

Figure 3-4: BTS Login screen – identifying circuit and packet BTS files

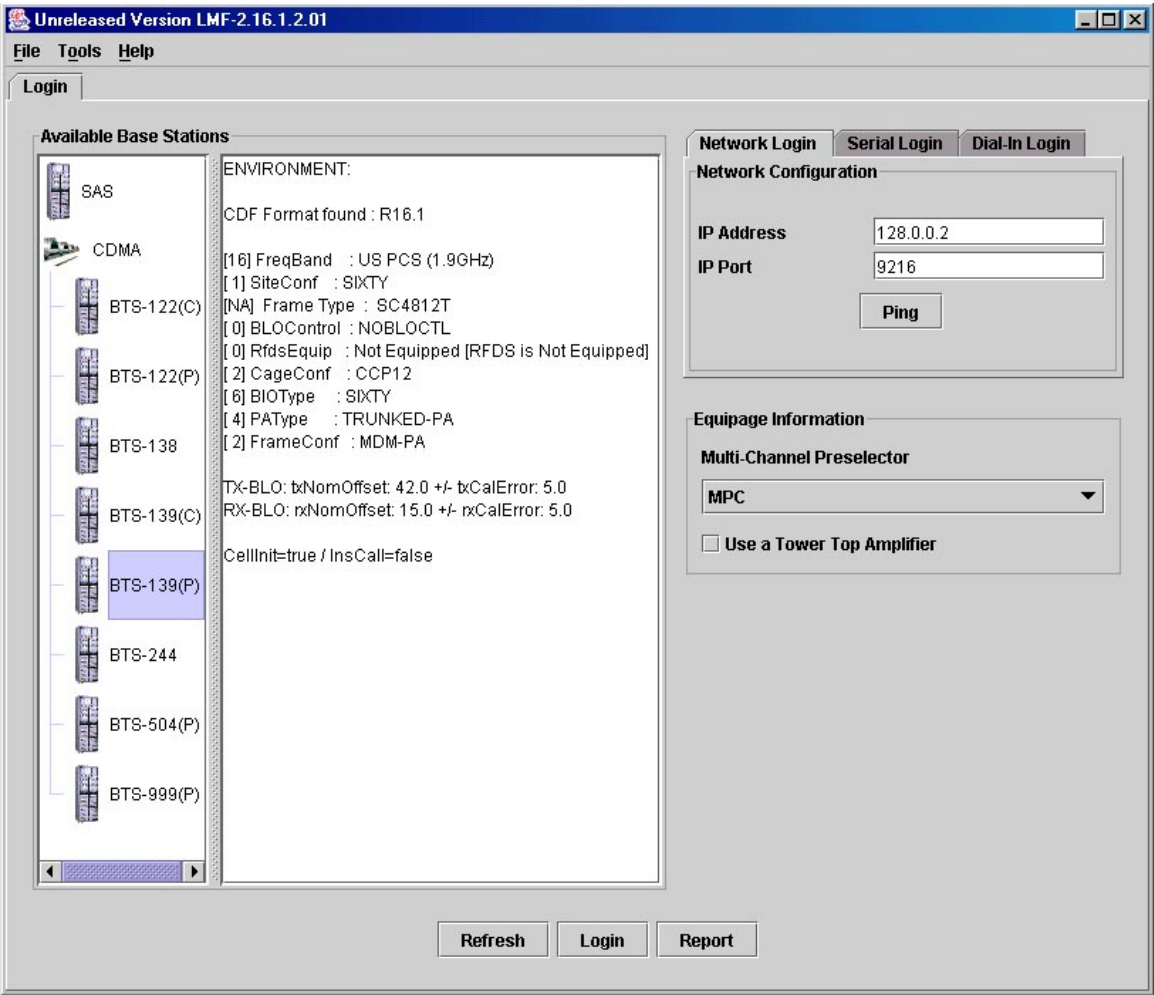


Figure 3-5: Self-Managed Network Elements (NEs) state of a packet mode SC4812T

3

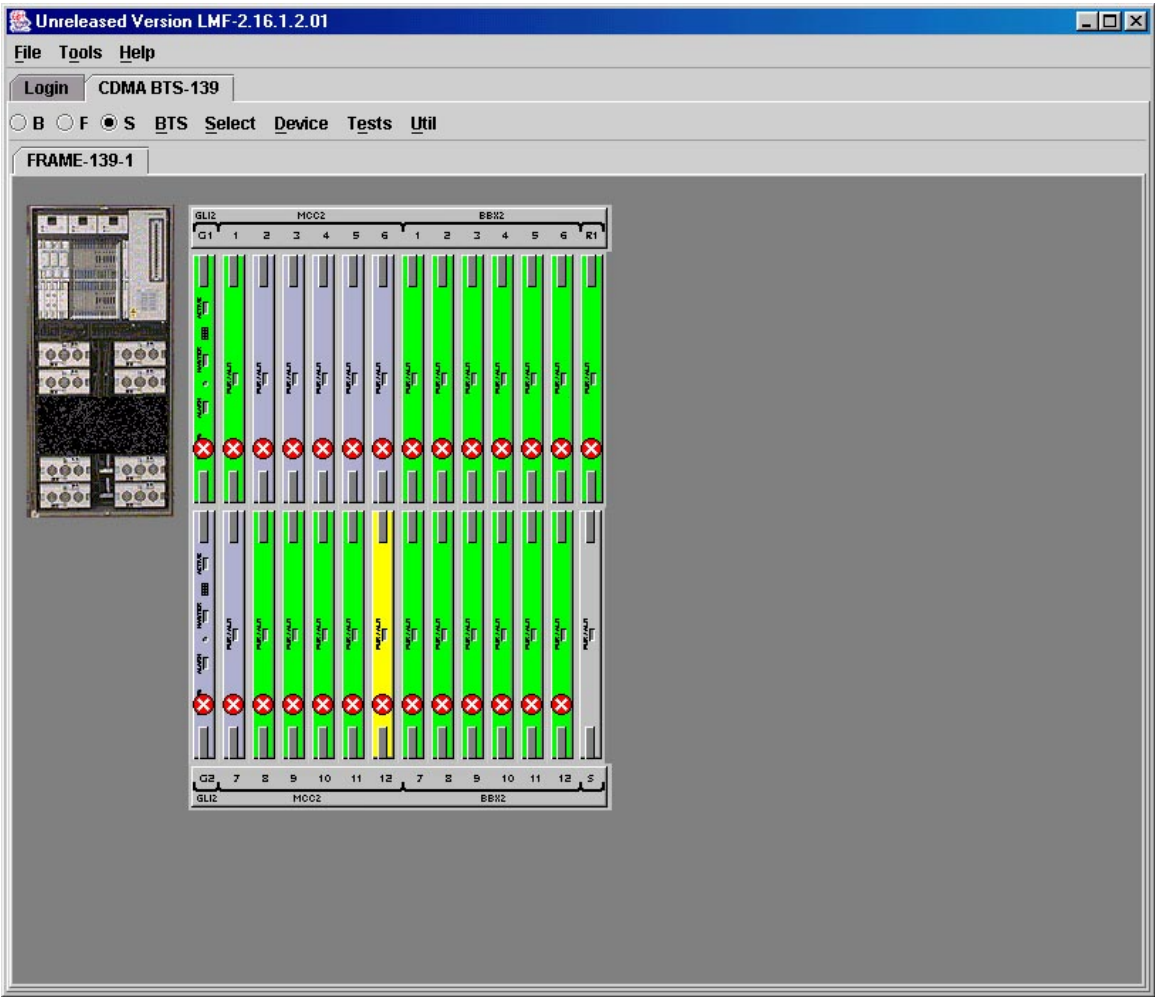
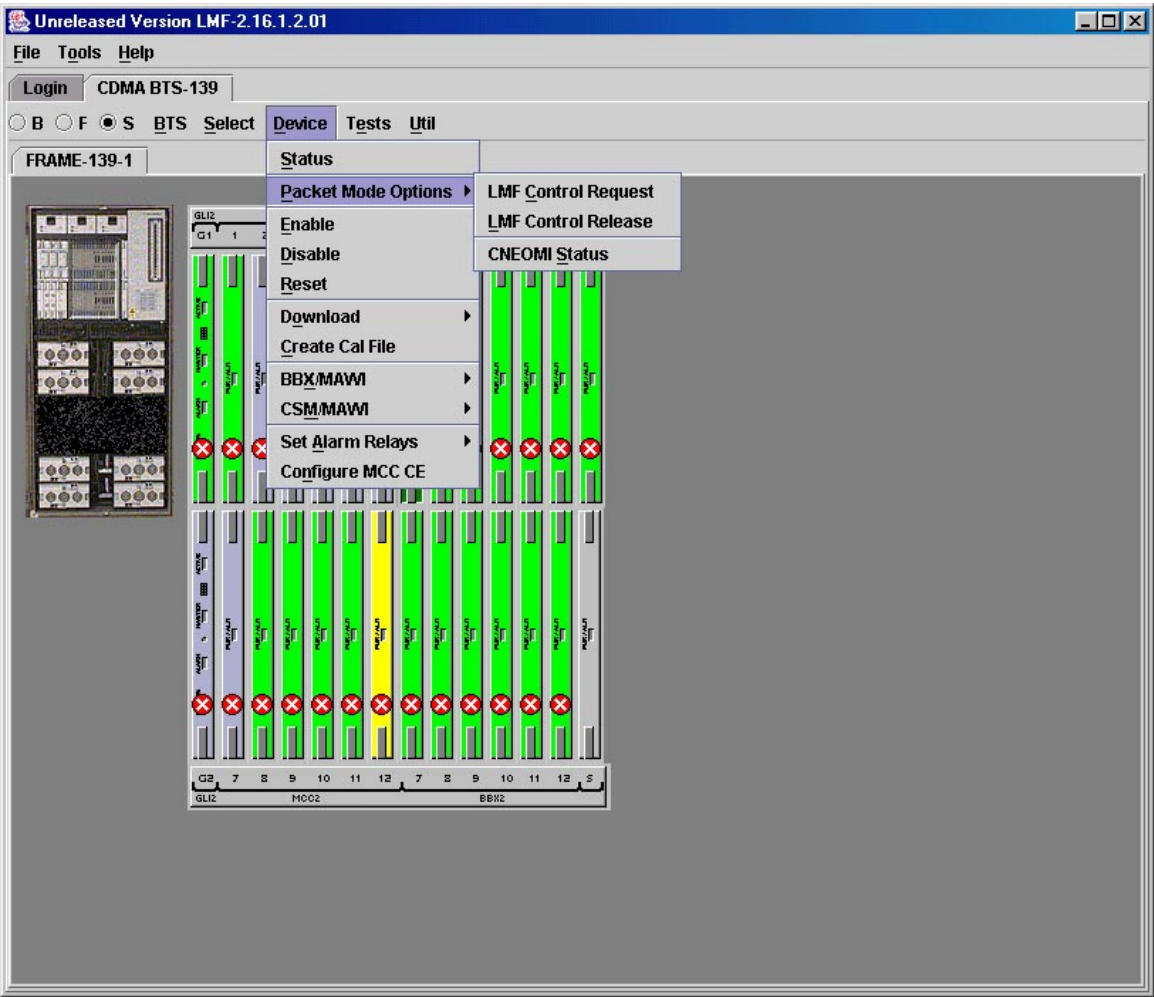
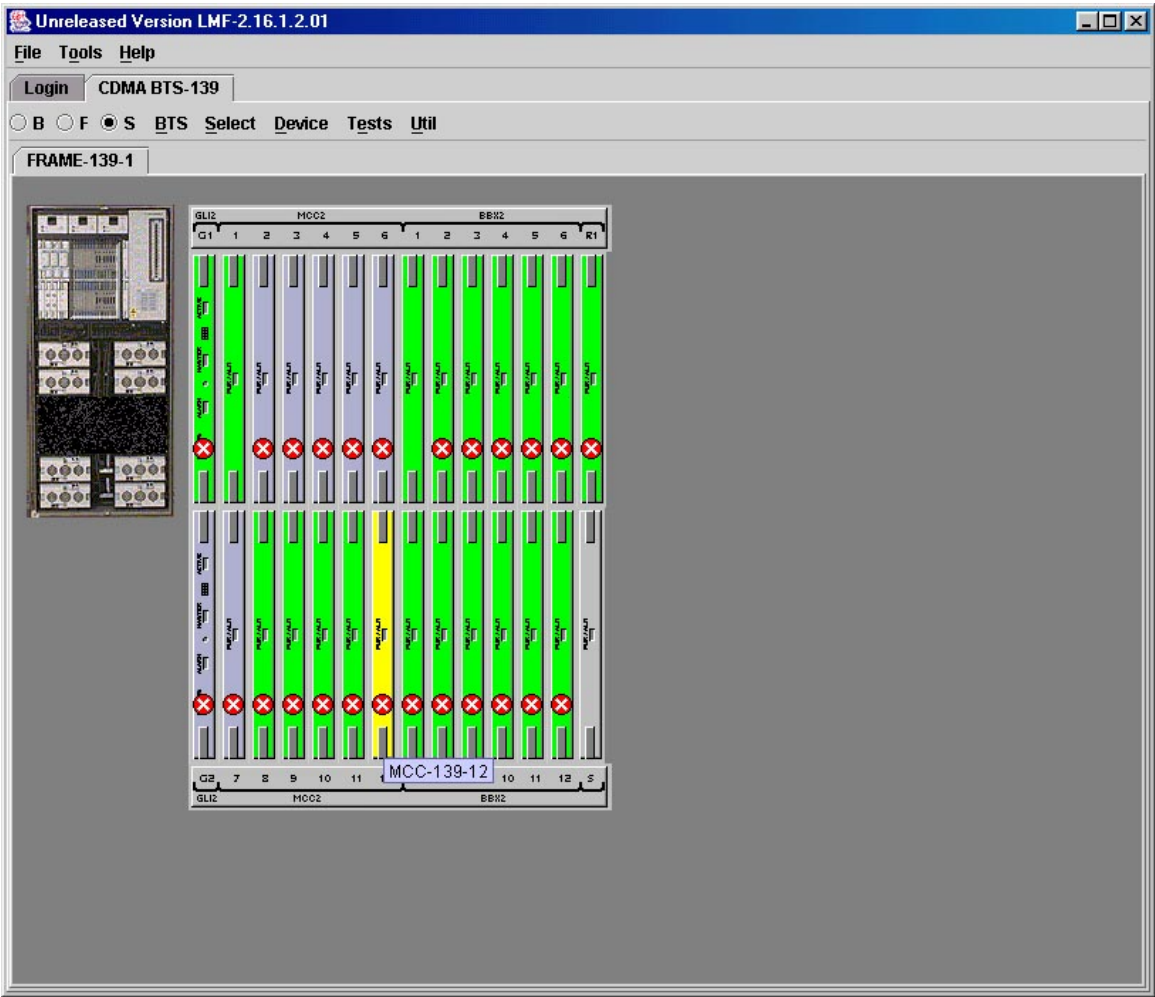


Figure 3-6: Available packet mode commands



3

Figure 3-7: Packet mode site with MCC-1 and BBX-1 under LMF control



Command Line Interface Overview

The LMF also provides Command Line Interface (CLI) capability. Activate the CLI by clicking on a shortcut icon on the desktop. The CLI can not be launched from the GUI, only from the desktop icon.

Both the GUI and the CLI use a program known as the handler. Only one handler can be running at one time. Due to architectural limitations, the GUI must be started before the CLI if you want the GUI and CLI to use the same handler. When the CLI is launched after the GUI, the CLI automatically finds and uses an in-progress login session with a BTS initiated under the GUI. This allows the use of the GUI and the CLI in the same BTS login session. If a CLI handler is already running when the GUI is launched (this happens if the CLI window is already running when the user starts the GUI, or if another copy of the GUI is already running when the user starts the GUI), a dialog window displays the following warning message:

```
The CLI handler is already running.
This may cause conflicts with the LMF.
Are you sure you want to start the application?
      Yes      No
```

This window also contains **Yes** and **No** buttons. Selecting **Yes** starts the application. Selecting **No** terminates the application.

CLI Format Conventions

The CLI command syntax is as follows:

- verb
- device including device identifier parameters
- switch
- option parameters consisting of:
 - keywords
 - equals signs (=) between the keywords and the parameter values
 - parameter values

Spaces are required between the verb, device, switch, and option parameters. A hyphen is required between the device and its identifiers. Following is an example of a CLI command.

measure bbx–<bts_id>–<bbx_id> **rss****i** **channel=6** **sector=5**

Refer to *LMF CLI Commands* for a complete explanation of the CLI commands and their usage.

Logging into a BTS

Logging into a BTS establishes a communication link between the BTS and the LMF. An LMF session can be logged into only one BTS at a time.

Prerequisites

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

- The LMF is correctly installed on the LMF computer.
- A *bts-**nnn*** folder with the correct CDF/NECF and CBSC files exists.
- The LMF computer was connected to the BTS before starting the *Windows* operating system and the LMF software. If necessary, restart the computer after connecting it to the BTS in accordance with Table 3-5 and Figure 3-3.

CAUTION

Be sure that the correct **bts-#.cdf/necf** and **cbsc-#.cdf** file are used for the BTS. These should be the CDF/NECF files that are provided for the BTS by the CBSC. Failure to use the correct CDF/NECF files can result in invalid optimization. **Failure to use the correct CDF/NECF files to log into a live (traffic-carrying) site can shut down the site.**

BTS Login from the GUI Environment

Follow the procedure in Table 3-6 to log into a BTS when using the GUI environment.

Table 3-6: BTS GUI Login Procedure

✓	Step	Action
	1	Start the CDMA LMF GUI environment by double clicking on the WinLMF desktop icon (if the LMF is not running). 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: The CLI handler is already running. This may cause conflicts with the LMF. Are you sure you want to start the application? Yes No
	2	Click on the Login tab (if not displayed).
	3	If no base stations are displayed in the Available Base Stations pick list, double click on the CDMA icon.
	4	Click on the desired BTS number. For explanation of BTS numbering, see Figure 3-4.
	5	Click on the Network Login tab (if not already in the forefront).
	6	Enter the correct IP address (normally 128.0.0.2 for a field BTS) if not correctly displayed in the IP Address box.

