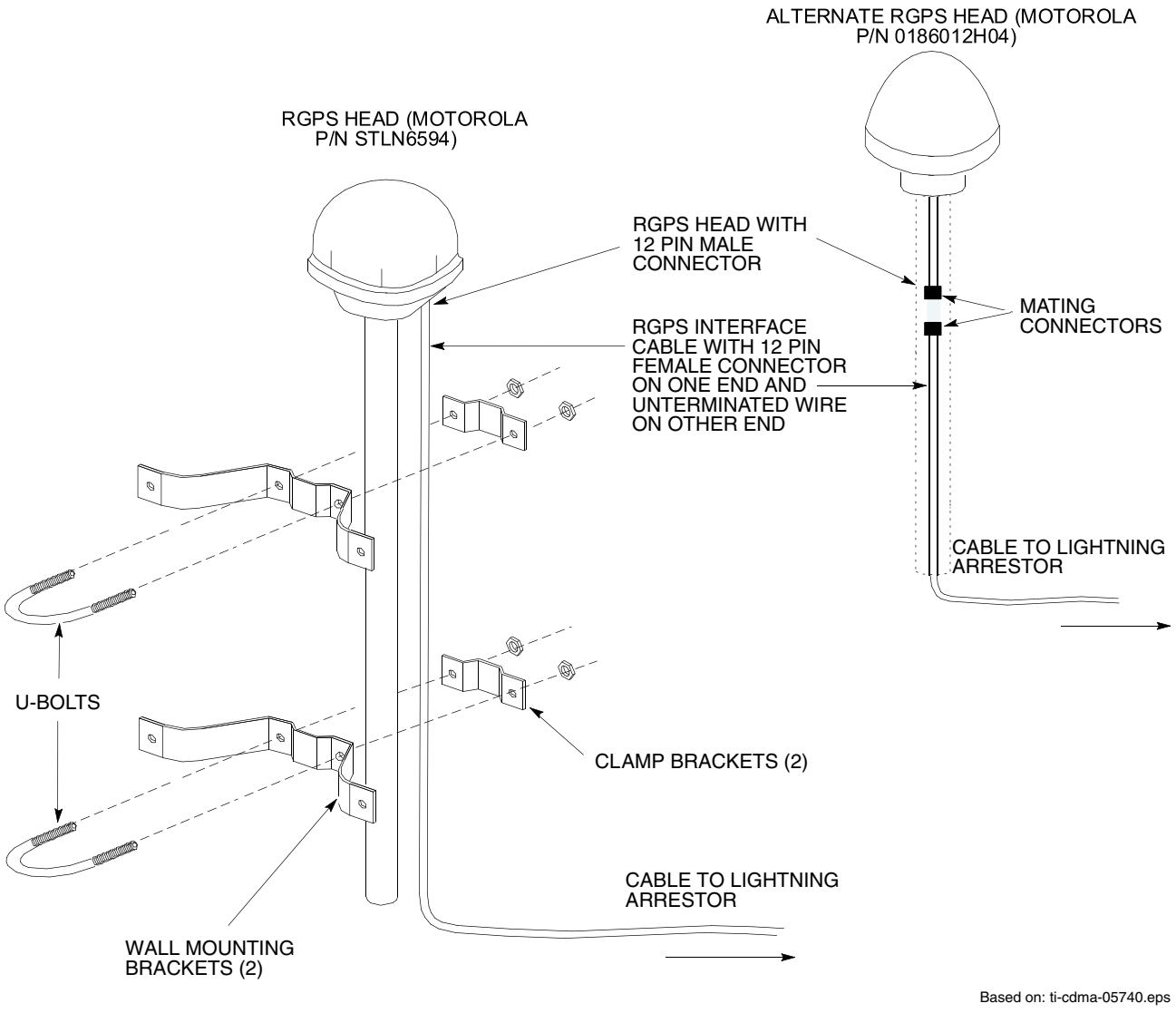
NOTE

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.

