

antenna feed line loss can be combined to determine the required power at the frame antenna connections. The corresponding BBX2 output level required to achieve that power level on any channel/sector can then be determined based on Bay Level Offset (BLO) data determined during the optimization process.

NOTE

Refer to the Figure 3-1 and the *LMF Help function* for additional information on the layout of the LMF directory structure (including CDF file locations and formats).

The CDF is normally obtained from the CBSC on a DOS formatted diskette, or through a file transfer protocol (ftp), if the LMF computer has ftp capability. Refer to the *LMF Help function*, and the LMF Help function, for more information.

CDF Site Equipage Verification

If it has not already been done, review and verify the site equipage data in the CDF with the actual site hardware and the site engineering documentation. Use a text editor to view the CDF contents.



CAUTION

Use extreme care not to make any changes to the CDF content while viewing the file. Changes to the CDF can cause the site to operate unreliably or render it incapable of operation.



CAUTION

Always wear a conductive, high impedance wrist strap while handling any circuit card/module to prevent damage by ESD. Extreme care should be taken during the removal and installation of any card/module. After removal, the card/module should be placed on a conductive surface or back into the anti-static bag in which it was shipped.

BTS System Release Software Download

The System Release software (for example R2.15.x.x) being used by the Base Station System (BSS) must be successfully downloaded to the BTS processor boards before optimization can be performed. Device initialization code is normally downloaded to the processor boards from the CBSC. Device application code and data is loaded from the CDMA LMF computer terminal.

Preparing the LMF

Overview

Before optimization can be performed, the CDMA LMF must be installed and configured on a computer platform meeting Motorola–specified requirements (see Recommended Test Equipment and Software in Chapter 1).



IMPORTANT

For the CDMA LMF graphics to display properly, the computer platform must be configured to display *more than 256 colors*. See the operating system software instructions for verifying and configuring the display settings.

Software and files for installing and updating the CDMA LMF are provided on CD ROM disks. The following items must be available:

- CDMA LMF Program on CD ROM
- CDMA LMF Binaries on CD ROM
- Configuration Data File (CDF) for each supported BTS (on floppy disk)
- CBSC File for each supported BTS (on floppy disk)

The following section provides information and instructions for installing and updating CDMA LMF software and files.

LMF Installation and Update Procedures

NOTE

First Time Installation Sequence:

1. Install Java Runtime Environment (JRE)
2. Install U/WIN K–shell emulator
3. Install LMF software
4. Install BTS Binaries
5. Install/create BTS folders

Follow the procedure in Table 3-1 to:

1. Install the CDMA LMF program using the CDMA LMF CD ROM
2. Install binary files using the CDMA LMF CD ROM

Table 3-1: CD ROM Installation

Step	Action
1	Insert the CDMA LMF CD ROM disk into your disk drive. <ul style="list-style-type: none">• If the Setup screen appears, follow the instructions displayed on the screen.• If the Setup screen is not displayed, proceed to Step 2.
2	Click on the Start button

Table 3-1: CD ROM Installation

Step	Action
3	Select Run .
4	Enter d:\autorun in the Open box and click OK . NOTE <i>(If applicable, replace the letter d with the correct CD ROM drive letter.)</i>
5	Follow the directions displayed in the Setup screen.

Copy CBSC CDF Files to the LMF Computer

Before logging on to a BTS with the CDMA LMF computer to execute optimization/ATP procedures, the correct **bts-#.cdf** and **cbsc-#.cdf** files must be obtained from the CBSC and put in a **bts-#** folder in the CDMA LMF computer. This requires creating versions of the CBSC CDF files on a DOS-formatted floppy diskette and using the diskette to install the CDF files on the CDMA LMF computer.



IMPORTANT

When copying CDF files, comply with the following to prevent BTS login problems with the Windows LMF:

- The numbers used in the **bts-#.cdf** and **cbsc-#.cdf** filenames must correspond to the locally-assigned numbers for each BTS and its controlling CBSC.
- The generic **cbsc-1.cdf** file supplied with the Windows LMF will work with locally numbered BTS CDF files. Using this file *will not provide a valid optimization* unless the generic file is edited to replace default parameters (e.g., channel numbers) with the operational parameters used locally.

The procedure in Table 3-2 lists the steps required to transfer the CDF files from the CBSC to the CDMA LMF computer. For any further information, refer to the *CDMA LMF Operator's Guide* (Motorola part no. 68P64114A21) or the CDMA LMF Help screen.

Table 3-2: Copying CBSC CDF Files to the LMF Computer

Step	Action
1	Login to the CBSC workstation.
2	Insert a DOS-formatted floppy diskette in the workstation drive.
3	Type eject -q and press the Enter key.

... continued on next page

Table 3-2: Copying CBSC CDF Files to the LMF Computer

Step	Action
4	Type mount and press the Enter key. NOTE <ul style="list-style-type: none"> • Look for the “<i>floppy/no_name</i>” message on the last line displayed. • If the eject command was previously entered, <i>floppy/no_name</i> will be appended with a number. Use the explicit <i>floppy/no_name</i> reference displayed when performing step 7.
5	Change to the directory, where the files to be copied reside, by typing cd <directoryname> (e.g., cd bts-248) and pressing the Enter key.
6	Type ls and press the Enter key to display the list of files in the directory.
7	With <i>Solaris versions of Unix</i> , create <i>DOS-formatted versions</i> of the <i>bts-#.cdf</i> and <i>cbsc-#.cdf</i> files on the diskette by entering the following command: unix2dos <source filename> /floppy/no_name/<target filename> (e.g., unix2dos bts-248.cdf /floppy/no_name/bts-248.cdf). NOTE <ul style="list-style-type: none"> • Other versions of Unix do not support the unix2dos and dos2unix commands. In these cases, use the Unix cp (copy) command. The <i>copied</i> files will be difficult to read with a DOS or Windows text editor because Unix files do not contain line feed characters. Editing <i>copied</i> CDF files on the CDMA LMF computer is, therefore, not recommended. • Using cp, multiple files can be <i>copied</i> in one operation by separating each filename to be copied with a space and ensuring the destination directory (<i>floppy/no_name</i>) is listed at the end of the command string following a space (e.g., cp bts-248.cdf cbsc-6.cdf /floppy/no_name).
8	Repeat steps 5 through 7 for each <i>bts-#</i> which must be supported by the CDMA LMF computer.
9	When all required files have been copied to the diskette type eject and press the Enter key.
10	Remove the diskette from the CBSC drive.
11	If it is not running, start the Windows operating system on the CDMA LMF computer.
12	Insert the diskette containing the <i>bts-#.cdf</i> and <i>cbsc-#.cdf</i> files into the CDMA LMF computer.
13	Using MS Windows Explorer, create a corresponding <i>bts-#</i> folder in the <i>wlmf\cdma</i> directory for each <i>bts-#.cdf/cbsc-#.cdf</i> file pair copied from the CBSC.
14	Use MS Windows Explorer to transfer the cbsc-#.cdf and bts-#.cdf files from the diskette to the corresponding wlmf\cdma\bts-# folders created in step 13.

3

Creating a Named HyperTerminal Connection for MMI Communication

Confirming or changing the configuration data of certain BTS Field Replaceable Units (FRU) requires establishing an MMI communication session between the CDMA LMF computer and the FRU. Using features of the Windows operating system, the connection properties for an MMI session can be saved on the CDMA LMF computer as a named Windows HyperTerminal connection. This eliminates the need for setting up connection parameters each time an MMI session is required to support optimization.

Once the named connection is saved, a shortcut for it can be created on the Windows desktop. Double-clicking the shortcut icon will start the connection without the need to negotiate multiple menu levels.

Follow the procedures in Table 3-3 to establish a named HyperTerminal connection and create a Windows desktop shortcut for it.



Table 3-3: Create HyperTerminal Connection

Step	Action
1	From the Windows Start menu, select: Programs > Accessories
2	Select Communications , double click the Hyperterminal folder, and then double click on the Hypertrm.exe icon in the window which opens. NOTE <ul style="list-style-type: none"> • If a Location Information Window appears, enter the required information, then click on the Close button. (This is required the first time, even if a modem is not to be used.) • If a You need to install a modem..... message appears, click on NO.
3	When the Connection Description box opens: <ul style="list-style-type: none"> – Type a name for the connection being defined (e.g., MMI Session) in the Name: window, – Highlight any icon preferred for the named connection in the Icon: chooser window, and – Click OK.
4	NOTE For CDMA LMF computer configurations where COM1 is used by another interface such as test equipment and a physical port is available for COM2, select COM2 in the following step to prevent conflicts. From the Connect using: pick list in the Connect To box displayed, select Direct to Com 1 or Direct to Com 2 for the RS–232 connection port, and click OK .

. . . continued on next page

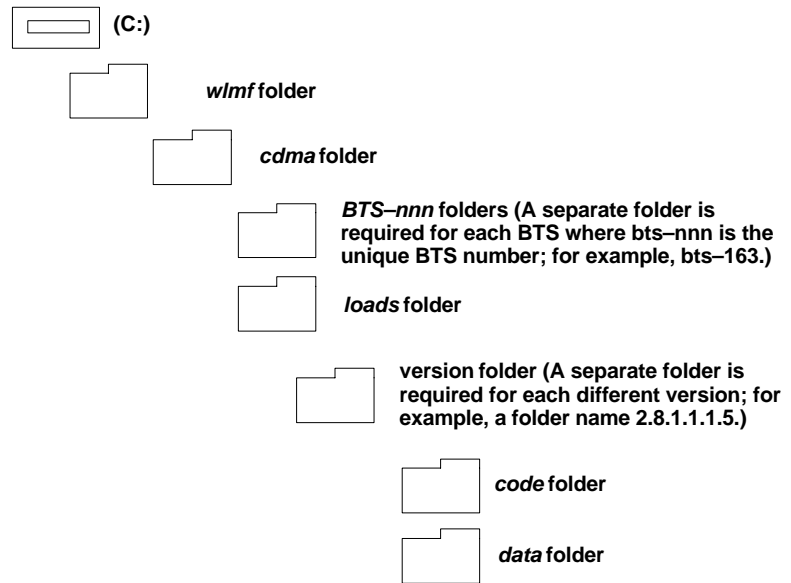
Table 3-3: Create HyperTerminal Connection

Step	Action
5	In the Port Settings tab of the COM# Properties window displayed, configure the RS-232 port settings as follows: <ul style="list-style-type: none"> • Bits per second: 9600 • Data bits: 8 • Parity: None • Stop bits: 1 • Flow control: None
6	Click OK .
7	Save the defined connection by selecting: File > Save
8	Close the HyperTerminal window by selecting: File > Exit
9	Click the Yes button to disconnect when prompted.
10	If the Hyperterminal folder window is still open, proceed to step 12.
11	Select Communications and double click the Hyperterminal folder.
12	Highlight the newly-created connection icon by clicking on it.
13	<i>Right click and drag</i> the highlighted connection icon to the Windows desktop and release the right mouse button.
14	From the popup menu which appears, select Create Shortcut(s) Here .
15	If desired, reposition the shortcut icon for the new connection by dragging it to another location on the Windows desktop.
16	Close the Hyperterminal folder window by selecting: File > Close

Folder Structure Overview

The CDMA LMF uses a *wlmf* folder that contains all of the essential data for installing and maintaining the BTS. The following list outlines the folder structure for CDMA LMF. Except for the *bts-*nnn** folders, these folders are created as part of the CDMA LMF installation.

Figure 3-1: CDMA LMF Folder Structure



wlmf Folder

The *wlmf* folder contains the CDMA LMF program files.

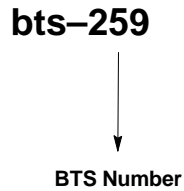
cdma Folder

The *cdma* folder contains the *bts-*nnn** folders and the *loads* folder. It also contains a default *cbsc-1.cdf* file that can be copied to a *bts-*nnn** folder for use, if one cannot be obtained from the CBSC (Centralized Base Station Controller) when needed.

*bts-*nnn** Folders

Each *bts-*nnn** folder contains a CAL file, a CDF file and a *cbsc* file for the BTS. Other files required by CDMA LMF may also be located in the *bts-*nnn** folder. A *bts-*nnn** folder must be created for each BTS that is to be logged in to. The *bts-*nnn** folder must be correctly named (for example: *bts-273*) and must be placed in the *cdma* folder. Figure 3-2 shows an example of the file naming syntax for a BTS folder.

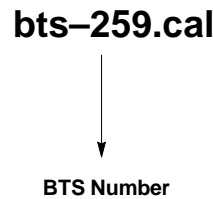
Figure 3-2: BTS Folder Name Syntax Example



bts-*nnn*.cal File

The CAL (Calibration) file contains the bay level offset data (BLO) that is used for BLO downloads to the BBX devices. The CAL file is automatically created and updated by the CDMA LMF when TX calibration is performed. Figure 3-3 details the file name syntax for the CAL file.

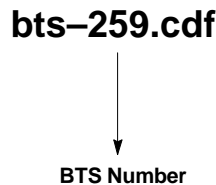
Figure 3-3: CAL File Name Syntax Example



bts-*nnn*.cdf File

The CDF file contains data that defines the BTS and data that is used to download data to the devices. A CDF file must be placed in the applicable BTS folder before the CDMA LMF can be used to log into that BTS. CDF files are normally obtained from the CBSC using a floppy disk. A file transfer protocol (ftp) method can be used if the CDMA LMF computer has that capability. Figure 3-4 details the file name syntax for the CDF file.

Figure 3-4: CDF Name Syntax Example



***cbsc* File**

The *cbsc-#.cdf* (Centralized Base Station Controller) file contains data for the BTS. If one is not obtained from the CBSC, a copy of the default *cbsc-1.cdf* file located in the *cdma* folder can be used.



IMPORTANT

Using the *generic cbsc-1.cdf* file will not provide a valid optimization unless the generic file is edited to replace default parameters with local operational parameters (e.g., CDMA channel numbers must be changed from the default “384” to those used locally by the BTS).

***loads* Folder**

The *loads* folder contains the version folder(s). It does not contain any files.

***version* Folder**

The *version* folder(s) contains the *code* and *data* folders. It does not contain any files. The name of version folders is the software version number of the code files that are included in its code folder. Version folders are created as part of the CDMA LMF installation and CDMA LMF updates. Each time the CDMA LMF is updated, another version folder will be created with the number of the software version for the code files being installed.

***code* Folder**

The code folder contains the binary files used to load code into the devices. A unique binary code file is required for each device type in the BTS to be supported with the CDMA LMF. Current version code files for each supported device created in this folder from the CDMA LMF CD ROM as part of the CDMA LMF installation/update process. Figure 3-5 shows an example of the file naming syntax for a code load file.

Figure 3-5: Code Load File Name Syntax Example

bbx_ram.bin.0600

Device Type

Hardware bin number

If this number matches the bin number of the device, the code file will automatically be used for the download*

* The device bin number can be determined by using the Status function after logging into a BTS. If the device does not have a bin number, one of the following default numbers must be used.

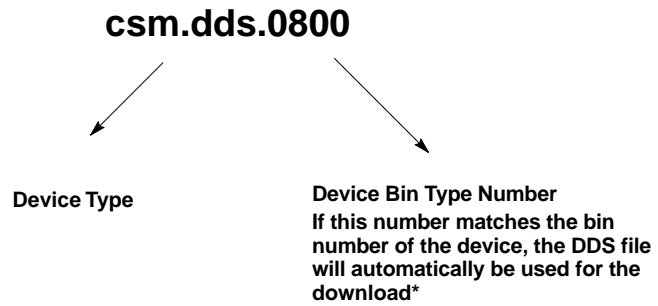
GLI=0100
LCI=0300
MCC=0C00
BBX=0600
BDC=0700
CSM=0800
TSU=0900
LPAC=0B00
MAWI=0D00

If a code file with the correct version and bin numbers is not found, a file selection window will appear.

data Folder

The data folder contains a DDS (Device Definition Structure) data file for each supported device type. The DDS files are used to specify the CDF file data that is used to download data to a device. Current version DDS files for each supported device type are created in this folder from the CDMA LMF CD ROM as part of the CDMA LMF installation or update process. Figure 3-6 shows an example of the file naming syntax for a code load file.

Figure 3-6: DDS File Name Syntax Example



* The device bin number can be determined by using the Status function after logging into a BTS. If the device does not have a bin number, one of the following default numbers must be used.

- GLI=0100
- LCI=0300
- MCC=0C00
- BBX=0600
- BDC=0700
- CSM=0800
- TSU=0900
- LPAC=0B00

Span Lines – Interface and Isolation

T1/E1 Span Interface



IMPORTANT

At active sites, the OMC-R/CBSC must disable the BTS and place it out of service (OOS). **DO NOT** remove the span line cable connectors until the OMC-R/CBSC has disabled the BTS.

Each frame is equipped with one 50-pair punchblock for spans, customer alarms, remote GPS, and BTS frame alarms. See Figure 3-9 and refer to Table 3-5 for the physical location and punchdown location information.

Before connecting the LMF computer to the frame LAN, the OMC-R/CBSC must disable the BTS and place it OOS to allow the LMF to control the BTS. This prevents the CBSC from inadvertently sending control information to the BTS during LMF-based tests.

Isolate BTS from T1/E1 Spans

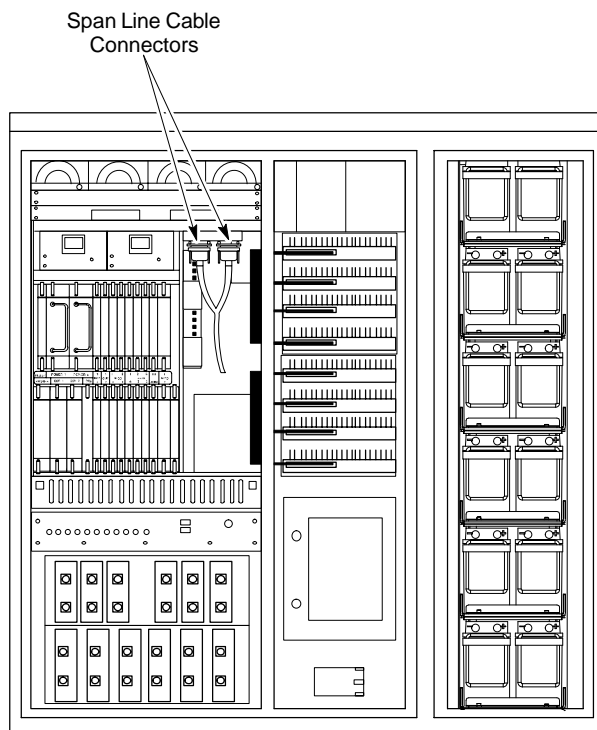
Once the OMC-R/CBSC has disabled the BTS, the spans must be disabled to ensure the LMF will maintain control of the BTS. To disable the spans, disconnect the cable connector for the BTS-to-CBSC Transcoder span at the Span I/O card (Figure 3-7).



IMPORTANT

If the BTS is a multi-frame logical BTS, *do not* disconnect the inter-frame span.

Figure 3-7: Disconnecting Span Lines



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T1/E1 Span Isolation

Table 3-4 describes the action required for span isolation.

Table 3-4: T1/E1 Span Isolation	
Step	Action
1	Have the OMCR/CBSC place the BTS OOS.
2	To disable the span lines, locate the connector for the span or spans which must be disabled and remove the respective connector from the applicable SCCP cage Span I/O board (Figure 3-7).

Configure Optional Channel Service Units

The *M-PATH 537* Channel Service Unit (CSU) module provides in-band SNMP-managed digital service access to T1 and fractional T1 lines. The *M-PATH 437* Channel Service Unit (CSU) module provides in-band SNMP-managed digital service access to E1 and fractional E1 lines. CSU modules units plug into the CSU shelf (see Figure 3-8).

The CSU shelf can support two *M-PATH 537* or two *M-PATH 437* CSU modules. The 537 CSU module supports a single T1 span connection. The 437 CSU module supports a single E1 span connection.

Remote *M-PATH* management is available via SNMP over an in-band data link on the span line (using a facility data link or 8–64 Kbps of a DS0 channel). The unit at the near end of the management path can be an SNMP manager or another *M-PATH* CSU.

Programming of the *M-PATH* is accomplished through the DCE 9-pin connector on the front panel of the CSU shelf. Manuals and a Microsoft Windows programming disk are supplied with each unit.

For more information refer to *M-PATH T1 Channel Service Unit User’s Guide*, *ADC Kentrox* part number 65–77538101 or the *M-PATH E1 Channel Service Unit User’s Guide*, *ADC Kentrox* part number TBD.

Setting the Control Port

Whichever control port is chosen, it must first be configured so the control port switch settings match the communication parameters being used by the control device. If using the rear-panel DTE control port, set the SHELF ADDRESS switch SA5 to “up.” If using the rear-panel DCE control port, position the SHELF ADDRESS switch down.

For more information, refer to the 2-Slot Universal Shelf Installation Guide, *ADC Kentrox* part number 65–78070001.

Plug one of the cables listed below into the Control Port connectors:

<i>Part Number</i>	<i>Description of Cable</i>
01–95006–022 (six feet)	DB–9S to DB–9P
01–95010–022 (ten feet)	

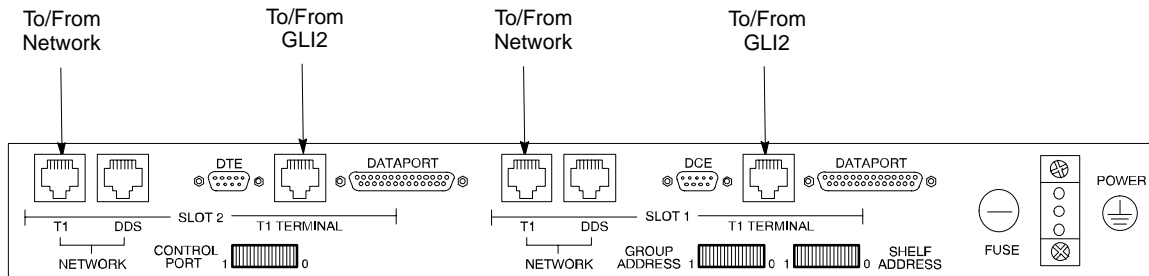
The control port cables can be used to connect the shelf to:



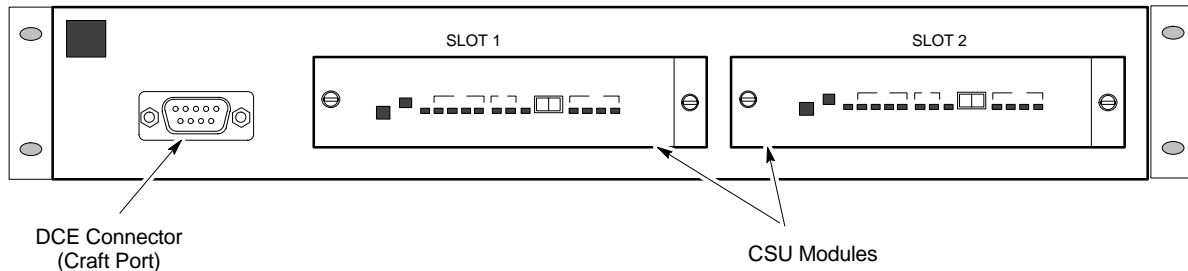
Span Lines – Interface and Isolation – continued

- A PC using the AT 9-pin interface
- A modem using the 9-pin connector
- Other shelves in a daisy chain

Figure 3-8: Rear and Front View of CSU Shelf



Rear View



Front View

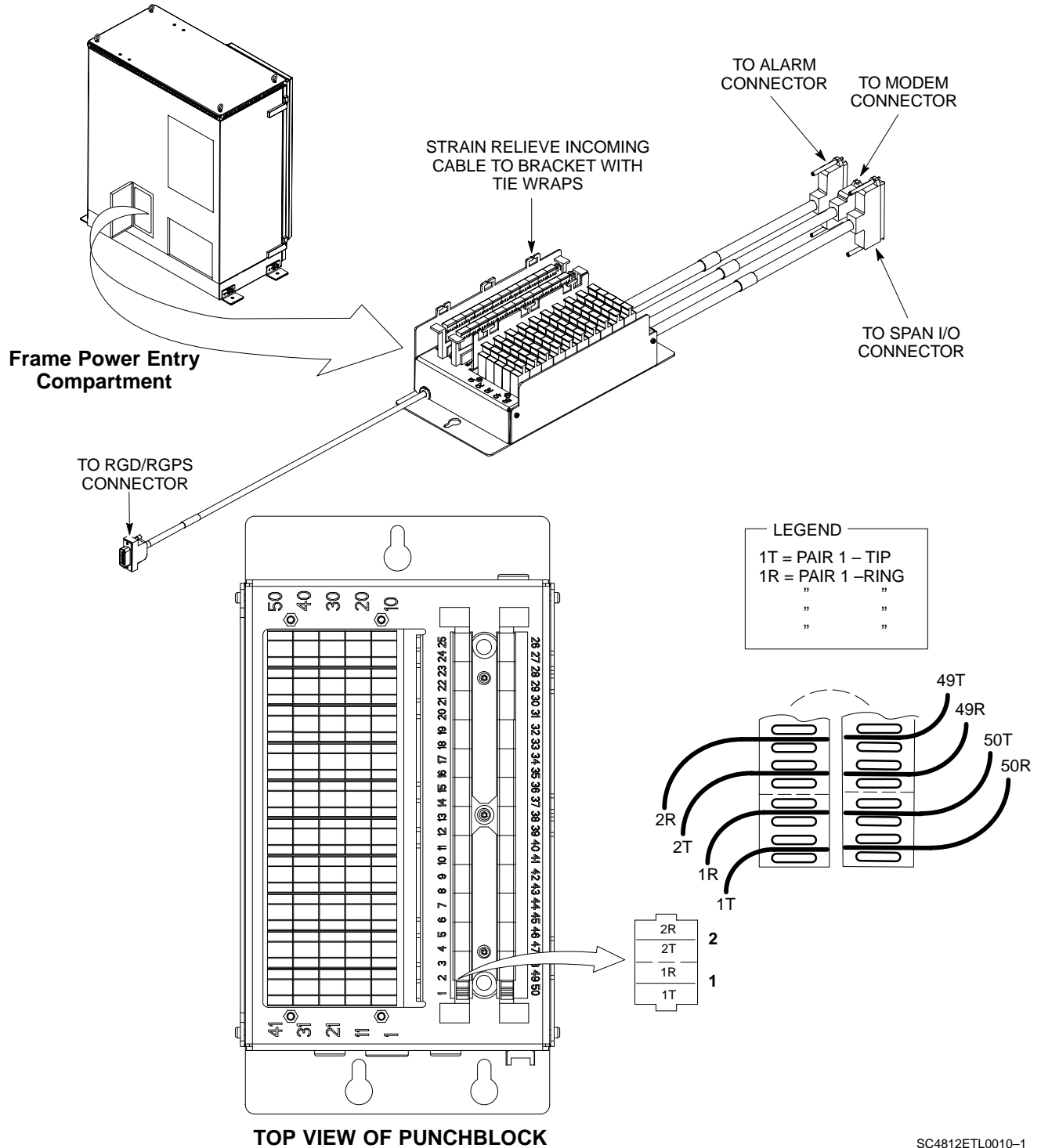
REF. FW00212

3

Alarm and Span Line Cable
Pin/Signal Information

See Figure 3-9 and refer to Table 3-5 for the physical location and punchdown location information for the 50-pair punchblock.