... continued on next page

Table 3-6: BTS GUI Login Procedure

✓	Step	Action
		NOTE 128.0.0.2 is the default IP address for MGLI–1 in field BTS units. 128.0.0.1 is the default IP address for MGLI–2.
	7	Type in the correct IP Port number (normally 9216) if not correctly displayed in the IP Port box.
	8	Click on Ping . – If the connection is successful, the Ping Display window shows text similar to the following: Reply from 128 128.0.0.2: bytes=32 time=3ms TTL=255 – If there is no response the following is displayed: 128.0.0.2:9216:Timed out If the MGLI fails to respond, reset and perform the ping process again. If the MGLI still fails to respond, typical problems are shorted BNC to inter–frame cabling, open cables, crossed A and B link cables, missing 50–Ohm terminators, or the MGLI itself.
	9	Change the Multi-Channel Preselector (from the Multi-Channel Preselector pick list), normally MPC , corresponding to your BTS configuration, if required.
		NOTE When performing RX tests on expansion frames, do not choose EMPC if the test equipment is connected to the starter frame.
	10	Click on the Use a Tower Top Amplifier , if applicable.
	11	Click on Login . (A BTS tab with the BTS and frame numbers is displayed.)
		NOTE • If you attempt to login to 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 will have to be downloaded with 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 procedure in Table 3-7 to log into a BTS when using the CLI environment.

NOTE

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 3-6 to start the GUI environment and log into a BTS.

Table 3-7: BTS CLI Login Procedure		
✓	Step	Action
	1	Double-click the WinLMF CLI desktop icon (if the LMF CLI environment is not already running).
		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.
	2	At the /wlmf prompt, enter the following command: login bts-<i><bts#></i> host=<i><host></i> port=<i><port></i> where: 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) 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) A response similar to the following will be displayed: 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"

Logging Out

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

NOTE	The GUI and CLI environments use the same connection to a BTS. If a GUI and the CLI session are running for the same BTS 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 3-8 to logout of a BTS when using the GUI environment.

Table 3-8: BTS GUI Logout Procedure		
✓	Step	Action
	1	Click on BTS on the BTS tab menu bar.
	2	Click the Logout item in the pull-down 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 pop-up message appears stating the system should 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 pop-up 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 pop-up, and click OK in the Logout Error pop-up which appears again.
	6	If further work is to be done in the GUI, restart it.
		NOTE - The Logout item on the BTS menu bar will only log you out of the displayed BTS. - You can also log out of all BTS sessions and exit 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 3-9 to logout of a BTS when using the CLI environment.

Table 3-9: BTS CLI Logout Procedure		
✓	Step	Action
		NOTE 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.
	1	Log out of a BTS by entering the following command: logout bts-<bts#> A response similar to the following will be displayed: <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	If desired, close the CLI interface by entering the following command: exit A response similar to the following will be displayed before the window closes: <pre>Killing background processes....</pre>

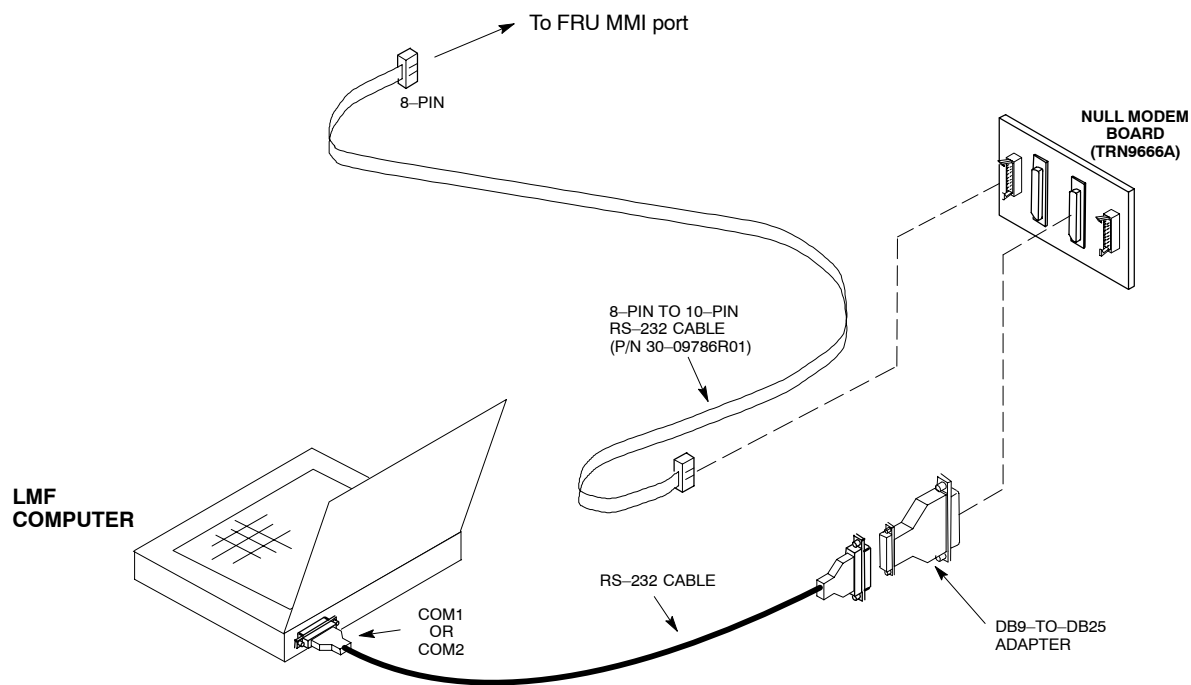
Establishing an MMI Communication Session

Equipment Connection – Figure 3-8 illustrates common equipment connections for the LMF computer. For specific connection locations on FRUs, refer to the illustration accompanying the procedures which require the MMI communication session.

Initiate MMI Communication – For those procedures which require MMI communication between the LMF and BTS FRUs, follow the procedures in Table 3-10 to initiate the communication session.

Table 3-10: Establishing MMI Communications

Step	Action
1	Connect the LMF computer to the equipment as detailed in the applicable procedure that requires the MMI communication session.
2	If the LMF computer has only one serial port (COM1) and the LMF is running, disconnect the LMF from COM1 by performing the following:
2a	– Click on Tools in the LMF window menu bar, and select Options from the pull-down menu list. — An LMF Options dialog box will appear.
2b	– In the LMF Options dialog box, click the Disconnect Port button on the Serial Connection tab.
3	Start the named HyperTerminal connection for MMI sessions by double clicking on its <i>Windows</i> desktop shortcut. NOTE If a <i>Windows</i> desktop shortcut was not created for the MMI connection, access the connection from the <i>Windows</i> Start menu by selecting: Programs > Accessories > Hyperterminal > HyperTerminal > <Named HyperTerminal Connection (e.g., MMI Session)>
4	Once the connection window opens, establish MMI communication with the BTS FRU by pressing the LMF computer <Enter> key until the prompt identified in the applicable procedure is obtained.

Figure 3-8: CDMA LMF Computer Common MMI Connections

Online Help

Task oriented online help is available in the LMF by clicking on **Help** in the window menu bar, and selecting **LMF Help** from the pull-down menu.

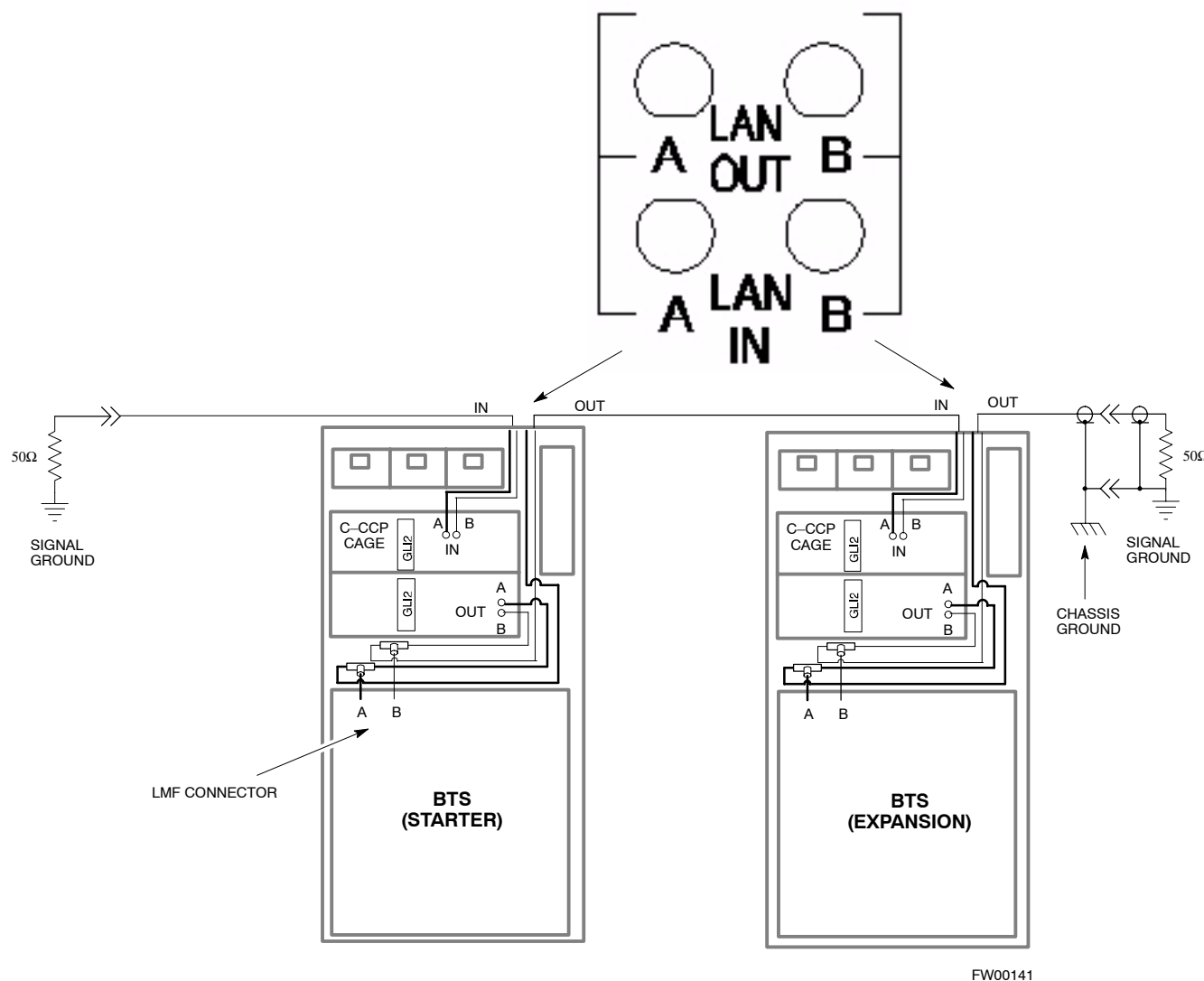
Pinging the Processors

Pinging the BTS

For proper operation, the integrity of the Ethernet LAN A and B links must be verified. Figure 3-9 represents a typical BTS Ethernet configuration. The drawing depicts one link (of two identical links), A and B.

Ping is a program that routes request packets to the LAN network modules to obtain a response from the specified “targeted” BTS.

Figure 3-9: BTS Ethernet LAN Interconnect Diagram



Follow the procedure in Table 3-11 and refer to Figure 3-9 as required to ping each processor (on both LAN A and LAN B) and verify LAN redundancy is operating correctly.

CAUTION Always wear a conductive, high impedance wrist strap while handling any circuit card/module to prevent damage by ESD.

NOTE

IMPORTANT: The Ethernet LAN A and B cables must be installed on each frame/enclosure before performing this test. All other processor board LAN connections are made via the backplanes.

Table 3-11: Pinging the Processors

✓	Step	Action
	1	If you have not already done so, connect the LMF to the BTS (see Table 3-5 on page 3-17).
	2	From the Windows desktop, click the Start button and select Run .
	3	In the Open box, type ping and the <i><MGLI IP address></i> (for example, ping 128.0.0.2). NOTE 128.0.0.2 is the default IP address for MGLI–1 in field BTS units. 128.0.0.1 is the default IP address for MGLI–2.
	4	Click on the OK button.
	5	If the connection is successful, text similar to the following is displayed: Reply from 128 128.0.0.2: bytes=32 time=3ms TTL=255 If there is no response the following is displayed: Request timed out If the MGLI fails to respond, reset and perform the ping process again. If the MGLI still fails to respond, typical problems are shorted BNC to inter-frame cabling, open cables, crossed A and B link cables, missing 50–Ohm terminators, or the MGLI itself.

Download the BTS

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, or, for software upgrades, from the CBSC using the DownLoad Manager (DLM). 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 LMF is *NOT routine maintenance nor 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 cannot communicate with the BTS to perform the download.

If you must download ROM code, the procedures are located in **Appendix G**.

Before ROM code can be downloaded from the 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.

NOTE

The ROM code file is not available for GLI3s. GLI3s are ROM code loaded at the factory.

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. A *compatible revision–level* RAM code must then be downloaded to the device. Compatible code loads for ROM and RAM must be used for the device type to ensure proper performance. The compatible device code release levels for the BSS software release being used are listed in the Version Matrix section of the SC™ CDMA Release Notes (supplied on the tape or CD-ROM containing the BSS software).

RAM Code

Before RAM code can be downloaded from the 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 LMF file structure. The RAM code file will be selected automatically if the file is in the `<x>:\lmf home directory>\cdma\loads\<n.n.n.n>\code` folder (where *n.n.n.n* is the download code version number that matches the “NextLoad” parameter of the CDF file). The RAM code file in the code folder must have the correct hardware bin number for the device to be loaded.

RAM code can be downloaded to a device that is in any state. After the download is started, the device being downloaded changes 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 LMF automatically also downloads data and then enables the MGLI. When enabled, the MGLI will change to INS_ACT (bright green). A redundant GLI will not be automatically enabled and will remain OOS_RAM (yellow). When the redundant GLI is manually commanded to enable through the LMF, it will change state to INS_SBY (olive green).

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

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

- Master Group Line Interface (MGLI2 or MGLI3)
- Redundant GLI (GLI2 or GLI3)
- Clock Synchronization Module (CSM) (*Only if new revision code must be loaded*)
- Multi Channel Card (MCC24E, MCC8E or MCC–1X)
- Broadband Transceiver (BBX2 or BBX–1X)
- Test Subscriber Interface Card (TSIC) – if RFDS is installed

NOTE	The MGLI <i>must</i> be successfully downloaded with code and data, and put INS <i>before</i> downloading any other device. The download code process for an MGLI automatically downloads data and enables the MGLI before downloading other devices. The other devices can be downloaded in any order.
-------------	---

Verify GLI ROM Code Loads

Devices should not be loaded with a RAM code version which is not compatible with the ROM code with which they are loaded. Before downloading RAM code and data to the processor cards, follow the procedure in Table 3-12 to verify the GLI devices are loaded with the correct ROM code for the software release used by the BSS.

Prerequisite

Identify the correct GLI ROM code load for the software release being used on the BSS by referring to the Version Matrix section of the SC™ CDMA Release Notes (supplied on the tapes or CD-ROMs containing the BSS software).

Table 3-12: Verify GLI ROM Code Loads	
Step	Action
1	<i>If it has not already been done</i> , start a <i>GUI</i> LMF session and log into the BTS (refer to Table 3-6).
2	Select all GLI devices by clicking on them, and select Device > Status from the BTS menu bar.
3	In the status report window which opens, note the number in the ROM Ver column for each GLI.
4	If the ROM code loaded in the GLIs is <i>not</i> the correct one for the software release being used on the BSS, perform the following:
4a	– Log out of the BTS as described in Table 3-8 or Table 3-9, as applicable.
4b	– Disconnect the LMF computer.
4c	– Reconnect the span lines as described in Table 5-7.
4d	– Have the CBSC download the correct ROM code version to the BTS devices.
5	When the GLIs have the correct ROM load for the software 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 RAM Code and Data to MGLI and GLI

Follow the procedure in Table 3-13 to download the firmware application code for the MGLI. The download code action downloads data and also enables the MGLI.

Prerequisite

- Prior to performing this procedure, ensure a code file exists for each of the devices to be loaded.
- The LMF computer is connected to the BTS (refer to Table 3-5), and is logged in using the *GUI* environment (refer to Table 3-6).

Table 3-13: Download and Enable MGLI

✓	Step	Action
	1	Be sure the LMF will use the correct software release for code and data downloads by performing the following steps:
	1a	– Click on Tools in the LMF menu bar, and select Update NextLoad > CDMA from the pull-down menus.
	1b	– Click on the BTS to be loaded. — The BTS will be highlighted.
	1c	– Click the button next to the correct code version for the software release being used. — A black dot will appear in the button circle.
	1d	– Click Save .
	1e	– Click OK to close each of the advisory boxes which appear.
	2	Prepare to download code to the MGLI by clicking on the device.
	3	Click Device in the BTS menu bar, and select Download > Code/Data in the pull-down menus. – A status report is displayed confirming change in the device(s) status.
	4	Click OK to close the status window. – The MGLI will automatically be downloaded with data and enabled.
	5	Once the MGLI is enabled, load and enable additional installed GLIs by clicking on the devices and repeating Steps 3 and 4.
	6	Click OK to close the status window for the additional GLI devices.

Download Code and Data to Non–GLI Devices

Downloads to non–GLI devices can be performed individually for each device or all equipped devices can be downloaded with one action.

NOTE

- When downloading multiple devices, the download may fail for some of the devices (a time out occurs). These devices can be downloaded separately after completing the multiple download.
- CSM devices are RAM code–loaded at the factory. RAM code is downloaded to CSMs only if updating to a newer software version.

Follow the procedure in Table 3-14 to download RAM code and data to non–GLI devices.

Table 3-14: Download RAM Code and Data to Non–GLI Devices

✓	Step	Action
	1	Select the target CSM, MCC, and/or BBX device(s) by clicking on them.
	2	Click Device in the BTS menu bar, and select Download > Code/Data in the pull–down menus. – A status report displays the result 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 is successfully downloaded with code and has changed to OOS-RAM, the status LED should be rapidly flashing GREEN.
		NOTE The command in Step 2 loads both code and data. Data can be downloaded without doing a code download anytime a device is OOS–RAM using the command in Step 4.
	4	To download just the firmware application data to each device, select the target device and select: Device>Download>Data

BBX Cards Remain OOS_ROM

If BBX cards remain OOS_ROM (blue) after power–up or following code load, refer to Table 6-4, steps 9 and 10.

Select CSM Clock Source

CSMs must be enabled prior to enabling the MCCs. Procedures in the following two sub-sections cover the actions to accomplish this. For additional information on the CSM sub-system, see “Clock Synchronization Manager (CSM) Sub-system Description” in the CSM System Time – GPS & LFR/HSO Verification section of this chapter.