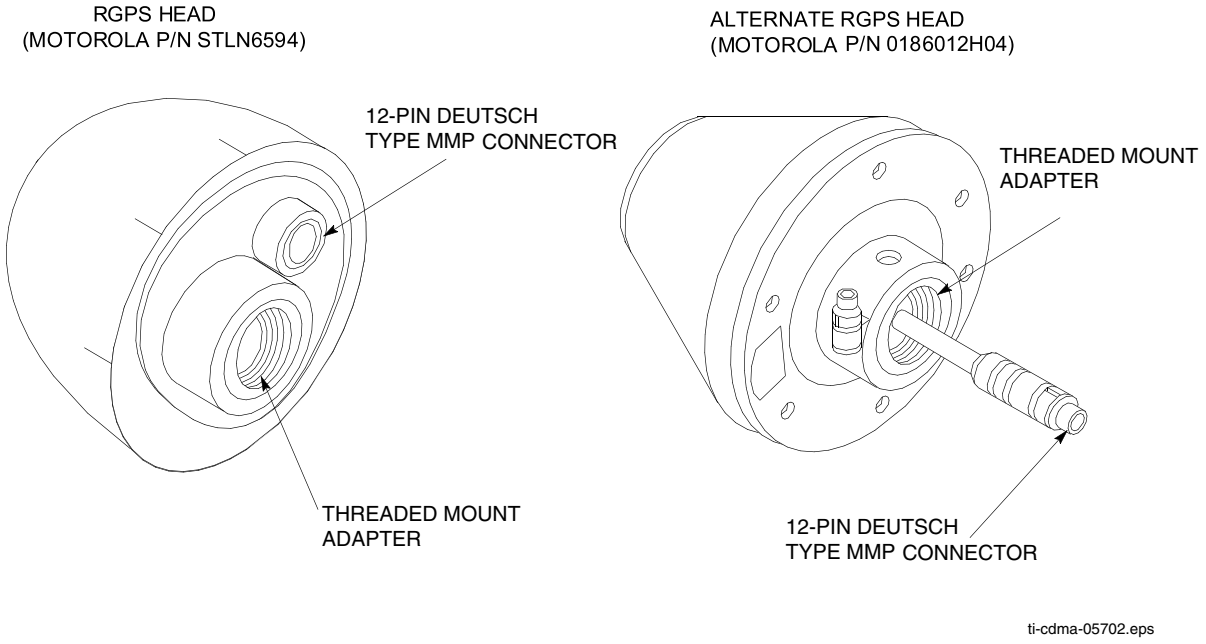
Figure 1-18 RGPS Head Mounting Details



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.

Table 6-6 FRU replacement conditions

FRU	Ref Designator	What to Shutdown...
QHSO	HSO	Nothing; FRU is hot swappable and BTS system timing is sourced by an alternate source.

Required items

Documents

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

Tools

- Torque driver
- T20 TORX driver
- T25 TORX driver

Torque requirements

- SSI mounting bracket thumbscrews and QHSO thumbscrew, 2.37 N-m (21 in-lb)

Replacement unit

- QHSO (Quartz High Stability Oscillator) — Motorola model SGLA4017

Prerequisites

Before you begin

Before you begin, record the pertinent information in Table 6-7.

Table 6-7 Item number replacement list

Item	Number
BTS number	
Failed QHSO number	

QHSO replacement procedure

CAUTION

- This procedure requires working on or around circuitry extremely sensitive to ESD. Wear a conductive, high impedance wrist strap while performing this procedure.
- Follow appropriate safety measures.

Perform the steps described in Procedure 6-4 to replace the QHSO.

Procedure 6-4 Replacing the QHSO

AT THE BTS SITE	
1	Wear a conductive, high impedance wrist strap while performing the following procedure.
	NOTE **DO NOT** power down the SSI! **NOTE** **DO NOT** disconnect any cables from connectors on the SSI!
2	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.
3	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 mounting shelf. Pull the SSI out of the mounting shelf.
4	**CAUTION** Be careful not to accidentally disconnect any SSI cables while manipulating the SSI. Set the SSI on its bracket right angle flange so that the SSI rear panel/QHSO is accessible.
5	Using a T20 TORX bit and driver, loosen the thumbscrew on the QHSO. Using your thumb and finger, completely loosen the captive thumbscrew.

Continued

Procedure 6-4 Replacing the QHSO (Continued)

6	Grasp the left end (that is, thumbscrew end) of QHSO and pull it away from the SSI rear panel until the 9–pin D-connector is fully disengaged.
7	Slide the QHSO until its mounting tab is disengaged from the retaining slot on the SSI rear panel.
8	With the replacement QHSO properly positioned in front of the SSI rear panel, insert the QHSO mounting tab under the retaining slot on the SSI rear panel.
9	Align the QHSO 9–pin D-connector with the HSO connector on the SSI rear panel. Firmly push the QHSO against the SSI rear panel until the connectors are fully engaged.  **NOTE** After the replacement QHSO is re-connected, it is powered up.
10	Align the QHSO thumbscrew with the threaded hole. Using a T20 TORX bit and driver, tighten the thumbscrew to 2.3 N-m (20 in-lbs).  **NOTE** To optimize the system at this time, refer to **Optimization required** following this table.
11	Properly position the SSI so that the two hooks on the SSI bracket are engaged in the two slots on the mounting shelf.
12	Engage the two captive thumbscrews, on the SSI bracket right angle flange, into the mounting shelf.
13	Using a T25 TORX bit and torque driver, tighten the thumbscrews to 2.37 N-m (21 in-lb).