Figure 3-9: 50-Pair Punchblock



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Span Lines – Interface and Isolation – continued

3

Table 3-5: Punchdown Location for 50-Pair Punch Block

<i>Site Component</i>	<i>Signal Name</i>	<i>Punchdown</i>	<i>Color</i>
NOT USED		1T	
		1R	
		2T	
		2R	
		3T	
		3R	
		4T	
		4R	
		5T	
		5R	
	6T		
	6R		
	7T		
LFR/HSO	LFR_HSO_GND	7R	Orange
	EXT_IPPS_POS	8T	Red
	EXT_IPPS_NEG	8R	White
	CAL_+	9T	Red
	CAL_-	9R	Green
	LORAN_+	10T	Red
	LORAN_-	10R	Blue
PILOT BEACON	Pilot Beacon Alarm – Minor	11T	
	Pilot Beacon Alarm – Rtn	11R	
	Pilot Beacon Alarm – Major	12T	
	Pilot Beacon Control – NO	12R	
	Pilot Beacon Control – COM	13T	
	Pilot Beacon Control – NC	13R	
CUSTOMER OUTPUTS / INPUTS	Customer Outputs 1 – NO	14T	
	Customer Outputs 1 – COM	14R	
	Customer Outputs 1 – NC	15T	
	Customer Outputs 2 – NO	15R	
	Customer Outputs 2 – COM	16T	
	Customer Outputs 2 – NC	16R	
	Customer Outputs 3 – NO	17T	
	Customer Outputs 3 – COM	17R	
	Customer Outputs 3 – NC	18T	
	Customer Outputs 4 – NO	18R	
	Customer Outputs 4 – COM	19T	
	Customer Outputs 4 – NC	19R	
	Customer Inputs 1	20T	
	Cust_Rtn_A_1	20R	
	Customer Inputs 2	21T	
	Cust_Rtn_A_2	21R	
	Customer Inputs 3	22T	
	Cust_Rtn_A_3	22R	
	Customer Inputs 4	23T	
	Cust_Rtn_A_4	23R	
	Customer Inputs 5	24T	
	Cust_Rtn_A_5	24R	
	Customer Inputs 6	25T	
	Cust_Rtn_A_6	25R	
	Customer Inputs 7	26T	
	Cust_Rtn_A_7	26R	
	Customer Inputs 8	27T	

... continued on next page

Span Lines – Interface and Isolation – continued

Table 3-5: Punchdown Location for 50-Pair Punch Block

Site Component	Signal Name	Punchdown	Color
CUSTOMER OUTPUTS / INPUTS	Cust_Rtn_A_8	27R	
	Customer Inputs 9	28T	
	Cust_Rtn_A_9	28R	
	Customer Inputs 10	29T	
	Cust_Rtn_A_10	29R	
SPAN	RVC_TIP_A	30T	Red/Bk
	RVC_RING_A	30R	Red
	XMIT_TIP_A	31T	White/Bk
	XMIT_RING_A	31R	White
	RVC_TIP_B	32T	Green/Bk
	RVC_RING_B	32R	Green
	XMIT_TIP_B	33T	Blue/Bk
	XMIT_RING_B	33R	Blue
	RVC_TIP_C	34T	Yellow/Bk
	RVC_RING_C	34R	Yellow
	XMIT_TIP_C	35T	Brown/Bk
	XMIT_RING_C	35R	Brown
	RVC_TIP_D	36T	Orange/Bk
	RVC_RING_D	36R	Orange
	XMIT_TIP_D	37T	Violet/Bk
	XMIT_RING_D	37R	Violet
	RVC_TIP_E	38T	Gray/Bk
	RVC_RING_E	38R	Gray
	XMIT_TIP_E	39T	Pink/Bk
	XMIT_RING_E	39R	Pink
RVC_TIP_F	40T	Tan/Bk	
RVC_RING_F	40R	Tan	
XMIT_TIP_F	41T	Bk/White	
XMIT_RING_F	41R	Bk	
RGPS	GPS_POWER_A+	42T	Blue
	GPS_POWER_A-	42R	Blue/Bk
	GPS_POWER_B+	43T	Yellow
	GPS_POWER_B-	43R	Yellow/Bk
	GPS_RX+	44T	White
	GPS_RX-	44R	White/Bk
	GPS_TX+	45T	Green
	GPS_TX-	45R	Green/Bk
	Signal Ground	46T	Red
	Master Frame	46R	Red/Bk
Phone Line	GPS_lpps+	47T	Brown
	GPS_lpps-	47R	Brown/Bk
Phone Line	Telco_Modem_T	48T	
	Telco_Modem_R	48R	
Miscellaneous	Chasis Ground	49T	Cable Drain
	Reserved	49R	
	Reserved	50T	
	Reserved	50R	

LMF to BTS Connection

LMF to BTS Connection

The CDMA LMF computer may be connected to the LAN A or B connector located behind the frame lower air intake grill. Figure 3-10 below shows the general location of these connectors. LAN A is considered the primary LAN.

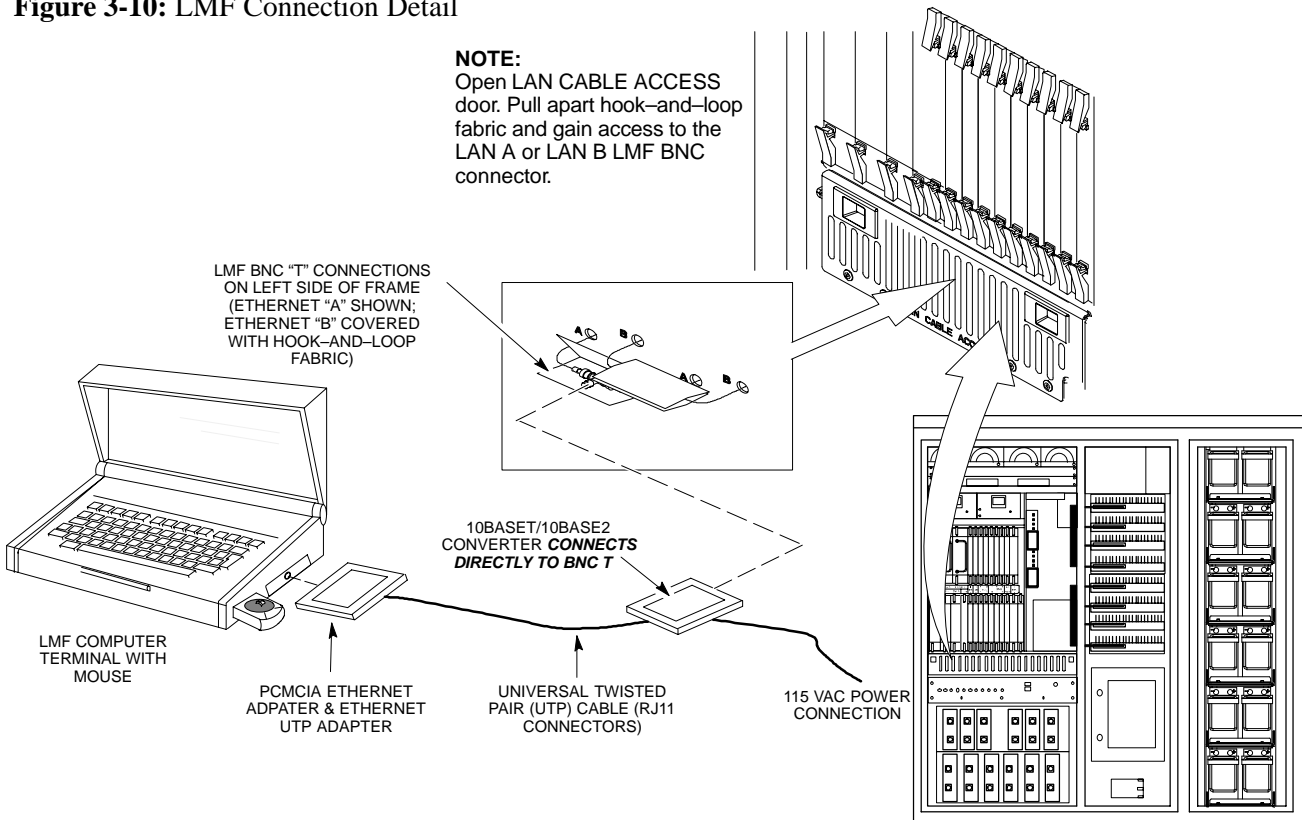
Table 3-6: Connect the LMF to the BTS

Step	Action
1	To gain access to the LAN connectors, open the LAN cable and utility shelf access panel, then <i>pull apart the hook-and-loop fabric covering the BNC "T" connector</i> (see Figure 3-10). If desired, slide out the utility shelf for the LMF computer.
2	Connect the CDMA LMF computer to the LAN A (left-hand) BNC connector via PCMCIA Ethernet Adapter.

NOTE
Xircom Model PE3-10B2 or equivalent can also be used to interface the CDMA LMF Ethernet connection to the BTS frame connected to the PC parallel port, powered by an external AC/DC transformer. In this case, *the BNC cable must not exceed three feet in length.*

*** IMPORTANT**
The LAN shield is isolated from chassis ground. The LAN shield (exposed portion of BNC connector) **must not touch the chassis** during optimization.

Figure 3-10: LMF Connection Detail



SC4812ETL0012-2

Using CDMA LMF

Basic CDMA LMF Operation

The CDMA LMF allows the user to work in the two following operating environments which are accessed using the specified desktop icons:

- Graphical User Interface (GUI) using the WinLMF icon
- Command Line Interface (CLI) using the WinLMF CLI icon

The GUI is the *primary* optimization and acceptance testing operating environment. The CLI environment provides additional capability to the user to perform manually controlled acceptance tests and audit the results of optimization and calibration actions.

Basic operation of the CDMA LMF in either environment includes performing the following:

- Selecting and Deselecting BTS devices
- Enabling devices
- Disabling devices
- Resetting devices
- Obtaining device status

The following additional basic operation can be performed in a GUI environment:

- Sorting a status report window

For detailed information on performing these and other CDMA LMF operations, refer to the *LMF Help function* and the *LMF CLI Reference; 68P09253A56*.



IMPORTANT

Unless otherwise noted, LMF procedures in this manual are performed using the GUI environment.

CDMA LMF and Logical BTS

An SC4812ET Lite logical BTS can consist of up to two SC4812ET Lite frames. When the CDMA LMF is connected to a frame 1 Ethernet port of a logical BTS, access is available to all devices in all of the frames that make up the logical BTS. A logical BTS CDF file that includes equipment information for all of the logical BTS frames and their devices is required for proper LMF interface. A CBSC CDF file that includes channel data for all of the logical BTS frames is also required.

The first frame of a logical BTS has a **-1** suffix (for example, **BTS-812-1**) and the second frame of the logical BTS is numbered with the suffix, **-101** (e. g. **BTS-812-101**). When the CDMA LMF is logged into a BTS, a FRAME tab is displayed for each frame. If there is only one frame for the BTS, there will only be one tab (e.g., **FRAME-282-1** for **BTS-282**). If a logical BTS has more than one frame, there will be a

separate **FRAME** tab for each frame (for example, **FRAME-438-1**, and **FRAME-438-101** for **BTS-438** that has both frames). If an RFDS is included in the CDF file, an **RFDS** tab (e.g., **RFDS-438-1**) will be displayed.

Actions, such as ATP tests, can be initiated for selected devices in one or more frames of a logical BTS. Refer to the CDMA LMF Select devices help screen for information on how to select devices.

3

Logging Into a BTS



CAUTION

Be sure that the correct **bts-#.cdf** and **cbsc-#.cdf** file is used for the BTS. These should be the CDF files that are provided for the BTS by the CBSC. Failure to use the correct CDF files can result in invalid optimization.

Failure to use the correct CDF files to log into a live (traffic-carrying) site can shut down the site.

Logging into a BTS establishes a communications link between the BTS and the CDMA LMF. You may be logged into one or more BTSs at a time, but only one CDMA LMF may be logged into each BTS.

Before attempting to start the CDMA LMF computer and the CDMA LMF software, confirm the CDMA LMF computer is properly connected to the BTS (see Table 3-6). Follow the procedures in Table 3-7 to log into a BTS.

Prerequisites

Before attempting to log into a BTS, ensure the following have been completed:

- The CDMA LMF is correctly installed and prepared.
- A **bts-*nnn*** folder with the correct CDF and CBSC files exists.
- The CDMA LMF computer was connected to the BTS before starting the Windows operating system and the CDMA LMF software. If necessary, restart the computer after connecting it to the BTS in accordance with Table 3-6 and Figure 3-10.

BTS Login from the GUI Environment

Follow the procedures in Table 3-7 to log into a BTS when using the GUI environment.

Table 3-7: BTS GUI Login Procedure

✓	Step	Action
	1	<p>Start the CDMA LMF GUI environment by double-clicking on the WinLMF desktop icon (if the LMF is not running).</p> <p>NOTE If a warning similar to the following is displayed, select No, shut down other LMF sessions which may be running, and start the CDMA LMF GUI environment again:</p> <p>The CLI handler is already running. This may cause conflicts with the LMF. Are you sure you want to start the application?</p> <p style="text-align: center;">Yes No</p>
	2	Click on Login tab (if not displayed).
	3	Double click on CDMA (in the Available Base Stations pick list).
	4	Click on the desired BTS number.
	5	Click on the Network Login tab (if not already in the forefront).
	6	Enter correct IP address (normally 128.0.0.2) for a field BTS, if not correctly displayed in the IP Address box.
	7	Type in the correct IP Port number (normally 9216) if not correctly displayed in the IP Port box.
	8	Change the Multi-channel Preselector from the Multi-channel Preselector pick list (normally MPC) to a device corresponding to your BTS configuration, if required.
	9	Use a Tower Top Amplifier is not applicable to the SC4812ET Lite.
	10	<p>Click on Login. (A BTS tab with the BTS is displayed.)</p> <p>NOTE</p> <ul style="list-style-type: none"> • If you attempt to log into a BTS that is already logged on, all devices will be gray. • There may be instances where the BTS initiates a log out due to a system error (i.e., a device failure). • If the MGLI is OOS-ROM (blue), it must be downloaded with RAM code before other devices can be seen. • If the MGLI is OOS-RAM (yellow), it must be enabled before other installed devices can be seen.



BTS Login from the CLI Environment

Follow the procedures in Table 3-8 to log into a BTS when using the CLI environment.



IMPORTANT

If the CLI and GUI environments are to be used at the same time, the *GUI must be started first and BTS login must be performed from the GUI*. Refer to Table 3-7 to start the GUI environment and log into a BTS.

Table 3-8: BTS CLI Login Procedure

✓	Step	Action
	1	Double-click the WinLMF CLI desktop icon (if the LMF CLI environment is not already running).
	2	<p>NOTE If a BTS was logged into under a GUI session before the CLI environment was started, the CLI session will be logged into the same BTS, and step 2 is not required.</p> <p>At the /wlmf prompt, enter the following command:</p> <p>login bts-<bts#> host=<host> port=<port></p> <p>where:</p> <p>host = MGLI card IP address (defaults to address last logged into for this BTS or 128.0.0.2 if this is first login to this BTS)</p> <p>port = IP port of the BTS (defaults to port last logged into for this BTS or 9216 if this is first login to this BTS)</p> <p>A response similar to the following will be displayed:</p> <pre>LMF> 13:08:18.882 Command Received and Accepted COMMAND=login bts-33 13:08:18.882 Command In Progress 13:08:21.275 Command Successfully Completed REASON_CODE="No Reason"</pre>

Logging Out

Logging out of a BTS is accomplished differently for the GUI and CLI operating environments.



IMPORTANT

The GUI and CLI environments use the same connection to a BTS. If a BTS is logged into in both the GUI and CLI environments at the same time, logging out of the BTS in either environment will log out of it for both. When either a login or logout is performed in the CLI window, there is no GUI indication that the login or logout has occurred.

Logging Out of a BTS from the GUI Environment

Follow the procedure in Table 3-9 to logout of a BTS when using the GUI environment.

Table 3-9: BTS GUI Logout Procedure

✓	Step	Action
	1	Click on Select on the BTS tab menu bar.
	2	Click the Logout item in the pulldown menu (a Confirm Logout pop-up message will appear).
	3	Click on Yes (or press the Enter key) to confirm logout. The Login tab will appear. NOTE If a logout was previously performed on the BTS from a CLI window running at the same time as the GUI, a Logout Error popup message will appear stating the system could not log out of the BTS. When this occurs, the GUI must be exited and restarted before it can be used for further operations.
	4	If a Logout Error popup message appears stating that the system could not log out of the Base Station because the given BTS is not logged in, click OK and proceed to step 5.
	5	Select File > Exit in the window menu bar, click Yes in the Confirm Logout popup, and click Yes in the Logout Error popup which appears again.
	6	If further work is to be done in the GUI, restart it. NOTE <ul style="list-style-type: none"> • The Select menu on the BTS tab will only log you out of the displayed BTS. • You can also log out of all BTS sessions and exit CDMA LMF by clicking on the File selection in the menu bar and selecting Exit from the File menu list. A Confirm Logout pop-up message will appear.

Logging Out of a BTS from the CLI Environment

Follow the procedure in Table 3-10 to logout of a BTS when using the CLI environment.

Table 3-10: BTS CLI Logout Procedure

✓	Step	Action
	1	<p>* IMPORTANT</p> <p>If the BTS is also logged into from a GUI running at the same time and further work must be done with it in the GUI, proceed to step 2.</p> <p>Logout of a BTS by entering the following command:</p> <p>logout bts-<bts#></p> <p>A response similar to the following will be displayed:</p> <pre>LMF> 13:24:51.028 Command Received and Accepted COMMAND=logout bts-33 13:24:51.028 Command In Progress 13:24:52.04 Command Successfully Completed REASON_CODE="No Reason"</pre>
	2	<p>If desired, close the CLI interface by entering the following command:</p> <p>exit</p> <p>A response similar to the following will be displayed before the window closes:</p> <pre>Killing background processes....</pre>

Establishing an MMI Communication Session

For those procedures which require MMI communication between the CDMA LMF and BTS FRUs, follow the procedures in Table 3-11 to initiate the communication session.

Figure 3-11 illustrates common equipment connections for the CDMA LMF computer. For specific connection locations on FRUs, refer to the illustration accompanying the procedures which require the MMI communication session.

Table 3-11: Establishing MMI Communication

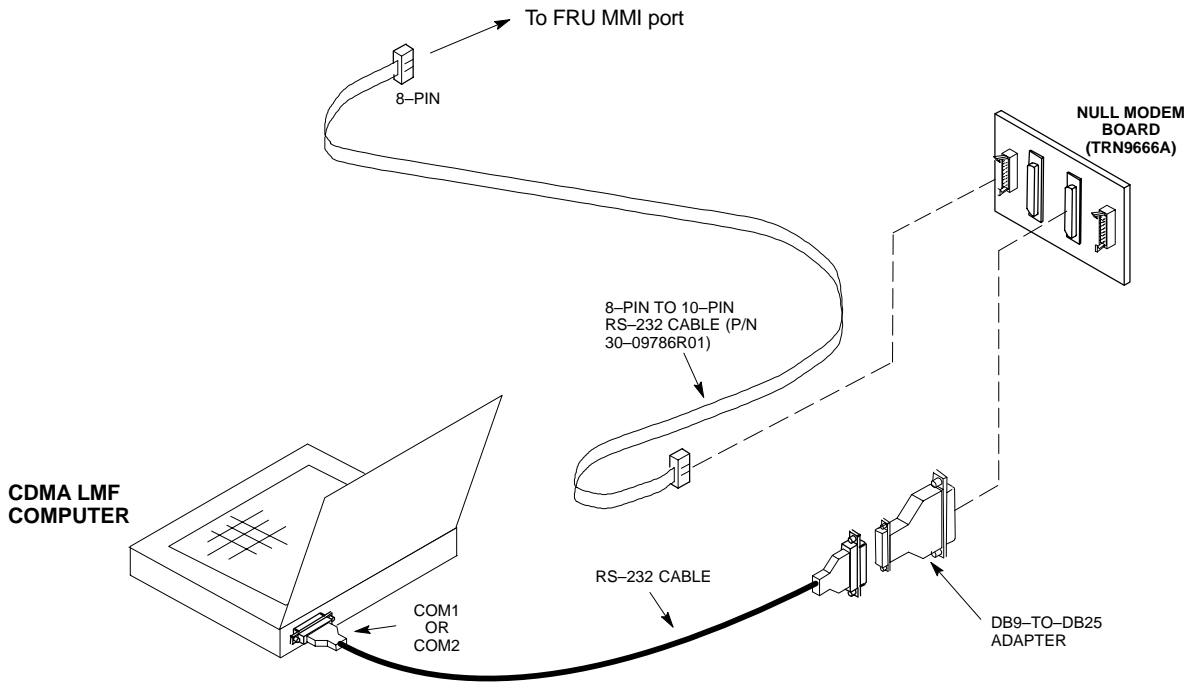
Step	Action
1	Connect the CDMA LMF computer to the equipment as detailed in the applicable procedure which requires the MMI communication session.
2	Start the named HyperTerminal connection for MMI sessions by double clicking on its Windows desktop shortcut.

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Table 3-11: Establishing MMI Communication	
Step	Action
	<p>NOTE</p> <p>If a Windows desktop shortcut was not created for the MMI connection, access the connection from the Windows Start menu by selecting:</p> <p>Programs > Accessories > Hyperterminal > HyperTerminal > <Named HyperTerminal Connection (e.g., MMI Session)></p>
3	Once the connection window opens, establish MMI communication with the BTS FRU by pressing the CDMA LMF computer Enter key until the prompt identified in the applicable procedure is obtained.

Figure 3-11: CDMA LMF Computer Common MMI Connections



Online Help

Task oriented online help is available in CDMA LMF by clicking on **Help** in the menu bar.

Pinging the Processors

Pinging the BTS

For proper operation, the integrity of the Ethernet LAN A and B links must be verified. Figure 3-12 represents a typical BTS Ethernet configuration for the SC4812ET Lite with an expansion frame. The drawing depicts cabling and termination for both the A and B LANs.

Ping is a program that sends request packets to the LAN network modules to get a response from the specified “target” module.

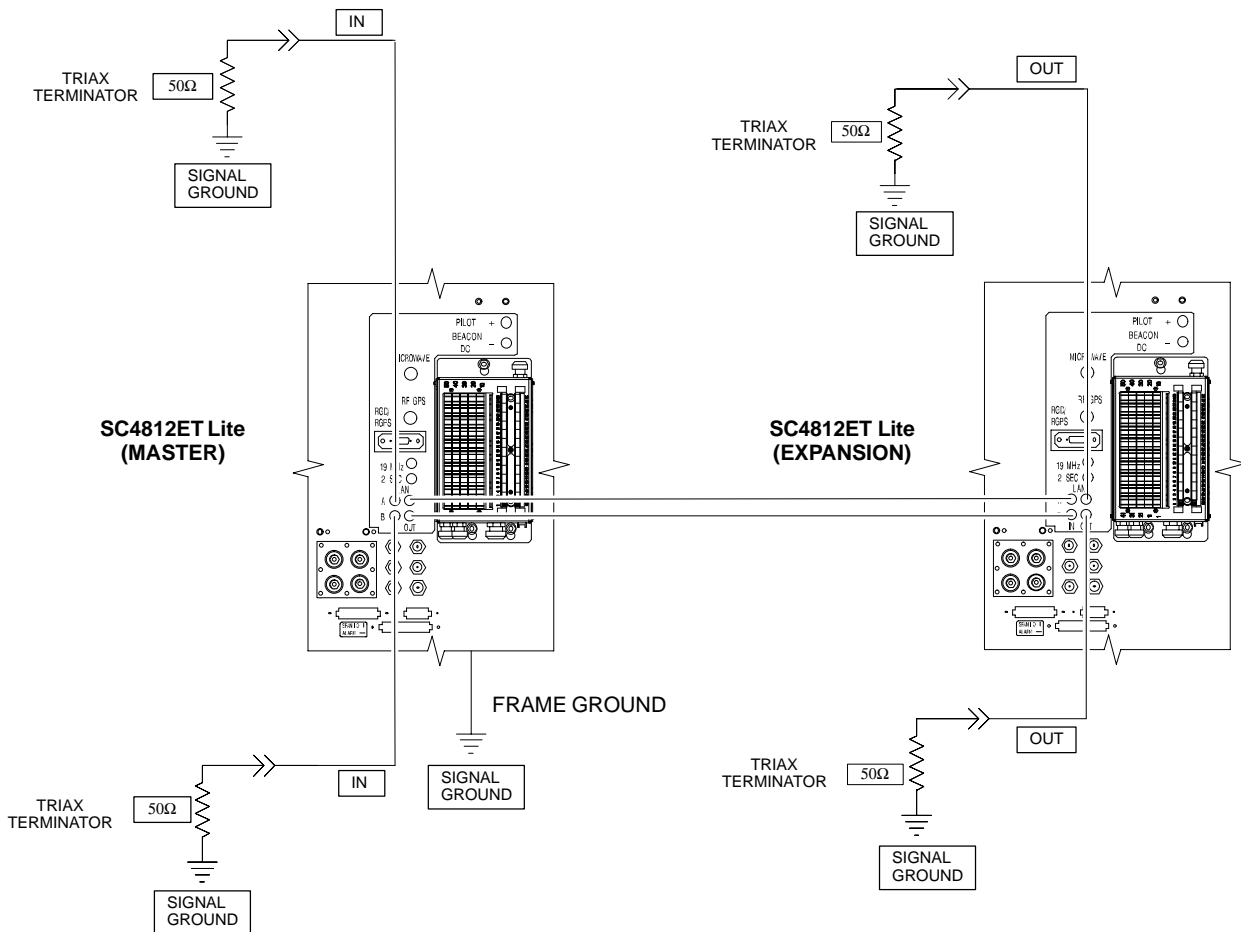
Follow the steps in Table 3-12 to ping each processor (on both LAN A and LAN B) and verify LAN redundancy is working properly.



CAUTION

Always wear a conductive, high impedance wrist strap while handling any circuit card/module to prevent damage by Electro-Static Discharge (ESD).

Figure 3-12: BTS Ethernet LAN Interconnect Diagram



SC4812ETL0013-4



IMPORTANT

The Ethernet LAN A and B cables and/or terminations must be installed on each frame/enclosure external LAN connector before performing this test. All other processor board LAN connections are made through the backplanes.

Table 3-12: Pinging the Processors

Step	Action
1	If this is a first-time communication with a newly-installed frame or a GLI2 which has been replaced, perform the procedure in Table 6-3 and then return to step 2.
2	Be sure uncabled LAN A and B IN and OUT connectors in the power entry compartment (rear of frame – Figure 3-9 and Figure 3-12) are terminated with 50 Ω loads.
3	<i>If it has not already been done</i> , interface the LMF computer to the BTS (refer to Table 3-6 and Figure 3-10.)
4	<i>If it has not already been done</i> , start a GUI LMF session and log into the BTS (refer to Table 3-7).
5	In the power entry compartment, remove the 50Ω termination on the frame LAN B IN connector. The CDMA LMF session should remain active. Replace the 50Ω terminator on the BTS frame LAN B IN connector.
6	From the Windows desktop, click the Start button and select Run .
7	In the Open box, type ping and the GLI2 IP address (for example, ping 128.0.0.2). NOTE 128.0.0.2 is the default IP address for the GLI2 in field BTS units.
8	Click on OK .
9	If the targeted module responds, a DOS window will appear with a display similar to the following: Reply from 128.0.0.2: bytes=32 time=3ms TTL=255 • If the device responds, <i>proceed to step 18</i> . If there is no response the following is displayed: Request timed out • If the GLI2 fails to respond, it should be reset and re-pinged. If it still fails to respond, typical problems would be: failure of the CDMA LMF to login, shorted BNC to inter-frame cabling, open cables, crossed A and B link cables, or the GLI2 itself.
10	Logout of the BTS as described in Table 3-9, exit from the CDMA LMF program, and restart the Windows operating system on the CDMA LMF computer.
11	Restart the CDMA LMF GUI program as described in <i>LMF Help function</i> , and log into the BTS as described in Table 3-7.
12	Perform steps 6 through 9 again. • If the device responds, <i>proceed to step 18</i> . If there is still no response, <i>proceed to step 13</i> .