Select CSM Clock Source

A CSM can have three different clock sources. The **Clock 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
- Mate GPS
- Remote GPS
- HSO (only for sources 2 & 3)
- HSO Extender
- HSOX (only for sources 2 & 3)
- LFR (only for sources 2 & 3)
- 10 MHz (only for sources 2 & 3)
- NONE (only for sources 2 & 3)

Prerequisites

- MGLI is INS_ACT (bright green)
- CSM is OOS_RAM (yellow) or INS_ACT (bright green)

Follow the procedure in Table 3-15 to select a CSM Clock Source.

Table 3-15: Select CSM Clock Source		
✓	Step	Action
	1	Select the applicable CSM(s) for which the clock source is to be selected.
	2	Click on Device in the BTS menu bar, and select CSM/MAWI > Select Clock Source... in the pull-down menu list. – A CSM clock reference source selection window will appear.
	3	Select the applicable clock source in the Clock Reference Source pick lists. Uncheck the related check boxes for Clock Reference Sources 2 and 3 if you do not want the displayed pick list item to be used.
	4	Click on the OK button. – A status report is displayed showing the results of the operation.
	5	Click on the OK button to close the status report window.

NOTE

For non-RGPS sites only, verify the CSM configured with the GPS receiver “daughter board” is installed in the CSM–1 slot before continuing.

Enable CSMs

NOTE

- CSMs are code loaded at the factory. This data is retained in EEPROM. The download code procedure is required in the event it becomes necessary to code load CSMs with updated software versions. Use the status function to determine the current code load versions.
- The CSM(s) to be enabled must have been downloaded with code (Yellow, OOS–RAM) and data.

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 CSM2 card is required when using the R–GPS. The GPS receiver (mounted on CSM–1) is the primary timing reference and synchronizes the entire cellular system. CSM–2 provides redundancy but does not have a GPS receiver.

The BTS may be equipped with a remote GPS, LORAN–C LFR, HSO 10 MHz Rubidium source, or HSOX for expansion frames, 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.

Follow the procedure in Table 3-16 to enable the CSMs.

Table 3-16: Enable CSMs

✓	Step	Action
	1	Click on the target CSM (CSM–2 first, if equipped with two CSMs).
	2	From the Device pull down, select Enable . – A status report is displayed confirming change in the device(s) status. – Click OK to close the status report window.
		NOTE – The board in slot CSM 1 interfaces with the GPS receiver. The enable sequence for this board can take up to one hour (see below). – FAIL may be shown in the status report table for a slot CSM 1 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.
		* IMPORTANT – The GPS satellite system satellites are not in a geosynchronous orbit and are maintained and operated by the United States Department of Defense (D.O.D.). The D.O.D. 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. – 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. – 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).

... continued on next page

Table 3-16: Enable CSMs

✓	Step	Action
		NOTE – If equipped with two CSMs, CSM–1 should be bright green (INS–ACT) and CSM–2 should be dark green (INS–STY) – After the CSMs have been successfully enabled, observe the PWR/ALM LEDs are steady green (alternating green/red indicates the card is in an alarm state).
	3	If more than an hour has passed, refer to CSM Verification, see Figure 3-11 and Table 3-20 to determine the cause.

3

Enable MCCs

Follow the procedure in Table 3-17 to enable the MCCs.

NOTE	The MGLI and primary CSM must be downloaded and enabled (IN–SERVICE ACTIVE) before downloading and enabling the MCC.
-------------	--

Table 3-17: Enable MCCs

✓	Step	Action
	1	Select the MCCs to be enabled or from the Select pull–down menu choose MCCs .
	2	Click on Device in the BTS menu bar, and select Enable in the pull–down menu list. – A status report is displayed showing the results of the enable operation.
	3	Click on OK to close the status report window.

Enable Redundant GLIs

Follow the procedure in Table 3-18 to enable the redundant GLI(s).

Table 3-18: Enable Redundant GLIs

✓	Step	Action
	1	Select the target redundant GLI(s).
	2	From the Device menu, select Enable . – A status report window confirms the change in the device(s) status and the enabled GLI(s) is green.
	3	Click on OK to close the status report window.

CSM System Time – GPS & LFR/HSO Verification

CSM & LFR Background

The primary function of the Clock Synchronization Manager (CSM) boards (slots 1 and 2) is to maintain CDMA system time. The CSM in slot 1 is the primary timing source while slot 2 provides redundancy. The CSM2 card (CSM second generation) 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. CSM2 can have a daughter card as a local GPS receiver to support an RF–GPS signal.

The CSM2 switches between the primary and redundant units (slots 1 and 2) upon failure or command. CDMA Clock Distribution Cards (CCDs) buffer and distribute even–second reference and 19.6608 MHz clocks. CCD–1 is married to CSM–1 and CCD–2 is married to CSM 2. A failure on CSM–1 or CCD–1 cause the system to switch to redundant CSM–2 and CCD–2.

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 CSM2 card is required when using the R–GPS. DPLL circuits employed by the CSM provide switching between the primary and redundant unit upon request. Synchronization between the primary and redundant CSM cards, as well as the LFR or HSO back–up source, provides excellent reliability and performance.

Each CSM board features an ovenized, crystal oscillator that provides 19.6608 MHz clock, even second tick reference, and 3 MHz sinewave reference, referenced to the selected synchronization source (GPS, LORAN–C Frequency Receiver (LFR), or High Stability Oscillator (HSO), T1 Span, or external reference oscillator sources).

The 3 MHz signals are also routed to the RDM EXP 1A & 1B connectors on the top interconnect panel for distribution to co–located frames at the site.

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 on CSM–1. During normal operation, the CSM–1 board selects GPS as the primary source (see Table 3-20). The source selection can also be overridden via the LMF or by the system software.

Front Panel LEDs

The status of the LEDs on the CSM boards are as follows:

- Steady Green – Master CSM locked to GPS or LFR (INS).
- Rapidly Flashing Green – Standby CSM locked to GPS or LFR (STBY).
- Flashing Green/Rapidly Flashing Red – CSM OOS–RAM attempting to lock on GPS signal.
- Rapidly Flashing Green and Red – Alarm condition exists. Trouble Notifications (TNs) are currently being reported to the GLI.

Low Frequency Receiver/High Stability Oscillator (LFR/HSO)

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

LFR – 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.

HSO – 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 (see Table 3-19). HSO, HSO2, and HSOX use the same source code in source selection (see Table 3-19).

NOTE

Allow the **base site and test equipment to warm up for 60 minutes** after any interruption in oscillator power. CSM board 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.

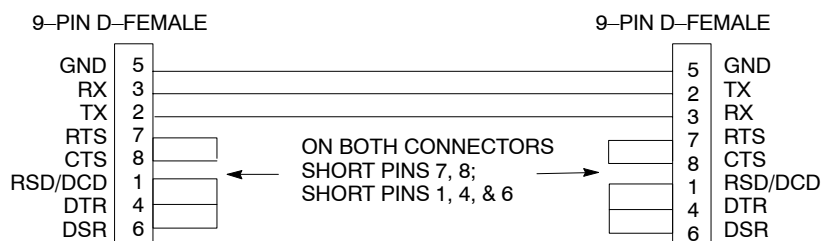
CSM Frequency Verification

The objective of this procedure is the initial verification of the CSM boards before performing the RF path verification tests. Parts of this procedure will be repeated for final verification *after* the overall optimization has been completed.

Null Modem Cable

A null modem cable is required. It is connected between the MMI port of the primary CSM and the null modem board. Figure 3-10 shows the wiring detail for the null modem cable.

Figure 3-10: Null Modem Cable Detail



FW00362

Prerequisites

Ensure the following prerequisites have been met before proceeding:

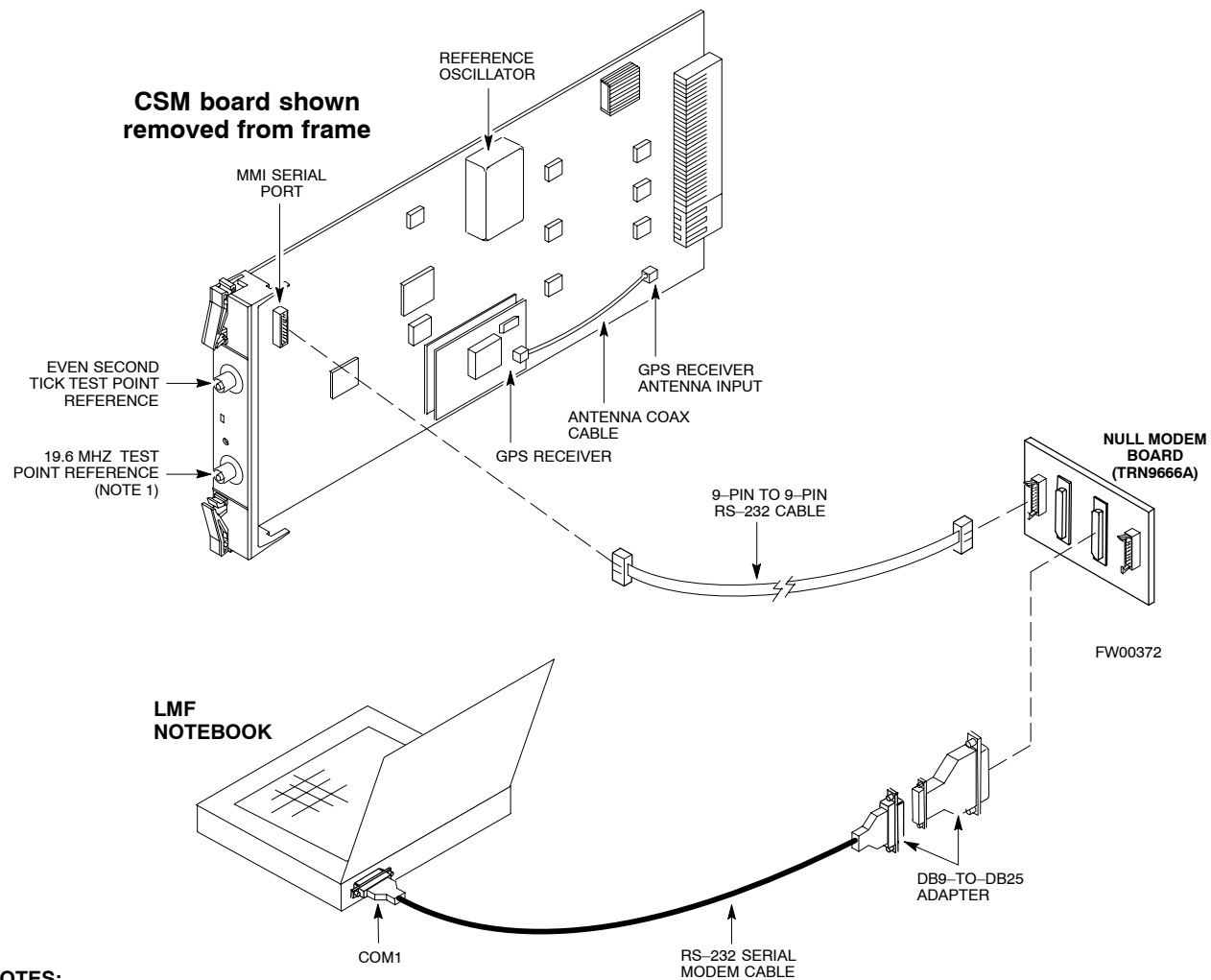
- The LMF is **NOT** logged into the BTS.
- The COM1 port is connected to the MMI port of the primary CSM via a null modem board.

Test Equipment Setup: GPS & LFR/HSO Verification

Follow the procedure in Table 3-19 to set up test equipment while referring to Figure 3-11 as required.

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

Step	Action
1	Perform one of the following operations: - For local GPS (RF–GPS), verify a CSM board with a GPS receiver is installed in primary CSM slot 1 and that CSM–1 is INS. This is verified by checking the board ejectors for kit number SGLN1145 on the board in slot 1. - For Remote GPS (RGPS), verify a CSM2 board is installed in primary slot 1 and that CSM–1 is INS. This is verified by checking the board ejectors for kit number SGLN4132ED (or later).
2	Remove CSM–2 (if installed) and connect a serial cable from the LMF COM 1 port (via null modem board) to the MMI port on CSM–1.
3	Reinstall CSM–2.
4	Start an MMI communication session with CSM–1 by using the Windows desktop shortcut icon (see Table 3-3) NOTE The LMF program must not be running when a Hyperterminal session is started if COM1 is being used for the MMI session.
5	When the terminal screen appears, press the <Enter> key until the CSM> prompt appears.

Figure 3-11: 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

Follow the procedure in Table 3-20 to initialize and verify proper GPS receiver operation.

Prerequisites

Ensure the following prerequisites have been met before proceeding:

- The LMF is not logged into the BTS.
- The COM1 port is connected to the MMI port of the primary CSM via a null modem board (see Figure 3-11).
- The primary CSM and HSO (if equipped) have been warmed up for at least 15 minutes.

CAUTION	Connect the GPS antenna to the GPS RF connector ONLY . Damage to the GPS <i>antenna</i> and/or <i>receiver</i> can result if the GPS antenna is inadvertently connected to any other RF connector.
----------------	---

Table 3-20: GPS Initialization/Verification

Step	Action																																																																																										
1	To verify that Clock alarms (0000), Dpll is locked and has a reference source, and GPS self test passed messages are displayed within the report, issue the following MMI command bstatus – Observe the following typical response: <u>Clock Alarms (0000):</u> DPLL <u>is locked and has a reference source.</u> GPS receiver self test result: <u>passed</u> Time since reset 0:33:11, time since power on: 0:33:11																																																																																										
2	Enter the following command at the CSM> prompt to display the current status of the Loran and the GPS receivers. sources – Observe the following typical response for systems equipped with LFR: <table><tr><th>N</th><th>Source Name</th><th>Type</th><th>TO</th><th>Good</th><th>Status</th><th>Last Phase</th><th>Target Phase</th><th>Valid</th></tr><tr><td>0</td><td><u>LocalGPS</u></td><td>Primary</td><td>4</td><td>YES</td><td>Good</td><td>0</td><td>0</td><td>Yes</td></tr><tr><td>1</td><td>LFR CHA</td><td>Secondary</td><td>4</td><td>YES</td><td>Good</td><td>–2013177</td><td>–2013177</td><td>Yes</td></tr><tr><td>2</td><td>Not Used</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> <u>Current reference source number: 0</u> – Observe the following typical response for systems equipped with HSO: <table><tr><th>Num</th><th>Source Name</th><th>Type</th><th>TO</th><th>Good</th><th>Status</th><th>Last Phase</th><th>Target Phase</th><th>Valid</th></tr><tr><td>0</td><td>Local GPS</td><td>Primary</td><td>4</td><td>Yes</td><td>Good</td><td>3</td><td>0</td><td>Yes</td></tr><tr><td>1</td><td><u>HSO</u></td><td><u>Backup</u></td><td>4</td><td>No</td><td>N/A</td><td>timed-out*</td><td>Timed-out*</td><td>No</td></tr></table> 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: ss 1 12 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. The HSO should be valid within one (1) minute, assuming the DPLL is locked and the HSO rubidium oscillator is fully warmed. <table><tr><th>Num</th><th>Source Name</th><th>Type</th><th>TO</th><th>Good</th><th>Status</th><th>Last Phase</th><th>Target Phase</th><th>Valid</th></tr><tr><td>0</td><td>Local GPS</td><td>Primary</td><td>4</td><td>Yes</td><td>Good</td><td>3</td><td>0</td><td>Yes</td></tr><tr><td>1</td><td><u>HSO</u></td><td><u>Backup</u></td><td>4</td><td>Yes</td><td>N/A</td><td>xxxxxxxxxx</td><td>xxxxxxxxxx</td><td>Yes</td></tr></table>	N	Source Name	Type	TO	Good	Status	Last Phase	Target Phase	Valid	0	<u>LocalGPS</u>	Primary	4	YES	Good	0	0	Yes	1	LFR CHA	Secondary	4	YES	Good	–2013177	–2013177	Yes	2	Not Used								Num	Source Name	Type	TO	Good	Status	Last Phase	Target Phase	Valid	0	Local GPS	Primary	4	Yes	Good	3	0	Yes	1	<u>HSO</u>	<u>Backup</u>	4	No	N/A	timed-out*	Timed-out*	No	Num	Source Name	Type	TO	Good	Status	Last Phase	Target Phase	Valid	0	Local GPS	Primary	4	Yes	Good	3	0	Yes	1	<u>HSO</u>	<u>Backup</u>	4	Yes	N/A	xxxxxxxxxx	xxxxxxxxxx	Yes
N	Source Name	Type	TO	Good	Status	Last Phase	Target Phase	Valid																																																																																			
0	<u>LocalGPS</u>	Primary	4	YES	Good	0	0	Yes																																																																																			
1	LFR CHA	Secondary	4	YES	Good	–2013177	–2013177	Yes																																																																																			
2	Not Used																																																																																										
Num	Source Name	Type	TO	Good	Status	Last Phase	Target Phase	Valid																																																																																			
0	Local GPS	Primary	4	Yes	Good	3	0	Yes																																																																																			
1	<u>HSO</u>	<u>Backup</u>	4	No	N/A	timed-out*	Timed-out*	No																																																																																			
Num	Source Name	Type	TO	Good	Status	Last Phase	Target Phase	Valid																																																																																			
0	Local GPS	Primary	4	Yes	Good	3	0	Yes																																																																																			
1	<u>HSO</u>	<u>Backup</u>	4	Yes	N/A	xxxxxxxxxx	xxxxxxxxxx	Yes																																																																																			
3	HSO information (underlined text above, verified from left to right) is usually the #1 reference source. If this is not the case, have the OMCR 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.																																																																																										

... continued on next page

Table 3-20: GPS Initialization/Verification

Step	Action
4	If any of the above mentioned areas fail, verify: – 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 board warpage
5	Verify the following GPS information (underlined text above): – GPS information is usually the 0 reference source. – At least one Primary source must indicate “Status = good” and “Valid = yes” to bring site up.
6	Enter the following command at the CSM> prompt to verify that the GPS receiver is in tracking mode. gstatus – Observe the following typical response: <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>

... continued on next page

Table 3-20: GPS Initialization/Verification

Step	Action
7	Verify the following GPS information (shown above in <u>underlined</u> text): – 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 than 30. 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).
8	If steps 1 through 7 pass, the GPS is good. NOTE If any of the above mentioned areas fail, verify that: – 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.
9	Enter the following commands at the CSM> prompt to verify that the CSM is warmed up and that GPS acquisition has taken place. debug dpllp 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 10</i>) <pre>CSM>DPLL Task Wait. 884 seconds left. DPLL Task Wait. 882 seconds left. DPLL Task Wait. 880 seconds left. etc.</pre>
	NOTE 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.