Optimization required

Refer to 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

7

XMI Replacement Procedures

XMI (Transceiver Module Internal) Module

XMI Description

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

The XMI contains sector RF transceivers and integrated sector TX RF Linear Power Amplifiers (LPAs).

The XMI provides the BTS site RF air-interface for subscriber units and a high speed serial data interface for transporting baseband data between the sector transceivers and the DMI modems.

One XMI is equipped for the low capacity UBS Macro frame. (See Figure 1-1 UBS Macro BTS low-tier/low-capacity frame (1000 mm rack) on page 1-27 and Figure 1-2 Low capacity UBS Macro BTS starter frame (1800 mm rack) on page 1-28.)

Two XMIs are equipped for the mid capacity UBS Macro frame. (See Figure 1-3 UBS Macro BTS mid-capacity frame (1800 mm rack) on page 1-30.)

The XMI can support a UBS Macro frame in either an omni (1-sector) or 3-sector antenna configuration.

An XMI in a UBS Macro frame can support the following quantity of carriers per sector:

- For the 800 MHz and 1.9 GHz RF bands, one XMI in a 3-sector antenna configuration can support 4 carriers with reduced TX RF power output per sector-carrier and up to 3 carriers with full TX RF power output per sector-carrier.
- For the 800 MHz RF band, 8 carriers per sector for an omni (1-sector) antenna configuration.
- For the 1.9 GHz RF band, 5 carriers per sector for an omni (1-sector) antenna configuration.

The XMI transceiver uses receive diversity for each sector.

For transmit, the XMI transceiver typically provides 2 - 30 W transmit RF output power per sector/carrier (120 W total available RF power, when measured at the output of the UBS Macro frame). In a 3-sector antenna configuration, the maximum TX RF power per sector-carrier is 20W.

The XMI operates from +27 V DC input power.

All external XMI I/O connections are made on the XMI front panel.

The XMI has the following items:

- Main XMI processor/memory. This processor communicates with the XPAC, RX and TX circuits, MMI and ENET (LMT) ports, and the controller in the DMI via the CPRI links.
- Phase-locked loop (PLL) reference clock circuit that is synchronized to CPRI link serial data input from the DMI. This clock reference signal is used to frequency synthesize all RX & TX local oscillators.
- DC power distribution which includes a +27 V DC input bus bar with four automotive style fuses. These fuses provide protected + 27 V DC branch circuits, one for each sector LPA and one for the transceiver (TX/RX) PCB.
- Heat sinks and cooling fans. The cooling fans in the fan tray mounted on the rear of the XMI draw air in from air vents on the XMI front panel through the XMI and exhausts air out the XMI rear panel.
- Internal wiring for PCB interconnection.
- Front panel with connectors for external equipment connections.

RX Main & RX Diversity Signal Handling

In the UBS Macro frame, the main RX antenna signal from each sector IDRF (Integrated Duplexer RX Filter) is applied to the corresponding sector main RX RF input of XMI 1. This input is applied to the main receiver path of the corresponding XMI 1 sector receiver.

For low capacity frames with one XMI, the diversity RX antenna signal from each sector IDRF is applied to the corresponding sector diversity RX RF input of XMI 1. This input is applied to the diversity receiver path of the corresponding XMI 1 sector receiver.

For mid capacity frames with two XMIs, the main RX antenna signal from each sector IDRF is applied to the corresponding sector main RX RF input of XMI 1. XMI 1 provides pre-amplified main RX antenna signals at its RX EXP OUT connector. This connector connects to one of the following:

- optional RX splitter XMI 1 RX EXP IN connector. The RX splitter splits the main RX antenna signal and distributes it to the RX splitter XMI 2 RX EXP OUT connector. This connector is cabled to XMI 2 RX EXP IN connector. This connection provides the main receiver path of the corresponding XMI 2 sector receiver.

- optional XMI 1/XMI 2 RX cross-connect cable. This cable connects XMI 1 RX EXP OUT connector to XMI 2 RX EXP IN connector. This connection provides the main receiver path of the corresponding XMI 2 sector receiver.

For mid capacity frames with two XMIs, the diversity RX antenna signal from each sector IDRF is applied to the corresponding sector diversity RX RF input of XMI 2. XMI 2 provides pre-amplified diversity RX antenna signals at its RX EXP OUT connector. This connector connects to one of the following:

- optional RX splitter XMI 2 RX EXP IN connector. The RX splitter splits the diversity RX antenna signal and distributes it to the RX splitter XMI 1 RX EXP OUT connector. This connector is cabled to XMI 1 RX EXP IN connector. This connection provides the diversity receiver path of the corresponding XMI 1 sector receiver.

- optional XMI 1/XMI 2 RX cross-connect cable. This cable connects XMI 2 RX EXP OUT connector to XMI 1 RX EXP IN connector. This connection provides the diversity receiver path of the corresponding XMI 1 sector receiver.