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Table 3-12: Pinging the Processors

Step	Action
13	If ping was unsuccessful after restarting the CDMA LMF computer, press the MGLI front panel reset pushbutton and perform steps 6 through 9 again.
14	<p>NOTE <i>Refer to Table 6-1 if ping was unsuccessful after resetting the MGLI.</i></p>
15	After the BTS has been successfully pinged, be sure the 50Ω termination was replaced on the BTS frame LAN B IN connector in the power entry compartment (Figure 3-12). Disconnect the LMF cable from the LAN shelf LAN A connector, and connect it to LAN B (right-hand connector) using a BNC-female-to-BNC-female adapter (refer to Figure 3-10).
16	In the power entry compartment, remove the 50Ω termination on the BTS frame LAN A IN connector.
17	Repeat steps 5 through 8 using LAN B.
18	After the BTS has been successfully pinged on the secondary LAN, replace the 50Ω termination on the frame LAN A IN connector in the power entry compartment.
19	Disconnect the LMF cable from the LAN shelf LAN B and connect it to LAN A using a BNC-female-to-BNC-female adapter.
20	Remove and replace the 50Ω termination on the LAN B IN connector to force the MGLI to switch to primary LAN A.
21	Repeat steps 5 through 8 to ensure proper primary LAN operation.

Overview

Before a BTS can operate, each equipped device must contain device initialization (ROM) code. ROM code is loaded in all devices during manufacture or factory repair. Device application (RAM) code and data must be downloaded to each equipped device by the user before the BTS can be made fully functional for the site where it is installed.

ROM Code

Downloading ROM code to BTS devices from the CDMA LMF is *NOT routine maintenance or a normal part of the optimization process*. It is only done in unusual situations where the resident ROM code in the device does not match the release level of the site operating software *AND* the CBSC can not communicate with the BTS to perform the download. An example would be a BTS loaded with Release 9.2 software where a GLI loaded with Release 2.8.1 ROM code must be installed to replace a malfunctioning MGLI.

Before ROM code can be downloaded from the CDMA LMF, the correct ROM code file for each device to be loaded must exist on the LMF computer. ROM code *must be manually selected* for download.

ROM code can be downloaded to a device that is in any state. After the download is started, the device being downloaded will change to OOS-ROM (blue). The device will remain OOS-ROM (blue) when the download is completed. The same Revision-level RAM code must then be downloaded to the device. For example, if Release 2.9.2.1.1 ROM code is downloaded, Release 2.9.2.1.1 RAM code must be downloaded.

Procedures to load ROM code are located in Appendix G.

RAM Code

Before RAM code can be downloaded from the CDMA LMF, the correct RAM code file for each device must exist on the LMF computer. RAM code can be automatically or manually selected depending on the **Device** menu item chosen and where the RAM code file for the device is stored in the CDMA LMF file structure. The RAM code file will be selected automatically if the file is in the `\lmf\cdma\loads\n.n.n.n\code` folder (where *n.n.n.n* is the version number of the download code that matches the “NextLoad” parameter of the CDF file). The RAM code file in the code folder must have the correct hardware bin number.

RAM code can be downloaded to a device that is in any state. After the download is started, the device being loaded will change to OOS-ROM (blue). When the download is completed successfully, the device will change to OOS-RAM (yellow). When code is downloaded to an MGLI or GLI, the CDMA LMF automatically also downloads data and then enables the MGLI. When enabled, the MGLI will change to INS (green).

For non-GLI devices, data must be downloaded after RAM code is downloaded. To download data, the device state must be OOS-RAM (yellow).

RAM code downloading requires a few minutes. After the download starts, the non-GLI device being loaded changes to OOS-ROM (blue). If the download is completed successfully, the non-GLI device changes to OOS-RAM (yellow).

The devices to be loaded with RAM code and data are:

- Master Group Line Interface (MGLI2)
- Redundant GLI (GLI2)
- Clock Synchronization Module (CSM) (*Only if new revision code must be loaded*)
- Multi Channel CDMA (MCC24 or MCC8E) card
- Broadband Transceiver (BBX2)
- RFDS Test Subscriber Interface Card (TSIC), if equipped



IMPORTANT

The MGLI *must* be successfully downloaded with RAM code and data, and in INS (green) status *before* downloading any other device. The RAM code download process for an MGLI automatically downloads data and then enables the MGLI.

Verify GLI ROM Code Loads

Devices should not be loaded with RAM code which is for a different system release than the ROM code with which they are loaded. Before downloading RAM code and data to the processor cards, follow the procedure in Table 3-13 to verify the GLI devices are loaded with the correct ROM code for the system release used by the BSS.

Table 3-13: Verify GLI ROM Code Loads	
Step	Action
1	<i>If it has not already been done</i> , start a GUI LMF session and log into the BTS (refer to Table 3-7).
2	Select all GLI devices by clicking on them, and select Device > Status from the menu bar.
3	In the status report window which opens, note the number in the ROM Ver column for each GLI2. <ul style="list-style-type: none"> • The system release number will be the first two decimal divisions of the number; for example, the number 2.15.0.0.3 would be for System Release 2.15, and 2.9.2.2.34 would be for System Release 2.9.
4	If the ROM code loaded in the GLIs is not for the correct system release, log out of the BTS, disconnect the CDMA LMF computer, reconnect the span lines as described in Table 5-7, and have the CBSC download the correct ROM code version to the BTS devices.
5	When the GLIs have the correct ROM load for the system release being used, be sure the span lines are disabled as outlined in Table 3-4 and proceed to downloading RAM code and data.

Download the BTS – continued

Download RAM Code and Data to MGLI and GLI

Follow the steps outlined in Table 3-14 to download the RAM code and data to the MGLI and other installed GLI devices.

Prerequisites

- Prior to performing these procedures, ensure a code file exists for each of the devices to be loaded.
- The CDMA LMF computer is connected to the BTS (refer to Table 3-6), and is logged in using the *GUI* environment (refer to Table 3-7).

Table 3-14: Download and Enable MGLI and GLI Devices

Step	Action
1	From the Util pull down menu, select Tools , then Update NextLoad .
2	Select the correct code version for the system release being used and click Save .
3	Download code to the MGLI by clicking on the device.
4	From the Device pull down menu, select Download Code . A status report is displayed confirming change in the device(s) status. Click OK to close the status window. <i>(The MGLI will automatically be downloaded with data and enabled.)</i>
5	Once the MGLI is enabled, load and enable additional installed GLIs by clicking on the devices and repeating step 4.
6	Click OK to close the status window for the additional GLI devices.

Download RAM Code and Data to Non-GLI Devices

Downloads to non-GLI devices can be performed individually for each device or all installed devices can be downloaded with one action. RAM code and data are downloaded to non-GLI devices in separate steps.



IMPORTANT

CSM devices are RAM code-loaded at the factory. RAM code is downloaded to CSMs *only if a newer software version needs to be loaded*.

NOTE

When downloading to multiple devices, the download may fail for some of the devices (a time-out occurs). These devices can be loaded individually after completing the multiple download.

Follow the steps in Table 3-15 to download RAM code and data to non-GLI devices.

Table 3-15: Download RAM Code and Data to Non-GLI Devices

Step	Action
1	Select the target CSM, MCC, and BBX device(s).
2	From the Device pull down menu, select Download Code . A status report is displayed that shows the results of the download for each selected device.
3	Click OK to close the status report window when downloading is completed. NOTE After a BBX, CSM, or MCC device is successfully loaded with RAM code and has changed to the OOS-RAM state (yellow), the status LED should be rapidly flashing GREEN.
4	To download data, select the target CSM and MCC device(s).
5	From the Device pull down menu, select Download Data . A status report is displayed that shows the results of the download for each selected device.
6	Click OK to close the status report window when downloading is completed.

Select CSM Clock Source

A CSM can have three different clock sources. The Select CSM Source function can be used to select the clock source for each of the three inputs. This function is only used if the clock source for a CSM needs to be changed. The Clock Source function provides the following clock source options.

- Local GPS
- Remote GPS
- HSO (only for source 2 & 3)
- LFR (only for source 2 & 3)
- 10 MHz (only for source 2 & 3)
- NONE (only for source 2 & 3)

Prerequisites

MGLI=INS_ACT (green), CSM= OOS_RAM (yellow) or INS_ACT (green)

Table 3-16: Select CSM Clock Source

Step	Action
1	Select the applicable CSM(s).
2	Click on the Device menu.
3	Click on the Clock Source menu item.
4	Click on the Select menu item. A clock source selection window is displayed.
5	Select the applicable clock source in the Clock Reference Source pick lists. Uncheck the related check box if you do not want the displayed pick list item to be used.

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Table 3-16: Select CSM Clock Source

Step	Action
6	Click on the OK button. A status report window is displayed showing the results of the selection action.
7	Click on the OK button to close the status report window.

Enable CSMs

Each BTS CSM system features two CSM boards per site. In a typical operation, the primary CSM locks its Digital Phase Locked Loop (DPLL) circuits to GPS signals. These signals are generated by either an on-board GPS module (RF-GPS) or a remote GPS receiver (R-GPS). The GPS receiver interfaced to CSM 1 is used as the primary timing reference and synchronizes the entire cellular system. CSM 2 provides clock synchronization back-up, but does not have a GPS receiver.

The BTS may be equipped with a LORAN-C Low Frequency Receiver (LFR), a High Stability Oscillator (HSO), or external 10 MHz Rubidium source which the CSM can use as a secondary timing reference. In all cases, the CSM monitors and determines what reference to use at a given time.



IMPORTANT

For RF-GPS, verify the CSM configured with the GPS receiver “daughter board” is installed in the frame’s CSM 1 slot before continuing.

Follow the steps outlined in Table 3-17 to enable the CSMs installed in the SCCP shelves.

Table 3-17: Enable CSMs

Step	Action
1	<p>NOTE If equipped with two CSMs, enable CSM-2 first.</p> <p>Click on the target CSM. From the Device pull down, select Enable.</p>
2	<p>A status report is displayed confirming change in the device(s) status. Click OK to close the status report window.</p> <p>NOTE</p> <ul style="list-style-type: none"> • CSM 1 houses the GPS receiver. The enable sequence can take up to <i>one hour</i> (see below). • FAIL may be shown in the status report table for enable action. If Waiting For Phase Lock is shown in the Description field, the CSM changes to the Enabled state after phase lock is achieved.

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Table 3-17: Enable CSMs	
Step	Action
	<p>* IMPORTANT</p> <p>The GPS satellite system satellites are not in a geosynchronous orbit and are maintained and operated by the United States Department of Defense (DOD). The DOD periodically alters satellite orbits; therefore, satellite trajectories are subject to change. A GPS receiver that is INS contains an “almanac” that is updated periodically to take these changes into account.</p> <p>If a GPS receiver has not been updated for a number of weeks, it may take up to an hour for the GPS receiver “almanac” to be updated.</p> <p>Once updated, the GPS receiver must track at least four satellites and obtain (hold) a 3-D position fix for a minimum of 45 seconds before the CSM will come in service. (In some cases, the GPS receiver needs to track only one satellite, depending on accuracy mode set during the data load).</p>
3	<p>NOTE</p> <ul style="list-style-type: none"> • If equipped with two CSMs, CSM-1 should be bright green (INS-ACT) and CSM-2 should be dark green(INS-STB) • If more than an hour has passed, refer to CSM Verification, see Figure 3-13 and Table 3-20 to determine the cause. <p>After the CSMs have been successfully enabled, be sure the PWR/ALM LEDs are steady green (alternating green/red indicates the card is in an alarm state).</p>

Enable MCCs

This procedure configures the MCC and sets the “tx fine adjust” parameter. The “tx fine adjust” parameter is not a transmit gain setting, but a timing adjustment that compensates for the processing delay in the BTS (approximately 3 μS).

Follow the steps outlined in Table 3-18 to enable the MCCs installed in the SCCP shelves.



IMPORTANT

The MGLI and CSM must be downloaded and enabled, prior to downloading and enabling the MCC.

Table 3-18: Enable MCCs	
Step	Action
1	Click on the target MCC(s) or from the Select pull down menu choose All MCCs .
2	From the Device menu, select Enable A status report is displayed confirming change in the device(s) status.
3	Click OK to close the status report window.

Clock Synchronization Manager (CSM) System Time

The primary function of the Clock Synchronization Manager (CSM) cards is to maintain CDMA system time. The CSM card in SCCP shelf slot CSM-1 is the primary timing source while the card in slot CSM-2 provides redundancy. The second generation CSM card (CSM2) is required when using the remote GPS receiver (R-GPS). R-GPS uses a GPS receiver in the antenna head that has a digital output to the CSM2 card. A CSM2 card can have a local GPS receiver daughter card to support an RF-GPS signal.

Each CSM2 card features a temperature-stabilized, crystal oscillator that provides 19.6608 MHz clock, even second pulse, and 3 MHz reference signals to the synchronization source selected from the following (refer to Table 3-20 for source selection/verification procedures):

- GPS: local/RF-GPS or remote/R-GPS
- LORAN-C Low Frequency Receiver (LFR) or High Stability Oscillator (HSO)
- External reference oscillator sources

CDMA Clock Distribution Cards (CCDs) buffer and distribute even-second reference and 19.6608 MHz clock signals from the CSM cards. CCD 1 is married to the card in slot CSM-1, and CCD 2 is married to the card in slot CSM-2.

The BTS switches between the primary and redundant units (card slots CSM-1 and CSM-2, respectively) upon failure or command. A failure in CSM-1 or CCD 1 will cause the system to switch to the CSM-2-CCD 2 redundant card pair.

Fault management has the capability of switching between the GPS synchronization source and the LFR/HSO backup source in the event of a GPS receiver failure in CSM-1. During normal operation, the card in CSM-1 selects GPS as the primary timing source (Table 3-20). The source selection can also be overridden via the CDMA LMF or by the system software.

In addition to providing GPS synchronization to the LFR or HSO back-up sources, synchronization between the primary and redundant CSM-CCD pairs increases reliability.

Low Frequency Receiver/ High Stability Oscillator

The CSM performs the overall configuration and status monitoring functions of the LFR/HSO. In the event of GPS failure, the LFR/HSO is capable of maintaining synchronization initially established by the GPS reference signal.

The LFR requires an active external antenna to receive LORAN-C RF signals. Timing pulses are derived from this signal, which is

synchronized to Universal Time Coordinates (UTC) and GPS time. The LFR can maintain system time indefinitely after initial GPS lock.

The HSO is a high stability 10 MHz oscillator with the necessary interface to the CSMs. The HSO is typically installed in those geographical areas not covered by the LORAN-C system. Since the HSO is a free-standing oscillator, system time can only be maintained for 24 hours after 24 hours of GPS lock.

Upgrades and Expansions: LFR2/HSO2/HSOX

LFR2/HSO2 (second generation cards) both export a timing signal to the expansion or logical BTS frames. The associated expansion or logical frames require an HSO-expansion (HSOX) whether the starter frame has an LFR2 or an HSO2. The HSOX accepts input from the starter frame and interfaces with the CSM cards in the expansion frame. LFR and LFR2 use the same source code in source selection (Table 3-20). HSO, HSO2, and HSOX use the same source code in source selection (Table 3-20).

NOTE

Allow the **base site and test equipment to warm up for 60 minutes** after any interruption in oscillator power. CSM card warm-up allows the oscillator oven temperature and oscillator frequency to stabilize prior to test. Test equipment warm-up allows the Rubidium standard timebase to stabilize in frequency before any measurements are made.

CSM Frequency Verification

The objective of this procedure is the initial verification of the Clock Synchronization Module (CSM) cards before performing the RF path verification tests.

**Test Equipment Setup
(GPS & LFR/HSO Verification)**

Follow the steps outlined in Table 3-19 to set up test equipment.

Table 3-19: Test Equipment Setup (GPS & LFR/HSO Verification)

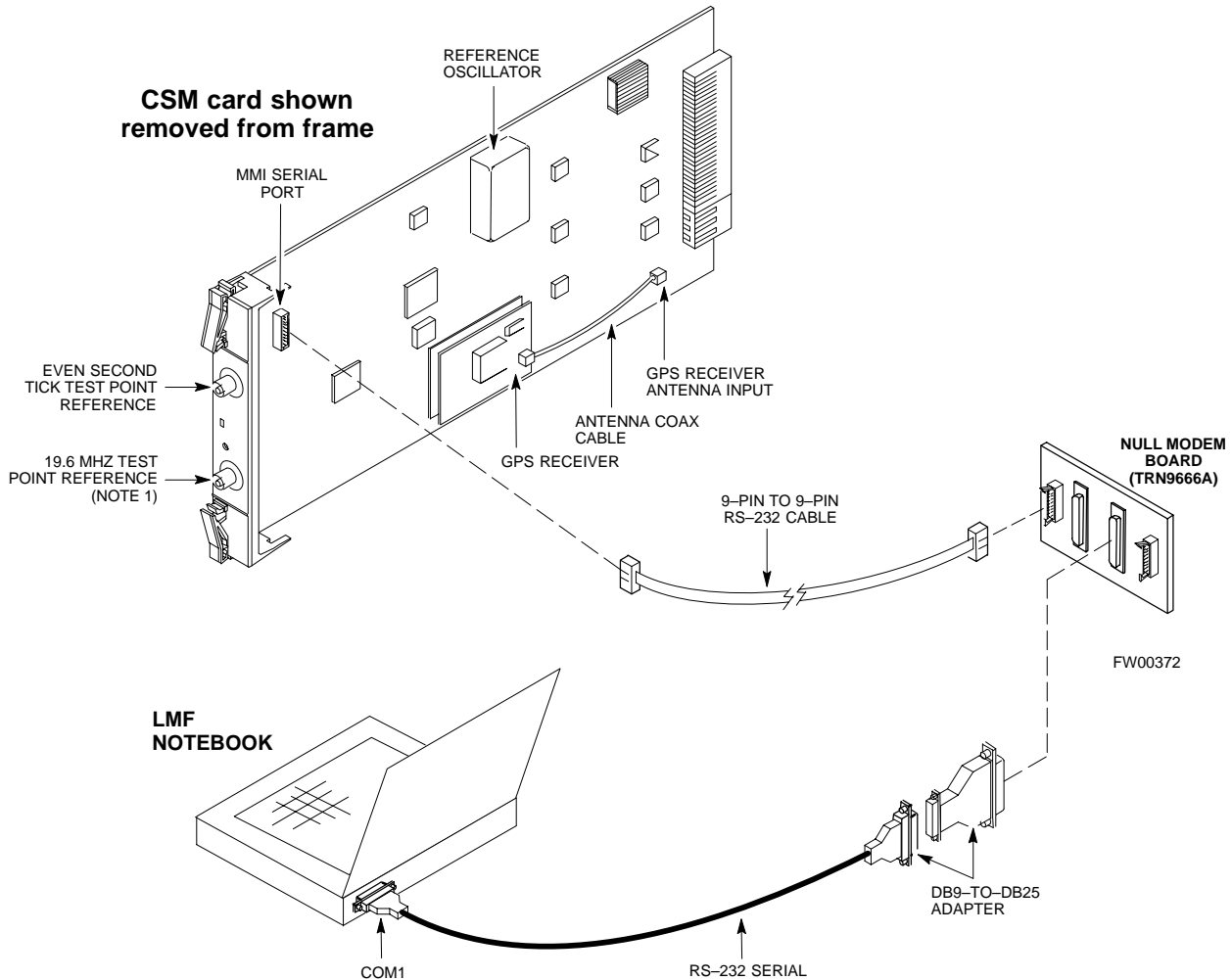
Step	Action
1a	For local GPS (RF-GPS): Verify a CSM card with a GPS receiver is installed in the primary CSM slot, CSM-1, and that CSM-1 is INS. NOTE This is verified by checking the card ejectors for kit number SGLN1145 on the card in slot 1.
1b	For Remote GPS (RGPS): Verify a CSM2 card is installed in primary slot CSM-1 and that CSM-1 is INS. NOTE This is verified by checking the card ejectors for kit number SGLN4132CC or subsequent.
2	Remove CSM-2 (if installed) and connect a serial cable from the LMF COM 1 port (via null modem card) to the MMI port on CSM-1 (see Figure 3-13).
3	Reinstall CSM-2.
4	Start an MMI communication session with CSM-1 by using the Windows desktop shortcut icon (see Table 3-11) .
5	When the terminal screen appears press the Enter key until the CSM> prompt appears.



CAUTION

In the power entry compartment, connect the GPS antenna to the RF GPS connector **ONLY**. Damage to the GPS *antenna* and/or *receiver* can result if the GPS antenna is inadvertently connected to any other RF connector.

Figure 3-13: CSM MMI Terminal Connection



NOTES:

- One LED on each CSM:
 Green = IN-SERVICE ACTIVE
 Fast Flashing Green = OOS-RAM
 Red = Fault Condition
 Flashing Green & Red = Fault

GPS Initialization/Verification

Prerequisites

Ensure the following prerequisites have been met before proceeding:

- The primary CSM and HSO (if equipped) has been warmed up for at least 15 minutes.
- The CDMA LMF computer is connected to the MMI port of the primary CSM as shown in Figure 3-13.
- A HyperTerminal session has been started (Table 3-11), and the CSM> prompt is present in the HyperTerminal window (Table 3-19).

Follow the steps outlined in Table 3-20 to initialize and verify proper GPS receiver functioning.

Table 3-20: GPS Initialization/Verification

Step	Action
1	<p>To verify that Clock alarms (0000), Dp11 is locked and has a reference source, and GPS self test passed messages are displayed within the report, issue the following MMI command</p> <p>bstatus</p> <ul style="list-style-type: none"> The system will display a response similar to the following: <pre>CSM Status INS:ACTIVE Slot A Clock MASTER. BDC_MAP:000, This CSM's BDC Map:0000</pre> <p><u>Clock Alarms (0000):</u></p> <pre>DPLL is locked and has a reference source. GPS receiver self test result: <u>passed</u></pre> <p>Time since reset 0:33:11, time since power on: 0:33:11 </p>
2	<p>Enter the following command at the CSM> prompt to display the current status of the Loran and GPS receivers:</p> <p>sources</p> <ul style="list-style-type: none"> When equipped with LFR, the system will generate a response similar to the following: <pre>N Source Name Type TO Good Status Last Phase Target Phase Valid ----- 0 LocalGPS Primary 4 YES Good 0 0 Yes 1 LFR CHA Secondary 4 YES Good -2013177 -2013177 Yes 2 Not Used</pre> <p><u>Current reference source number: 0</u></p> When equipped with HSO, the system will generate a response similar to the following: <pre>Num Source Name Type TO Good Status Last Phase Target Phase Valid ----- 0 Local GPS Primary 4 Yes Good 3 0 Yes 1 HSO Backup 4 No N/A timed-out* Timed-out* No</pre> <p>*NOTE “Timed-out” should only be displayed while the HSO is warming up. “Not-Present” or “Faulty” should not be displayed. If the HSO does not appear as one of the sources, then configure the HSO as a back-up source by entering the following command at the CSM> prompt:</p> <p>ss 1 12</p> <p>After a maximum of 15 minutes, the Rubidium oscillator should reach operational temperature and the LED on the HSO should now have changed from red to green. After the HSO front panel LED has changed to green, enter sources <cr> at the CSM> prompt. Verify that the HSO is now a valid source by confirming that the bold text below matches the response of the “sources” command.</p> <p>The HSO should be valid within one (1) minute, assuming the DPLL is locked and the HSO rubidium oscillator is fully warmed.</p> <pre>Num Source Name Type TO Good Status Last Phase Target Phase Valid ----- 0 Local GPS Primary 4 Yes Good 3 0 Yes 1 HSO Backup 4 Yes N/A xxxxxxxxxxxx xxxxxxxxxxxx Yes</pre>

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Table 3-20: GPS Initialization/Verification

Step	Action
3	<p>HSO information (underlined text above, verified from left to right) is usually the #1 reference source. If this is not the case, have the <i>OMCR</i> determine the correct BTS timing source has been identified in the database by entering the display bts csmgen command and correct as required using the edit csm csmgen refsrc command.</p> <p>* IMPORTANT</p> <p>If any of the above areas fail, verify:</p> <ul style="list-style-type: none"> – If LED is RED, verify that HSO had been powered up for at least 5 minutes. After oscillator temperature is stable, LED should go GREEN <i>Wait for this to occur before continuing !</i> – If “timed out” is displayed in the Last Phase column, suspect the HSO output buffer or oscillator is defective – Verify the HSO is FULLY SEATED and LOCKED to prevent any possible card warpage
4	<p>Verify the following GPS information (underlined text above):</p> <ul style="list-style-type: none"> – GPS information is usually the 0 reference source. – At least one Primary source must indicate “Status = good” and “Valid = yes” to bring site up.