... continued on next page

Table 3-20: GPS Initialization/Verification

Step	Action
10	Observe the following typical response if the CSM is warmed up. <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>
11	Verify the following GPS information (underlined text above, from left to right): – 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.
12	Enter the following commands at the CSM> prompt to exit the debug mode display. debug dpllp

LFR Initialization/Verification

The LORAN–C LFR is a full size card that resides in the C–CCP Shelf. The LFR is a completely self-contained unit that interfaces with the CSM via a serial communications link. The CSM handles the overall configuration and status monitoring functions of the LFR.

The LFR receives a 100 kHz, 35 kHz BW signal from up to 40 stations (8 chains) simultaneously and provides the following major functions:

- Automatic antenna pre-amplifier calibration (using a second differential pair between LFR and LFR antenna)
- A 1 second ± 200 ns strobe to the CSM

If the BTS is equipped with an LFR, follow the procedure in Table 3-21 to initialize the LFR and verify proper operation as a backup source for the GPS.

NOTE

If **CSMRefSrc2** = 2 in the CDF file, the BTS is equipped with an LFR. If **CSMRefSrc2** = 18, the BTS is equipped with an HSO.

Table 3-21: LFR Initialization/Verification

Step	Action	Note
1	At the CSM> prompt, enter lstatus <cr> to verify that the LFR is in tracking mode. A typical response is: <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>	<i>This must be greater than 100 before LFR becomes a valid source.</i> <i>This shows the LFR is locked to the selected PLL station.</i> <i>This search list and PLL data must match the configuration for the geographical location of the cell site.</i>
2	Verify the following LFR information (highlighted above in boldface type): – 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 signal to noise (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. – 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 Yes Good -2013177 -2013177 Yes 2 Not used Current reference source number: 1 </pre>	

... continued on next page

Table 3-21: LFR Initialization/Verification

Step	Action	Note
4	LORAN–C LFR information (highlighted above in boldface type) is usually the #1 reference source (verified from left to right). NOTE If any of the above mentioned areas fail, verify: – 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 .	
	NOTE 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.	

HSO Initialization/Verification

The HSO module is a full–size card that resides in the C–CCP Shelf. This completely self contained high stability 10 MHz oscillator interfaces with the CSM via a serial communications link. The CSM handles the overall configuration and status monitoring functions of the HSO. In the event of GPS failure, the HSO is capable of maintaining synchronization initially established by the GPS reference signal for a limited time.

The HSO is typically installed in those geographical areas not covered by the LORAN–C system and provides the following major functions:

- Reference oscillator temperature and phase lock monitor circuitry
- Generates a highly stable 10 MHz sine wave.
- Reference divider circuitry converts 10 MHz sine wave to 10 MHz TTL signal, which is divided to provide a 1 PPS strobe to the CSM.

Prerequisites

- The LMF is not logged into the BTS.
- The COM1 port is connected to the MMI port of the primary CSM via a null modem board.
- The primary CSM and the HSO (if equipped) have warmed up for 15 minutes.

If the BTS is equipped with an HSO, follow the procedure in Table 3-22 to configure the HSO.

Table 3-22: HSO Initialization/Verification

Table 3-22: HSO Initialization/Verification																																													
Step	Action																																												
1	At the BTS, slide the HSO card into the cage. NOTE The LED on the HSO should light <i>red</i> for no longer than 15-minutes, then switch to <i>green</i>. The CSM must be locked to GPS.																																												
2	On the LMF at the CSM> prompt, enter sources <cr>. – Observe the following typical response for systems equipped with HSO: <table><tr><th>Num</th><th>Source Name</th><th>Type</th><th>TO</th><th>Good</th><th>Status</th><th>Last Phase</th><th>Target Phase</th><th>Valid</th></tr><tr><td>0</td><td>Local GPS</td><td>Primary</td><td>4</td><td>Yes</td><td>Good</td><td>0</td><td>0</td><td>Yes</td></tr><tr><td>1</td><td>HSO</td><td>Backup</td><td>4</td><td>Yes</td><td>N/A</td><td>xxxxxxx</td><td>–69532</td><td>Yes</td></tr><tr><td>2</td><td>Not used</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Current reference source number: 0 When the CSM is locked to GPS, verify that the HSO “Good” field is <i>Yes</i> and the “Valid” field is <i>Yes</i>.									Num	Source Name	Type	TO	Good	Status	Last Phase	Target Phase	Valid	0	Local GPS	Primary	4	Yes	Good	0	0	Yes	1	HSO	Backup	4	Yes	N/A	xxxxxxx	–69532	Yes	2	Not used							
Num	Source Name	Type	TO	Good	Status	Last Phase	Target Phase	Valid																																					
0	Local GPS	Primary	4	Yes	Good	0	0	Yes																																					
1	HSO	Backup	4	Yes	N/A	xxxxxxx	–69532	Yes																																					
2	Not used																																												
3	If source “1” is not configured as HSO, enter at the CSM> prompt: ss 1 12 <cr> Check for <i>Good</i> in the Status field.																																												
4	At the CSM> prompt, enter sources <cr>. Verify the HSO valid field is <i>Yes</i>. If not, repeat this step until the “Valid” status of <i>Yes</i> is returned. The HSO should be valid within one (1) minute, assuming the DPLL is locked and the HSO Rubidium oscillator is fully warmed.																																												

Test Equipment Set-up

Connecting Test Equipment to the BTS

The following equipment is required to perform optimization:

- LMF
- Test set
- Directional coupler and attenuator
- RF cables and connectors
- Null modem cable (see Figure 3-10)
- GPIB interface box

Refer to Table 3-23 and Table 3-24 for an overview of connections for test equipment currently supported by the LMF. In addition, see the following figures:

- Figure 3-16 and Figure 3-17 show the test set connections for TX calibration.
- Figure 3-19 and Figure 3-20 show test set connections for IS–95 A/B optimization/ATP tests.
- Figure 3-21 shows test set connections for IS–95 A/B and CDMA 2000 optimization/ATP tests.
- Figure 3-23 and Figure 3-24 show typical TX and RX ATP setup with a directional coupler (shown with and without RFDS).

Test Equipment GPIB Address Settings

All test equipment is controlled by the LMF through an IEEE–488/GPIB bus. To communicate on the bus, each piece of test equipment must have a GPIB address set which the LMF will recognize. The standard address settings used by the LMF for the various types of test equipment items are as follows:

- Signal generator address: **1**
- Power meter address: **13**
- Communications system analyzer: **18**

Using the procedures included in the Verifying and Setting GPIB Addresses section of Appendix F, verify and, if necessary, change the GPIB address of each piece of employed test equipment to match the applicable addresses above

Supported Test Equipment

CAUTION To prevent damage to the test equipment, all TX test connections must be through the directional coupler and in-line attenuator as shown in the test setup illustrations.

IS–95 A/B Testing

Optimization and ATP testing for IS–95A/B may be performed using one of the following test sets:

- CyberTest
- Advantest R3465 and HP 437B or Gigatronics Power Meter
- Hewlett–Packard HP 8935
- Hewlett–Packard HP 8921 (W/CDMA and PCS Interface for 1.7/1.9 GHz) and HP 437B or Gigatronics Power Meter

The equipment listed above cannot be used for CDMA 2000 testing.

CDMA2000 1X Operation

Optimization and ATP testing for CDMA2000 1X sites or carriers may be performed using the following test equipment:

- Advantest R3267 Analyzer with Advantest R3562 Signal Generator
- Agilent E4406A with E4432B Signal Generator
- Agilent 8935 series E6380A communications test set (formerly HP 8935) with option 200 or R2K and with E4432B signal generator for 1X FER

The E4406A/E4432B pair, or the R3267/R3562 pair, should be connected together using a GPIB cable. In addition, the R3562 and R3267 should be connected with a serial cable from the Serial I/O to the Serial I/O. This test equipment is capable of performing tests in both IS–95 A/B mode and CDMA 2000 mode if the required options are installed.

- Agilent E7495A communications test set

Optional test equipment

- Spectrum Analyzer (HP8594E) – can be used to perform cable calibration.

Test Equipment Preparation

See Appendix F for specific steps to prepare each type of test set and power meter to perform calibration and ATP.

Agilent E7495A communications test set requires additional setup and preparation. This is described in detail in Appendix F.

Test Equipment Connection Charts

To use the following charts to identify necessary test equipment connections, locate the communications system analyzer being used in the **COMMUNICATIONS SYSTEM ANALYZER** columns, and read down the column. Where a dot appears in the column, connect one end of the test cable to that connector. Follow the horizontal line to locate the end connection(s), reading up the column to identify the appropriate equipment and/or BTS connector.

IS-95A/B-only Test Equipment Connections

Table 3-23 depicts the interconnection requirements for currently available test equipment *supporting IS-95A/B only* which meets Motorola standards and is supported by the LMF.

Table 3-23: IS-95 A/B Test Equipment Setup										
SIGNAL	COMMUNICATIONS SYSTEM ANALYZER					ADDITIONAL TEST EQUIPMENT				BTS
	Cyber-Test	Advant-est R3465	HP 8935	HP 8921A	HP 8921 W/PCS	Power Meter	GPiB Inter-face	LMF	30 dB Directional Coupler & 20 dB 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				30 DB COUPLER AND 20 DB PAD	TX1-6
RX TEST CABLES	RF GEN OUT	RF OUT 50-OHM	RF IN/OUT	DUPLEX OUT	RF OUT ONLY					RX1-6

CDMA2000 1X/IS-95A/B-capable Test Equipment Connections

Table 3-24 depicts the interconnection requirements for currently available test equipment supporting *both* CDMA 2000 1X and IS-95A/B which meets Motorola standards and is supported by the LMF.

Table 3-24: CDMA2000 1X/IS-95A/B Test Equipment Interconnection

SIGNAL	COMMUNICATIONS SYSTEM ANALYZER				ADDITIONAL TEST EQUIPMENT						BTS
	Agilent 8935 (Option 200 or R2K)	Agilent E7495A	Advantest R3267	Agilent E4406A	Agilent E4432B Signal Generator	Advantest R3562 Signal Generator	Power Meter	GPIO Interface	LMF	30 dB Directional Coupler & 20 dB Pad*	
EVEN SECOND SYNCHRONIZATION	EXT TRIG IN	EVEN SECOND SYNC IN	EXT TRIG	TRIGGER IN	PATTERN TRIG IN	EVEN SECOND SYNC IN					SYNC MONITOR
	●	●	●	●	●	●					●
											●
											●
19.6608 MHZ CLOCK	MOD TIME BASE IN			EXT REF IN		EXT REF IN					FREQ MONITOR
	●			●		●					●
											●
											●
CONTROL IEEE 488 BUS	IEEE 488		GPIO	HP-IB	GPIO	HP-IB	HP-IB	GPIO	SERIAL PORT		
	●		●	●	●	●	●	●	●		
10 MHZ	10 MHZ IN		10 MHZ OUT	10 MHZ OUT (SWITCHED)	10 MHZ IN	SYNTH REF IN					
	●		●	●	●	●					
SIGNAL SOURCE CONTROLLED SERIAL I/O			SERIAL I/O		SERIAL I/O						
			●		●						
TX TEST CABLES	RF IN/OUT	PORT 2 RF IN	RF IN	RF INPUT 50 OHM	RF OUTPUT 50 OHM	RF IN/OUT				30 DB COUPLER AND 20 DB PAD	TX1-6
	●	●	●	●	●	●				●	●
										●	●
										●	●
										●	●
RX TEST CABLES	DUPLEX OUT *	PORT 1 RF OUT	RF OUT 50-OHM	RF OUT ONLY	RF OUTPUT 50-OHM	RF OUT 50 OHM					RX1-6
	●	●	●	●	●	●					●
											●
											●
											●

* WHEN USED ALONE, THE AGILENT 8935 WITH OPTION 200 OR R2K SUPPORTS IS-95A/B RX TESTING BUT NOT CDMA2000 1X RX TESTING.

Equipment Warm-up

NOTE

To assure BTS stability and contribute to optimization accuracy of the BTS, warm-up the BTS test equipment prior to performing the BTS optimization procedure as follows:

- Agilent E7495A for a minimum of 30 minutes
- All other test sets for a minimum of 60 minutes

Time spent running initial or normal 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 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 3-12 through Figure 3-15 show 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.

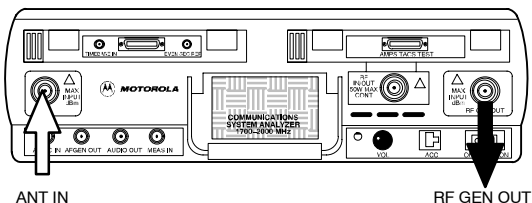
Manual Cable Calibration

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

Figure 3-12: IS-95A/B Cable Calibration Test Setup –
CyberTest, Agilent 8935, Advantest R3465, and HP 8921A

SUPPORTED TEST SETS

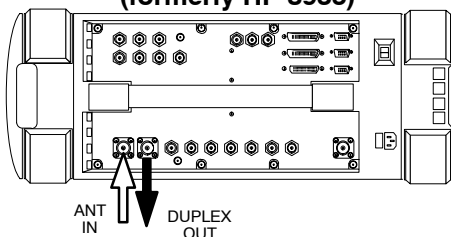
Motorola CyberTest



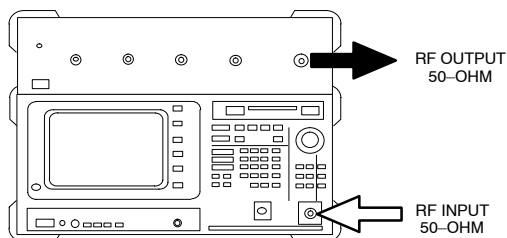
Note: The Directional Coupler is not used with the CyberTest Test Set. The TX cable is connected directly to the CyberTest Test Set.

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.

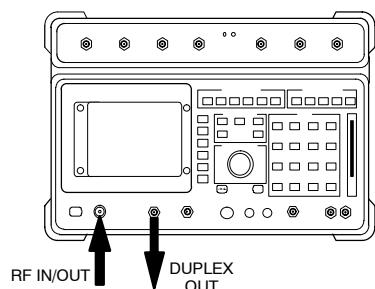
Agilent 8935 Series E6380A (formerly HP 8935)



Advantest Model R3465



Hewlett-Packard Model HP 8921A

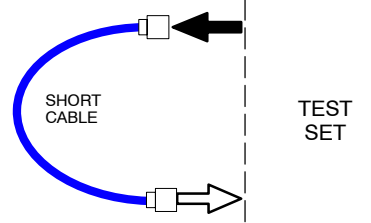


Note: For 800 MHz only. The HP8921A cannot be used to calibrate cables for PCS frequencies.

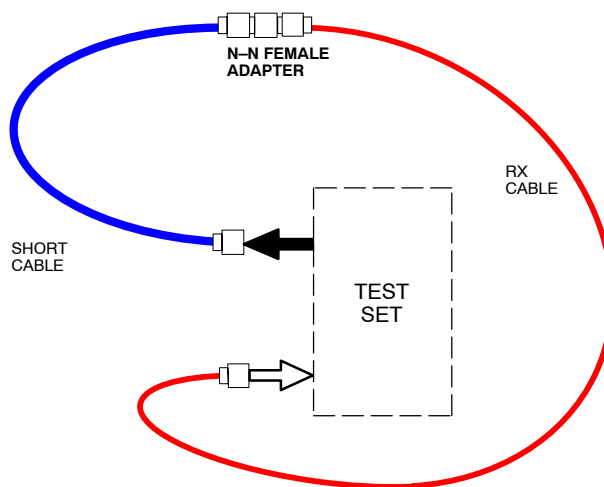
FW00089

CALIBRATION SET UP

A. SHORT CABLE CAL



B. RX TEST SETUP



C. TX TEST SETUP

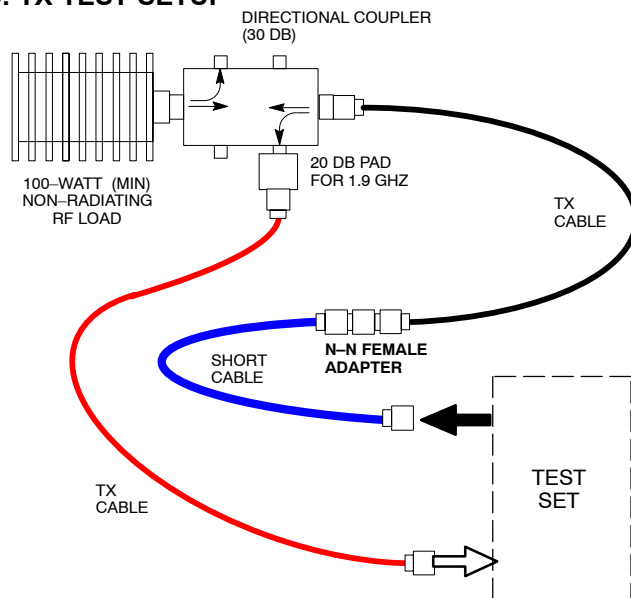
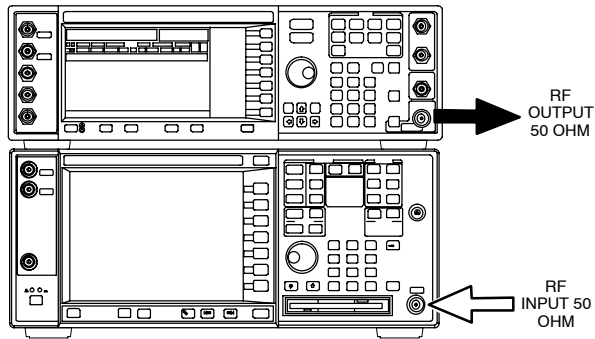


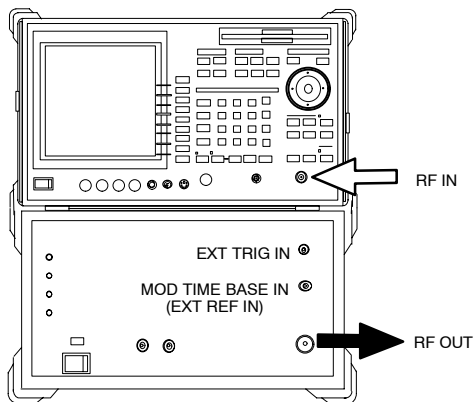
Figure 3-13: IS-95A/B and CDMA 2000 1X Cable Calibration Test Setup –
Agilent E4406A/E4432B and Advantest R3267/R3562

SUPPORTED TEST SETS

Agilent E4432B (Top) and E4406A (Bottom)