The XMI automatically detects whether the RX signals are coming directly from the IDRFs through the QMA cables or indirectly through the RX Expansion ports and adjusts its internal RX gain accordingly. This automatic detection and gain adjustment occurs only during an XMI power-up or reset.

XMI RX Output Signal Handling

Each XMI sector main/diversity receiver detects the RF RX carriers for the corresponding sector. The detected main/diversity RX signals are A/D converted. These converted digital signals are applied to the RX baseband control array. This array selects the best main/diversity RX signals for the carriers assigned to the XMI.

The RX baseband control array outputs the selected RX digital signals to the RX baseband bus. The RX baseband bus is applied to the Serializer/De-serializer & Data Multiplexer/De-multiplexer. This stage multiplexes the RX baseband bus signals and converts them to a high-speed serial data signal. This multiplexed RX baseband serial data signal is applied to the high-speed serial data interface which provides 1.2288 Gbps links to the HSL data ports on the front panel of the XMI.

XMI High-speed Serial data Links (HSL)

The XMI has redundant 1.2288 Gbps high-speed serial data links, one link per HSL 1 and HSL 2 data ports on the front panel of the XMI. These data ports, on the XMI, are connected to the high-speed serial data interface on the DMIs.

The high-speed serial data link has a multiplexed serial data signal that contains RX/TX sector-carrier traffic and overhead data as well as any DMI/XMI communications data.

TX Input Signal Flow

The multiplexed TX baseband serial data signal is applied, via the high-speed serial data interface, to the input of the Serializer/De-serializer & Data Multiplexer/De-multiplexer. This stage demultiplexes and deserializes the TX baseband serial data signal into TX baseband I & Q output signals for each sector-carrier.

Each sector-carrier TX baseband I & Q signal is applied to the TX baseband control array. This array conditions and combines all of the TX I & Q signals and then selectively routes them to a pair of quadrature signal outputs for the appropriate sector (i.e., one pair per sector).

Each pair of quadrature signals is applied to the corresponding sector RF transmitter. The quadrature signals are D/A converted and the resultant analog signal causes the sector transmitter to output a low power multiplexed TX RF signal with the applicable FM modulated TX carrier frequencies. This low power multi-carrier signal is referred to as the TX RF small signal.

TX RF Small Signal Handling

For 800 MHz XMIs, the TX RF small signal from each sector RF transmitter in the XMI is routed to the TXD connector on the front panel of the XMI. When the TXD connector is properly terminated, each sector TX RF path is completed and the TX RF small signal from each sector RF transmitter in the XMI is applied to the 3-sector TX RF input FTM. The FTM provides 3-sector TX RF output signals which drive the LPAs.

NOTE

For proper operation of the XMI TX RF outputs, the XMI TXD connector must be terminated with either a TXD attenuator or a TXD cable connected to a TX combiner.

Currently the 800 MHz UBS Macro BTS frame do not support the use of a TX combiner, but it will in the future. Therefore a TXD attenuator must be installed in the TXD connector on all 800 MHz XMIs.

For 1.9 GHz XMIs, the TX RF small signal from each sector RF transmitter in the XMI is routed directly to the 3-sector TX RF input FTM. The FTM provides 3-sector TX RF output signals which drive the LPAs.

NOTE

The 1.9 GHz XMIs do not have a TXD connector.

In the future, the 1.9 GHz UBS Macro BTS frames will be equipped with 2:1 cavity combiners that will connect to the TX output of the XMI LPAs.

TX RF Power Amplification

The 3-sector TX RF input FTM transforms the phase of each sector TX RF small signal. Each of these phase transformed input signals drives the corresponding sector TX RF LPA section.

The sector TX RF LPA section amplifies the low power multi-carrier TX RF signal (i.e., TX RF small signal) to the final XMI TX RF power output for the sector. (Note that each XMI sector TX RF LPA section is capable of providing 30 W maximum TX RF power output). The final TX RF power output signal of each sector TX RF LPA is applied to the 3-sector TX RF output FTM.

The output FTM transforms the phase of each sector final TX RF power output signal. Each of these phase transformed sector output signals is applied to a corresponding RF coaxial switch that is relay actuated. Each RF coaxial switch routes the sector final TX RF power output signal to the corresponding sector TX RF output port (i.e., TX1, TX2 or TX3) on the XMI front panel. The open/closed state of each RF coaxial switch is controlled by its associated relay. When the relay is unenergized, its RF coaxial switch is open (N.O. = Normally Open). This condition occurs when the XMI looses DC power and may also occur under XPAC control.

In the UBS Macro frame, the final TX RF power output signal from each sector of XMI 1 is routed to the corresponding sector TX antenna via the corresponding sector IDRF.