. . . continued on next page

3

Table 3-20: GPS Initialization/Verification

Step	Action
5	<p>Enter the following command at the CSM> prompt to verify that the GPS receiver is in tracking mode.</p> <p>gstatus</p> <p>– Observe the following typical response:</p> <pre> 24:06:08 <u>GPS Receiver Control Task State: tracking satellites.</u> 24:06:08 Time since last valid fix: 0 seconds. 24:06:08 24:06:08 Recent Change Data: 24:06:08 Antenna cable delay 0 ns. 24:06:08 Initial position: lat 117650000 msec, lon -350258000 msec, height 0 cm (GPS) 24:06:08 Initial position accuracy (0): estimated. 24:06:08 24:06:08 GPS Receiver Status: 24:06:08 Position hold: lat 118245548 msec, lon -350249750 msec, height 20270 cm 24:06:08 Current position: lat 118245548 msec, lon -350249750 msec, height 20270 cm (GPS) 24:06:08 <u>8 satellites tracked, receiving 8 satellites, 8 satellites visible.</u> 24:06:08 <u>Current Dilution of Precision (PDOP or HDOP): 0.</u> 24:06:08 Date & Time: 1998:01:13:21:36:11 24:06:08 GPS Receiver Status Byte: 0x08 24:06:08 Chan:0, SVID: 16, Mode: 8, RSSI: 148, Status: 0xa8 24:06:08 Chan:1, SVID: 29, Mode: 8, RSSI: 132, Status: 0xa8 24:06:08 Chan:2, SVID: 18, Mode: 8, RSSI: 121, Status: 0xa8 24:06:08 Chan:3, SVID: 14, Mode: 8, RSSI: 110, Status: 0xa8 24:06:08 Chan:4, SVID: 25, Mode: 8, RSSI: 83, Status: 0xa8 24:06:08 Chan:5, SVID: 3, Mode: 8, RSSI: 49, Status: 0xa8 24:06:08 Chan:6, SVID: 19, Mode: 8, RSSI: 115, Status: 0xa8 24:06:08 Chan:7, SVID: 22, Mode: 8, RSSI: 122, Status: 0xa8 24:06:08 24:06:08 GPS Receiver Identification: 24:06:08 COPYRIGHT 1991-1996 MOTOROLA INC. 24:06:08 SFTW P/N # 98-P36830P 24:06:08 SOFTWARE VER # 8 24:06:08 SOFTWARE REV # 8 24:06:08 SOFTWARE DATE 6 AUG 1996 24:06:08 MODEL # B3121P1115 24:06:08 HDWR P/N # _ 24:06:08 SERIAL # SSG0217769 24:06:08 MANUFACTUR DATE 6B07 24:06:08 OPTIONS LIST IB 24:06:08 The receiver has 8 channels and is equipped with TRAIM.</pre>
6	<p>Verify the following GPS information (shown above in <u>underlined</u> text):</p> <ul style="list-style-type: none"> – At least 4 satellites are tracked, and 4 satellites are visible. – GPS Receiver Control Task State is “tracking satellites”. <i>Do not continue until this occurs!</i> – Dilution of Precision indication is not more that 30. <p>Record the current position base site latitude, longitude, height and height reference (height reference to Mean Sea Level (MSL) or GPS height (GPS). (GPS = 0 MSL = 1).</p>

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Table 3-20: GPS Initialization/Verification	
Step	Action
7	<p>If steps 1 through 6 pass, the GPS is good.</p> <p>* IMPORTANT</p> <p>If any of the above mentioned areas fail, verify that:</p> <ul style="list-style-type: none"> – If <i>Initial position accuracy</i> is “estimated” (typical), at least 4 satellites must be tracked and visible (1 satellite must be tracked and visible if actual lat, log, and height data for this site has been entered into CDF file). – If <i>Initial position accuracy</i> is “surveyed,” position data currently in the CDF file is assumed to be accurate. GPS will not automatically survey and update its position. – The GPS antenna is not obstructed or misaligned. – GPS antenna connector center conductor measures approximately +5 Vdc with respect to the shield. – There is no more than 4.5 dB of loss between the GPS antenna OSX connector and the BTS frame GPS input. – Any lightning protection installed between GPS antenna and BTS frame is installed correctly.
8	<p>Enter the following commands at the CSM> prompt to verify that the CSM is warmed up and that GPS acquisition has taken place.</p> <p>debug dpllp</p> <p>Observe the following typical response if the CSM is not warmed up (15 minutes from application of power) (<i>If warmed-up proceed to step 9</i>)</p> <pre>CSM>DPLL Task Wait. 884 seconds left. DPLL Task Wait. 882 seconds left. DPLL Task Wait. 880 seconds left.etc.</pre> <p>NOTE</p> <p>The warm command can be issued at the MMI port used to force the CSM into warm-up, but the reference oscillator will be unstable.</p>
9	<p>Observe the following typical response if the CSM is warmed up.</p> <pre>c:17486 off: <u>-11</u>, 3, <u>6</u> <u>TK SRC:0</u> S0: 3 S1:-2013175,-2013175 c:17486 off: <u>-11</u>, 3, <u>6</u> <u>TK SRC:0</u> S0: 3 S1:-2013175,-2013175 c:17470 off: <u>-11</u>, 1, <u>6</u> <u>TK SRC:0</u> S0: 1 S1:-2013175,-2013175 c:17486 off: <u>-11</u>, 3, <u>6</u> <u>TK SRC:0</u> S0: 3 S1:-2013175,-2013175 c:17470 off: <u>-11</u>, 1, <u>6</u> <u>TK SRC:0</u> S0: 1 S1:-2013175,-2013175 c:17470 off: <u>-11</u>, 1, <u>6</u> <u>TK SRC:0</u> S0: 1 S1:-2013175,-2013175</pre>
10	<p>Verify the following GPS information (underlined text above, from left to right):</p> <ul style="list-style-type: none"> – Lower limit offset from tracked source variable is not less than -60 (equates to 3µs limit). – Upper limit offset from tracked source variable is not more than +60 (equates to 3µs limit). – TK SRC: 0 is selected, where SRC 0 = GPS.
11	<p>Enter the following commands at the CSM> prompt to exit the debug mode display.</p> <p>debug dpllp</p>

LORAN-C
Initialization/Verification

Table 3-21: LORAN-C Initialization/Verification

Step	Action	Note
1	<p>At the CSM> prompt, enter lstatus <cr> to verify that the LFR is in tracking mode. A typical response is:</p> <pre> CSM> lstatus <cr> LFR Station Status: Clock coherence: 512 _____> 5930M 51/60 dB 0 S/N Flag: 5930X 52/64 dn -1 S/N Flag: 5990 47/55 dB -6 S/N Flag: 7980M 62/66 dB 10 S/N Flag: 7980W 65/69 dB 14 S/N Flag: . PLL Station . _____> 7980X 48/54 dB -4 S/N Flag: 7980Y 46/58 dB -8 S/N Flag:E 7980Z 60/67 dB 8 S/N Flag: 8290M 50/65 dB 0 S/N Flag: 8290W 73/79 dB 20 S/N Flag: 8290W 58/61 dB 6 S/N Flag: 8970M 89/95 dB 29 S/N Flag: 8970W 62/66 dB 10 S/N Flag: 8970X 73/79 dB 22 S/N Flag: 8970Y 73/79 dB 19 S/N Flag: 8970Z 62/65 dB 10 S/N Flag: 9610M 62/65 dB 10 S/N Flag: 9610V 58/61 dB 8 S/N Flag: 9610W 47/49 dB -4 S/N Flag:E 9610X 46/57 dB -5 S/N Flag:E 9610Y 48/54 dB -5 S/N Flag:E 9610Z 65/69 dB 12 S/N Flag: 9940M 50/53 dB -1 S/N Flag:S 9940W 49/56 dB -4 S/N Flag:E 9940Y 46/50 dB-10 S/N Flag:E 9960M 73/79 dB 22 S/N Flag: 9960W 51/60 dB 0 S/N Flag: 9960X 51/63 dB -1 S/N Flag: 9960Y 59/67 dB 8 S/N Flag: 9960Z 89/96 dB 29 S/N Flag: LFR Task State: lfr locked to station 7980W LFR Recent Change Data: Search List: 5930 5990 7980 8290 8970 9940 9610 9960 _____> PLL GRI: 7980W LFR Master, reset not needed, not the reference source. CSM> </pre>	<p><i>This must be greater than 100 before LFR becomes a valid source.</i></p> <p><i>This shows the LFR is locked to the selected PLL station.</i></p> <p><i>This search list and PLL data must match the configuration for the geographical location of the cell site.</i></p>

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3

Table 3-21: LORAN-C Initialization/Verification

Step	Action	Note
2	Verify the following LFR information (highlighted above in boldface type): <ul style="list-style-type: none"> – Locate the “dot” that indicates the current phase locked station assignment (assigned by MM). – Verify that the station call letters are as specified in site documentation as well as M X Y Z assignment. – Verify the S/N ratio of the phase locked station is greater than 8. 	
3	At the CSM> prompt, enter sources <cr> to display the current status of the the LORAN receiver. <ul style="list-style-type: none"> – Observe the following typical response. <pre> Num Source Name Type TO Good Status Last Phase Target Phase Valid ----- 0 Local GPS Primary 4 Yes Good -3 0 Yes 1 LFR ch A Secondary 4 <u>Yes</u> <u>Good</u> -2013177 -2013177 <u>Yes</u> 2 Not used Current reference source number: 1 </pre> <p>*NOTE “Timed-out” should only be displayed while the LFR is warming up. “Not-Present” or “Faulty” should not be displayed. If the LFR does not appear as one of the sources, then configure the LFR as a back-up source by entering the following command at the CSM> prompt:</p> <p>ss 1 2</p>	
4	LORAN LFR information (highlighted above in boldface type) is usually the #1 reference source (verified from left to right). <p>* IMPORTANT</p> If any of the above mentioned areas fail, verify: <ul style="list-style-type: none"> – The LFR antenna is not obstructed or misaligned. – The antenna pre-amplifier power and calibration twisted pair connections are intact and < 91.4 m (300 ft) in length. – A dependable connection to suitable Earth Ground is in place. – The search list and PLL station for cellsite location are correctly configured . <p>NOTE</p> LFR functionality should be verified using the “source” command (as shown in Step 3). Use the <u>underlined</u> responses on the LFR row to validate correct LFR operation.	
5	Close the hyperterminal window.	

Test Equipment Setup

Connecting Test Equipment to the BTS

All test equipment is controlled by the LMF through an IEEE-488/GPIB bus. The LMF requires each piece of test equipment to have a factory set GPIB address. If there is a communications problem between the LMF and any piece of test equipment, verify that the GPIB addresses have been set correctly as follows:

- Power meter address should be **13**
- Communications test set should be **18**

The following test equipment is required to perform optimization, calibration and ATP tests:

- CDMA LMF
- Communications test set model supported by the CDMA LMF
- Power meter model supported by the CDMA LMF (required when using the HP 8921A/600 and Advantest R3465 test sets)
- Non-radiating transmit line termination load
- Directional coupler and in-line attenuator
- RF cables and adapters

Refer to Table 3-22 for an overview of connections for test equipment currently supported by the CDMA LMF. In addition, see the following figures:

- Figure 3-15 and Figure 3-16 show the test set connections for TX calibration
- Figure 3-17 and Figure 3-18 show the test set connections for optimization/ATP tests

Supported Test Equipment

Optimization and ATP testing may be performed using the following test equipment:

- CyberTest
- Advantest R3465 and HP-437B or Gigatronics Power Meter
- Hewlett-Packard HP 8935
- Hewlett-Packard HP 8921 (W/CDMA and PCS Interface (1.9 GHz)) and HP-437B or Gigatronics Power Meter
- Spectrum Analyzer (HP8594E) – *optional*
- Rubidium Standard Timebase – *optional*



CAUTION

To prevent damage to the test equipment, all transmit (TX) test connections must be through a 30 dB directional coupler *plus* a 20 dB in-line attenuator for both the 800 MHz and 1.9 GHz BTSs.

Test Equipment Set-up – continued

Test Equipment Preparation

For specific steps to prepare each type of test set and power meter to perform calibration and ATP, see Appendix F.

Test Equipment Connection Chart

Table 3-22 depicts the current test equipment available meeting Motorola standards.

To identify the connection ports, locate the test equipment presently being used in the **TEST SETS** columns, and read down the column. Where a ball appears in the column, connect one end of the test cable to that port. Follow the horizontal line to locate the end connection(s), reading up the column to identify the appropriate equipment/BTS port.

SIGNAL	TEST SETS					ADDITIONAL TEST EQUIPMENT				BTS	
	Cyber-Test	Ad-vantest	HP 8935	HP 8921A	HP 8921 W/PCS	Power Meter	GPIB Interface	LMF	Directional Coupler & Pad*		
EVEN SECOND SYNCHRONIZATION	EVEN SEC REF	EVEN SEC SYNC IN	EVEN SECOND SYNC IN	EVEN SECOND SYNC IN	EVEN SECOND SYNC IN					SYNC MONITOR	
19.6608 MHZ CLOCK	TIME BASE IN	CDMA TIME BASE IN	EXT REF IN	CDMA TIME BASE IN	CDMA TIME BASE IN					FREQ MONITOR	
CONTROL IEEE 488 BUS	IEEE 488	GPIB	HP-IB	HP-IB	HP-IB	HP-IB	GPIB	SERIAL PORT			
TX TEST CABLES	RF IN/OUT	INPUT 50-OHM	RF IN/OUT	RF IN/OUT	RF IN/OUT				20 DB PAD	BTS PORT	TX1-6
RX TEST CABLES	RF IN/OUT	RF OUT 50-OHM	DUPLEX	DUPLEX OUT	RF OUT ONLY						RX1-12



Equipment Warm-up



IMPORTANT

Warm-up *BTS equipment for a minimum of 60 minutes* prior to performing the BTS optimization procedure. This assures BTS site stability and contributes to optimization accuracy. (Time spent running initial power-up, hardware/firmware audit, and BTS download counts as warm-up time.)



WARNING

Before installing any test equipment directly to any BTS **TX OUT** connector, verify there are *no* CDMA BBX channels keyed. At active sites, have the OMC-R/CBSC place the antenna (sector) assigned to the LPA under test OOS. Failure to do so can result in serious personal injury and/or equipment damage.

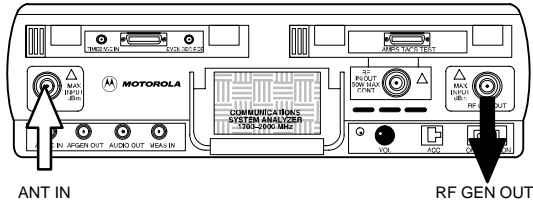
Automatic Cable Calibration Set-up

Figure 3-14 shows the cable calibration setup for various supported test sets. The left side of the diagram depicts the location of the input and output ports of each test set, and the right side details the set up for each test. Table 3-26 provides a procedure for calibrating cables.

Figure 3-14: Cable Calibration Test Setup

SUPPORTED TEST SETS

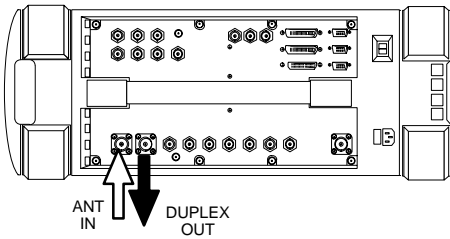
Motorola CyberTest



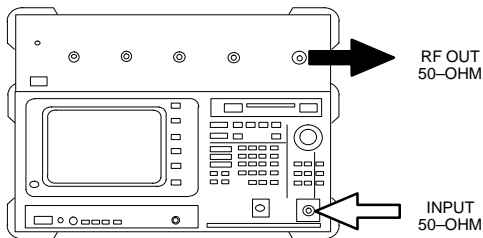
Note: The Directional Coupler is not used with the CyberTest Test Set. The TX cable is connected directly to the CyberTest Test Set.

A 10dB attenuator must be used with the short test cable for cable calibration with the CyberTest Test Set. The 10dB attenuator is used only for the cable calibration procedure, not with the test cables for TX calibration and ATP tests.

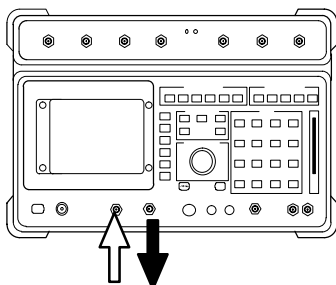
Hewlett-Packard Model HP 8935



Advantest Model R3465



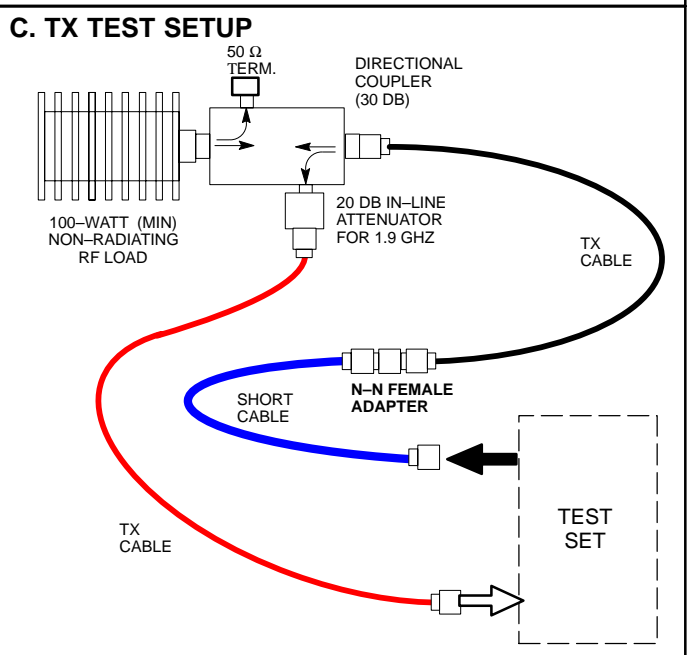
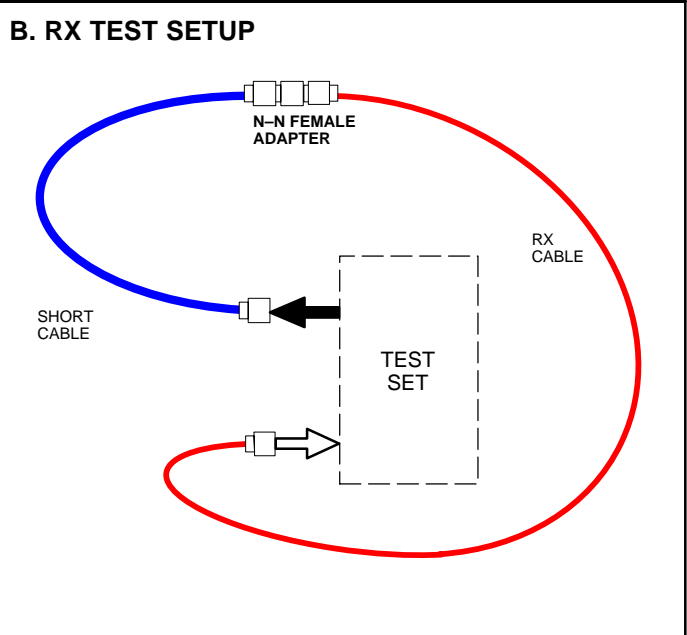
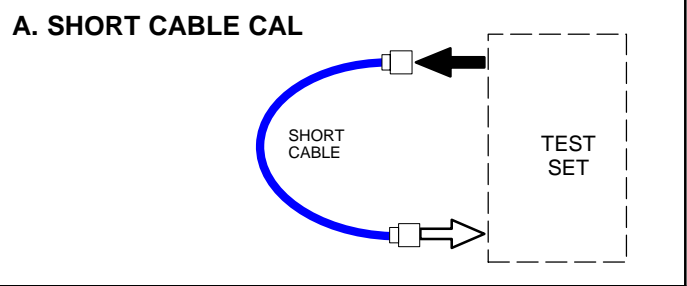
Hewlett-Packard Model HP 8921A



Note: For 800 MHz only. The HP8921A cannot be used to calibrate cables for PCS frequencies.

FW00089

CALIBRATION SET UP



Test Equipment Set-up – continued

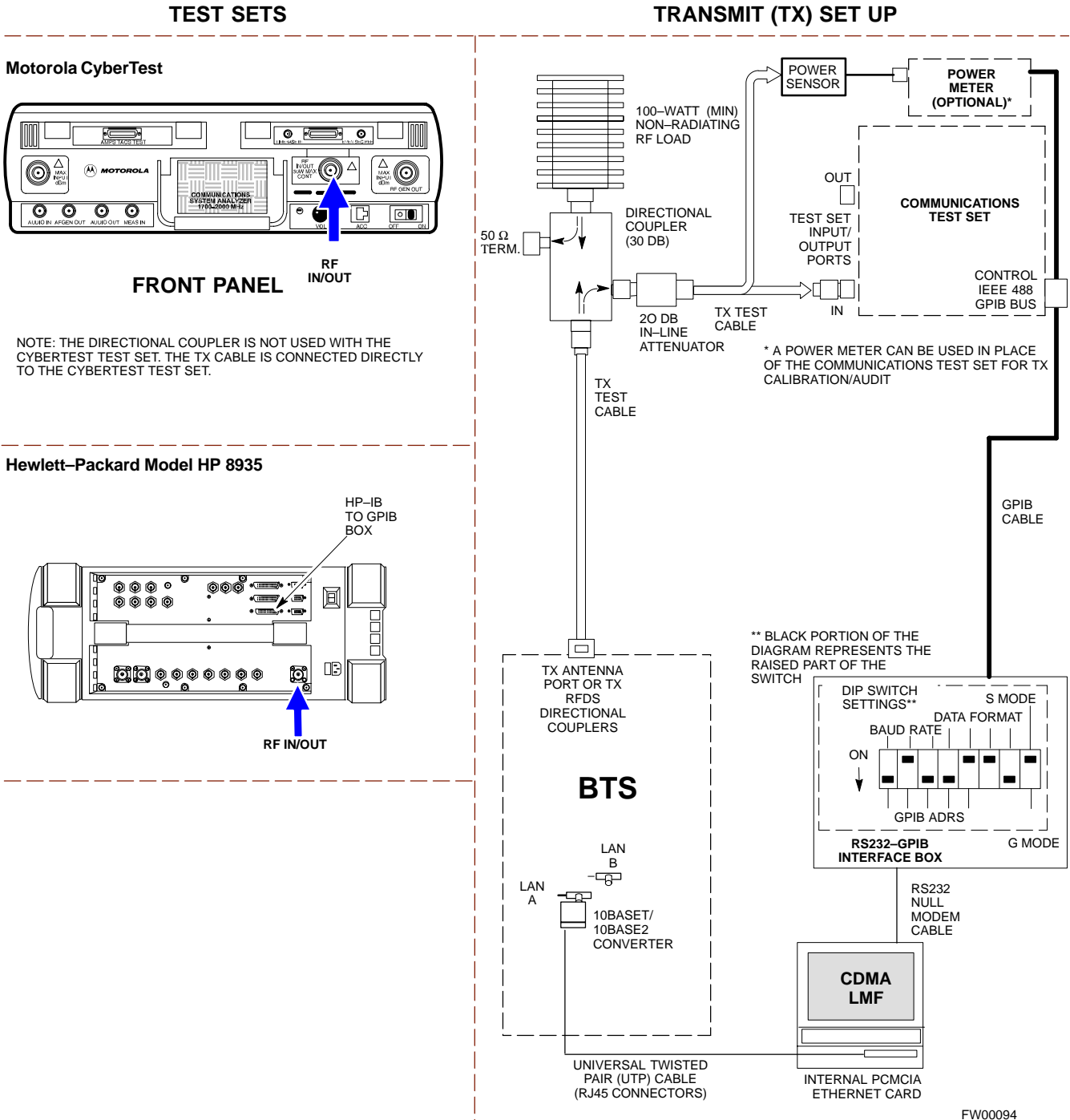
Manual Cable Calibration

If manual cable calibration is required, refer to the procedures in Appendix F.

Set-up for TX Calibration

Figure 3-15 and Figure 3-16 show the test set connections for TX calibration.

Figure 3-15: TX Calibration Test Setup (CyberTest and HP 8935)



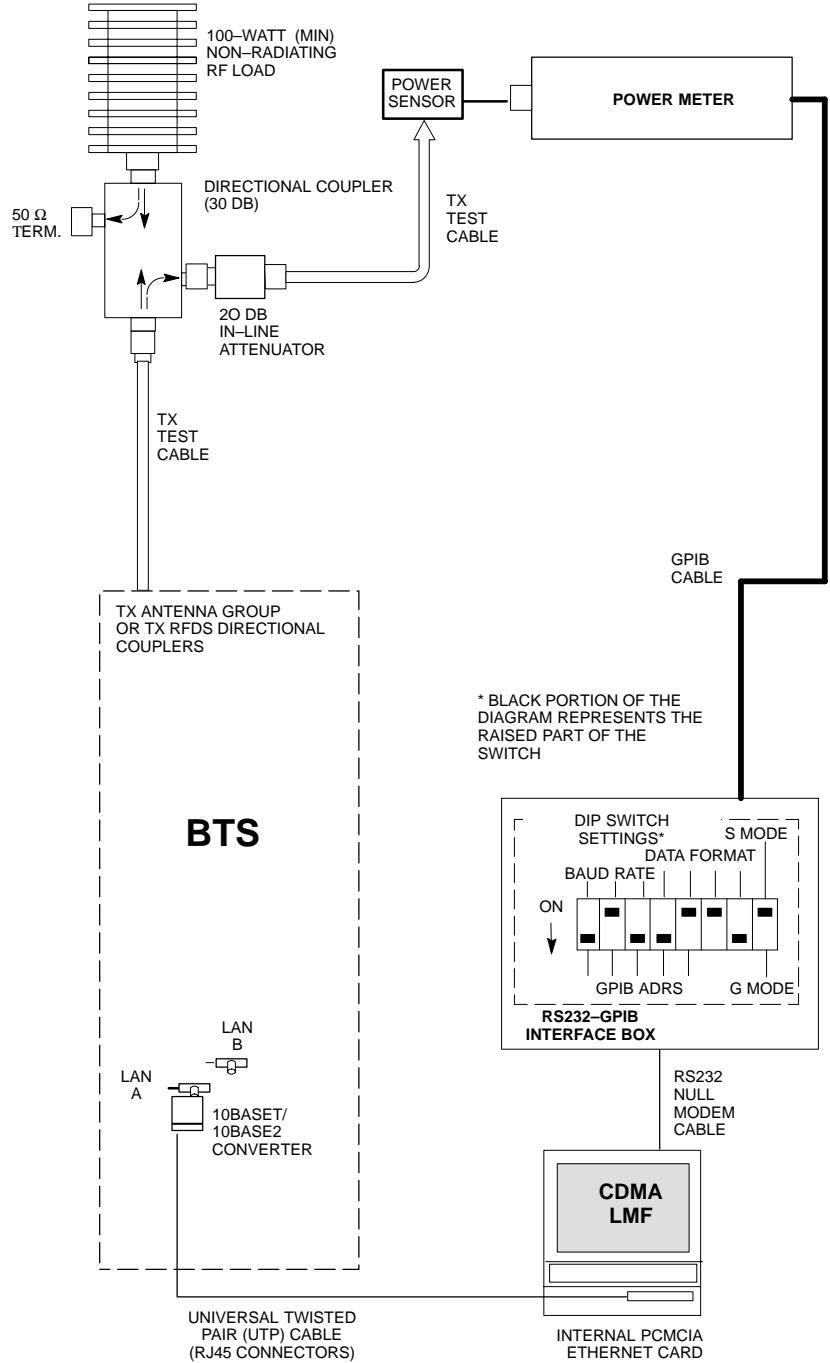
FW00094

Figure 3-16: TX Calibration Test Setup HP 8921A and Advantest

TEST SETS

TRANSMIT (TX) SET UP

NOTE: THE HP8921A AND ADVANTEST **CANNOT** BE USED FOR TX CALIBRATION. A POWER METER MUST BE USED.



FW00095

3

Test Equipment Set-up – continued

Setup for Optimization/ATP

Figure 3-17 and Figure 3-18 show the test set connections for optimization/ATP tests.