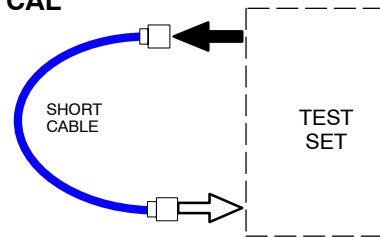


Advantest R3267 (Top) and R3562 (Bottom)

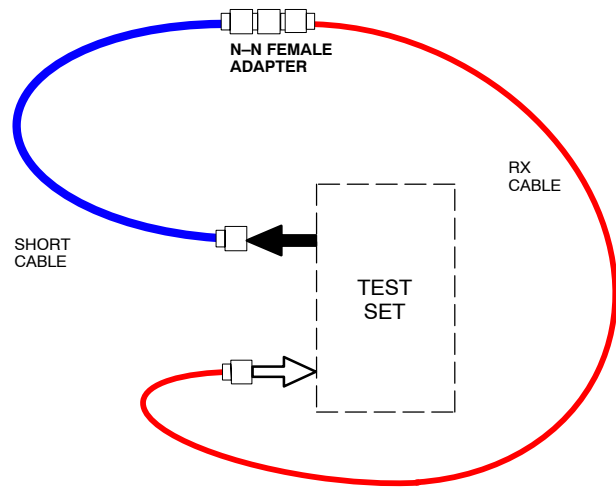


CALIBRATION SET UP

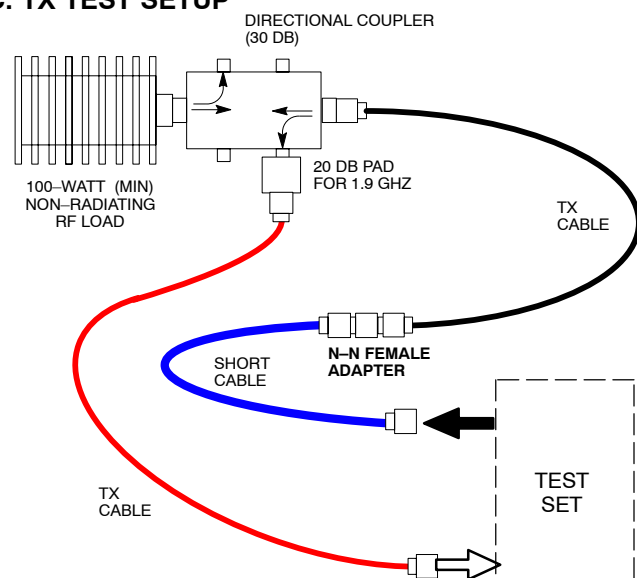
A. SHORT CABLE CAL



B. RX TEST SETUP



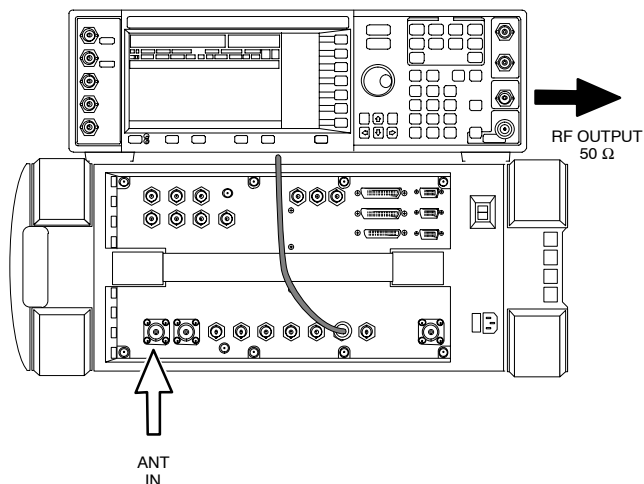
C. TX TEST SETUP



REF FW00089

Figure 3-14: CDMA2000 1X Cable Calibration Test Setup – Agilent 8935/E4432B**SUPPORTED TEST SETS**

Agilent E4432B (Top) and 8935 Series
E6380A (Bottom)

**NOTE:**

10 MHZ IN ON REAR OF SIGNAL GENERATOR IS CONNECTED TO
10 MHZ REF OUT ON SIDE OF CDMA BASE STATION TEST SET.

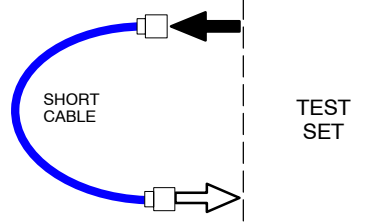
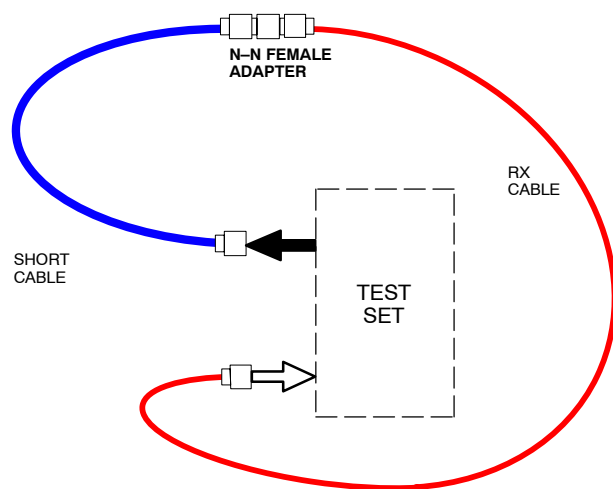
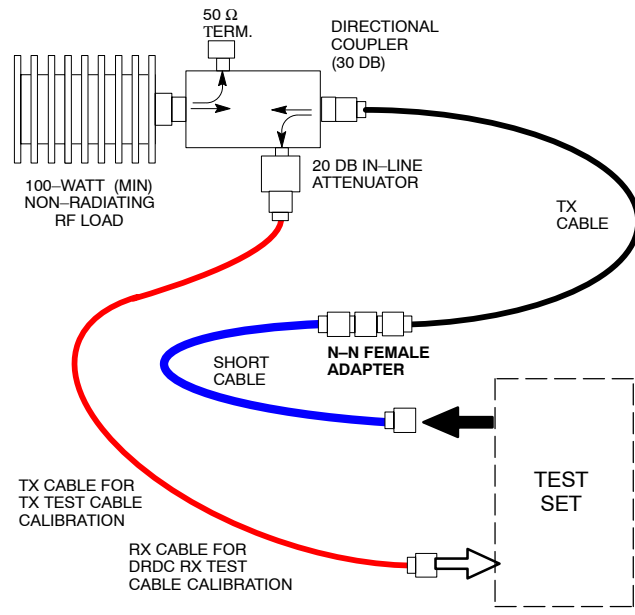
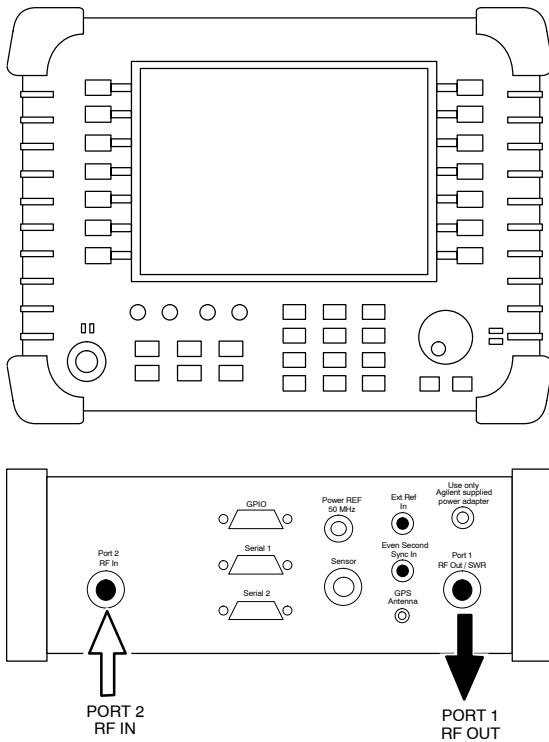
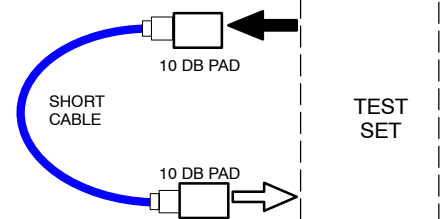
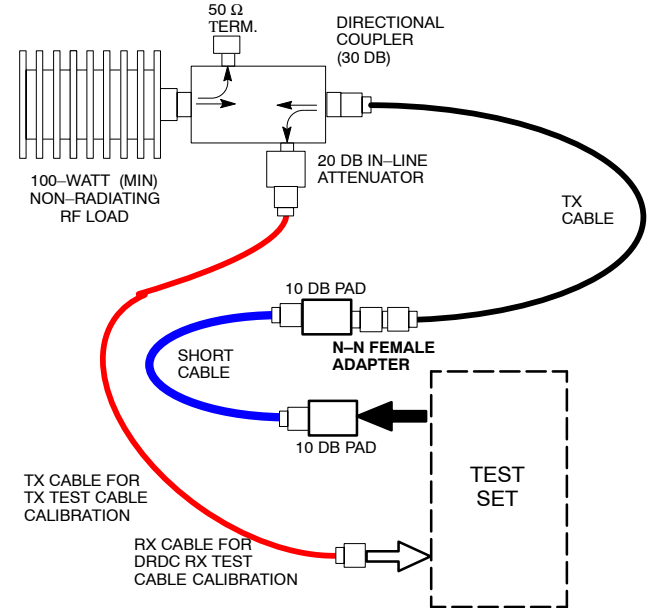
CALIBRATION SET UP**A. SHORT CABLE CAL****B. RX TEST SETUP****D. TX TEST SETUP**

Figure 3-15: CDMA2000 1X Cable Calibration Test Setup – Agilent E7495A**SUPPORTED TEST SETS****Agilent E7495A****CALIBRATION SET UP****A. SHORT CABLE CAL****D. RX and TX TEST SETUP**

Set-up for TX Calibration

Figure 3-16 through Figure 3-18 show the test set connections for TX calibration.

Figure 3-16: TX Calibration Test Setup – CyberTest (IS-95A/B) and Agilent 8935 (IS-95A/B and CDMA2000 1X), and Advantest R3465

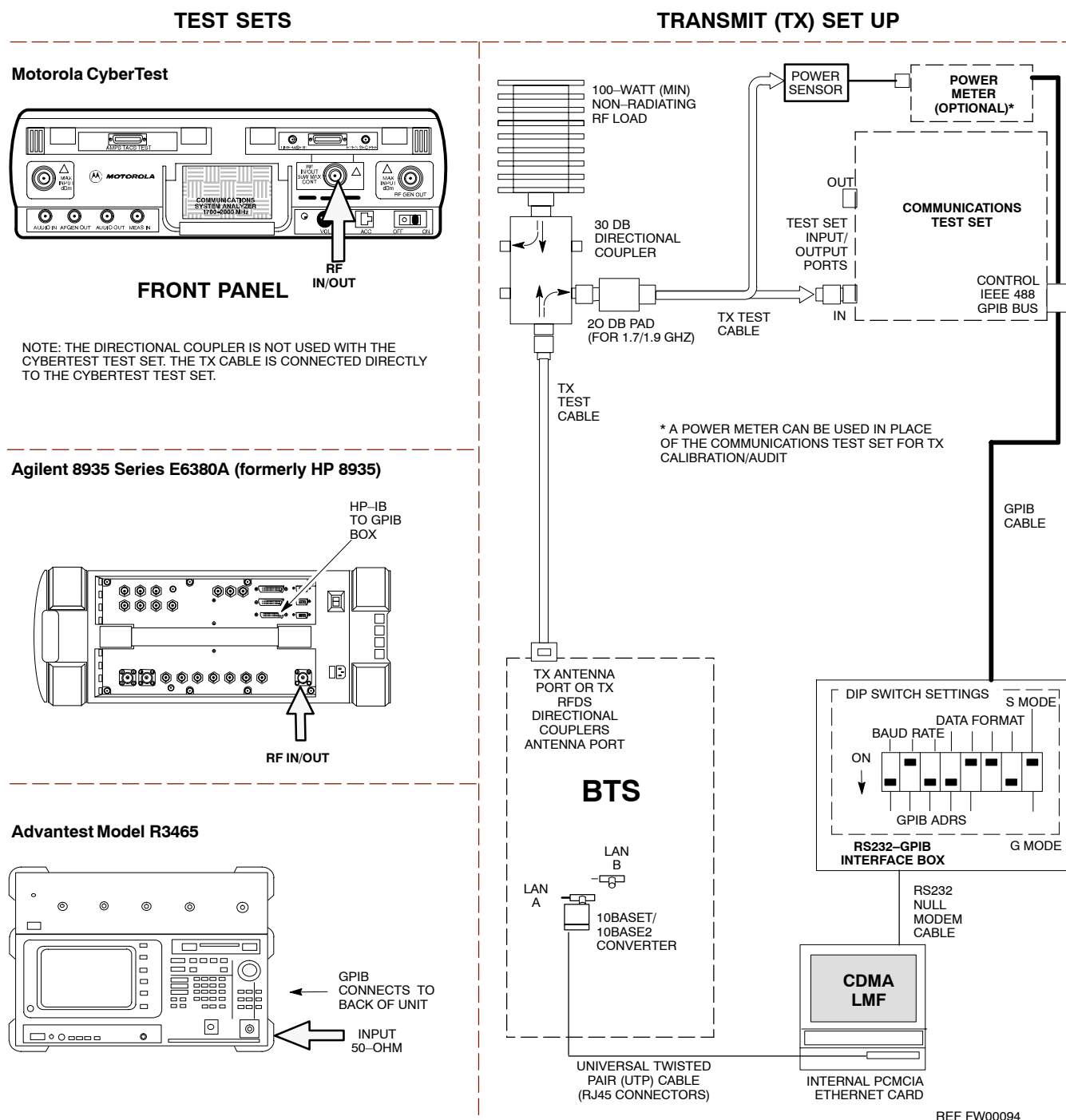


Figure 3-17: TX Calibration Test Setup –
Agilent E4406A and Advantest R3567 (IS-95A/B and CDMA2000 1X)

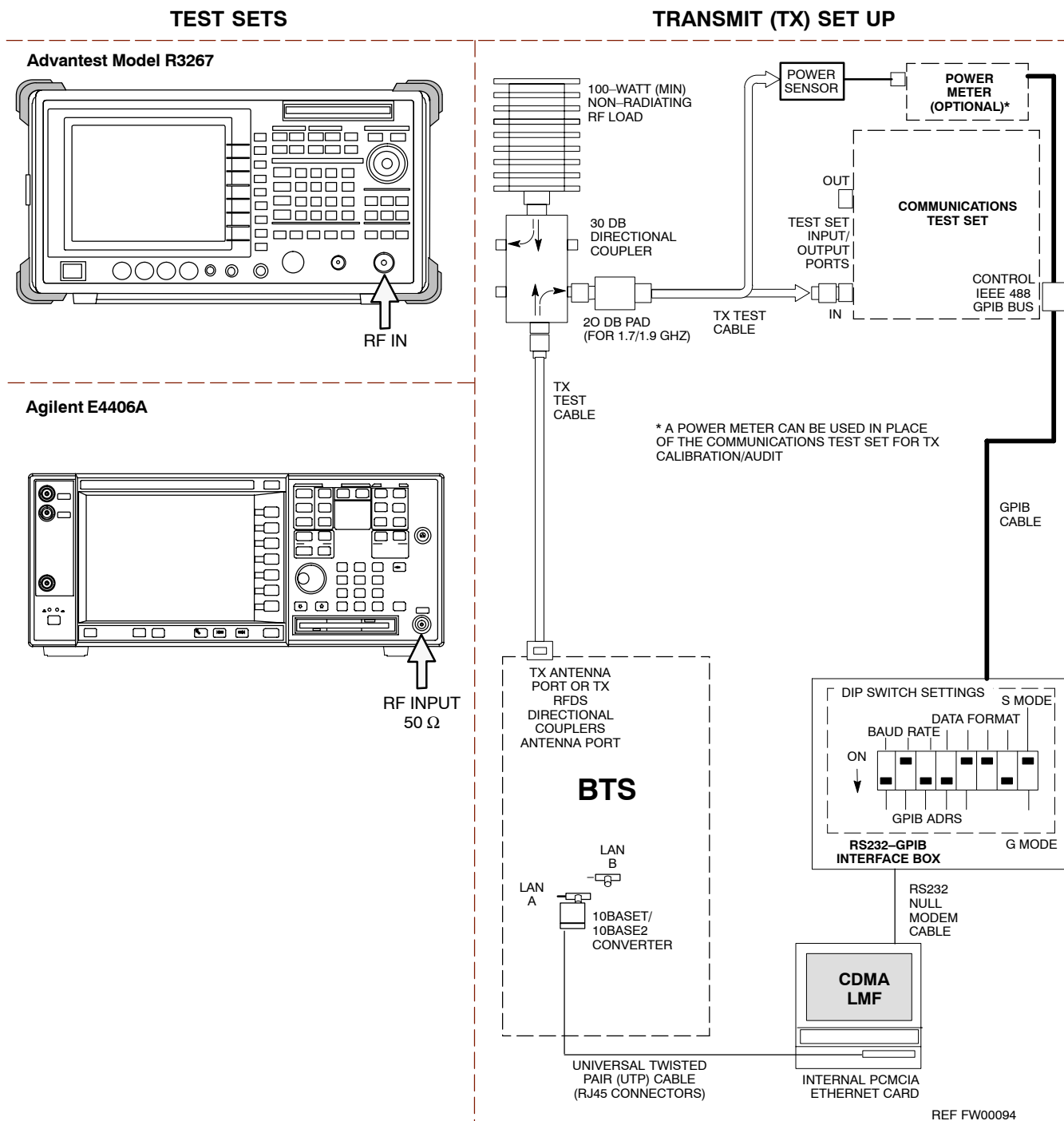
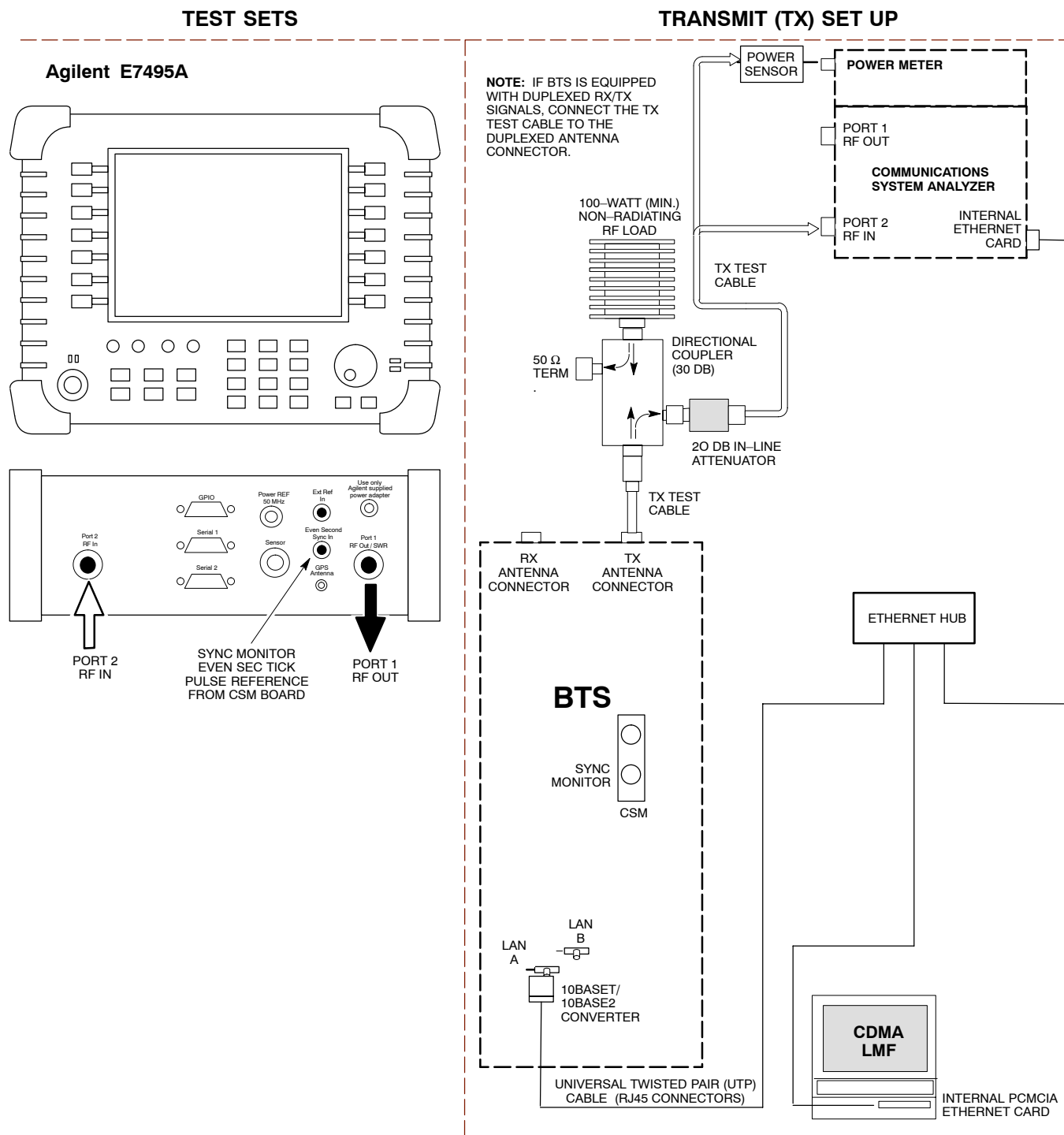