XPAC Functions

The XMI PA Controller (XPAC) communicates with the XMI processor and controls/monitors the following XMI circuits:

- 3-sector TX RF output FTM.
- Three multi-carrier TX RF LPA sections; one LPA section for each sector.
- Five cooling fans in the fan tray mounted on the rear of the XMI.

The XPAC and the XMI processor exchange control data and status/alarm messages via a dedicated serial bus. The XPAC collects status/alarm inputs from each sector TX RF LPA, each cooling fan and the TX RF output FTM. Then the XPAC reports this status/alarm information in data messages to the XMI processor.

The output FTM detects forward/reverse power of each sector TX RF output and reports it to the XPAC. If something like a sector antenna path with an extreme impedance mismatch causes abnormal detected forward/reverse power, the XPAC will signal the respective FTM RF coaxial switch relay to open the switch and block the sector TX RF output signal.

Each sector TX RF LPA has phase and power level sensors/controls throughout the LPA signal path that the XPAC uses to dynamically increase/decrease the phase and power level of the sector TX RF output signal as needed.

The XPAC monitors XMI and PA heatsink temperatures as well as the speed (TACH) of each of the five cooling fans. The XPAC sends a Pulse-Width Modulated (PWM) DC control signal to each fan to increase/decrease fan speed as needed to provide proper cooling.

System Impact/Considerations

NOTE

Performing this replacement procedure in a UBS Macro frame with one XMI will cause BTS downtime and suspend all BTS call processing.

NOTE

Performing this replacement procedure in a UBS Macro frame with more than one XMI will not cause BTS downtime, but will reduce BTS call processing capacity.

In the UBS Macro frame with one XMI, removal of the XMI has the following effects:

- Interrupts the Main and Diversity RX signal paths for all sectors.
- Interrupts TX RF output power on all sectors.

In the UBS Macro frame with more than one XMI: If XMI 1 is removed, the Main RX signal path is interrupted for all sectors. If XMI 2 is removed, the Diversity RX signal path is interrupted for all sectors.

Alarms will be reported during the replacement procedure.

The XMI **is not** “hot swappable”.

Table 7-1 FRU Replacement Conditions

FRU	What to Shut Down...
XMI	From the OMCR, lock the XMI being removed. Then shut down XMI DC input power.

Required items

Manpower

- Two people are required to lift, carry, or handle the XMI module.

Documents

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

Tools

- T25 TORX bit.
- Torque driver.
- XMI removable handle with two M5 screws.
- Heat protective gloves for handling/touching a “HOT" XMI.

Replacement Unit

- 800 MHz XMI FRU assembly with removable XMI handle attached (Motorola model SGTF4194)
- 1.9 GHz XMI FRU assembly with removable XMI handle attached (Motorola model STWG4000)

XMI I/O Panel Connectors/Ports & LEDs

XMI I/O Panel

Figure 1-9 800 MHz XMI Module Front Panel I/O Detail on page 1-38 shows I/O connectors on the front panel of the UBS Macro BTS 800 MHz XMI. Figure 1-10 1.9 GHz XMI Module Front Panel I/O Detail on page 1-39 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 these figures is the same as when it is installed in the frame. These figures show connector/port locations, connector types and brief cabling details.

Connectors/Ports

The following text describes each connector/port on the XMI front panel.

- **+27V & RTN** - XMI DC input power connections. Connects to corresponding XMI DC power connector on the PDU of the UBS Macro frame. The PDU XMI DC power connector supplies protected +27 V via a 90 A circuit breaker. The +27V pin is the positive feed and RTN (i.e., DC ground) pin is the negative return.

- **RX1 M, RX2 M, RX3 M** - Main RX antenna signal input from the corresponding sector (i.e., 1, 2, 3) Integrated Duplexer RX Filter (IDRF). These connectors are for a single coaxial cable connection.

- **RX1 D, RX2 D, RX3 D** - Diversity (i.e., DIV) RX antenna signal input from the corresponding sector (i.e., 1, 2, 3) IDRF. These connectors are for a single coaxial cable connection.

- **RX EXP OUT** - Buffered sector Main and Diversity RX antenna signal outputs from the respective sector multi-carrier, dual-receive path RF receivers. These output signals are meant for distribution to an RX splitter or another XMI. This connector supports multi-coaxial cable connections.

- **RX EXP IN** - Sector main and diversity RX antenna signal inputs to the respective sector multi-carrier, dual-receive path RF receivers. These input signals are meant for distribution from an RX splitter or another XMI. This connector supports multi-coaxial cable connections.

- **TXD** - Present on 800 MHz XMI only. TX Distribution (TXD) I/O port supports up to three TX RF small signal inputs (i.e., one per sector to each sector TX RF LPA in the XMI) and up to three TX RF small signal outputs (i.e., one per sector from each sector multi-carrier RF transmitter in the XMI). Must be terminated with a TXD connector or cable to the TXD connector on a future TX combiner. This connector supports multi-coaxial cable connections.