Figure 3-17: Optimization/ATP Test Setup Calibration (CyberTest, HP 8935 and Advantest)

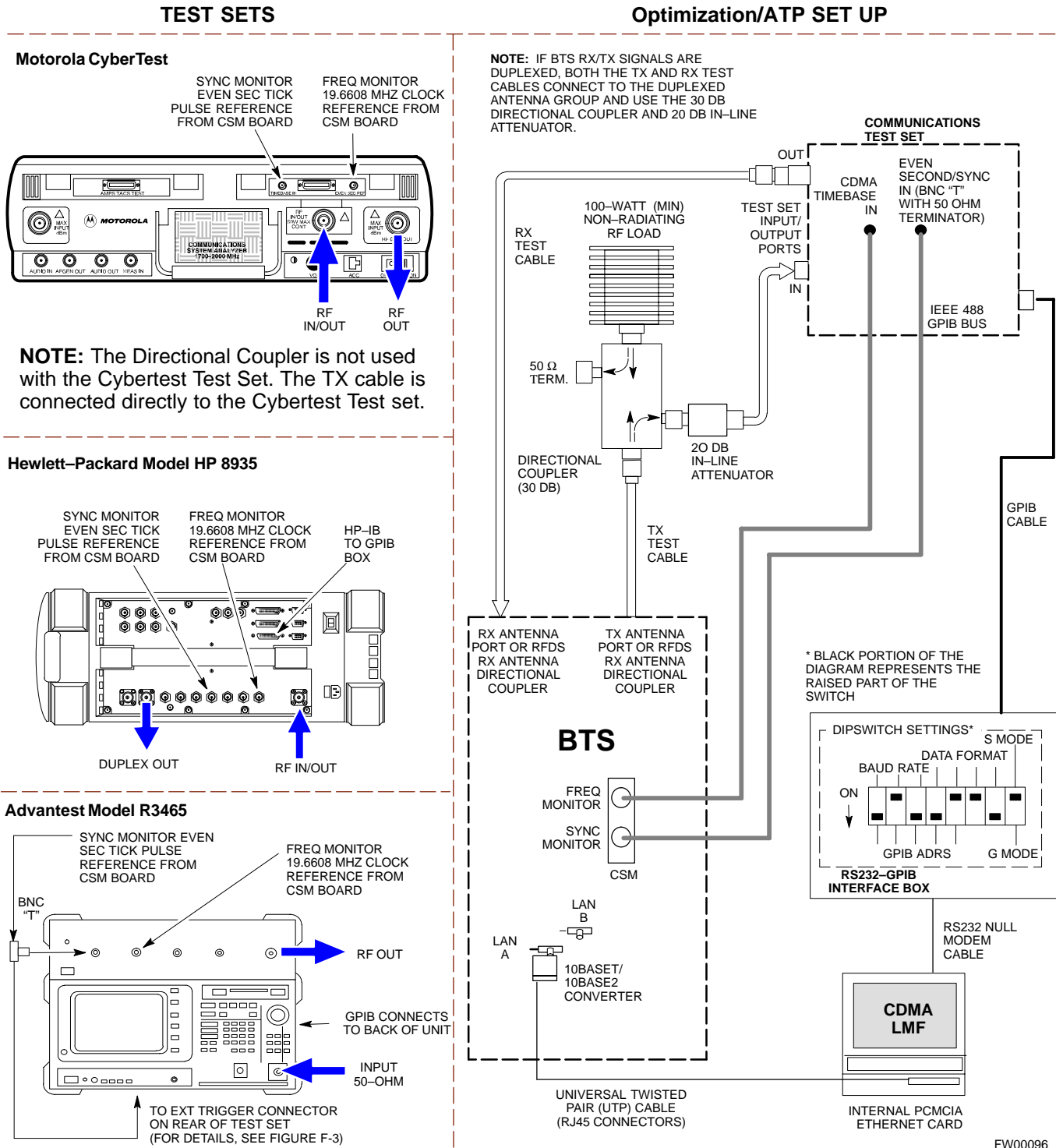


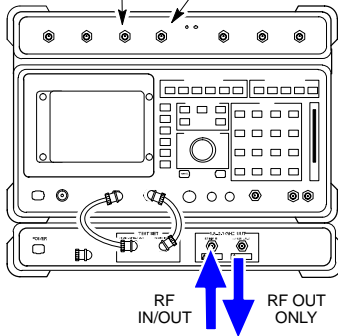
Figure 3-18: Optimization/ATP Test Setup HP 8921A

TEST SETS

Hewlett-Packard Model HP 8921A W/PCS Interface (for 1700 and 1900 MHz)

SYNC MONITOR
EVEN SEC TICK
PULSE REFERENCE
FROM CSM BOARD

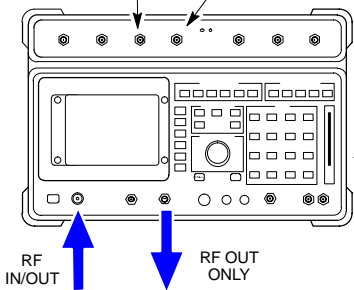
FREQ MONITOR
19.6608 MHZ CLOCK
REFERENCE FROM
CSM BOARD



Hewlett-Packard Model HP 8921A (for 800 MHz)

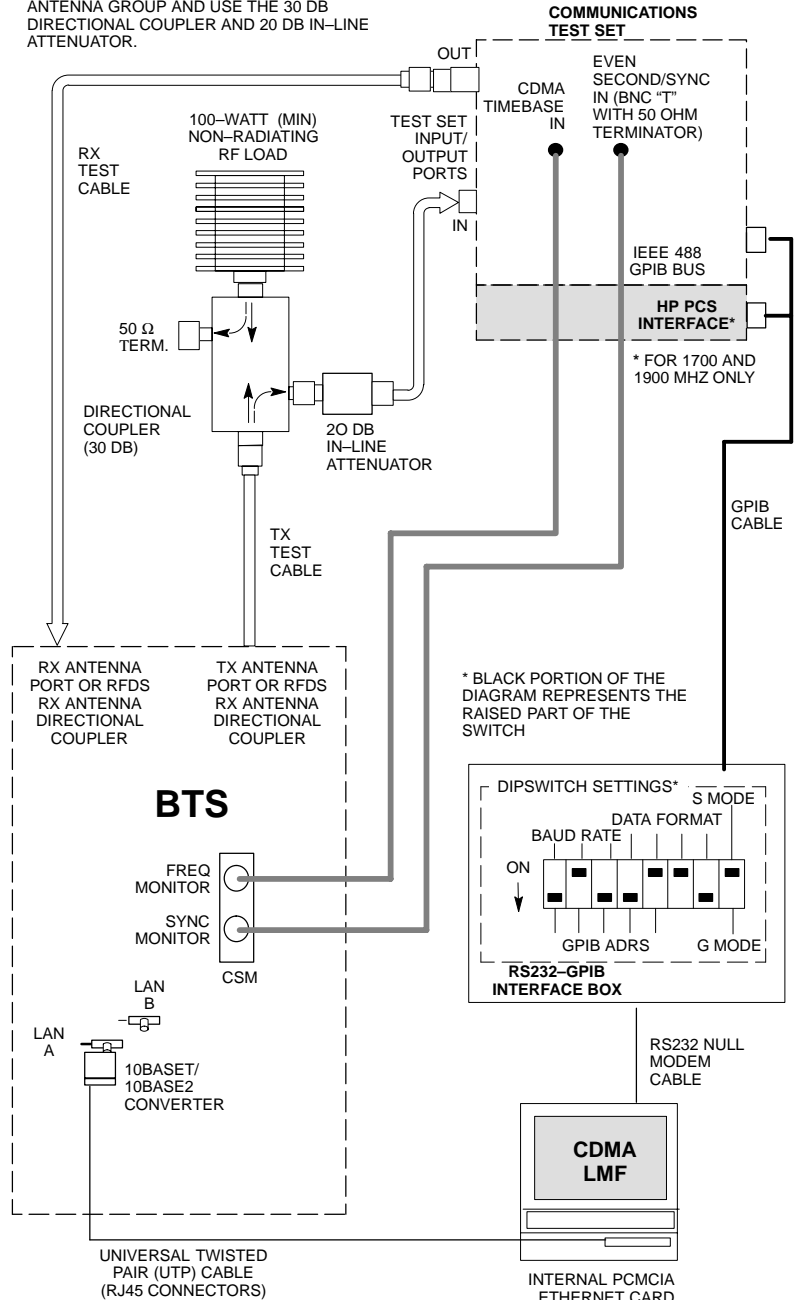
SYNC MONITOR
EVEN SEC TICK
PULSE REFERENCE
FROM CSM BOARD

FREQ MONITOR
19.6608 MHZ CLOCK
REFERENCE FROM
CSM BOARD



Optimization/ATP SET UP

NOTE: IF BTS RX/TX SIGNALS ARE DUPLEXED, BOTH THE TX AND RX TEST CABLES CONNECT TO THE DUPLEXED ANTENNA GROUP AND USE THE 30 DB DIRECTIONAL COUPLER AND 20 DB IN-LINE ATTENUATOR.



REF FW00097

Test Set Calibration

Background

Proper test equipment set-up ensures that all measurements are correct and the test equipment and associated test cables do not introduce measurement errors.

NOTE

If the *test equipment set* (see Chapter 1, Terms and Abbreviations) being used to interface with the BTS has been calibrated and maintained as a set, this procedure does not need to be performed.

This procedure must be performed *before* the optimization. Verify all test equipment (including all associated test cables and adapters actually used to interface all test equipment and the BTS) has been calibrated and maintained as a set.



CAUTION

If any piece of test equipment, test cable, or RF adapter, that makes up the calibrated *test equipment set* has been replaced, the *set* must be re-calibrated. Failure to do so can introduce measurement errors, resulting in incorrect measurements and degradation to system performance. Motorola recommends repeating cable calibration before testing at each BTS site.



IMPORTANT

Calibration of the communications test set (or equivalent test equipment) must be performed at the site before calibrating the overall test set. Calibrate the test equipment *after* it has been allowed to warm-up and stabilize for a *minimum of 60 minutes*.

Purpose

These procedures access the CDMA LMF automated calibration routine used to determine the path losses of the supported communications analyzer, power meter, associated test cables, and (if used) antenna switch that make up the overall calibrated *test equipment set*. After calibration, the gain/loss offset values are stored in a test measurement offset file on the CDMA LMF.

Manual cable calibration procedures using the HP8921A and Advantest R3465 communications test sets are provided in Appendix F, if needed. Manual power meter calibration procedures are also included in Appendix F.

Selecting Test Equipment

Prerequisites

A **Serial Connection** and a **Network Connection** tab are provided for test equipment selection. The **Serial Connection** tab is used when the test equipment items are connected directly to the CDMA LMF computer via a GPIB box (normal setup). The **Network Connection** tab is used when the test equipment is to be connected remotely via a network connection.

Ensure the following has been completed before selecting test equipment:

- Test equipment is correctly connected and turned on.
- Test equipment GPIB addresses have been verified as correct.
- CDMA LMF computer serial port and test equipment are connected to the GPIB box.

Selecting Test Equipment

Use **Options > LMF Options** in the menu bar to select test equipment automatically (using the autodetect feature) or manually.

Manually Selecting Test Equipment in a Serial Connection Tab

Test equipment can be manually specified before, or after, the test equipment is connected. CDMA LMF does not check to see if the test equipment is actually detected for manual specification.

Table 3-23: Selecting Test Equipment Manually in a Serial Connection Tab

Step	Action
1	In the menu bar, click Options and select LMF Options... from the pulldown. The LMF Options window appears.
2	Click on the Serial Connection tab (if not in the forefront).
3	Select the correct serial port in the COMM Port pick list (normally COM1).
4	Click on the Manual Specification button (if not enabled).
5	Click on the check box corresponding to the test item(s) to be used.
6	Type the GPIB address in the corresponding GPIB address box. <i>Addresses are:</i> 13=Power Meter 18=CDMA Analyzer

... continued on next page

Table 3-23: Selecting Test Equipment Manually in a Serial Connection Tab

Step	Action
7	Click on Apply . (The button will darken until the selection has been recorded.) NOTE With manual selection, CDMA LMF does not detect the test equipment to see if it is connected and communicating with CDMA LMF.
8	Click on Dismiss to close the test equipment window.

Automatically Selecting Test Equipment in a Serial Connection Tab

When using the auto-detection feature to select test equipment, the CDMA LMF examines which test equipment items are actually communicating with CDMA LMF. Follow the procedure in Table 3-24 to use the auto-detect feature.

Table 3-24: Selecting Test Equipment Using Auto-Detect

Step	Action
1	In the menu bar, click Options and select LMF Options... from the pulldown. The LMF Options window appears.
2	Click on the Serial Connection tab (if not in the forefront).
3	Select the correct serial port in the COMM Port pick list (normally COM1).
4	Click on Auto-Detection (if not enabled).
5	Type in the GPIB addresses in the box labeled GPIB address to search (if not already displayed). * IMPORTANT When both a power meter and analyzer are selected, the first item listed in the GPIB addresses to search box will be used for RF power measurements (i.e., TX calibration). The address for a power meter is normally 13 and the address for a CDMA analyzer is normally 18 . If 13,18 is included in the GPIB addresses to search box, the power meter (13) will be used for RF power measurements. If the test equipment items are manually selected the CDMA analyzer is used only if a power meter is not selected.
6	Click Apply . The button will darken until the selection has been committed. A check mark will appear in the Manual Configuration section for detected test equipment items.
7	Click Dismiss to close the LMF Options window.

Calibrating Test Equipment

The calibrate test equipment function zeros the power measurement level of the test equipment item that is to be used for TX calibration and audit. If both a power meter and an analyzer are connected (for example, an HP 437 and an HP8921A/600), only the power meter is zeroed.

Calibrate Test Equipment from the **Util** menu list is used to calibrate test equipment item *before* being used for testing. The test equipment must be selected before beginning calibration. Follow the procedure in Table 3-25 to calibrate the test equipment.

Table 3-25: Test Equipment Calibration

Step	Action
1	From the Util menu, select Calibrate Test Equipment . A Directions window is displayed. Follow the instructions provided.
2	Follow the direction provided.
3	Click on Continue to close the Directions window. A status window is displayed.
4	Click on OK to close the status report window.

Calibrating Cables – Overview

The cable calibration function is used to measure the loss (in dB) for the TX and RX cables that are to be used for testing. A CDMA analyzer is used to measure the loss of each cable configuration (TX cable configuration and RX cable configuration). The cable calibration consists of the following steps.

- Measure the loss of a short cable. This is done to compensate for any measurement error of the analyzer. The short cable, which is used only for the calibration process, is used in series with both the TX and RX cable configuration when they are measured. The measured loss of the short cable is deducted from the measured loss of the TX and RX cable configuration to determine the actual loss of the TX and RX cable configurations. This deduction is done so any error in the analyzer measurement will be adjusted out of both the TX and RX measurements.
- The short cable plus the RX cable configuration loss is measured. The RX cable configuration normally consists only of a coax cable with type-N connectors that is long enough to reach from the BTS RX port the test equipment. For BTSs with antenna ports carrying *duplexed TX and RX*, a directional coupler and, if required by BTS type, an additional attenuator are also used on the RX cable configuration and must be included in the measurement.
- The short cable plus the TX cable configuration loss is measured. The TX cable configuration normally consists of two coax cables with type-N connectors and a directional coupler, a load, and an additional attenuator if required by the BTS type. The total loss of the path loss

of the TX cable configuration must be as required for the BTS (normally 30 or 50 dB). The Motorola Cybertest analyzer is different in that the required attenuation/load is built into the test set so the TX cable configuration consists only of the required length coax cable.

Calibrating Cables with a CDMA Analyzer

The **Cable Calibration** menu item from the **Util** menu list is used to calibrate both TX and RX test cables for use with CDMA LMF.

NOTE

LMF cable calibration cannot be accomplished with an HP8921A analyzer for 1.9 MHz. A different analyzer type or the signal generator and spectrum analyzer method must be used (refer to Table 3-27 and Table 3-28). Cable calibration values must be manually entered if the signal generator and spectrum analyzer method is used. For the HP8921A, refer to Appendix F.

The test equipment must be selected before this procedure can be started. Follow the procedure in Table 3-26 to calibrate the cables. Figure 3-14 illustrates the cable calibration test equipment setup.

Table 3-26: Cable Calibration	
Step	Action
1	From the Util menu, select Cable Calibration . A Cable Calibration window is displayed.
2	Enter a channel number(s) in the Channels box. Multiple channels numbers must be separated with a comma, no space (i.e., 200,800). When two or more channels numbers are entered, the cables will be calibrated for each channel. Interpolation will be accomplished for other channels as required for TX calibration.
3	Select TX and RX CABLE CAL , TX CABLE CAL or RX CABLE CAL in the Cable Calibration picklist.
4	Click OK . Follow the directions displayed for each step. A status report window will be displayed with the results of the cable calibration.



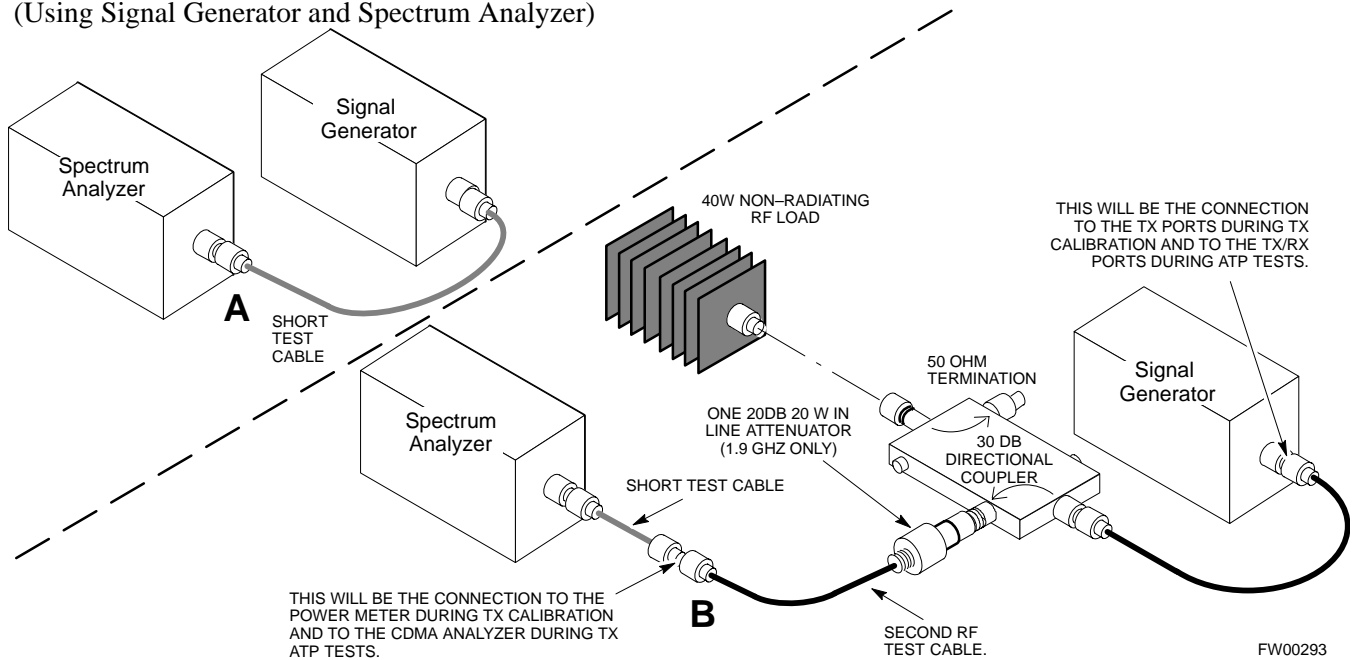
Calibrating TX Cables Using a Signal Generator and Spectrum Analyzer

Follow the procedure in Table 3-27 to calibrate the TX cables using the signal generator and spectrum analyzer. Refer to Figure 3-19 for a diagram of the signal generator and spectrum analyzer.

3

Table 3-27: Calibrating TX Cables Using Signal Generator and Spectrum Analyzer	
Step	Action
1	Connect a short test cable between the spectrum analyzer and the signal generator.
2	Set signal generator to 0 dBm at the customer frequency of the 869.7–893.31 MHz band for North American cellular and 1930–1990 MHz band for North American PCS.
3	Use spectrum analyzer to measure signal generator output (see Figure 3-19, “A”) and record the value.
4	Connect the spectrum analyzer’s short cable to point “B”, as shown in the lower portion of the diagram, to measure cable output at customer frequency (869.7–893.31 MHz band for North American cellular and 1930–1990 MHz for North American PCS) and record the value at point “B”.
5	Calibration factor = A – B Example: Cal = –1 dBm – (–53.5 dBm) = 52.5 dB
<p>NOTE</p> <p>The short cable is used for <i>calibration only</i>. It is <i>not</i> part of the final test setup. After calibration is completed, <i>do not</i> re-arrange any cables. Use the equipment setup, as is, to ensure test procedures use the correct calibration factor.</p>	

Figure 3-19: Calibrating Test Equipment Setup for TX Cable Calibration (Using Signal Generator and Spectrum Analyzer)



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Test Set Calibration – continued

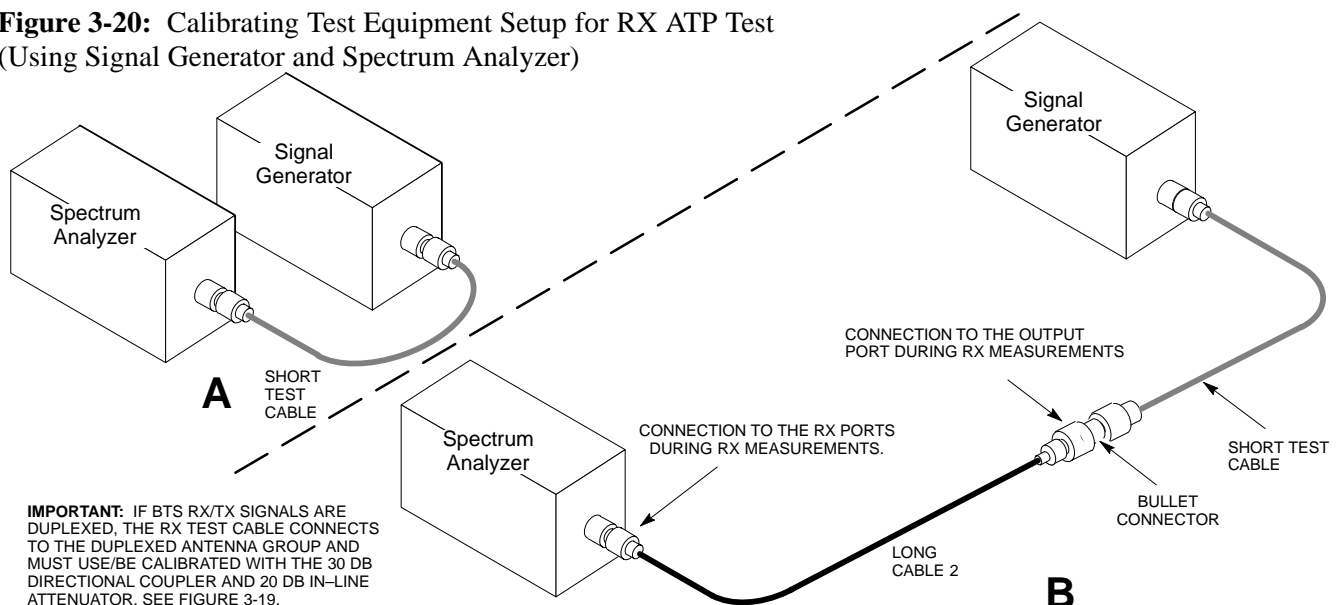
Calibrating RX Cables Using a Signal Generator and Spectrum Analyzer

Follow the procedure in Table 3-28 to calibrate the RX cables using the signal generator and spectrum analyzer. Refer to Figure 3-20, if required.

Table 3-28: Calibrating RX Cables Using a Signal Generator and Spectrum Analyzer	
Step	Action
1	Connect a short test cable to the spectrum analyzer and connect the other end to the Signal Generator.
2	Set signal generator to -10 dBm at the customer's RX frequency of 824.7–848.31 MHz for North American cellular or 1850–1910 MHz band for North American PCS.
3	Use spectrum analyzer to measure signal generator output (see Figure 3-20, "A") and record the value for "A".
4	Connect the test setup, as shown in the lower portion of the diagram, to measure the output at the customer's RX frequency (824.7–848.31 MHz for North American cellular or 1850–1910 MHz band for North American PCS). Record the value at point "B". * IMPORTANT When preparing to calibrate a BTS with <i>duplexed TX and RX</i> the cable calibration setup must include the 30 dB directional coupler and 20 dB in-line attenuator as in the TX cable calibration shown in Figure 3-19.
5	Calibration factor = $A - B$ Example: $\text{Cal} = -12 \text{ dBm} - (-14 \text{ dBm}) = 2 \text{ dB}$ NOTE The short test cable is used for test equipment setup calibration <i>only</i> . It is not part of the final test setup. After calibration is completed, <i>do not</i> re-arrange any cables. Use the equipment setup, as is, to ensure test procedures use the correct calibration factor.

3

Figure 3-20: Calibrating Test Equipment Setup for RX ATP Test (Using Signal Generator and Spectrum Analyzer)



Setting Cable Loss Values

Cable loss values for the TX and RX test cable configurations are normally set by accomplishing automatic cable calibration with use of the applicable test equipment. The resulting values are stored in the cable loss files. The cable loss values can also be set/changed manually.



CAUTION

Cable loss values *must* be manually entered in the LMF database if manual cable calibration was performed. Failure to do this will result in inaccurate BTS calibration and reduced site performance.

Prerequisites

- Logged into the BTS

Table 3-29: Setting Cable Loss Values

Step	Action
1	Click on the Util menu.
2	Select Edit > Cable Loss > TX or RX . A data entry pop-up window will appear.
3	Click on the Add Row button to add a new channel number. Then click in the Channel # and Loss (dBm) columns and enter the desired values.
4	To edit existing values click in the data box to be changed and change the value.
5	To delete a row, click on the row and then click on the Delete Row button.
6	Click on the Save button to save displayed values.
7	Click on the Dismiss button to exit the window. Values that were entered/changed after the Save button was used will not be saved. NOTE <ul style="list-style-type: none"> • If cable loss values exist for two different channels the LMF will interpolate for all other channels. • Entered values will be used by the LMF as soon as they are saved. You do not have to logout and login.



Setting TX Coupler Loss Value

If an in-service TX coupler is installed the coupler loss (e.g., 30 dB) must be manually entered so it will be included in the LMF TX calibration and audit calculations.

Prerequisites

- Logged into the BTS

Table 3-30: Setting TX Coupler Loss Values

Step	Action
1	Click on the Util menu.
2	Select Edit > TX Coupler Loss . A data entry pop-up window will appear.
3	Click in the Loss (dBm) column for each carrier that has a coupler and enter the appropriate value.
4	To edit existing values click in the data box to be changed and change the value.
5	Click on the Save button to save displayed values.
6	<p>Click on the Dismiss button to exit the window. Values that were entered/changed after the Save button was used will not be saved.</p> <p>NOTE</p> <ul style="list-style-type: none"> • The In-Service Calibration check box in the Options > LMF Options > BTS Options tab must be checked before entered TX coupler loss values will be used by the TX calibration and audit functions. • Entered values will be used by the LMF as soon as they are saved. You do not have to logout and login.



Bay Level Offset Calibration

Introduction

Calibration compensates for normal equipment variations within the BTS and assures maximum measurement accuracy.

RF Path Bay Level Offset Calibration

3

Bay Level Offset (BLO) calibration identifies the accumulated gain in every transmit path (BBX2 slot) at the BTS site and stores that value in the CDMA LMF CAL file. The BLOs are subsequently downloaded to each BBX2.

Each transmit path starts at an SCCP shelf backplane BBX2 slot, travels through the CIO card, trunking module, LPA, trunking module (again), TX filter or TX filter combiner, DRDC or TRDC, and ends at a BTS TX antenna port.

Each receive path starts at a BTS RX antenna port, travels through a DRDC or TRDC, the MPC card, the CIO card, and terminates at a backplane BBX2 slot.

Calibration identifies the accumulated gain in every transmit path (by BBX2 slot) at the BTS site and stores that value in the CAL file. When the TX path calibration is performed, the RX path BLO will automatically be set to the default value.

When to Calibrate BLOs

Calibration of BLOs is required after initial BTS installation.