Figure 3-18: TX Calibration Test Setup – Agilent E7495A (IS-95A/B and CDMA2000 1X)

Setup for Optimization/ATP

Figure 3-19 and Figure 3-21 show test set connections for IS-95 A/B optimization/ATP tests. Figure 3-21 and Figure 3-22 show test set connections for IS-95 A/B/C optimization/ATP tests.

Figure 3-19: Optimization/ATP Test Setup Calibration – Agilent 8935

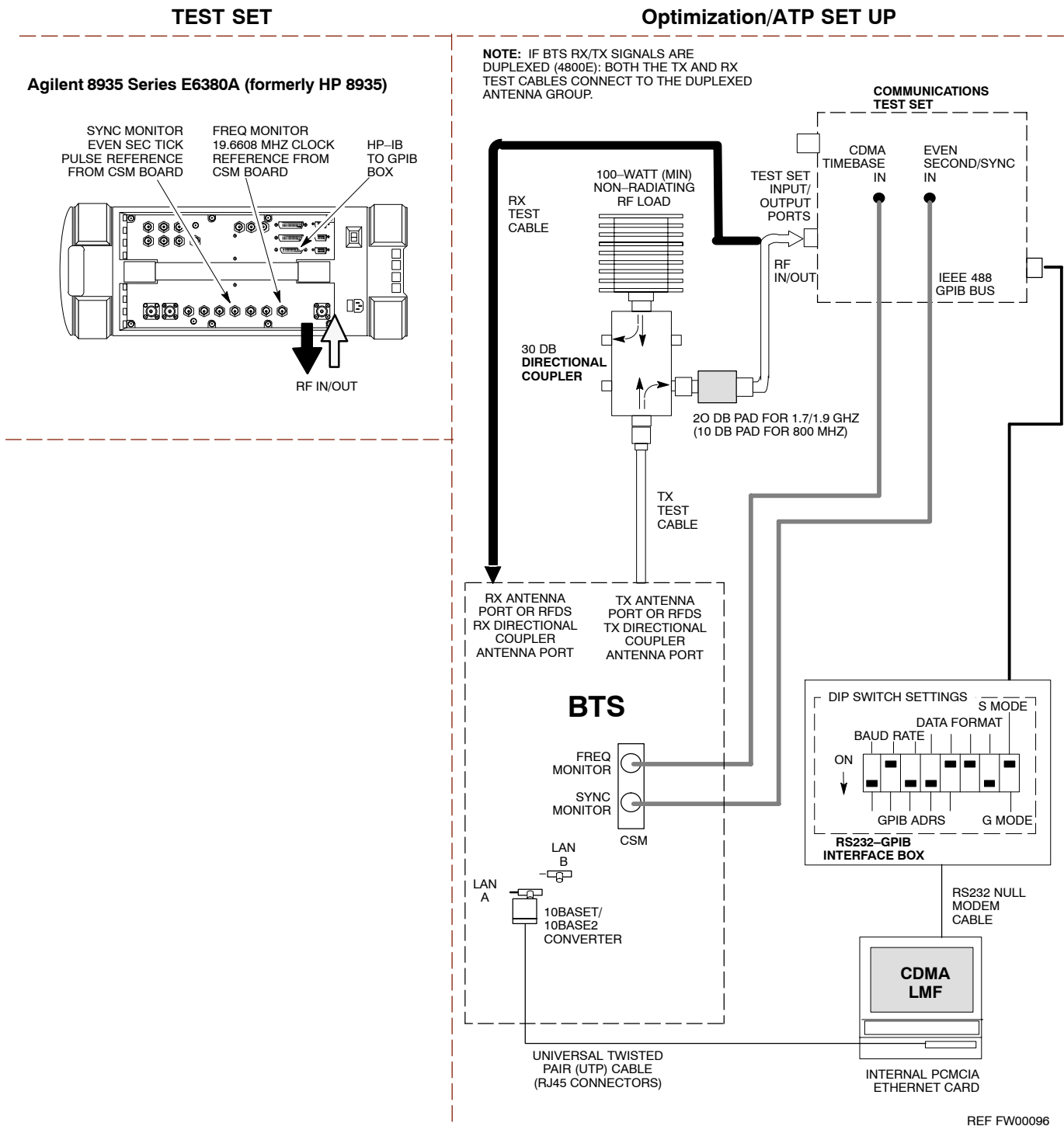
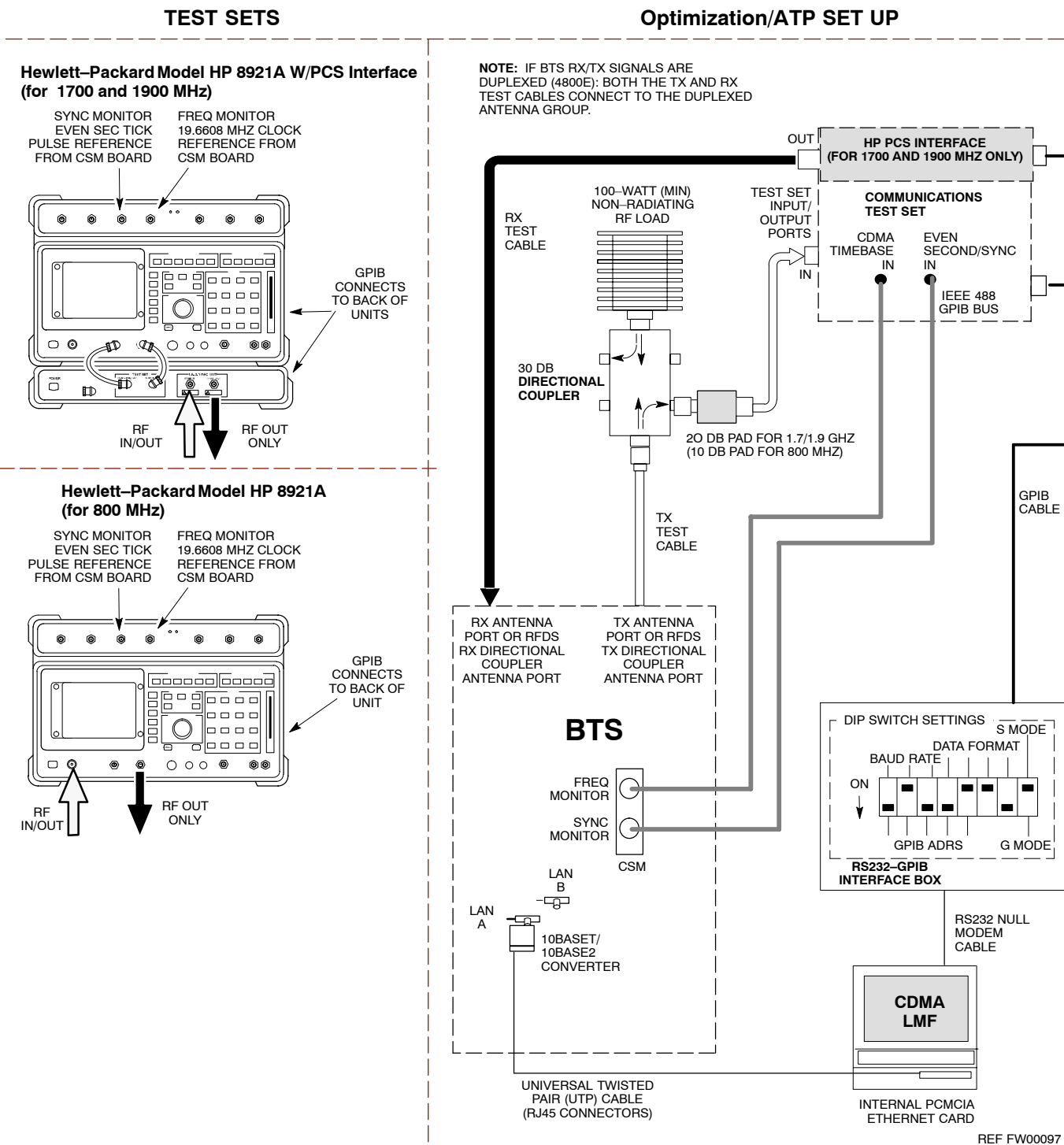


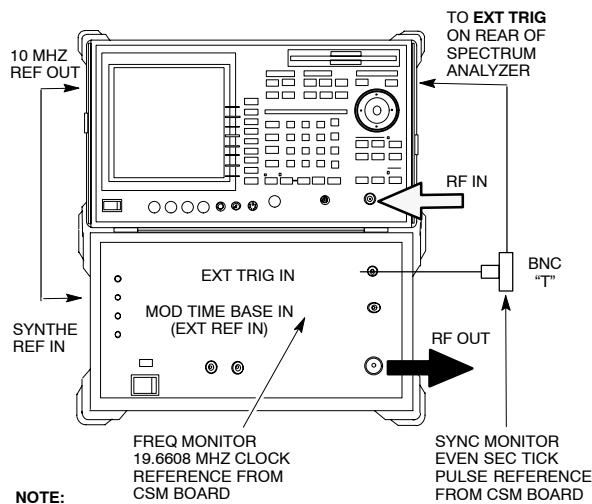
Figure 3-20: Optimization/ATP Test Setup – HP 8921

REF FW00097

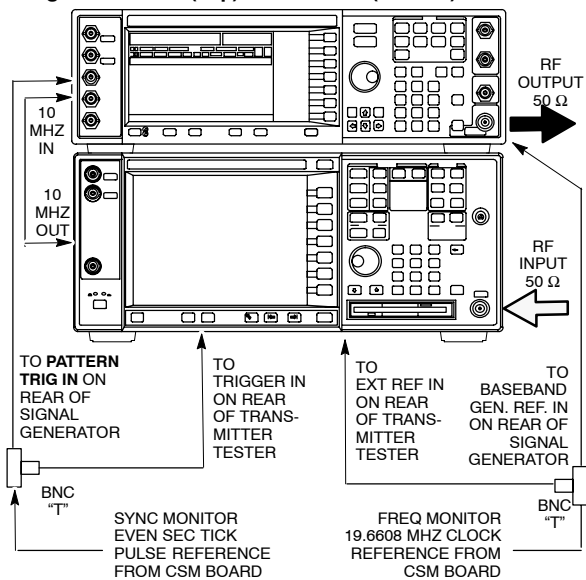
Figure 3-21: IS-95A/B and CDMA2000 1X Optimization/ATP Test Setup –
 Advantest R3267/3562, Agilent E4432B/E4406A

TEST SETS

Advantest R3267 (Top) and R3562 (Bottom)

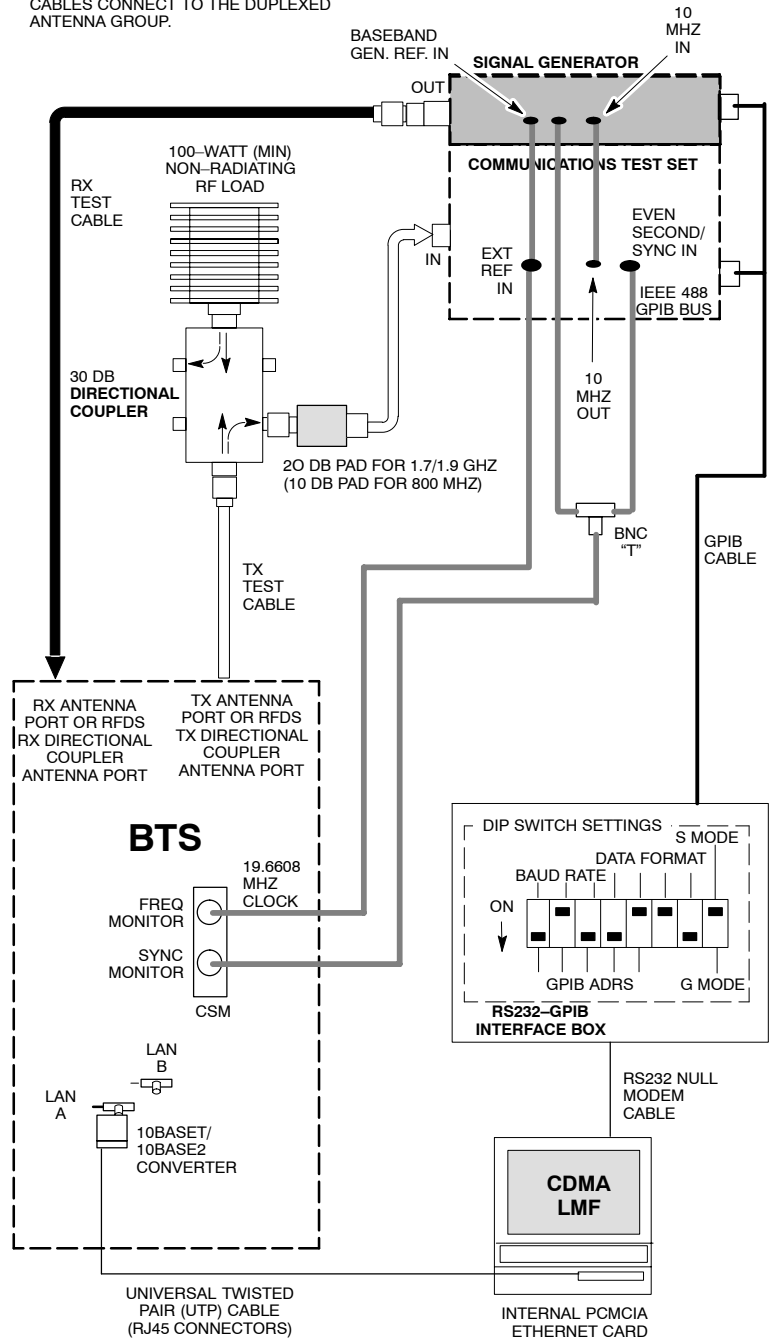


Agilent E4432B (Top) and E4406A (Bottom)



Optimization/ATP SET UP

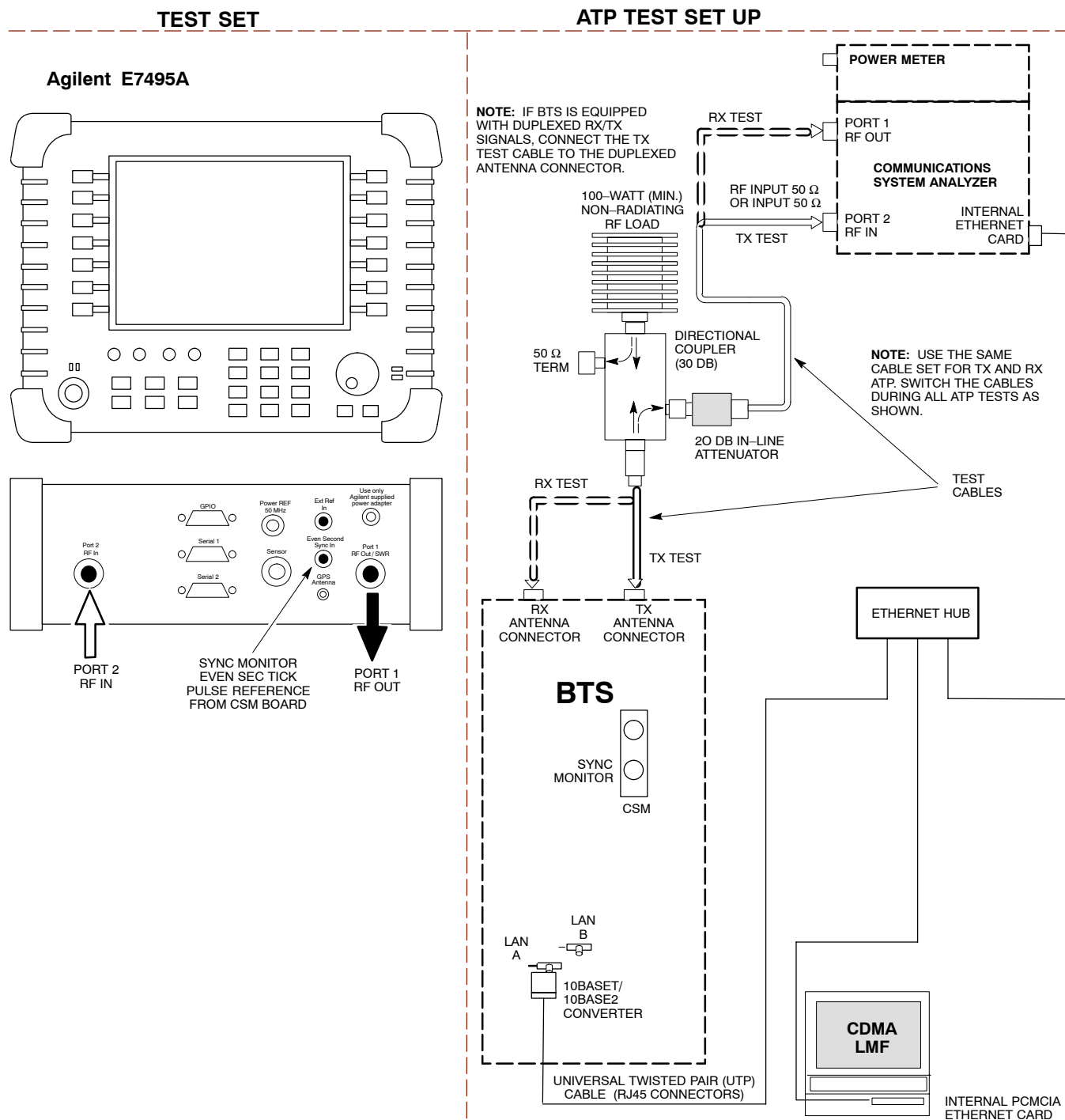
NOTE: IF BTS RX/TX SIGNALS ARE DUPLEXED: BOTH THE TX AND RX TEST CABLES CONNECT TO THE DUPLEXED ANTENNA GROUP.