- **TX1, TX2, TX3** - TX RF power output signals (i.e., one per sector from each sector TX RF LPA in the XMI). These sector TX RF power output signals are routed to the corresponding sector IDRF TX antenna port. These connectors are for a single coaxial cable connection.
  - TX1, TX2 and TX3 are used for a 3-sector antenna configuration.
  - Only TX1 is used for a 1-sector (i.e., Omni) antenna configuration.

- **CONTROL** - (for future use) This connector supports I/O control signals that are exchanged between the XMI and the future frame mounted TX combiner. This connector is a 9-pin female subminiature D type connector.

- **HSL1 & HSL2** - High-speed Serial data Link (HSL) port connectors that each provide a 1.2288 Gbps high-speed serial data links between the XMI and the respective DMI. The high-speed serial data links support the transfer of baseband I & Q data as well as control data between the DMI and XMI. These connectors are cabled to the appropriate XMI high-speed serial data link connector on the DMI front I/O panel.

CAUTION

MMI and LMT ports are for debug purposes and are not intended for use by customer service personnel.

- **MMI** - Debug RS-232 port allows the operator MMI access to the XMI MCU controller via a computer terminal through either a modem or a null modem cable. The MMI port is an 8-pin RJ-45 connector.
- **LMT** - This port is intended for development use only. It is a debug port configured for full-duplex fast Ethernet 10/100BaseT and allows local MMI access to the XMI MCU controller via a Local Maintenance Terminal (LMT) with an Ethernet interface. The LMT port is an 8-pin RJ-45 connector.

LEDs

Table 7-2 shows the possible states for the XMI front panel LEDs and the corresponding indication.

Table 7-2 XMI LEDs States and Indications

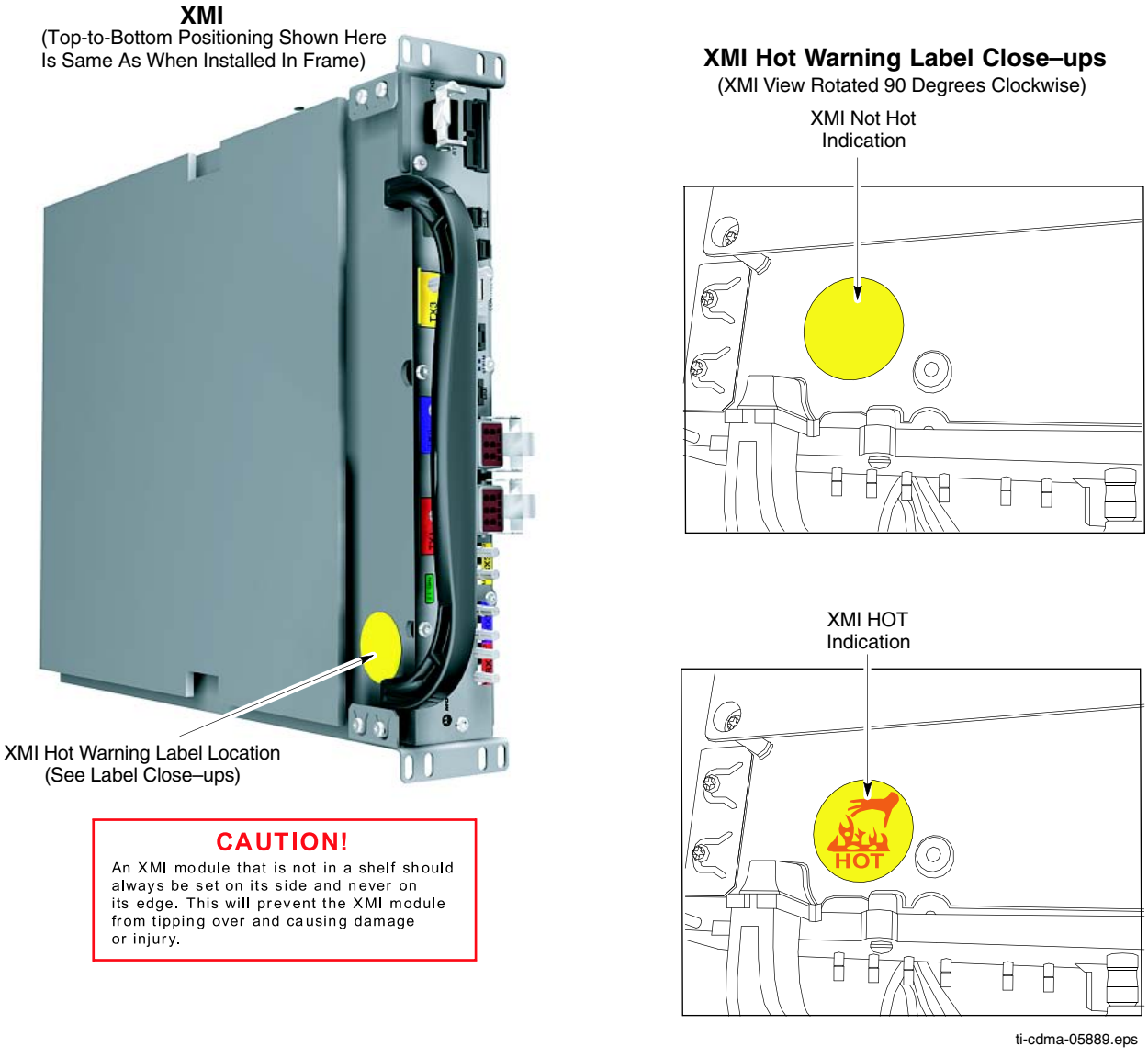
ALM (ALARM; Red) LED State	INST (INSTANCE) LED State	STA (STATUS; Green) LED State	Indication
Off	Off	Off	No DC Power to FRU
On	Orange	On	LED Indicator Test (temporary; 0.5 sec to 1 sec)
On	N/A	Off	FRU Failure
Off	N/A	N/A	No FRU Failure
Flashing (1.5 sec-On/1 sec-Off)	N/A	N/A	Partial (soft) FRU Failure
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			