The BLO data of an operational BTS site must be re-calibrated once each year. Motorola recommends re-calibrating the BLO data for all associated RF paths after replacing any of the following components or associated interconnecting RF cabling:

- BBX2 board
- SCCP shelf
- CIO card
- CIO-to-LPA trunking module RF cable
- LPA trunking module
- LPA
- Trunking module-to-TX filter/filter combiner RF cable
- TX filter or TX filter combiner
- TX filter/filter combiner-to-DRDC/TRDC cable
- DRDC or TRDC

TX Path Calibration

The TX Path Calibration assures correct site installation, cabling, and the first order functionality of all installed equipment. The proper function of each RF path is verified during calibration. The external test equipment is used to validate/calibrate the TX paths of the BTS.



WARNING

Before installing any test equipment directly to any **TX OUT** connector you must *first verify that there are no CDMA channels keyed*. Have the OMC-R place the sector assigned to the LPA under test OOS. Failure to do so can result in serious personal injury and/or equipment damage.



CAUTION

Always wear a conductive, high impedance wrist strap while handling any circuit card/module. If this is not done, there is a high probability that the card/module could be damaged by ESD.



IMPORTANT

At new site installations, to facilitate the complete test of each SCCP shelf (if the shelf is not already fully populated with BBX2 boards), move BBX2 boards from shelves currently not under test and install them into the empty BBX2 slots of the shelf currently being tested to insure that all BBX2 TX paths are tested.

- This procedure can be bypassed on operational sites that are due for periodic optimization.
- Prior to testing, view the CDF file to verify the correct BBX2 slots are equipped. Edit the file as required to include BBX2 slots not currently equipped (per Systems Engineering documentation).

RX Path Calibration

RX path calibration is not required or supported on CDMA BTS systems. Default RX calibration values are written to the RX calibration data files during the TX calibration routine. Functionality is verified during Frame Erasure Rate (FER) testing.

BLO Calibration Data File

During the calibration process, the CDMA LMF creates a calibration (CAL) data file where BLO values are stored. After calibration has been completed, this offset data must be downloaded to the BBX2s using the CDMA LMF Download BLO function. An explanation of the file is shown below.

NOTE

Due to the size of the file, Motorola recommends printing out a copy of a bts.cal file and referring to it for the following descriptions.

The CAL file is subdivided into sections organized on a per-slot basis (a slot Block).

The **Slot 1 Block** contains the calibration data for the six BBX2 slots. The **Slot 20 Block** contains the calibration data for the redundant BBX2 (see Table 3-32). Each BBX2 slot Block header contains:

- A creation Date and Time – broken down into separate parameters of createMonth, createDay, createYear, createHour, and createMin.
- The number of calibration entries – fixed at 720 entries corresponding to 360 calibration points of the CAL file – plus the slot Block format.

Within the slot Block body, the BBX2 calibration data (BayLevelCal) is organized as a large flat array. The array is organized by branch, BBX2 SCCP cage slot, and calibration point.

- The first breakdown of the array indicates which branch the contained calibration points are for. The array covers transmit, main receive, and diversity receive offsets as follows:

Range	Branch Assignment
C[1]–C[120]	Transmit
C[121]–C[240]	No SC4812ET Lite BLO cal point entries (default only)
C[241]–C[360]	Receive
C[361]–C[480]	No SC4812ET Lite BLO cal point entries (default only)
C[481]–C[600]	Diversity Receive
C[601]–C[720]	No SC4812ET Lite BLO cal point entries (default only)

- The second breakdown of the array is by BBX by sector. Three sectors are allowed.

Table 3-32: SC4812ET Lite BTS.cal File Array (Per Sector)				
BBX2	Sectorization	TX Branch	RX Branch	RX Diversity Branch
Slot[1] (Primary BBX2s 1 through 6)				
1 (Omni)	3-Sector, 1st Carrier	C[1]–C[20]	C[241]–C[260]	C[481]–C[500]
2		C[21]–C[40]	C[261]–C[280]	C[501]–C[520]
3		C[41]–C[60]	C[281]–C[300]	C[521]–C[540]
4	3-Sector, 2nd Carrier	C[61]–C[80]	C[301]–C[320]	C[541]–C[560]
5		C[81]–C[100]	C[321]–C[340]	C[561]–C[580]
6		C[101]–C[120]	C[341]–C[360]	C[581]–C[600]
Not Used in SC4812ET Lite (CAL file entries are Channel 0 with default power set level.)		C[121]–C[140]	C[361]–C[380]	C[601]–C[620]
		C[141]–C[160]	C[381]–C[400]	C[621]–C[640]
		C[161]–C[180]	C[401]–C[420]	C[641]–C[660]
		C[181]–C[200]	C[421]–C[440]	C[661]–C[680]
		C[201]–C[220]	C[441]–C[460]	C[681]–C[700]
		C[221]–C[240]	C[461]–C[480]	C[701]–C[720]
Slot[20] (Redundant BBX2–R1)				
1 (Omni)	3-Sector, 1st Carrier	C[1]–C[20]	C[241]–C[260]	C[481]–C[500]
2		C[21]–C[40]	C[261]–C[280]	C[501]–C[520]
3		C[41]–C[60]	C[281]–C[300]	C[521]–C[540]
4	3-Sector, 2nd Carrier	C[61]–C[80]	C[301]–C[320]	C[541]–C[560]
5		C[81]–C[100]	C[321]–C[340]	C[561]–C[580]
6		C[101]–C[120]	C[341]–C[360]	C[581]–C[600]
Not Used in SC4812ET Lite (CAL file entries are Channel 0 with default power set level.)		C[121]–C[140]	C[361]–C[380]	C[601]–C[620]
		C[141]–C[160]	C[381]–C[400]	C[621]–C[640]
		C[161]–C[180]	C[401]–C[420]	C[641]–C[660]
		C[181]–C[200]	C[421]–C[440]	C[661]–C[680]
		C[201]–C[220]	C[441]–C[460]	C[681]–C[700]
		C[221]–C[240]	C[461]–C[480]	C[701]–C[720]

- Refer to the CAL file print-out and Table 3-32. It can be seen that there is one BBX2 slot per sector, and 10 calibration points for each BBX2 (sector) are supported for each branch. Each “calibration point” consists of *two* entries.
- The first entry for a calibration point (all odd entries) identifies the CDMA channel (frequency) where the BLO is measured. The second calibration point entry (all even entries) is the power set level (PwrLvlAdj). The valid range for PwrLvlAdj is from 2500 to 27500

(2500 corresponds to -125 dBm and 27500 corresponds to +125 dBm).

- The 10 calibration points for each slot/branch combination must be stored in order of increasing frequency. If less than 10 points (frequencies) are calibrated, the BLO data for the highest frequency calibrated is written into the remainder of the 10 points for that slot/branch.

Example:

$$\left. \begin{array}{l} C[1]=384 \quad (\text{odd cal entry}) \\ C[2]=19102 \quad (\text{even cal entry}) \end{array} \right\} = 1 \text{ "calibration point"}$$

$$\begin{array}{l} C[3]=777 \quad (\text{odd cal entry}) \\ C[4]=19086 \quad (\text{even cal entry}) \\ \cdot \\ \cdot \\ \cdot \\ C[19]=777 \quad (\text{odd cal entry}) \\ C[20]=19086 \quad (\text{even cal entry}) \end{array}$$

In the example above, BLO was measured at only two frequencies (channels 384 and 777) for SCCP slot BBX-1 transmit (Table 3-32). The BLO data for the highest frequency measured (777) will be written to the remaining eight transmit calibration points (defined by entries C[5] through C[20]) for BBX2-1.

- When BLO data is downloaded to the BBXs, the data is downloaded to the devices in the order it is stored in the CAL file. TxCal data (C[1] – C[60]) is sent first. BBX2 slot 1’s 10 calibration points (C[1] – C[20]) are sent initially, followed by BBX2 slot 2’s 10 calibration points (C[21] – C[40]), and so on. The RxCal data is sent next, followed by the RxDCal data.
- Temperature compensation data (TempLevelCal) is also stored in the CAL file for each slot Block.

**Test Equipment Setup:
RF Path Calibration**

Follow the steps outlined in Table 3-33 and refer as needed to Figure 3-15 or Figure 3-16 to set up test equipment.

Table 3-33: Set Up Test Equipment (RF Path Calibration)	
Step	Action
1	<i>If it has not already been done</i> , refer to the procedure in Table 3-6 to interface the CDMA LMF computer terminal to the frame LAN A connector.
2	<i>If it has not already been done</i> , refer to Table 3-7 to start a GUI LMF session.
3	If required, calibrate the test equipment per the procedure in Table 3-25.

Table 3-33: Set Up Test Equipment (RF Path Calibration)

Step	Action
4	<p>! CAUTION</p> <p>To prevent damage to the test equipment, all transmit (TX) test connections must be via the 30 dB directional coupler for 800 MHz or via a 30 dB coupler with a 20 dB in-line attenuator for 1900 MHz.</p> <p><i>For TX path calibration</i>, verify that the coaxial cable from the appropriate ANTENNA connector (Figure 1-6 or Figure 1-7) is connected to the test equipment RF input port via the directional coupler.</p>



Transmit (TX) Path Calibration

The assigned channel frequency and desired power level at the frame TX ports for transmit calibration are derived from the BTS CDF file. Each BBX2 at the site is assigned to a sector and carrier. These are specified respectively in the sector and carrier *fields* of the ParentCARRIER parameter in each BBX2’s CDF file block. The channel frequency and desired power for the assigned *sector* are specified respectively in the ChannelList and SIFPilotPwr parameters of the CDF block for the CARRIER to which the BBX2 is assigned.

The calibration procedure attempts to adjust the measured power to within ±0.5 dB of the desired power. The calibration will pass if the error is less than ±1.5 dB.

The TX BLO for the SC4812ET Lite is approximately 42.0 dB ±5.0 dB. BLO is the gain in dB between the known power output of the BBX2 and the measured power at the TX port. BLO is derived by deducting the known BBX2 power output from the power measured at the TX port or (Measured Power) – (BBX2 TX Power Output).

Example:

$$\begin{aligned} \text{Measured Power (at TX port)} &= 36.0 \text{ dBm} \\ \text{Known BBX TX Power Output} &= -6.0 \text{ dBm} \\ \text{BLO} &= (36.0) - (-6.0) = 42.0 \text{ dB gain} \end{aligned}$$

The CDMA LMF **Tests** menu list items **TX Calibration** and **All Cal/Audit** perform TX BLO Calibration testing for installed BBX(s). The **All Cal/Audit** menu item initiates a series of actions to perform TX calibration, download BLO, and perform TX audit if the TX calibration passes. The **TX Calibration** selection performs only the TX calibration. When the **TX Calibration** selection is used, BLO download and TX audit *must be performed as separate activities*. All measurements are made through the appropriate antenna connector using the calibrated TX cable setup.

In both the **TX Calibration** and **All Cal/Audit** dialog boxes, a **Verify BLO** checkbox is provided and checked by default. After the actual TX calibration is completed during either the **TX Calibration** or **All Cal/Audit** process, the BLO derived from the calibration is compared to a standard, acceptable BLO tolerance for the BTS. In some installations,

additional items may be installed in the transmit path. The additional change in gain from these items could cause BLO verification failure and, therefore, failure of the entire calibration. In these cases, either the **Verify BLO** checkbox should be *unchecked* or the additional path losses should be added into each applicable sector using the **Util > Edit > TX Coupler Loss...** function.

Prerequisites

Before running this test, ensure that the following have been done:

- CSM-1, GLIs, MCCs, and BBX2s have correct code load and data load.
- Primary CSM and MGLI are INS.
- All BBX2s are OOS_RAM.
- Test equipment and test cables are calibrated and connected for TX BLO calibration.
- LMF is logged into the BTS in the *GUI* environment.

Connect the test equipment as shown in Figure 3-15 and Figure 3-16 and follow the procedure in Table 3-34 to perform the TX calibration test.



WARNING

Before installing any test equipment directly to any **TX OUT** connector, ***first verify there are no CDMA BBX2 channels keyed.*** Failure to do so can result in serious personal injury and/or equipment damage.



IMPORTANT

Verify all BBX2 boards removed and repositioned have been returned to their assigned shelves/slots. Any BBX2 boards moved since they were downloaded will have to be downloaded again.

Table 3-34: All Cal/Audit Path Calibration

Step	Action
1	Configure test equipment for TX path calibration per Table 3-33.
2	Select the BBX2(s) to be calibrated.
3	From the Tests menu, select All Cal/Audit .
4	Select the appropriate carrier(s) displayed in the Channels/Carrier pick list. Press and hold the <Shift> or <Ctrl> key to select multiple items.
5	Type the appropriate channel number in the Carrier n Channels box.
6	Click on OK .
7	Follow the cable connection directions as they are displayed. The test results will be displayed in the status report window.
8	Click on Save Results or Dismiss to close the status report window.

TX Calibration Test

Prerequisites

Ensure the following prerequisites have been met before proceeding:

- MGLI and primary CSM and BDC are INS_ACT (CSM clock valid)
- All BBXs are OOS-RAM (yellow)
- Test equipment and test cables are calibrated and connected for TX BLO calibration
- LMF is logged in to the BTS in the *GUI* environment



IMPORTANT

Verify all BBX boards removed and repositioned have been returned to their assigned shelves/slots. Any BBX boards moved since being downloaded will have to be downloaded with code and data again.

If just a TX calibration must be run by itself, follow the procedures in Table 3-35.

Table 3-35: TX Calibration Test

Step	Action
1	Configure test equipment for TX path calibration per Table 3-33.
2	Click on the BBX(s) to be calibrated.
3	From the Tests menu, select TX Calibration .
4	Select the appropriate carrier(s) displayed in the Channels/Carrier pick list (press and hold the Shift or Ctrl keyboard key to select multiple items).

... continued on next page

Table 3-35: TX Calibration Test

Step	Action
5	Enter the appropriate channel number in the Carrier n Channels box.
6	Click OK to display the status report window followed by a Directions pop-up window.
7	Follow the cable connection directions as they are displayed. The test results will be displayed in the status report window.
8	Click OK to close the status report window.

Exception Handling

In the event of a failure, the calibration procedure displays a **FAIL** message in the status report window and provides information in the **Description** field.

Recheck the test setup and connection and re-run the test. If the tests fail again, note specifics about the failure, and refer to Chapter 6, *Troubleshooting*.

Download BLO Procedure

After a successful TX path calibration, download the bay level offset (BLO) calibration file data to the BBX2s. BLO data is extracted from the CAL file for the Base Transceiver Subsystem (BTS) and downloaded to the selected BBX2 devices.

NOTE

If a successful **All Cal/Audit** was completed, this procedure does not need to be performed, as BLO is downloaded as part of the **All Cal/Audit**.

Prerequisites

Ensure the following prerequisites have been met before proceeding.

- BBXs being downloaded are OOS-RAM (yellow).
- TX calibration successfully completed

After a TX calibration has been performed using the procedure in Table 3-35, follow the steps in Table 3-36 to download the BLO data to the BBX2s.

Table 3-36: Download BLO

Step	Action
1	Select the BBX2(s) to be downloaded.
2	From the Device menu, select Download BLO . A status report window displays the result of the download. NOTE Selected device(s) do not change color when BLO is downloaded.
3	Click OK to close the status report window.

Calibration Audit Introduction

The BLO calibration audit procedure confirms the successful generation and storage of the BLO calibrations. The calibration audit procedure measures the path gain or loss of every BBX2 transmit path at the site. In this test, actual system tolerances are used to determine the success or failure of a test. The same external test equipment set up is used.



IMPORTANT

RF path verification, BLO calibration, and BLO data download to BBX2s must have been successfully completed prior to performing the calibration audit.

Transmit (TX) Path Audit

Perform the calibration audit of the TX paths of all equipped BBX2 slots, per the steps in Table 3-37.



WARNING

Before installing any test equipment directly to any **TX OUT** connector, *first verify there are no CDMA BBX2 channels keyed*. Failure to do so can result in serious personal injury and/or equipment damage.

NOTE

If a successful **All Cal/Audit** was completed, this procedure does not need to be performed, as BLO is downloaded as part of the **All Cal/Audit**.

TX Audit Test

The **Tests** menu item, **TX Audit**, performs the TX BLO Audit test for a BBX2(s). All measurements are made through the appropriate TX output connector using the calibrated TX cable setup.

Prerequisites

Before running this test, the following should be done:

- CSM-1, GLI2s, BBX2s have correct code load.
- Primary CSM and MGLI2 are INS.
- All BBX2s are OOS_RAM.
- Test equipment and test cables are calibrated and connected for TX BLO calibration.
- LMF is logged into the BTS.

After a TX calibration has been performed using the procedure in Table 3-35, or if verification of BLO data in the CAL file is required, connect the test equipment as shown in Figure 3-15 or Figure 3-16 and follow the procedure in Table 3-37 to perform the BTS TX Path Audit test.

Table 3-37: TX Path Audit

Step	Action
1	Select the BBX2(s) to be audited. From the Tests menu, select TX Audit .
2	Select the appropriate carrier(s) displayed in the Channels/Carrier pick list. Press and hold the <Shift> or <Ctrl> key to select multiple items.
3	Type the appropriate channel number in the Carrier n Channels box.
4	Click on OK .
5	Follow the cable connection directions as they are displayed. A status report window displays the test results.
6	Click on Save Results or Dismiss to close the status report window.

Exception Handling

In the event of a failure, the calibration procedure displays a **FAIL** message in the status report window and provides information in the **Description** field.

Recheck the test setup and connection and re-run the test. If the tests fail again, note specifics about the failure, and refer to Chapter 6, *Troubleshooting*.



Create CAL File

The Create Cal File function gets the BLO data from BBXs and creates/updates the CAL file for the BTS. If a CAL file does not exist a new one is created. If a CAL file already exists it is updated. After a BTS has been fully optimized a copy of the CAL file must exist so it can be transferred to the CBSC. If TX calibration has been successfully performed for all BBXs and BLO data has been downloaded, a CAL file will exist. Note the following:

- The Create Cal File function only applies to selected (highlighted) BBXs.



CAUTION

Editing the CAL file is not encouraged as this action can cause interface problems between the BTS and the LMF. To manually edit the CAL file you must first logout of the BTS. If you manually edit the CAL file and then use the Create Cal File function the edited information will be lost.

Prerequisites

Before running this test, the following should be done:

- LMF is logged into the BTS
- BBX2s are OOS_RAM with BLO downloaded

Table 3-38: Create CAL File

Step	Action
1	Select the applicable BBX2s. The CAL file will only be updated for the selected BBX2s.
2	Click on the Device menu.
3	Click on the Create Cal File menu item. The status report window displays the results of the action.
4	Click OK .

RFDS Setup and Calibration

RFDS Description

The optional RFDS is used to perform RF tests of the site from the CBSC or from the LMF. The RFDS contains the following FRUs:

- Antenna Select Unit (ASU)
- FWT Interface Card (FWTIC)
- Subscriber Unit Assembly (SUA)

For complete information regarding the RFDS, refer to the CDMA *CDMA RFDS Hardware Installation; 68P64113A93*, *CDMA RFDS User's Guide; 68P64114A51*, and the *LMF Help function*.

RFDS Parameter Settings

The `bts-#.cdf` file includes RFDS parameter settings that must match the installed RFDS equipment. The paragraphs below describe the editable parameters and their defaults. Table 3-39 explains how to edit the parameter settings.

- **RfdsEquip** – valid inputs are 0 through 2.
 - 0 = (default) RFDS is not equipped
 - 1 = Non-Cobra/Patzer box RFDS
 - 2 = Cobra RFDS
- **TsuEquip** – valid inputs are 0 or 1
 - 0 = (default) TSU not equipped
 - 1 = TSU is equipped in the system
- **MC1....4** – valid inputs are 0 or 1
 - 0 = (default) Not equipped
 - 1 = Multicouplers equipped in RFDS system
(*SC9600 internal RFDS only*)
- **Asu1/2Equip** – valid inputs are 0 or 1
 - 0 = (default) Not equipped
 - 1 = Equipped
- **TestOrigDN** – valid inputs are "" (default) or a numerical string up to 15 characters. (This is the phone number the RFDS dials when originating a call. A dummy number needs to be set up by the switch, and is to be used in this field.)

NOTE

Any text editor may be used to open the `bts-#.cdf` file to verify, view, or modify data.

Table 3-39: RFDS Parameter Settings

Step	Action
	<p>* IMPORTANT Log out of the BTS prior to performing this procedure.</p>
1	<p>Using a text editor, verify the following fields are set correctly in the <code>bts-#.cdf</code> file (1 = GLI based RFDS; 2 = Cobra RFDS).</p> <p>EXAMPLE:</p> <pre>RfdsEquip = 2 TsuEquip = 1 MC1Equip = 0 MC2Equip = 0 MC3Equip = 0 MC4Equip = 0 Asu1Equip = 1 Asu2Equip = 0 (1 if system is non-duplexed) TestOrigDN = '123456789'</pre> <p>NOTE The above is an example of the <code>bts-#.cdf</code> file that should have been generated by the OMC-R and copied to the LMF. These fields will have been set by the OMC-R if the RFDSPARM database is modified for the RFDS.</p>
2	<p>Save and/or quit the editor. If any changes were made to these fields data will need to be downloaded to the GLI2 (see Step 3, otherwise proceed to Step 4).</p>
3	<p>To download to the GLI2, click on the Device menu and select the Download Data menu item (<i>selected devices do not change color when data is downloaded</i>). A status report window is displayed showing status of the download. Click <i>OK</i> to close the status report window.</p> <p>! CAUTION After downloading data to the GLI2 the RFDS LED will slowly begin flashing red and green for approximately 2–3 minutes. DO NOT attempt to perform any functions with the RFDS until the LED remains green.</p>
4	<p>Status the RFDS TSU. A status report is displayed showing the software version number for the TSIC and SUA.</p> <p>* IMPORTANT If the LMF yields an error message, check the following:</p> <ul style="list-style-type: none"> • Ensure AMR cable is correctly connected from the BTS to the RFDS. • Verify RFDS has power. • Verify RFDS status LED is green. • Verify fields in the <code>bts-#.cdf</code> file are correct (see Step 1). • Status the GLI2 and ensure the device is communicating (via Ethernet) with the LMF, and the device is in the proper state (INS).

RFDS TSU NAM Programming

The NAM (number assignment module) information needs to be programmed into the TSU before it can receive and process test calls, or be used for any type of RFDS test. The RFDS TSU NAM must be programmed with the appropriate system parameters and phone number during hardware installation. The TSU phone and TSU MSI must be recorded for each BTS used for OMC-R RFDS software configuration.

NOTE

The user will only need to program the NAM for the initial install of the RFDS.

Explanation of Parameters used when Programming the TSU NAM

Table 3-40 defines the parameters used when editing the tsu.nam file.

Table 3-40: Definition of Parameters	
Access Overload Code Slot Index System ID Network ID	These parameters are obtained from the switch.
Primary Channel A Primary Channel B Secondary Channel A Secondary Channel B	These parameters are the channels which are to be used in operation of the system.
Lock Code Security Code Service Level Station Class Mark	Do <i>NOT</i> change.
IMSI MCC IMSI 11 12	These fields are obtained at the OMC using the following command: OMC000>disp bts-# imsi If the fields are blank, replace the IMSI fields in the NAM file to 0, otherwise use the values displayed by the OMC.
MIN Phone Number	These fields are the phone number assigned to the mobile. The ESN and MIN must be entered into the switch as well. NOTE This field is different from the TODN field in the bts-#.cdf file. The MIN is the phone number of the RFDS subscriber, and the TODN is the number the subscriber calls.



RFDS Setup and Calibration – continued

Valid NAM Ranges

Table 3-41 provides the valid NAM field ranges. If any of the fields are missing or out-of-range, the RFDS will error out.

Table 3-41: Valid NAM Field Ranges

NAM Field Name	Valid Range	
	Minimum	Maximum
Access Overload Code	0	15
Slot Index	0	7
System ID	0	32767
Network ID	0	32767
Primary Channel A	25	1175
Primary Channel B	25	1175
Secondary Channel A	25	1175
Secondary Channel B	25	1175
Lock Code	0	999
Security Code	0	999999
Service Level	0	7
Station Class Mark	0	255
IMSI 11 12	0	99
IMSI MCC	0	999
MIN Phone Number	N/A	N/A

Set Antenna Map Data

The antenna map data must be entered manually if an RFDS is installed. Antenna map data does not have to be entered if an RFDS is not installed. The antenna map data is only used for RFDS tests and is required if a RFDS is installed.

Prerequisite

- Logged into the BTS

Table 3-42: Set Antenna Map Data

Step	Action
1	Click on the Util menu.
2	Select Edit > Antenna Map > TX or RX . A data entry pop-up window will appear.
3	Enter/edit values as required for each carrier. NOTE Refer to the Util > Edit-antenna map LMF help screen for antenna map examples.
4	Click on the Save button to save displayed values.
5	Click on the Dismiss button to exit the window. Values that were entered/changed after the Save button was used will not be saved. NOTE Entered values will be used by the LMF as soon as they are saved. You do not have to logout and login.

Set RFDS Configuration Data

If an RFDS is installed the RFDS configuration data must be manually entered.

Prerequisite

- Logged into the BTS



IMPORTANT

The entered **antenna#** index numbers must correspond to the **antenna#** index numbers used in the antenna maps.

Table 3-43: Set RFDS Configuration Data

Step	Action
1	Click on the Util menu.
2	Select Edit > RFDS Configuration > TX or RX . A data entry pop-up window will appear.
3	Click on the Add Row button to add a new antenna number. Then click in the other columns and enter the desired data.
4	To edit existing values click in the data box to be changed and change the value. NOTE Refer to the Util > Edit–RFDS Configuration LMF help screen for RFDS configuration data examples.
5	To delete a row, click on the row and then click on the Delete Row button.
6	Click on the Save button to save displayed values.
7	Click on the Dismiss button to exit the window. Values that were entered/changed after the Save button was used will not be saved. NOTE Entered values will be used by the LMF as soon as they are saved. You do not have to logout and login.

RFDS Calibration

3

The RFDS Calibration option is used to calibrate the RFDS TX and RX paths. For a TX antenna path calibration the BTS XCVR is keyed at a pre-determined power level and the BTS power output level is measured by the RFDS. The power level is then measured at the TX antenna directional coupler by the power measuring test equipment item being used (power meter or analyzer). The difference (offset) between the power level at the RFDS and the power level at the TX antenna directional coupler is used as the TX RFDS calibration offset value.

For an RX antenna path calibration the RFDS is keyed at a pre-determined power level and the power input level is measured by the BTS XCVR. A CDMA signal at the same power level measured by the BTS XCVR is then injected at the RX antenna directional coupler by the CDMA communications analyzer. The difference (offset) between the RFDS keyed power level and power level measured at the BTS XCVR is the RFDS RX calibration offset value.

The TX and RX RFDS calibration offset values are written to the CAL file.

For each RFDS TSIC, the channel frequency is determined at the lower third and upper third of the appropriate band using the frequencies listed in Table 3-44.

System	Channel Calibration Points
800 MHz (A and B)	341 and 682
1.9 GHz	408 and 791



WARNING

Before installing any test equipment directly to any **TX OUT** connector, *verify that there are no CDMA BBX channels keyed*. Failure to do so can result in serious personal injury and/or equipment damage.