NOTE: FOR MANUAL TESTING, GPIB MUST BE CONNECTED BETWEEN THE ANALYZER AND THE SIGNAL GENERATOR

REF FW00758

Figure 3-22: IS-95A/B and CDMA2000 1X Optimization/ATP Test Setup – Agilent E7495A



ATP Setup with Directional Couplers

Figure 3-23 shows a typical TX ATP setup.

Figure 3-23: Typical TX ATP Setup with Directional Coupler

TX ANTENNA DIRECTIONAL COUPLERS

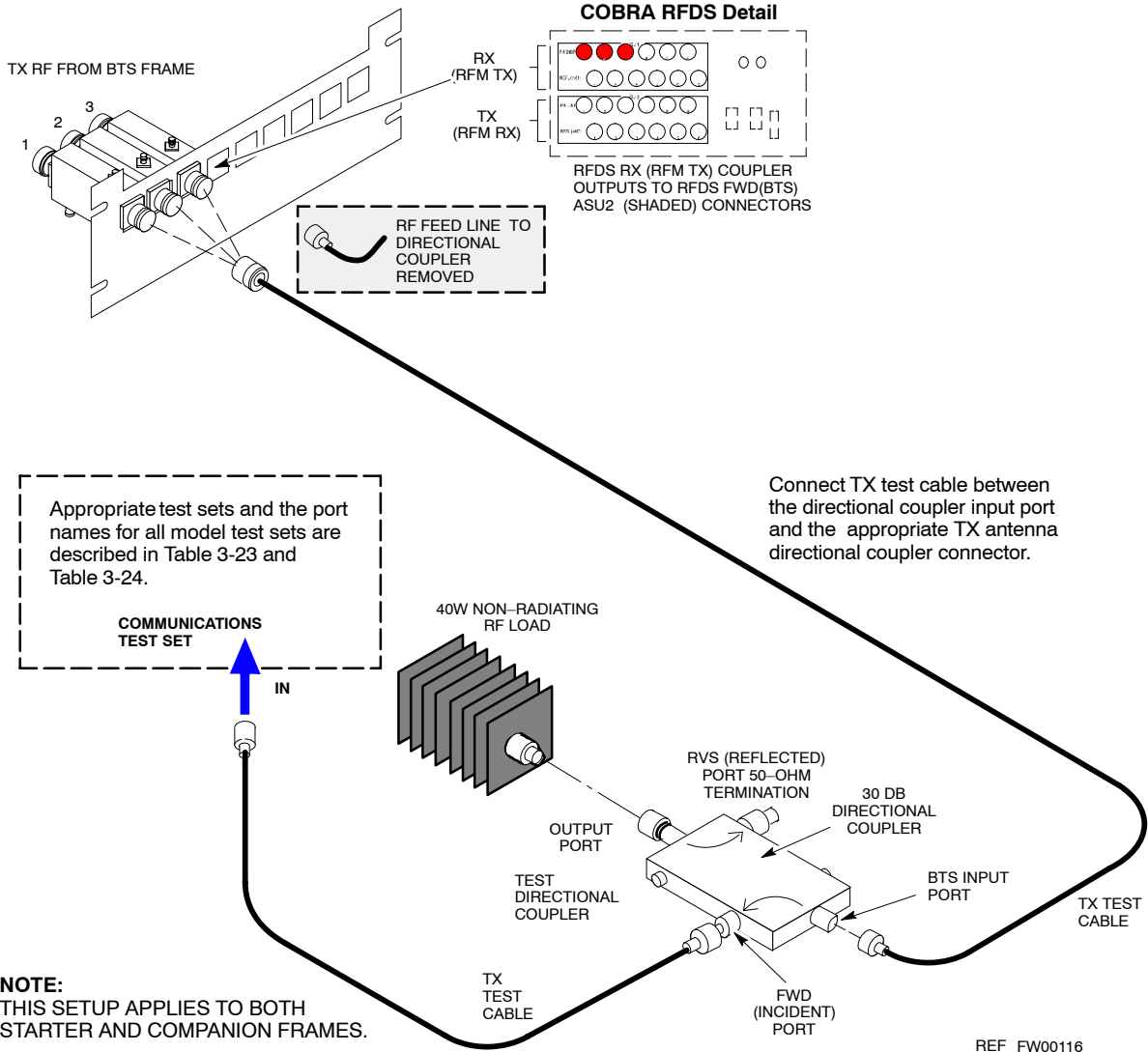
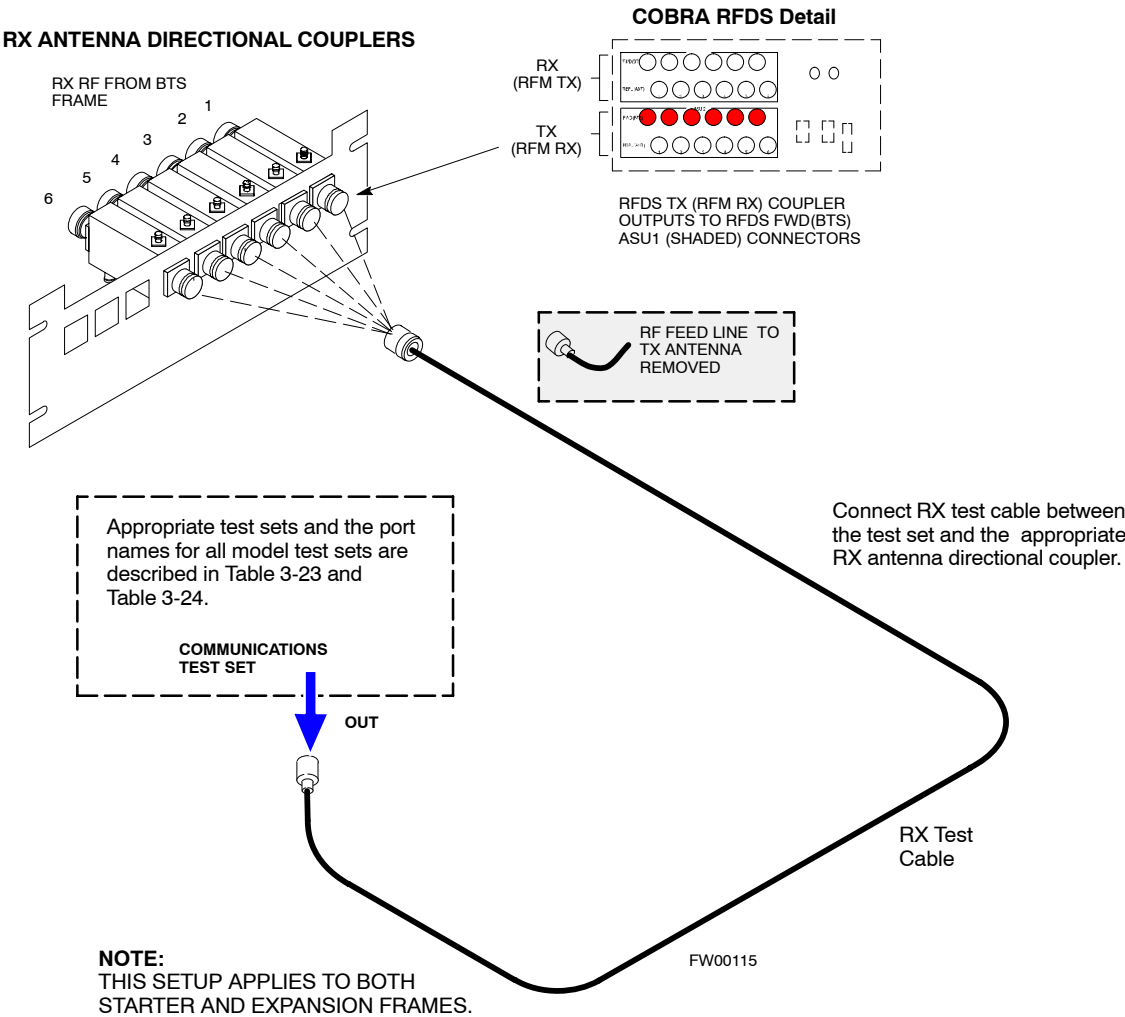


Figure 3-24: Typical RX ATP Setup with Directional Coupler

Figure 3-24 shows a typical RX ATP setup.



Test Set Calibration

Background

Proper test equipment calibration ensures that the test equipment and associated test cables do not introduce measurement errors, and that measurements are correct.

NOTE	If the <i>test equipment set</i> being used to optimize or test the BTS has been calibrated and maintained as a set, this procedure does not need to be performed.
-------------	--

This procedure must be performed *prior* to beginning 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 <i>test equipment set</i> has been replaced, the <i>set</i> 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.
----------------	--

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

Calibration Procedures Included

Automatic

Procedures included in this section use the LMF automated calibration routine to determine path losses of the supported communications analyzer, power meter, associated test cables, adapters, 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 LMF computer.

Manual

Agilent E4406A Transmitter Tester – The E4406A does not support the power level zeroing calibration performed by the LMF. If this instrument is to be used for Bay Level Offset calibration and calibration is attempted with the LMF **Calibrate Test Equipment** function, the LMF will return a status window failure message stating that zeroing power is not supported by the E4406A. Refer to the Equipment Calibration section of Appendix F for instructions on using the instrument's self-alignment (calibration) function prior to performing Bay Level Offset calibration.

Power Meters – Manual power meter calibration procedures to be performed prior to automated calibration are included in the Equipment Calibration section of Appendix F.

Cable Calibration – Manual cable calibration procedures using the HP 8921A and Advantest R3465 communications system analyzers are provided in the Manual Cable Calibration section of Appendix F, if needed.

GPIOB Addresses

GPIOB addresses can range from 1 through 30. The LMF will accept any address in that range, but the numbers entered in the LMF Options window GPIOB address box must match the addresses of the test equipment. Motorola recommends using 1 for a CDMA signal generator, 13 for a power meter, and 18 for a communications system analyzer. To verify and, if necessary, change the GPIOB addresses of the test equipment, refer to the Setting GPIOB Addresses section of Appendix F.

IP Addresses

For the Agilent E7495A Communications Test Set, set the IP address and complete initial setup as described in Appendix F (Specifically, see Table F-1 on page F-3).

Selecting Test Equipment

Serial Connection and **Network Connection** tabs are provided in the **LMF Options** window to specify the test equipment connection method. The **Serial Connection** tab is used when the test equipment items are connected directly to the LMF computer through a GPIOB box (normal setup). The **Network Connection** tab is used when the test equipment is to be connected remotely via a network connection or the Agilent E7495A Communications Test Set is used. Refer to Appendix F (Specifically, see Table F-1 on page F-3).

Prerequisites

Ensure the following prerequisites have been met before proceeding:

- Test equipment is correctly connected and turned on.
- GPIOB addresses set in the test equipment have been verified as correct using the applicable procedures in Appendix F. (GPIOB not applicable with Agilent E7495A)
- LMF computer serial port and test equipment are connected to the GPIOB box. (GPIOB not applicable with Agilent E7495A)

Selecting Test Equipment

Test equipment may be selected either manually with operator input or automatically using the LMF autodetect feature.

Manually Selecting Test Equipment in a Serial Connection Tab

Test equipment can be manually specified before, or after, the test equipment is connected. The LMF does not check to see if the test equipment is actually detected for manual specification. Follow the procedure in Table 3-25 to select test equipment manually.

Table 3-25: Selecting Test Equipment Manually in a Serial Connection Tab

✓	Step	Action
	1	In the LMF window menu bar, click Tools and select Options... from the pull-down menu. 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 (refer to the Setting GPIB Addresses section of Appendix F for directions on verifying and/or changing test equipment GPIB addresses). Motorola–recommended addresses are: 1 = signal generator 13 = power meter 18 = communications system analyzer * IMPORTANT When test equipment items are manually selected by the operator, the LMF defaults to using a power meter for RF power measurements. The LMF will use a communications system analyzer for RF power measurements only if a power meter is not selected (power meter checkbox not checked).
	7	Click on Apply. (The button darkens until the selection has been committed.) NOTE With manual selection, the LMF does not attempt to detect the test equipment to verify it is connected and communicating with the LMF. To verify and, if necessary, change the GPIB address of the test equipment, refer to Appendix F.
	8	Click on Dismiss to close the LMF Options window.

Automatically Selecting Test Equipment in Serial Connection Tab

When using the auto-detection feature to select test equipment, the LMF examines which test equipment items are actually communicating with the LMF. Follow the procedure in Table 3-26 to use the auto-detection feature.

Table 3-26: Selecting Test Equipment Using Auto-Detect

✓	Step	Action
	1	In the LMF window menu bar, click Tools and select Options... from the pull-down menu. The LMF Options window appears.
	2	If it is not in the forefront, click on the Serial Connection tab.
	3	Select the correct serial port in the COMM Port pick list (normally COM1).
	4	<i>If it is not selected (no black dot showing), click on the Auto-Detection button.</i>
	5	<i>If they are not already displayed in the box labeled GPIB address to search, click in the box and type in the GPIB addresses for the test equipment to be used, separating each address <i>with commas and no spaces</i>. (Refer to the Setting GPIB Addresses section of Appendix F for instructions on verifying and/or changing test equipment GPIB addresses.)</i> NOTE During the GPIB address search for a test equipment item to perform RF power measurements (that is, for TX calibration), the LMF will select the first item it finds with the capability to perform the measurement. If, for example, the address sequence 13,18,1 is included in the GPIB addresses to search box, the power meter (GPIB address 13) will be used for RF power measurements. If the address sequence 18,13,1 is included, the LMF will use the communications system analyzer (GPIB address 18) for power measurements.
	6	Click Apply . The button will darken until the selection has been committed. A check mark will appear in the applicable Manual Configuration section check boxes for detected test equipment items.
	7	Click Dismiss to close the LMF Options window.

Detecting Test Equipment when using Agilent E7495A

Check that no other equipment is connected to the LMF. Agilent E7495A equipment must be connected to the LAN to detect it. Then perform the procedures described in Appendix F (Specifically, see Table F-1 on page F-3, Table F-2, and Table F-3 on page F-4).

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, only the power meter is zeroed.

NOTE	The Agilent E4406A transmitter tester does not support power measurement level zeroing. Refer to the Equipment Calibration section of Appendix F for E4406A calibration.
-------------	--

Prerequisites

- LMF computer serial port and test equipment are connected to the GPIB box.
- Test equipment to be calibrated has been connected correctly for tests that are to be run.
- Test equipment has been selected in the LMF (Table 3-25 or Table 3-26)

Calibrating test equipment

Follow the procedure in Table 3-27 to calibrate the test equipment.

Table 3-27: Test Equipment Calibration		
✓	Step	Action
	1	From the Util menu, select Calibrate Test Equipment from the pull-down menu. A Directions window is displayed.
	2	Follow the directions provided.
	3	Click on Continue to close the Directions window and start the calibration process. A status report window is displayed.
	4	Click on OK to close the status report window.

Calibrating Cables Overview

The LMF Cable Calibration function is used to measure the path loss (in dB) for the TX and RX cables, adapters, directional couplers, and attenuators that make up the cable configurations used for testing. A communications system analyzer is used to measure the loss of both the TX test cable and the RX test cable configurations. LMF cable calibration consists of the following processes:

Measure the loss of a short cable

This is done to compensate for any measurement error of the communications system analyzer. The short cable, which is used only for the calibration process, is connected in series with both the TX and RX test cable configurations when they are measured.

The measured loss of the TX and RX test cable configurations minus the measured loss of the short cable equals the actual loss of the configurations. This is done so that any error in the analyzer measurement is eliminated from both the TX and RX measurements.

Measure the loss of the short cable plus the RX test cable configuration

The RX test cable configuration normally consists only of a coax cable with type–N connectors that is long enough to reach from the BTS RX connector to the test equipment.

When the BTS antenna connectors carry *duplexed TX and RX* signals, a directional coupler is required and an additional attenuator may also be required (for certain BTS types) for the RX test cable configuration. These additional items must be included in the path loss measurement.

Measure the loss of the short cable plus the TX test cable configuration

The TX test cable configuration normally consists of two coax cables with type–N connectors, a directional coupler, a termination load with sufficient rating to dissipate the BTS output power, and an additional attenuator, if required by the BTS type. The total path loss of the TX test configuration must be as required for the BTS (normally 30 or 50 dB).

The Motorola Cybertest analyzer differs from other communications system analyzers because the required attenuation/load is built into the test set. Because of this, the Cybertest TX test configuration consists only of the required length coax cable.