XMI "HOT" Warning Label Details

The XMI has a "HOT" warning label attached to it (see Figure 7-1 for label location and indications).

The hot warning label senses the surface temperature of the metal XMI housing. When the XMI surface temperature reaches 50 degrees C, the "HOT" warning is fully visible indicating that the XMI is too hot to touch and may cause burns. The "HOT" warning is partially visible at temperatures that are slightly lower than 50 degrees C. When the "HOT" warning is not visible at all, the XMI is safe to touch.

Figure 7-1 XMI "HOT" Warning Label Details



Prerequisites

WARNING

Do not touch the XMI with unprotected hands when the "HOT" label is fully visible. If the "HOT" label is fully visible, wear heat protective gloves when touching the metal case of the XMI. The "HOT" label becomes fully visible when the temperature of the metal case of the XMI reaches 50 degrees C. However, the label may be partially visible at lower case temperatures.

CAUTION

The XMI module is heavy. Two people are required to lift, carry, or handle the XMI module.

- Be sure the removable XMI handle is attached to the front of the XMI before physically handling the module.
- Be sure two people use both hands and wear protective footwear when handling the XMI.
- Be sure to use two people to support the module while sliding the module out of or into the shelf slot.

CAUTION

An XMI module that is not in a shelf should always be set on its side and never on its edge. This will prevent the XMI module from tipping over and causing damage or injury.

CAUTION

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.

CAUTION

The XMI should be locked by the OMCR operator just prior to being removed.

NOTE

Coordinate this repair task with the OMCR operator.

Before You Begin

Before you begin, record the pertinent information in the following table (see Table 7-3):

Table 7-3 Item Number Replacement List

Item	Number
BTS number	
XMI number	

XMI Replacement Procedures

The XMI replacement procedures consist of removing the failed XMI and then installing the replacement XMI.

XMI Removal

Follow the steps in Procedure 7-1 to remove the XMI.

Procedure 7-1 XMI Removal Procedure

AT THE BTS SITE	
1	Notify the OMC-R operator that you are replacing the XMI.
AT THE OMCR	
2	Open a CLI window. Refer to Accessing OMCR CLI window on page 3-3.
3	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.
4	Display the overall status of all devices at the BTS, including the XMI, by entering the following command at the prompt: omc-00000>**DISPLAY BTS-<bts#> STATUS**
5	Determine the status of XMI 1 by observing the BTS STATUS report. • For a failed XMI 1 that is in an out-of-service (OOS) state, go to step 8. • For a failed XMI 1 that is in an in service (INS) state, go to step 6.