Prerequisites

- BBX2s are INS_TEST
- Cable calibration has been performed
- TX calibration has been performed and BLO has been downloaded for the BTS
- Test equipment has been connected correctly for a TX calibration
- Test equipment has been selected and calibrated

Table 3-45: RFDS Calibration

Step	Action
1	Select the RFDS tab.
2	Click on the RFDS menu.
3	Click on the RFDS Calibration menu item.
4	Select the appropriate direction (TX/RX) in the Direction pick list.
5	Enter the appropriate channel number(s) in the Channels box. Separate the channel numbers with a comma or a dash if more than one channel number is entered (e.g., 247,585,742 or 385–395 for through).
6	Select the appropriate carrier(s) in the Carriers pick list (use the Shift or Ctrl key to select multiple carriers).
7	Select the appropriate RX branch (Both, Main, or Diversity) in the RX Branch pick list.
8	Select the appropriate baud rate (1=9600, 2=14400) in the Rate Set pick list.
9	Click on the OK button. A status report window is displayed, followed by a Directions pop-up window.
10	Follow the cable connection directions as they are displayed. Test results are displayed in the status report window.
11	Click on the OK button to close the status report window.
12	Click on the BTS tab.
13	Click on the MGLI.
14	<p>Download the CAL file which has been updated with the RFDS offset data to the selected GLI device by clicking on Device > Download Data from the tab menu bar and pulldown.</p> <p>NOTE The MGLI will automatically transfer the RFDS offset data from the CAL file to the RFDS.</p>



Program TSU NAM

Follow the procedure in Table 3-46 to program the TSU NAM. The NAM must be programmed before it can receive and process test calls, or be used for any type of RFDS test.

Prerequisites

- MGLI is INS.
- TSU is powered up and has a code load.

Table 3-46: Program NAM Procedure

Step	Action
1	Select the RFDS tab.
2	Select the TSU tab.
3	Click on the TSU menu.
4	Click on the Program TSU NAM menu item.
5	Enter the appropriate information in the boxes (see Table 3-40 and Table 3-41) .
6	Click on the OK button to display the status report.
7	Click on the OK button to close the status report window.

Alarms Testing

Alarm Verification

The alarms testing should be performed at a convenient point in the optimization/ATP process, since the LMF is necessary to ensure that the SC4812ET Lite is generating the appropriate alarms.

The SC 4812ET Lite is capable of concurrently monitoring 10 customer defined input signals and four customer defined outputs, which interface to the 50-pair punchblock. All alarms are defaulted to “Not Equipped” during ATP testing. Testing of these inputs is achieved by triggering the alarms and monitoring the LMF for state-transition messages from the active MGLI2.

Alarm Reporting Display

The Alarm Monitor window can be displayed to list alarms that occur after the window is displayed. To access the Alarm Monitor window, select **Util > Alarm Monitor**.

The following buttons are included.

- The **Options** button allows for a severity level (**Warning**, **Minor**, **Major**, **Critical**, and **Unknown**) selection. The default is all levels. To change the level of alarms reported click on the **Options** button and highlight the desired alarm level(s). To select multiple levels press the Ctrl key (for individual selections) or Shift key (for a range of selections) while clicking on the desired levels.
- The **Pause** button can be used to pause/stop the display of alarms. When the **Pause** button is clicked the name of the button changes to **Continue**. When the **Continue** button is click the display of alarms will continue. Alarms that occur between the time the **Pause** button is clicked and the **Continue** button is clicked will not be displayed.
- The **Clear** button can be used to clear the Alarm Monitor display. New alarms that occur after the **Clear** button is clicked will be displayed.
- The **Dismiss** button is used to dismiss/close the Alarm Monitor display.

Alarms Testing – continued

Alarm Testing Set-up

Prepare for any alarm testing by following the procedures in Table 3-47.

Table 3-47: Alarm Testing Preparation	
Step	Action
1	<i>If it has not already been done</i> , refer to the procedure in Table 3-6 to interface the CDMA LMF computer terminal to the frame LAN A connector.
2	<i>If it has not already been done</i> , refer to Table 3-7 to start a <i>GUI</i> LMF session.
3	Click on Util in the menu bar and select Alarm Monitor... from the pulldown. <ul style="list-style-type: none">An Alarm Monitor window will open.

Heat Exchanger Alarm Test

Table 3-48 gives instructions on testing the Heat Exchanger alarm.

Table 3-48: Heat Exchanger Alarm	
Step	Action
1	Set one of the two DC PDA heat exchanger circuit breakers to OFF . This will generate a heat exchanger alarm. Be sure that the CDMA LMF reports the correct alarm condition.
2	Alarm condition will be reported as BTS Relay #14, BTS Relay #15, BTS Relay #16, BTS Relay #17, BTS Relay #18 , with Contact Alarm Open*Clear* , respectively.
3	Set the circuit breaker turned off in step 1 to ON . Ensure that the alarm conditions have cleared on the CDMA LMF with Contact Alarm Closed*Clear* for each reported BTS relay. NOTE The heat exchanger will go through the start-up sequence.

Door Alarm

Table 3-49 gives instructions on testing the door alarms.

Table 3-49: ACLC and Power Entry Door Alarm	
Step	Action
1	Close the ACLC and power entry compartment doors on the frame. Ensure that no alarms are reported on the CDMA LMF.
2	Individually open and then close the ACLC and power entry compartment door. Ensure that the CDMA LMF reports an alarm when each door is opened.
3	Alarm condition will be reported as BTS Relay #27 contact.

Alarms Testing – continued

AC Fail Alarm

Table 3-50 gives instructions on testing the AC Fail Alarm.

Table 3-50: AC Fail Alarm	
Step	Action
1	<p>* IMPORTANT</p> <ul style="list-style-type: none"> • Back-up batteries <i>must be installed</i> when performing this test. • To prevent inadvertently shutting down the RF compartment electronics, the batteries should be charged before performing this test. <p>Set the ACLC MAIN circuit breaker to OFF.</p> <ul style="list-style-type: none"> • The CDMA LMF should report an alarm for an AC Fail condition as BTS Relay #21, BTS Relay #23, BTS Relay #24, and BTS Relay #29 contacts, respectively. • On the MAP, the MAJOR ALARM (red), MINOR ALARM (amber), and RECTIFIER FAIL (red) LEDs should light. • On the rectifiers, the DC and PWR LEDs should light red.
2	<p>Set the ACLC MAIN circuit breaker to ON.</p> <ul style="list-style-type: none"> • On the CDMA LMF, the AC Fail alarm should clear. • On the MAP, the MAJOR ALARM, MINOR ALARM, and RECTIFIER FAIL LEDs should extinguish. • On the rectifiers, the DC and PWR LEDs should change to green.

Minor Alarm

Table 3-51 gives instructions on performing a test to display a minor alarm.

Table 3-51: Minor Alarm	
Step	Action
1	<p>Set the TCP switch on the MAP to OFF. This will generate a minor alarm.</p> <ul style="list-style-type: none"> • The CDMA LMF should report the minor alarm as BTS Relay #24 contacts. • The TC DISABLE (red) and MINOR ALARM (amber) LEDs on the MAP should light.
2	<p>Set the TCP switch to ON. The alarm condition indications should clear.</p>

Rectifier Alarms

The following series of tests are for single rectifier modules in a multiple rectifier system. The systems include a three rectifier and a four rectifier system.

Single Rectifier Failure (Three Rectifier System)

Table 3-52 gives instructions on testing single rectifier failure or minor alarm in a **three (3) rectifier system** (single-carrier system). Procedures

Alarms Testing – continued

in this test are for a frame configured for single carrier operation with rectifiers installed in rectifier shelf positions 2, 3, and 4, from left to right when facing the frame.

Table 3-52: Single Rectifier Fail or Minor Alarm, Single-Carrier System

Step	Action
1	<p>! CAUTION</p> <p>Only perform this test if the rectifier current load displayed on the AMP indicator on the MAP is <i>125 amps or less</i>. Sufficient current capability to support a greater load may not be available when one rectifier is removed from the bus.</p> <p>On the ACLC, set the RECT. 2/4 circuit breaker to OFF.</p> <ul style="list-style-type: none"> • The DC and PWR LEDs should light red on the rectifier in shelf position 2. • The MINOR ALARM (amber) and RECTIFIER FAIL (red) LEDs on the MAP should light. • The CDMA LMF should report an alarm condition as BTS Relay #21 and BTS Relay #24 contacts, respectively.
2	<p>Set the RECT. 2/4 circuit breaker on the ACLC to ON.</p> <ul style="list-style-type: none"> • All alarm indications should clear on the rectifier, MAP, and CDMA LMF.

Multiple Rectifier Failure (Three Rectifier System)

Table 3-53 gives instructions on testing multiple rectifier failure or major alarm in a **three (3) rectifier system** (single-carrier system). Procedures in this test are for a frame configured for single carrier operation with rectifiers installed in rectifier shelf positions 2, 3, and 4, from left to right when facing the frame.

Table 3-53: Multiple Rectifier Failure or Major Alarm, Single-Carrier System

Step	Action
1	<p>! CAUTION</p> <p>Only perform this test if the rectifier current load displayed on the AMP indicator on the MAP is <i>65 amps or less</i>. Sufficient current capability to support a greater load may not be available when two rectifiers are removed from the bus.</p> <p>On the ACLC, set the RECT. 1/3 circuit breaker to OFF.</p> <ul style="list-style-type: none"> • The DC and PWR LEDs should light red on the rectifiers in shelf positions 1 and 3. • The MAJOR ALARM (red), MINOR ALARM (amber), and RECTIFIER FAIL (red) LEDs on the MAP should light. • The CDMA LMF should report an alarm condition as BTS Relay #21, BTS Relay #24, and BTS Relay #29 contacts, respectively.
2	<p>Set the RECT. 1/3 circuit breaker on the ACLC to ON.</p> <ul style="list-style-type: none"> • All alarm indications should clear on the rectifiers, MAP, and CDMA LMF.

Alarms Testing – continued

Single Rectifier Failure (Four Rectifier System)

Table 3-54 gives instructions on testing single rectifier failure or minor alarm in a **four (4) rectifier system** (two-carrier system).

Table 3-54: Single Rectifier Fail or Minor Alarm, Two-Carrier System	
Step	Action
1	<p>! CAUTION</p> <p>Only perform this test if the rectifier current load displayed on the AMP indicator on the MAP is <i>125 amps or less</i>. Sufficient current capability to support a greater load may not be available when two rectifiers are removed from the bus in the following steps.</p> <p>Unseat the rectifier in shelf position 4 from its connection at the rear of the shelf, but do not completely remove it from the shelf.</p> <ul style="list-style-type: none"> • The rectifier 4 DC and PWR LEDs may light red momentarily and extinguish. There should be no other indications on the frame or CDMA LMF.
2	<p>On the ACLC, set the RECT. 2/4 circuit breaker to OFF.</p> <ul style="list-style-type: none"> • The rectifier 2 DC and PWR LEDs should light red. • The MINOR ALARM (amber) and RECTIFIER FAIL (red) LEDs on the MAP should light. • The CDMA LMF should report an alarm condition as BTS Relay #21 and BTS Relay #24 contacts, respectively.
3	<p>Re-seat the rectifier in shelf position 4 into its connection at the rear of the shelf.</p>
4	<p>On the ACLC, set the RECT. 2/4 circuit breaker to ON.</p> <ul style="list-style-type: none"> • The rectifier DC and PWR LEDs should light green. • All alarm indications should clear on the rectifiers, MAP, and CDMA LMF.

Alarms Testing – continued

Multiple Rectifier Failure (Four Rectifier System)

Table 3-55 gives instructions on testing multiple rectifier failure or major alarm in a **four (4) rectifier system** (two-carrier system).

Table 3-55: Multiple Rectifier Failure or Major Alarm, Two-Carrier System	
Step	Action
1	<p>! CAUTION</p> <p>Only perform this test if the rectifier current load displayed on the AMP indicator on the MAP is <i>125 amps or less</i>. Sufficient current capability to support a greater load may not be available when two rectifiers are removed from the bus.</p> <p>On the ACLC, set the RECT. 2/4 circuit breaker to OFF.</p> <ul style="list-style-type: none"> • The DC and PWR LEDs should light red on the rectifiers in shelf positions 2 and 4. • The MAJOR ALARM (red), MINOR ALARM (amber), and RECTIFIER FAIL (red) LEDs on the MAP should light. • The CDMA LMF should report an alarm condition as BTS Relay #21, BTS Relay #24, and BTS Relay #29 contacts, respectively.
2	<p>Set the RECT. 2/4 circuit breaker on the ACLC to ON.</p> <ul style="list-style-type: none"> • All alarm indications should clear on the rectifiers, MAP, and CDMA LMF.

Battery Over Temperature Alarm (Optional)



CAUTION

Use special care to avoid damaging insulation on cables, or damaging battery cases when using a heat gun.

Table 3-56 gives instructions on testing the battery over-temperature alarm system.

Table 3-56: Battery Over-Temperature Alarm	
Step	Action
1	<p>Use a low-powered heat gun to gently heat the battery over-temperature sensor (see location in Figure 3-21).</p> <p>! CAUTION</p> <p>To avoid damaging the cable insulation, do not hold the hot air gun closer than three (3) inches from the sensor.</p>

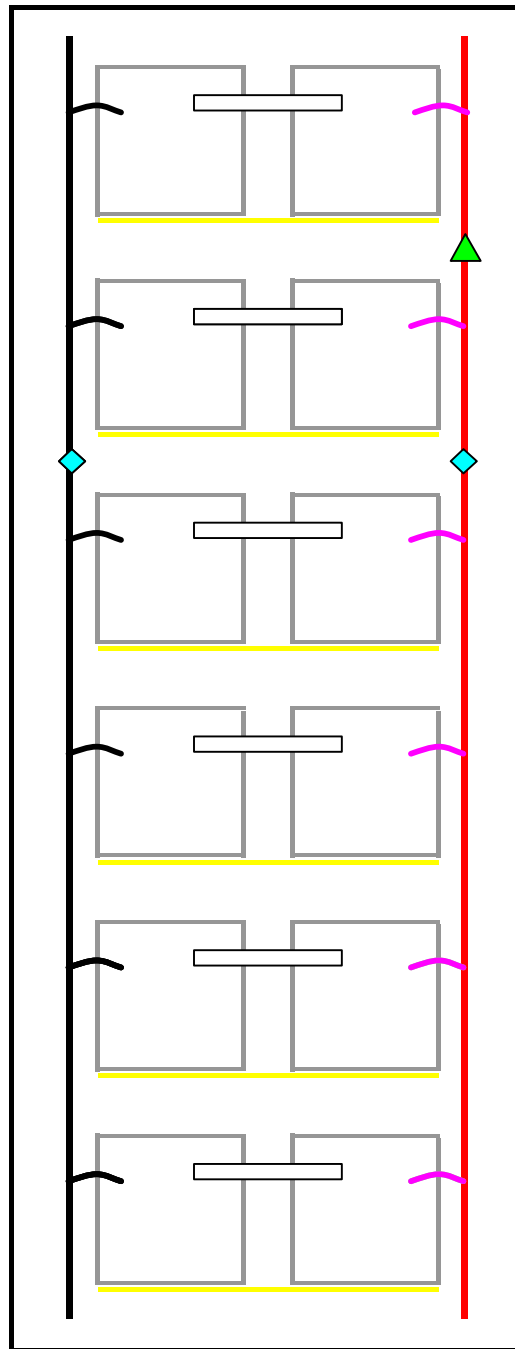
Table 3-56: Battery Over-Temperature Alarm

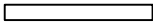



Step	Action
2	<p>NOTE</p> <p>When the over-temperature alarm point is reached, an audible click will sound as DC PDA relay K1 contacts engage and relay K2 contacts disengage (make-before-break operation).</p> <p>When the sensor is heated to approximately 51° C, a battery over-temperature alarm is generated with the following indications.</p> <ul style="list-style-type: none"> • On the MAP, the CHARGE DISABLE LED (red) should light and the MAIN CONN. ENABLE LED (green) should extinguish. • The CDMA LMF should display an alarm condition as BTS Relay #22 contacts.
3	<p>Switch the hot air gun to cool. Cool the sensor until the K1 and K2 contacts return to normal position (K1 open and K2 closed). The following indications that alarms have cleared should occur:</p> <ul style="list-style-type: none"> • On the MAP, the CHARGE DISABLE LED (red) should extinguish and the MAIN CONN. ENABLE (green) LED should light. • The alarm reported on CDMA LMF will clear



Figure 3-21: Battery Over-Temperature Sensor

3



-  Bus Bar
-  6 AWG Cables
-  Battery Overtemp Sensor
-  Negative Temperature Compensation Sensor

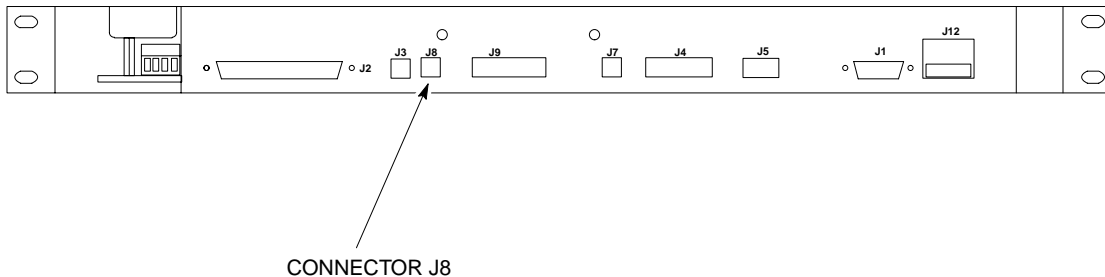
SC4812ETL0014-1

Rectifier Over Temperature Alarm

Table 3-57 gives instructions on testing the rectifier over-temperature alarm system.

Table 3-57: Rectifier Over-Temperature Alarm	
Step	Action
1	Remove the 14 tamper-resistant Torx fasteners securing the rear access panel to the rear of the frame (Figure 2-1), and remove the rear access panel. NOTE Panel fastener type can be either T-27 button head or T-30 pan head.
2	Looking up through the frame rear access opening, locate the rear of the MAP.
3	Remove the jumper plug from connector J8 on the rear panel of the MAP (Figure 3-22). The following conditions should occur: <ul style="list-style-type: none"> • Contacts on K1 and K2 change states (K1 now closed and K2 open). • The CDMA LMF reports an alarm condition as BTS Relay #26 contacts.
4	Reinstall the jumper plug in connector J8, and verify that all alarm conditions have cleared.
5	Reinstall the frame rear access panel, securing it with the 14 tamper-resistant Torx fasteners removed in step 1.

Figure 3-22: MAP Connector J8 (Rear of MAP)



SC4812ETL0021-1

Before Leaving the site

If no further operations are required after performing the alarm tests, complete the requirements in Table 5-8 before leaving the site.

Chapter 4: Automated Acceptance Test Procedure (ATP)

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Automated Acceptance Test Procedure – Introduction

Introduction

The automated Acceptance Test Procedure (ATP) allows Cellular Field Engineers (CFEs) to run automated acceptance tests on all equipped BTS subsystem devices using the CDMA LMF *GUI* environment and supported test equipment.

The operator can choose to save the results of these tests to a report file, from which *ATP reports* are generated for later printout.

Perform the ATP test on out-of-service sectors or sites only. Because all tests are controlled via the CDMA LMF computer using the GPIB interface from the CDMA LMF computer, only recommended test equipment supported by the CDMA LMF can be used.



IMPORTANT

Before using the LMF, use an editor to view the "CAVEATS" section in the "readme.txt" file in the c:\wlmf folder for any applicable information.



IMPORTANT

The ATP test is to be performed on out-of-service sectors *only*.

DO NOT substitute test equipment with other models not supported by the LMF.

NOTE

Refer to Chapter 3 for detailed information on test set connections for calibrating equipment, cables and other test set components, if required.

The CFE selects the appropriate ATP tests to run to satisfy customer and regulatory requirements for verifying cell site performance. These tests can be run individually or as one of the following groups:

- **All TX:** TX tests verify the performance of the BTS transmit elements. These include the GLI2, MCC, BBX2, BDC, and trunking modules, the LPAs, and passive components including splitters, combiners, bandpass filter(s), and RF cables.
- **All RX:** RX tests verify the performance of the BTS receive elements. These include the MPC (for starter frames), , BBX2, MCC, and GLI2 modules, and the passive components including RX filter (starter frame only), and RF cables.
- **All TX/RX:** Executes all TX and RX tests.
- **Full Optimization:** Executes the TX calibration, downloads BLO, and executes the TX audit before running all TX and RX tests.

Prerequisites

Before attempting to run *any* ATP tests, all applicable procedures outlined in Chapter 3, Optimization/Calibration, must have been completed successfully (i.e., code load and BLO calibration).

NOTE

You cannot substitute test equipment with other models not supported by the CDMA LMF.

Before attempting to run *any* ATP tests, ensure the following:

- BTS has been optimized and calibrated (see Chapter 3).
- LMF is logged into the BTS
- CSMs, GLI2s, BBX2s, MCCs and TSU (if the RFDS is installed) have correct code load and data load
- Primary CSM and GLI2 are INS_ACT
- MCCs are INS_ACT
- BBX2s are OOS-RAM
- BBX2s are calibrated and BLOs are downloaded
- Test cables are calibrated
- Test equipment is selected
- Test equipment is connected for ATP tests
- Test equipment has been warmed up 60 minutes and calibrated
- GPIB is on



WARNING

Before the FER is run, be sure that all LPAs are turned OFF (circuit breakers pulled) or that all transmitter connectors are properly terminated.

All transmit connectors must be properly terminated for all ATP tests.

Failure to observe these warnings may result in bodily injury or equipment damage.

TX/RX Antenna Connections

Refer to Figure 1-6 or Figure 1-7 for identification of the transmit and receive antenna connections where measurement are to be taken. Directional couplers for signal sampling by the RFDS, if installed, are integral to the SC4812ET Lite transmit and receive paths in the DRDCs and TRDCs. As a result, all ATP measurement connections are made at the antenna connectors on the RF interface panel.

Acceptance Tests – Test Set Up

Required Test Equipment

The following test equipment is required:

- LMF
- Power meter (used with HP8921A/600 and Advantest R3465)
- Communications test set



WARNING

Before installing any test equipment directly to any **TX OUT** connector, *verify that there are no CDMA channels keyed.*

At active sites, have the OMCR/CBSC place the carrier assigned to the LPAs under test OOS. Failure to do so can result in serious personal injury and/or equipment damage.

NOTE

You must recalibrate the test equipment before using it to perform the TX Acceptance Tests.

Acceptance Test Equipment Set Up

Follow the steps in Table 4-1 to set up test equipment for all tests.

Table 4-1: Set Up Test Equipment – TX Output Verify/Control Tests	
Step	Action
1	<i>If it has not already been done</i> , interface the LMF computer to the BTS (refer to Table 3-6 and Figure 3-10).
2	<i>If it has not already been done</i> , refer to Table 3-7 to start a <i>GUI</i> LMF session and log into the BTS.
3	<p><i>If it has not already been done</i>, refer to Figure 3-17 or Figure 3-18, as applicable for the test equipment being used, to connect test equipment for acceptance testing.</p> <p>* IMPORTANT CDMA LMF-based measurement commands factor in TX test cable loss between the RFM frame and test equipment. No additional attenuation can be inserted as the <i>additional losses would not be factored in.</i></p>

Abbreviated (All-inclusive) Acceptance Tests

All-inclusive Tests

The all-inclusive acceptance tests are performed from the LMF *GUI* environment. These tests execute various combinations of individual acceptance tests with a single command. This allows verification of multiple aspects of BTS performance while minimizing time needed for individual test set up and initiation.

There are three abbreviated acceptance tests which evaluate different performance aspects of the BTS. This allows the CFE to select testing to meet the specific requirements for individual maintenance and performance verification situations. The following summarizes the coverage of each abbreviated test:

- **All TX/RX.** Performs all transmit and receive ATPs on the selected MCCs and BBX2s.
- **All TX.** Performs complete set of transmit ATPs on the selected MCCs and BBX2s. Testing is the equivalent of performing all of the following individual tests:
 - **TX Mask** Test
 - **Rho** Test
 - **Pilot Time Offset** Test
 - **Code Domain Power** Test
- **All RX.** Performs complete receive ATP on the selected MCCs and BBX2s. Testing is the equivalent of performing the following:
 - **FER** Test

Abbreviated (All-inclusive) Acceptance Tests – continued

All TX/RX ATP Test

Follow the procedures in Table 4-2 to perform the abbreviated, all-inclusive **transmit and receive** test.

Table 4-2: All TX/RX ATP Test Procedure	
Step	Action
1	Set up the test equipment initially for abbreviated tests per Table 4-1.
2	Select the BBX2s and MCCs to be tested.
3	From the Tests menu, select All TX/RX .
4	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) displayed in the Channels/Carrier pick list. NOTE To select multiple items, hold down the Shift or Ctrl key while making the selections.
5	Enter the appropriate channel number in the Carrier n Channels box.
6	Click OK . The status report window is displayed and a Directions pop-up is displayed.
7	Follow the cable connection directions as they are displayed. The test results are displayed in the status report window.
8	Click Save Results or Dismiss . NOTE If Dismiss is used, the test results will not be saved in the test report file.

All TX ATP Test

Follow the procedures in Table 4-3 to perform the abbreviated, all-inclusive **transmit** test.

Table 4-3: All TX ATP Test Procedure	
Step	Action
1	Set up the test equipment for abbreviated tests per Table 4-1.
2	Select the BBX2s and MCCs to be tested.
3	From the Tests menu, select All TX .
4	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) displayed in the Channels/Carrier pick list. NOTE To select multiple items, hold down the Shift or Ctrl key while making the selections.
5	Enter the appropriate channel number in the Carrier n Channels box.
6	Click OK . The status report window is displayed and a Directions pop-up is displayed.
7	Follow the cable connection directions as they are displayed. The test results are displayed in the status report window.

. . . continued on next page

Abbreviated (All-inclusive) Acceptance Tests – continued

Table 4-3: All TX ATP Test Procedure	
Step	Action
8	Click Save Results or Dismiss . NOTE If Dismiss is used, the test results will not be saved in the test report file.

All RX ATP Test

Follow the procedures in Table 4-4 to perform the abbreviated, all-inclusive **receive** test.

Table 4-4: All RX ATP Test Procedure	
Step	Action
1	Set up the test equipment for abbreviated tests per Table 4-1.
2	Select the BBX2s and MCCs to be tested.
3	From the Tests menu, select All RX .
4	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) displayed in the Channels/Carrier pick list. NOTE To select multiple items, hold down the Shift or Ctrl key while making the selections.
5	Enter the appropriate channel number in the Carrier n Channels box.
6	Click OK . The status report window is displayed and a Directions pop-up is displayed.
7	Follow the cable connection directions as they are displayed. The test results are displayed in the status report window.
8	Click Save Results or Dismiss . NOTE If Dismiss is used, the test results will not be saved in the test report file.

Individual Acceptance Tests—Introduction

Individual Acceptance Tests

The following individual ATP tests can be used to evaluate specific aspects of BTS operation against individual performance requirements. All testing is performed using the CDMA LMF *GUI* environment.

TX Testing

TX tests verify any given transmit antenna path and output power control. All tests are performed using the external calibrated test set. All measurements are via the appropriate **TX OUT** connector.

TX tests verify TX operation of the entire CDMA Forward Link using all BBX2s assigned to all respective sector/antennas. Each BBX2 is keyed up to generate a CDMA carrier (using both bbs level and bay level offsets) at the CDF file carrier output power level (as specified in the site documentation).

RX Testing

RX testing verifies any given receive antenna path. All tests are performed using the external calibrated test set to inject a *CDMA* RF carrier with all zero longcode at the specified RX frequency via the appropriate **RX IN** connector.

RX tests verify RX operation of the entire CDMA Reverse Link using all equipped MCCs assigned to all respective sector/antennas.

Individual Tests

Spectral Purity TX Mask

This test verifies that the transmitted CDMA carrier waveform generated on each sector meets the transmit spectral mask specification (as defined in IS-97) with respect to the assigned cdf file values.

Waveform Quality (Rho)

This test verifies that the transmitted Pilot channel element digital waveform quality (rho) exceeds the minimum specified value in IS-97. *Rho* represents the correlation between the actual and perfect CDMA modulation spectrums. 1.0000 represents 100% (or perfect correlation).

Pilot Time Offset

The Pilot Time Offset is the difference between the CDMA analyzer measurement interval (based on the BTS system time reference) and the incoming block of transmitted data from the BTS (Pilot only, Walsh code 0).

Code Domain Power/Noise Floor

This test verifies the code domain power levels, which have been set for all ODD numbered Walsh channels, using the OCNS command. This is

done by verifying that the ratio of PILOT divided by OCNS is equal to 10.2 ± 2 dB, and, that the noise floor of all EVEN numbered “OFF” Walsh channels measures ≤ -27 dB (with respect to total CDMA channel power).

BTS Frame Error Rate

This test verifies the BTS receive Frame Error Rate (FER) on all Traffic Channel elements currently configured on all equipped MCCs (fullrate at one percent FER) at an RF input level of -119 dBm on the *main* RX antenna paths using all *equipped* MCCs and BBX2s at the site. The *diversity* RX antenna paths are also tested using the lowest equipped MCC/CE ONLY.

NOTE

There are no pass/fail criteria associated with FER readings taken at level below -119 dBm, other than to verify that the FER measurement reflects changes in the RX input signal level.

TX Spectral Purity Transmit Mask Acceptance Test

Background

This test verifies the spectral purity of each BBX carrier keyed up at a specific frequency *per the current CDF file assignment*. All tests are performed using the external calibrated test set controlled by the same command. All measurements are via the appropriate **TX OUT** connector.

Pilot gain will be set to 541 for each antenna, and the forward link will be disabled for all Traffic CHannel (TCH) elements from the MCCs. The BBX2 will be keyed up using both `bbx1v1` and bay level offsets, to generate a CDMA carrier (with pilot channel element only). RF output will be set at 40 dBm as measured at the appropriate TX output.

The calibrated communications test set will measure and return the attenuation level of all spurious and IM products with respect to the mean power of the CDMA channel measured in a 1.23 MHz bandwidth, in dB, verifying that results meet system tolerances at the following test points (see also Figure 4-1):

- For 800 MHz:
 - At least **-45 dB @ + 750 kHz** from center frequency
 - At least **-45 dB @ - 750 kHz** from center frequency
 - At least **-60 dB @ -1980 kHz** from center frequency
 - At least **-60 dB @ + 1980 kHz** from center frequency
- For 1.9 GHz:
 - At least **-45 dB @ + 900 kHz** from center frequency
 - At least **-45 dB @ - 900 kHz** from center frequency

The BBX2 will then dekey, and if selected, the redundant BBX2 will be assigned to the current TX antenna path under test. The test will then be repeated.

TX Spectral Purity Transmit Mask Acceptance Test – continued

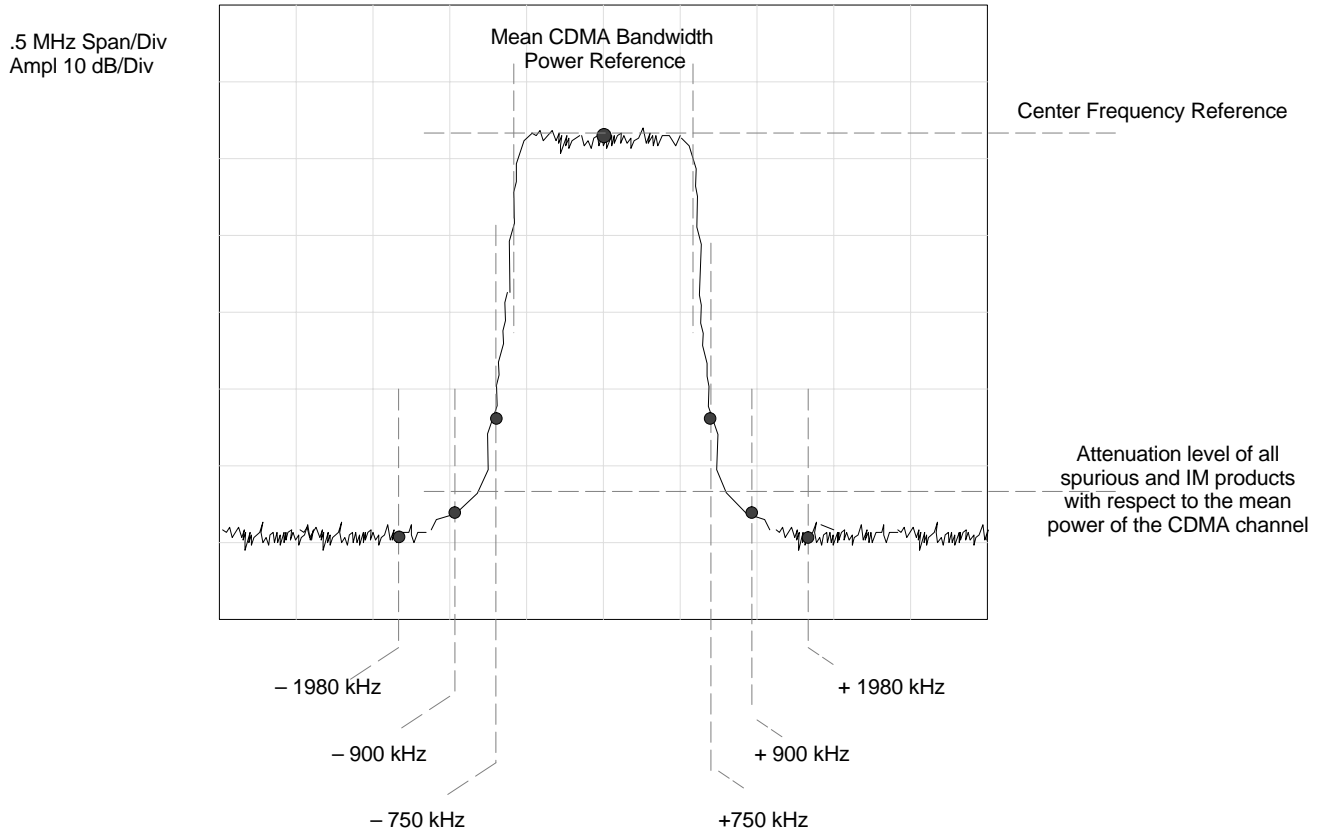
Spectral Purity TX Mask Acceptance Test

Follow the steps in Table 4-5 to verify the transmit spectral mask specification on all TX antenna paths using all BBXs equipped at the BTS.

Table 4-5: Test Spectral Purity Transmit Mask

Step	Action
1	Set up the test equipment for TX acceptance tests per Table 4-1.
2	Select the BBX2s to be tested.
3	From the Tests menu, select TX Mask .
4	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) displayed in the Channels/Carrier pick list. NOTE To select multiple items, hold down the Shift or Ctrl key while making the selections.
5	Enter the appropriate channel number in the Carrier n Channels box.
6	Click OK . The status report window is displayed and a Directions pop-up is displayed.
7	Follow the cable connection directions as they are displayed. The test results are displayed in the status report window.
8	Click Save Results or Dismiss . NOTE If Dismiss is used, the test results will not be saved in the test report file.

Figure 4-1: TX Mask Verification Spectrum Analyzer Display



TX Waveform Quality (Rho) Acceptance Test

Background

This test verifies the transmitted pilot channel element digital waveform quality of each BBX carrier keyed up at a specific frequency *per the current CDF file assignment*. All tests are performed using the external calibrated test set controlled by the same command. All measurements are via the appropriate **TX OUT** connector.

Pilot gain will be set to 262 for each antenna, and all TCH elements from the MCCs will be forward link disabled. The BBX2 will be keyed up using both `bbx1v1` and bay level offsets to generate a CDMA carrier (with pilot channel element only, Walsh code 0). RF output power is set at 40 dBm as measured at the appropriate TX output.

The calibrated communications test set will measure and return the pilot channel element digital waveform quality (rho) percentage, verifying that the result meets system tolerances:

Waveform quality (Rho) should be > **0.912**.

The BBX2 will then dekey, and if selected, the redundant BBX2 will be assigned to the current TX antenna path under test. The test will then be repeated.

Waveform Quality (Rho) Acceptance Test

Follow the steps in Table 4-6 to verify the pilot channel element waveform quality (rho) on the specified TX antenna paths using BBXs equipped at the BTS.

Table 4-6: Test Waveform Quality (Rho)

Step	Action
1	Set up the test equipment for TX acceptance tests per Table 4-1.
2	Select the BBX2s to be tested.
3	From the Tests menu, select Rho .
4	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) displayed in the Channels/Carrier pick list. NOTE To select multiple items, hold down the Shift or Ctrl key while making the selections.
5	Enter the appropriate channel number in the Carrier n Channels box.
6	Click OK . The status report window is displayed and a Directions pop-up is displayed.
7	Follow the cable connection directions as they are displayed. The test results are displayed in the status report window.
8	Click Save Results or Dismiss . NOTE If Dismiss is used, the test results will not be saved in the test report file.

TX Pilot Time Offset Acceptance Test

Background

This test verifies the transmitted pilot channel element Pilot Time Offset of each BBX carrier keyed up at a specific frequency *per the current CDF file assignment*. All tests will be performed using the external calibrated test set controlled by the same command. All measurements will be via the **TX OUT** connector.

The pilot gain will be set to 262 for each antenna and all TCH elements from the MCCs will be forward link disabled. The BBX2 will be keyed up using both `bbx1v1` and bay level offsets to generate a CDMA carrier (with pilot channel element only, Walsh code 0). TX power output is set at 40 dBm as measured at the TX output.

The calibrated communications test set will measure and return the Pilot Time Offset in μ s, verifying that results meet system tolerances:

Pilot Time Offset should be within **3 μ s** of the target PT Offset (zero μ s).

The BBX2 will then dekey, and if selected, the redundant BBX2 will be assigned to the current TX antenna path under test. The test will then be repeated.

NOTE

This test also executes and returns the TX Frequency and TX Waveform Quality (rho) ATP tests, however, only *Pilot Time Offset* results are written to the ATP test report.

Pilot Time Offset Acceptance Test

Follow the steps in Table 4-7 to verify the Pilot Time Offset on the specified TX antenna paths using BBXs and BDCs equipped at the BTS.

Table 4-7: Test Pilot Time Offset

Step	Action
1	Set up the test equipment for TX acceptance tests per Table 4-1.
2	Select the BBX2s to be tested.
3	From the Tests menu, select Pilot Time Offset .
4	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) displayed in the Channels/Carrier pick list. NOTE To select multiple items, hold down the Shift or Ctrl key while making the selections.
5	Enter the appropriate channel number in the Carrier n Channels box.
6	Click OK . The status report window is displayed and a Directions pop-up is displayed.

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TX Pilot Time Offset Acceptance Tests – continued

Table 4-7: Test Pilot Time Offset

Step	Action
7	Follow the cable connection directions as they are displayed. The test results are displayed in the status report window.
8	Click Save Results or Dismiss . NOTE If Dismiss is used, the test results will not be saved in the test report file.

TX Code Domain Power/Noise Floor Acceptance Test

Background

This test verifies the Code Domain Power and Noise Floor of each BBX carrier keyed up at a specific frequency *per the current CDF file assignment*. All tests are performed using the external calibrated test set controlled by the same command. All measurements are via the appropriate **TX OUT** connector.

Pilot gain will be set to 262 for each antenna and all equipped MCCs will be configured to supply all odd-numbered Walsh code Traffic channel elements by enabling Orthogonal Channel Noise Source (OCNS) on all odd MCC/CEs, (maximum 32 full rate channels with an OCNS gain of 81). All even-numbered Walsh code Traffic channel elements will not have OCNS enabled, and are considered “OFF”. All equipped MCCs will be forward-link enabled for the antenna/sector under test.

The BBX2 will be keyed up using both `bbx1v1` and bay level offsets, to generate a CDMA carrier consisting of pilot and OCNS channels. RF output power is set at 40 dBm as measured at the appropriate TX output.

The calibrated communications test set will measure and return the channel element power (dB) of all specified Walsh channels within the CDMA spectrum. Additional calculations will be performed to verify the following parameters are met (Figure 4-2):

- Traffic channel element power level will be verified by calculating the ratio of PILOT power to OCNS gain of all traffic channels (root sum of the square (RSS) of each OCNS gain divided by the Pilot power). This value should be **10.2 dB ± 2.0 dB**.
- Noise floor (unassigned “OFF” even numbered Walsh channels) are verified to be **≤ -27 dB** (with respect to total CDMA channel power).

The BBX2 will then dekey, and if selected, the redundant BBX2 will be assigned to the current TX antenna path under test. The test will then be repeated. Upon completion of the test, OCNS channels will be disabled on the specified MCC/CEs.

Code Domain Power/Noise Floor Test

Follow the steps in Table 4-8 to verify the Code Domain Power/Noise floor of each BBX carrier keyed up at a specific frequency.

TX Code Domain Power/Noise Floor Acceptance Test – continued

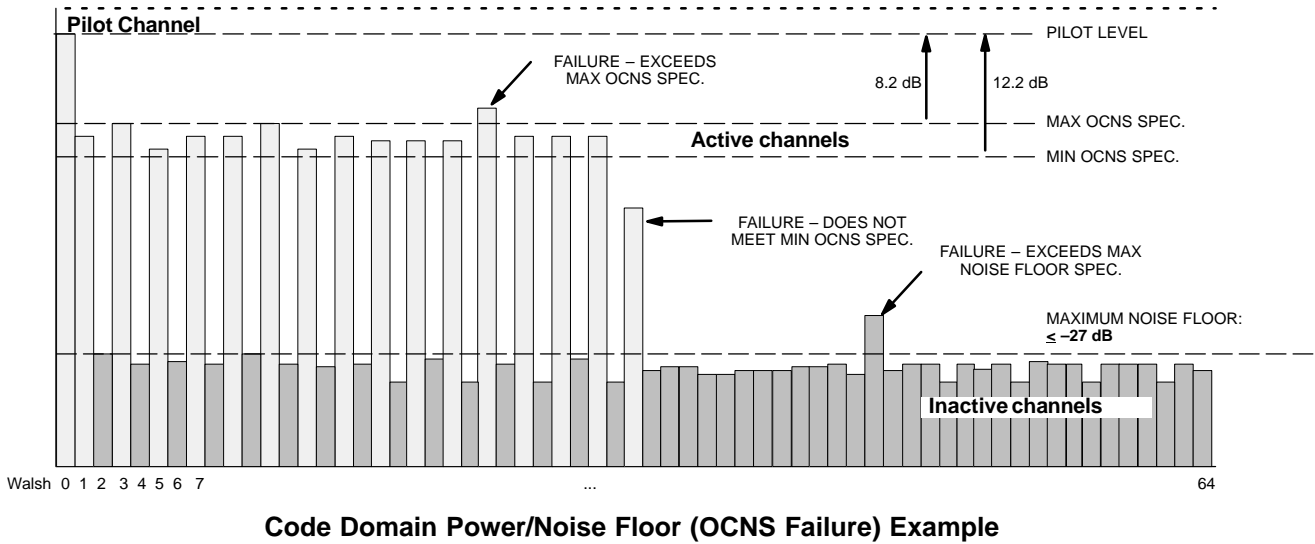
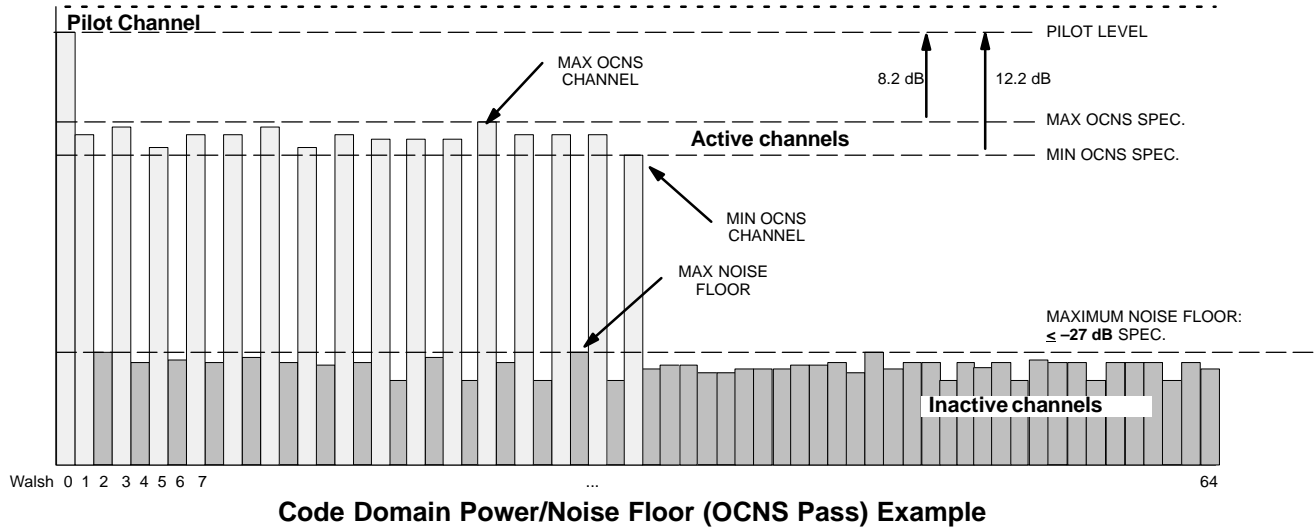
Table 4-8: Test Code Domain Power/Noise Floor

Step	Action
1	Set up the test equipment for TX acceptance tests per Table 4-1.
2	Select the BBX2s and MCCs to be tested.
3	From the Tests menu, select TX Mask .
4	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) displayed in the Channels/Carrier pick list. NOTE To select multiple items, hold down the Shift or Ctrl key while making the selections.
5	Enter the appropriate channel number in the Carrier n Channels box.
6	Click OK . The status report window is displayed and a Directions pop-up is displayed.
7	Follow the cable connection directions as they are displayed. The test results are displayed in the status report window.
8	Click Save Results or Dismiss . NOTE If Dismiss is used, the test results will not be saved in the test report file.

4

TX Code Domain Power/Noise Floor Acceptance Test – continued

Figure 4-2: Code Domain Analyzer CD Power/Noise Floor Display Examples



RX FER Acceptance Test

Background

This test verifies the BTS Frame Erasure Rate (FER) on *all* TCHs currently configured on *all* equipped MCCs (fullrate at 1% FER) at -119 dBm on the *main* RX antenna paths. The test is performed on all *diversity* RX antenna path using only the lowest equipped MCC/CE. All tests are performed using the external calibrated test set as the signal source controlled by the same command. All measurements are via the LMF.

Pilot gain will be set to 262 for each TX antenna, and the forward link for all TCH elements from the MCCs will be disabled. The BBX2 will be keyed up using only `bbx1v1` level offsets, to generate a CDMA carrier (with pilot channel element only). TX power output is set at +10 dBm. (The BBX must be keyed in order to enable the RX receive circuitry.)

The LMF will prompt the MCC/CE under test to measure all-zero longcode and provide the Frame Erasure Rate (FER) report on the selected active MCC on the Reverse Link for both the main and diversity RX antenna paths, verifying results meet the following specification:

FER returned less than **1%** and Total Frames measured is **1500**.

The BBX2 will then dekey, and if selected, the redundant BBX2 will be assigned to the current RX antenna paths under test. The test will then be repeated.

RX FER Acceptance Test – continued

FER Acceptance Test

Follow the steps in Table 4-9 to verify the FER on all RX antenna paths using all BBXs equipped at the BTS.

Step	Action
1	Set up the test equipment for RX acceptance tests per Table 4-1.
2	Select the BBX2s and MCCs to be tested.
3	From the Tests menu, select FER .
4	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) displayed in the Channels/Carrier pick list. NOTE To select multiple items, hold down the Shift or Ctrl key while making the selections.
5	Enter the appropriate channel number in the Carrier n Channels box.
6	From the RX Branch pick list, select the branch/branches to be tested.
7	Select the desired rate from the Rate Set pick list (1 = 9600, 2 = 14400).
8	Click OK . The status report window is displayed and a Directions pop-up is displayed.
9	Follow the cable connection directions as they are displayed. The test results are displayed in the status report window.
10	Click Save Results or Dismiss . NOTE If Dismiss is used, the test results will not be saved in the test report file.

Generating an ATP Report

Background

Each time an ATP test is run, an ATP report is updated and must be saved using the **Save Results** button to close the status report window. The ATP report *will not* be updated if the status reports window is closed using the **Dismiss** button.

ATP Report

A separate report is created for each BTS and includes the following for each test:

- Test name
- PASS or FAIL
- Description information (if applicable)
- BBX number
- Channel number
- Carrier number
- Sector number
- Upper test limit
- Lower test limit
- Test result
- Time stamp
- Details/Warning information (if applicable)

Follow the procedures in the Table 4-10 to view and create a printable file for the ATP report.

Table 4-10: Generating an ATP Report

Step	Action
1	Click on the Login tab (if not in the forefront).
2	Select the desired BTS from the available Base Station pick list.
3	Click on the Report button.
4	Click on a column heading to start the report.
5	If not desiring a printable file copy, click on the Dismiss button.
6	If requiring a printable file copy, select the desired file, type in the pick list and click on the Save button.

Chapter 5: Leaving the Site

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Updating Calibration Data Files

Updating CBSC Calibration Data Files

After completing the TX calibration and audit, updated CAL file information must be moved from the LMF Windows environment back to the CBSC, a Unix environment. The following procedures detail moving files from one environment to the other.

Copying CAL files from LMF to a Disk

Follow the procedures in Table 5-1 to copy the CAL files from a CDMA LMF computer to a 3.5 diskette.

Step	Action
1	With Windows running on the CDMA LMF computer, insert a disk into Drive A:.
2	Launch the Windows Explorer Program from your Programs menu list.
3	Select the applicable wlmf/cdma/bts-# folder.
4	Drag the bts-#.cal file to Drive A.
5	Repeat Steps 3 and 4, as required, for other bts-# folders.



Copying CAL Files from Diskette to the CBSC

Follow the procedures in Table 5-2 to copy CAL files from a diskette to the CBSC.

Step	Action
1	Log in to the CBSC on the OMC-R Unix workstation using your account name and password.
2	Place your diskette containing calibration file(s) in the workstation diskette drive.
3	Type in eject -q and press the Enter key.
4	Type in mount and press the Enter key. NOTE <ul style="list-style-type: none">• Check to see that the message "<i>floppy/no_name</i>" is displayed on the last line.• If the eject command was previously entered, <i>floppy/no_name</i> will be appended with a number. Use the explicit <i>floppy/no_name</i> reference displayed.
5	Type in cd /floppy/no_name and press the Enter key.
6	Type in ls -lia and press the Enter key. Verify that the bts-#.cal file is on the diskette.
7	Type in cd and press the Enter key.
8	Type in pwd and press the Enter key. Verify you are in your home directory (<i>/home/<name></i>).

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Table 5-2: Copying CAL Files from Diskette to the CBSC

Step	Action
9	<p>With <i>Solaris versions of Unix</i>, create a Unix-formatted version of the <code>bts-#.cal</code> file in your home directory by entering the following command:</p> <p>dos2unix /floppy/no_name/bts-#.cal bts-#.cal and press the Enter key (where # is BTS number).</p> <p>NOTE</p> <p>Other versions of Unix do not support the <code>dos2unix</code> command. In these cases, use the Unix <code>cp</code> (copy) command. The <i>copied</i> files will contain DOS line feed characters which must be edited out with a Unix text editor.</p>
10	Type in <code>ls -l *.cal</code> and press the Enter key. Verify the cal files have been copied.
11	Type in <code>eject</code> and press the Enter key.
12	Remove the diskette from the workstation.

Prepare to Leave the Site

Removing External Test Equipment

Perform the procedure in Table 5-3 to disconnect the test equipment and configure the BTS for active service.

Table 5-3: Remove External Test Equipment	
Step	Action
1	Disconnect all external test equipment from all TX and RX connectors at the rear of the frame.
2	Reconnect and visually inspect all TX and RX antenna feed lines at the frame RF interface panel. ! CAUTION Verify that all sector antenna feed lines are connected to the correct ports on the frame. Crossed antenna cables will cause system degradation of call processing.

Reset All Devices and Initialize Site Remotely

Generally, devices in the BTS should not be left with data and code loaded from the CDMA LMF. The configuration data and code loads used for normal operation could be different from those stored in the CDMA LMF files. By resetting all devices, the required data and code can be loaded from the CBSC when spans are again active.

To reset all devices and have the OMCR/CBSC bring up the site remotely, perform the procedure in Table 5-4.

Table 5-4: Reset BTS Devices and Remote Site Initialization	
Step	Action
1	Terminate the CDMA LMF session by following the procedures in Table 5-6.
2	NOTE In the following step, performing Table 2-6 DC voltage measurements other than those using the MAP VOLT and AMP indicators is not necessary if DC power system components have not been replaced during the optimization and/or ATP process. Cycle BTS power <i>off</i> , as specified in Table 2-9, and <i>on</i> , as specified in Table 2-5, Table 2-6, and step 1 of Table 2-7, respectively.
3	Reconnect spans by following the procedure in Table 5-7.
4	Notify the OMCR/CBSC to take control of the site and download code and data to the BTS.
5	Verify the CBSC can communicate with the GLIs.

Bringing Modules into Service with the CDMA LMF



IMPORTANT

Whenever possible, have the CBSC/MM bring up the site and enable all devices at the BTS.

Prepare to Leave the Site – continued

If there is a reason code and/or data should or could not be loaded remotely from the CBSC, follow the steps outlined in Table 5-5 *as required* to bring BTS processor modules from OOS to INS state.

Table 5-5: Bring Modules into Service	
Step	Action
1	In the CDMA LMF <i>GUI</i> environment, select the device(s) you wish to enable. NOTE <ul style="list-style-type: none"> • The MGLI, CSM, and applicable BDC must be INS before an MCC can be enabled to INS. • Processors which must be enabled and the order of enabling are as follows: <ul style="list-style-type: none"> – MGLI – GLI – CSMs – MCCs
2	Click on Device from the menu bar.
3	Click on Enable from the Device menu. A status report window is displayed. NOTE If a BBX is selected, a transceiver parameters window is displayed to collect keying information. <i>Do not enable the BBX.</i>
4	Click Cancel to close the transceiver parameters window, if applicable.
5	Click OK to close the status report window. The selected devices that successfully change to INS change color to green.

Terminating LMF Session/Removing Terminal

Perform the procedure in Table 5-6 as required to terminate the LMF *GUI* session and remove the CDMA LMF computer.

Table 5-6: Remove LMF	
Step	Action
1	! CAUTION Do not power down the CDMA LMF terminal without performing the procedure below. Corrupted/lost data files may result. Log out of all BTS sessions and exit CDMA LMF by clicking on the File selection in the menu bar and selecting Exit from the File menu list.
2	Click Yes in the Confirm Logout pop-up message which appears.
3	In the Windows Task Bar, click Start and select Shutdown .
4	Click Yes when the Shut Down Windows message appears
5	Wait for the system to shut down and the screen to go blank.

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