Continued

Procedure 7-1 XMI Removal Procedure (Continued)

6	Lock the failed XMI by entering the following command at the prompt: omc-000000>**LOCK XMI-<bts#>-<xmi#> UNC**
7	Display the status of the XMI, by entering the following command at the prompt: omc-000000>**DISPLAY BTS-<bts#> STATUS** Verify that the failed XMI is in an OOS_MANUAL state. Go to step 8.
AT THE BTS SITE	
8	Shut down DC power to the failed XMI by setting the corresponding XMI PDU DC circuit breaker to **OFF** (pulled out).
	 **WARNING** Do not touch the XMI with unprotected hands when the "HOT" label is fully visible. If the "HOT" label is fully visible, wear heat protective gloves when touching the metal case of the XMI. The "HOT" label becomes fully visible when the temperature of the metal case of the XMI reaches 50 degrees C. However, the label may be partially visible at lower case temperatures.  **CAUTION** Wear a conductive high impedance ESD wrist strap while performing the steps of this procedure.
9	 **CAUTION** For cables, disconnect the cable by pulling the connector - *NOT* by pulling on the cable. If necessary, label the cables before disconnecting them to ensure there is no uncertainty when reconnecting them. Disconnect all cables from the XMI front panel and move them out of the way.
10	For 800 MHz XMI only, remove the TXD attenuator from the TXD connector on the XMI front panel. This TXD attenuator will be reinstalled on the replacement XMI.

Continued

Procedure 7-1 XMI Removal Procedure (Continued)

11

Attach the removable XMI handle to the front of the failed XMI module (see Figure 1-9 800 MHz XMI Module Front Panel I/O Detail on page 1-38 or Figure 1-10 1.9 GHz XMI Module Front Panel I/O Detail on page 1-39 for location of XMI handle mounting screw holes) as follows:

- Align handle screw holes with handle mounting screw holes on the XMI front panel. (Note handle orientation; handle is not symmetrical.)
- Insert two M5 screws.
- Using a T25 TORX driver, tighten the screws to 3.2-3.6 N-m (28-32 in-lb).

12

Using a T25 TORX driver, remove the four XMI mounting screws; two screws at each of the top and bottom mounting tabs on the front of the module.

13

CAUTION

The XMI module is heavy. Two people are required to lift, carry, or handle the XMI module.

- Be sure the removable XMI handle is attached to the front of the XMI before physically handling the module.
- Be sure two people use both hands and wear protective footwear when handling the XMI.
- Be sure to use two people to support the module while sliding the module out of or into the shelf slot.

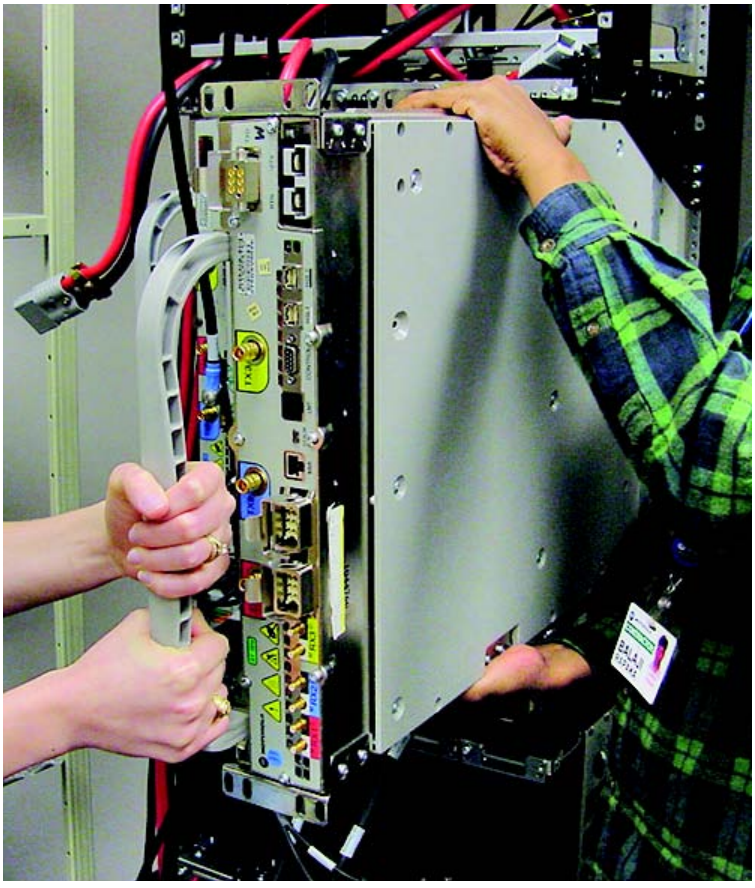
CAUTION

An XMI module that is not in a shelf should always be set on its side and never on its edge. This will prevent the XMI module from tipping over and causing damage or injury.

This step requires two people. Perform the following:

- (See Figure 7-2 Two People Properly Removing/Installing an XMI (removable XMI handle attached) on page 7-17.) One person grasp the XMI by the handle with both hands and pull outward sliding the module out of the shelf slot. The second person supports the bottom of the module with one hand and the top of the module with the other hand.
- (See Figure 7-3 Two People Properly Carrying an XMI (removable XMI handle attached) on page 7-18.) Carry the XMI module away from the frame and set it down on its side not on its edge.

Figure 7-2 Two People Properly Removing/Installing an XMI (removable XMI handle attached)



ti-cdma-06375.eps