Calibrate Test Cabling using Communications System Analyzer

Cable Calibration is used to calibrate both TX and RX test cables. Appendix F covers the procedures for manual cable calibration.

NOTE	LMF cable calibration cannot be accomplished using an HP8921 analyzer for 1.7/1.9 GHz. A different analyzer type or the signal generator and spectrum analyzer method (Table 3-29 and Figure 3-25) must be used. Cable calibration values must be manually entered into the LMF cable loss file if the signal generator and spectrum analyzer method is used. To use the HP8921A for <i>manual</i> test cable configuration calibration for 800 MHz BTSSs, refer to the Manual Cable Calibration section of Appendix F.
-------------	---

Prerequisites

- Test equipment is turned on and has warmed up for at least 60 minutes. Agilent E7495A requires only 30 minute warmup.
- Test equipment has been selected in the LMF (Table 3-25 or Table 3-26).
- Test equipment has been calibrated and correctly connected for the type of test cable configuration to be calibrated.

Calibrating cables

Refer to Figure 3-12, Figure 3-13, or Figure 3-14 and follow the procedure in Table 3-28 to calibrate the test cable configurations.

Table 3-28: Test Cabling Calibration using Comm. System Analyzer		
✓	Step	Action
	1	Click Util in the BTS menu bar, and select Cable Calibration... in the pull-down menu. A Cable Calibration window is displayed.
	2	Enter one or more channel numbers in the Channels box NOTE 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 are calibrated for each channel. Interpolation is 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 pick list.
	4	Click OK , and follow the directions displayed for each step. A status report window will be displayed with the results of the cable calibration.

Calibrate Test Cabling Using Signal Generator & Spectrum Analyzer

Follow the procedure in Table 3-29 to calibrate the TX/Duplexed RX cables using a signal generator and spectrum analyzer. Refer to Figure 3-25, if required. Follow the procedure in Table 3-30 to calibrate the Non-Duplexed RX cables using the signal generator and spectrum analyzer. Refer to Figure 3-26, if required.

Table 3-29: Calibrating TX/Duplexed RX Cables Using Signal Generator & Spectrum Analyzer

Step	Action
1	Connect a short test cable between the spectrum analyzer and the signal generator as shown in Figure 3-25, detail “A” (top portion of figure).
2	Set signal generator to 0 dBm at the customer frequency of: 869–894 MHz for North American Cellular or 1930–1990 MHz for North American PCS
3	Use spectrum analyzer to measure signal generator output (see Figure 3-25, A) & record the value.
4	Connect the spectrum analyzer’s short cable to point B , (as shown in the lower right portion of the diagram) to measure cable output at customer frequency of: 869–894 MHz for North American Cellular or 1930–1990 MHz for North American PCS Record the value at point B .
5	Calibration factor = (value measured with detail “A” setup) – (value measured with detail “B” setup) Example: Cal factor = –1 dBm – (–53.5 dBm) = 52.5 dB NOTE 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 test cable configuration as is to ensure test procedures use the correct calibration factor.

Figure 3-25: Cal Setup for TX/Duplexed RX Test Cabling Using Signal Generator & Spectrum Analyzer

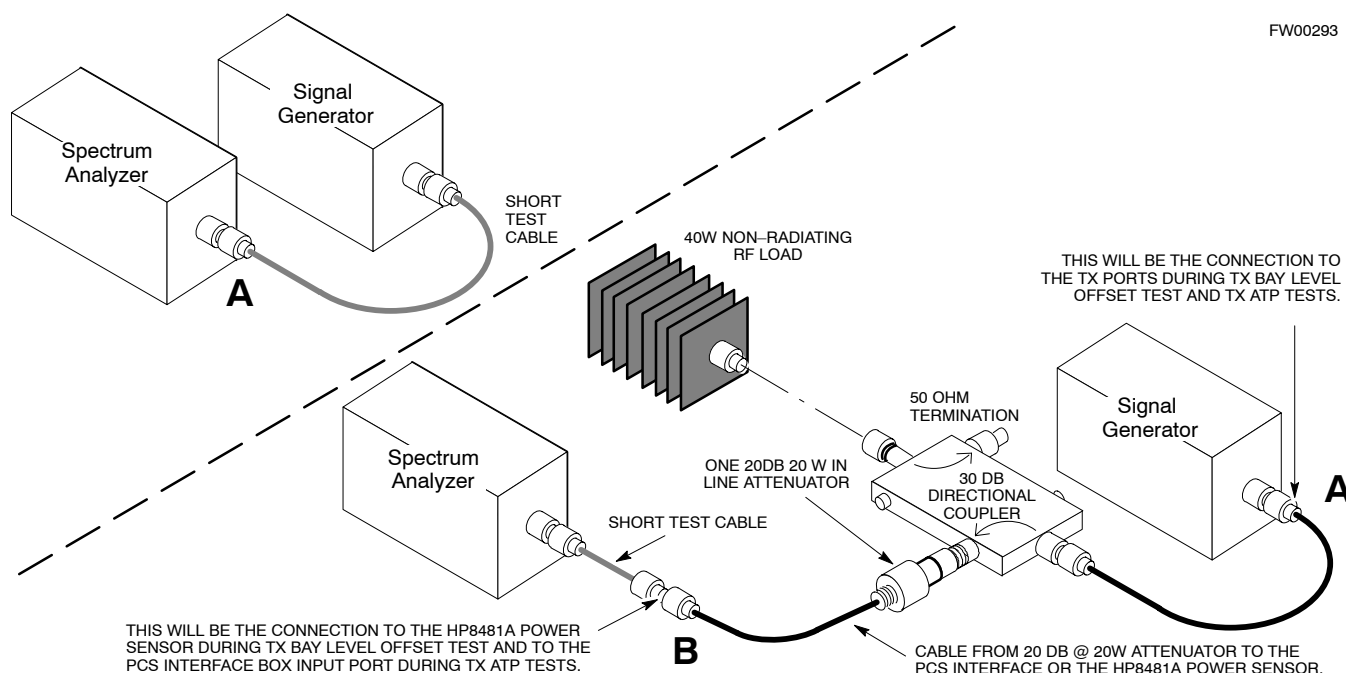
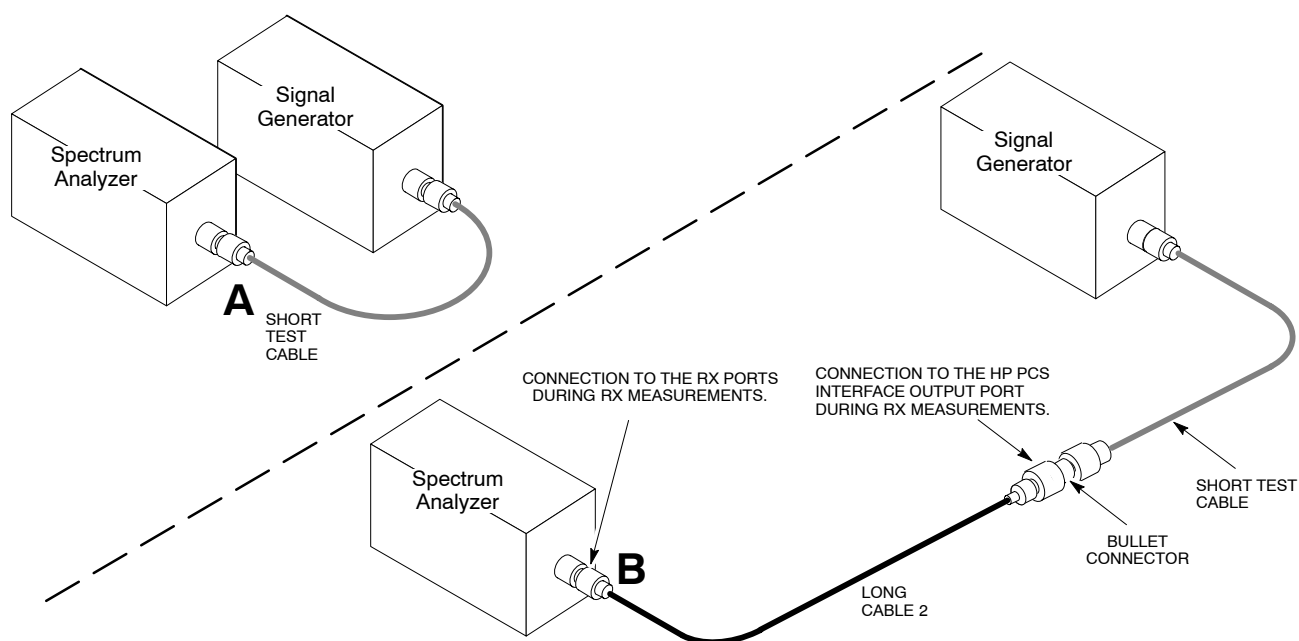


Table 3-30: Calibrating Non-Duplexed RX Cables Using a Signal Generator & Spectrum Analyzer

Step	Action
	NOTE When preparing to calibrate a BTS with Duplexed TX and RX the RX cable calibration must be done using calibration setup in Figure 3-25 and the procedure in Table 3-29.
1	Connect a short test cable between the spectrum analyzer and the signal generator as shown in Figure 3-26, detail “A” (top portion of figure).
2	Set signal generator to –10 dBm at the customer’s RX frequency of: 824–849 for North American Cellular or 1850–1910 MHz band for North American PCS
3	Use spectrum analyzer to measure signal generator output (see Figure 3-26, A) and record the value.
4	Connect the test setup, as shown in the lower portion of the diagram (see Figure 3-26, B) to measure the output at the customer’s RX frequency of: 824–849 for North American Cellular or 1850–1910 MHz band for North American PCS Record the value at point B.
5	Calibration factor = (value measured with detail “A” setup) – (value measured with detail “B” setup) Example: Cal factor = –1 dBm – (–53.5 dBm) = 52.5 dB NOTE 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 test cable configuration as is to ensure test procedures use the correct calibration factor.

Figure 3-26: Cal Setup for Non-Duplexed RX Test Cabling Using Signal Generator & Spectrum Analyzer

Setting Cable Loss Values

Cable loss values for TX and RX test cable configurations are normally set by accomplishing automatic cable calibration using the LMF and the applicable test equipment. The LMF stores the measured loss values in the cable loss files. The cable loss values can also be set or changed manually. Follow the procedure in Table 3-31 to set cable loss values.

CAUTION	If cable calibration was performed without using the LMF, cable loss values <i>must</i> be manually entered in the LMF database. Failure to do this will result in inaccurate BTS calibration and reduced site performance.
----------------	---

Prerequisites

- LMF is logged into the BTS

Table 3-31: Setting Cable Loss Values

Step	Action
1	Click Util in the BTS menu bar, and select Edit > Cable Loss in the pull-down menus. – A <i>tabbed</i> data entry pop-up window will appear.
2	Click on the TX Cable Loss tab or the RX Cable Loss tab, as required.
3	To add a new channel number, perform the following:
3a	– Click on the Add Row button.
3b	– Click in the Channel # or Loss (dBm) column, as required.
3c	– Enter the desired value.
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	<i>For each tab with changes</i> , click on the Save button to save displayed values.
7	Click on the Dismiss button to close the window. NOTE • Values entered or changed after the Save button was used will be lost when the window is dismissed. • 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. It is not necessary to log out and log back into the LMF for changes to take effect.

Setting TX Coupler Loss Values

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 and RX FER Test. Follow the procedure in Table 3-32 to set coupler loss values.

Prerequisites

- LMF is logged into the BTS
- Path loss, in dB, of the TX coupler must be known

Setting loss values

Table 3-32: Setting TX Coupler Loss Value	
Step	Action
1	Click Util in the BTS menu bar, and select Edit > Coupler Loss... in the pull-down menus. – A <i>tabbed</i> data entry pop-up window will appear.
2	Click on the TX Coupler Loss tab or the RX Coupler Loss tab, as required
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	<i>For each tab with changes</i> , click on the Save button to save displayed values.
6	Click on the Dismiss button to close the window. NOTE • Values entered or changed after the Save button is used will be lost when the window is dismissed. • The In-Service Calibration check box in the Tools > Options > BTS Options tab must be checked before entered TX coupler loss values will be used by the TX calibration and audit functions. • New or changed values will be used by the LMF as soon as they are saved. Logging out and logging in again <i>are not required</i> to cause saved changes to take effect.

Bay Level Offset Calibration

Introduction

Bay Level Offset (BLO) calibration is the central activity of the optimization process. BLO calibration compensates for normal equipment variations within the BTS RF paths and assures the correct transmit power is available at the BTS antenna connectors to meet site performance requirements.

RF Path Bay Level Offset Calibration

Calibration identifies the accumulated gain in every transmit path (BBX slot) at the BTS site and stores that value in a BLO database calibration table in the LMF. The BLOs are subsequently downloaded to each BBX.

For starter frames, each receive path starts at a BTS RX antenna port and terminates at a backplane BBX slot. Each transmit path starts at a BBX backplane slot, travels through the Power Amplifier (PA) and terminates at a BTS TX antenna port.

For expansion frames each receive path starts at the BTS RX port of the cell site starter frame, travels through the frame-to-frame expansion cable, and terminates at a backplane BBX slot of the expansion frame. The transmit path starts at a BBX backplane slot of the expansion frame, travels through the PA and terminates at a BTS TX antenna port of the same expansion frame.

Calibration identifies the accumulated gain in every transmit path (BBX slot) at the BTS site and stores that value in a BLO database. Each transmit path starts at a C–CCP shelf backplane BBX slot, travels through the PA, and ends at a BTS TX antenna port. When the TX path calibration is performed, the RX path BLO is automatically set to the default value.

At omni sites, BBX slots 1 and 13 (redundant) are tested. At sector sites, BBX slots 1 through 12, and 13 (redundant) are tested. Only those slots (sectors) *actually equipped* in the current CDF are tested, regardless of physical BBX board installation in the slot.

When to Calibrate BLOs

Calibration of BLOs is required:

- After initial BTS installation
- Once each year
- After replacing any of the following components or associated interconnecting RF cabling:
 - BBX board
 - C–CCP shelf
 - CIO card
 - CIO to Power Amplifier backplane RF cable
 - PA backplane
 - PA
 - TX filter / TX filter combiner
 - TX thru-port cable to the top of frame

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.

NOTE *At new site installations*, to facilitate the complete test of each CCP shelf (if the shelf is not already fully populated with BBX boards), move BBX boards from shelves currently not under test and install them into the empty BBX slots of the shelf currently being tested to insure that all BBX 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 BBX slots are equipped. Edit the file as required to include BBX slots not currently equipped (per Systems Engineering documentation).

BLO Calibration Data File

During the calibration process, the LMF creates a **bts–n.cal** calibration (BLO) offset data file in the **bts–n** folder. After calibration has been completed, this offset data must be downloaded to the BBXs using the Download BLO function. An explanation of the file is shown below.

NOTE Due to the size of the file, Motorola recommends that you print out a hard copy of a bts.cal file and refer to it for the following descriptions.

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

Slot 1 contains the calibration data for the 12 BBX slots. Slot 20 contains the calibration data for the redundant BBX. Each BBX slot header block 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 including the slot header and actual calibration data.

- The calibration data for a BBX is organized as a large flat array. The array is organized by branch, sector, 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:

Table 3-33: BLO BTS.cal File Array Assignments	
Range	Assignment
C[1]–C[240]	Transmit
C[241]–C[480]	Main Receive
C[481]–C[720]	Diversity Receive

NOTE Slot 385 is the BLO for the RFDS.

- The second breakdown of the array is per sector. Configurations supported are Omni, 3–sector or 6–sector.

Table 3-34: BTS.cal File Array (Per Sector)					
BBX	Sectorization		TX	RX	RX Diversity
Slot[1] (Primary BBXs 1 through 12)					
1 (Omni)	6 Sector, 1st Carrier	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, 3rd 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]
7	6 Sector, 2nd Carrier	3–Sector, 2nd Carrier	C[121]–C[140]	C[361]–C[380]	C[601]–C[620]
8			C[141]–C[160]	C[381]–C[400]	C[621]–C[640]
9			C[161]–C[180]	C[401]–C[420]	C[641]–C[660]
10		3–Sector, 4th Carrier	C[181]–C[200]	C[421]–C[440]	C[661]–C[680]
11			C[201]–C[220]	C[441]–C[460]	C[681]–C[700]
12			C[221]–C[240]	C[461]–C[480]	C[701]–C[720]

... continued on next page

Table 3-34: BTS.cal File Array (Per Sector)

Table 3-34: BTS.cal File Array (Per Sector)					
BBX	Sectorization		TX	RX	RX Diversity
Slot[20] (Redundant BBX-13)					
1 (Omni)	6 Sector, 1st Carrier	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, 3rd 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]
. . . continued on next page					
7	6 Sector, 2nd Carrier	3-Sector, 2nd Carrier	C[121]–C[140]	C[361]–C[380]	C[601]–C[620]
8			C[141]–C[160]	C[381]–C[400]	C[621]–C[640]
9			C[161]–C[180]	C[401]–C[420]	C[641]–C[660]
10		3-Sector, 4th Carrier	C[181]–C[200]	C[421]–C[440]	C[661]–C[680]
11			C[201]–C[220]	C[441]–C[460]	C[681]–C[700]
12			C[221]–C[240]	C[461]–C[480]	C[701]–C[720]

- Ten calibration points per sector are supported for each branch. Two entries are required for each calibration point.
- The first value (all odd entries) refer to the CDMA channel (frequency) where the BLO is measured. The second value (all even entries) is the power set level. The valid range for PwrLvlAdj is from 2500 to 27500 (2500 corresponds to –125 dBm and 27500 corresponds to +125 dBm).
- The 20 calibration entries for each sector/branch combination must be stored in order of increasing frequency. If less than 10 points (frequencies) are calibrated, the largest frequency that is calibrated is repeated to fill out the 10 points.

Example:

$C[1]=384,$ *odd cal entry*
= 1 “calibration point”

$C[2]=19102,$ *even cal entry*

$C[3]=777,$

$C[4]=19086,$

.

.

$C[19]=777,$

$C[20]=19086,$ (since only two cal points were calibrated this would be repeated for the next 8 points)

- When the BBX is loaded with image = data, the cal file data for the BBX is downloaded to the device in the order it is stored in the cal file. TxCal data is sent first, C[1] – C[240]. Sector 1’s ten calibration points are sent (C[1] – C[20]) followed by sector 2’s ten calibration points (C[21] – C[40]), etc. The RxCal data is sent next (C[241] – C[480]), followed by the RxDCal data (C[481] – C[720]).
- Temperature compensation data is also stored in the cal file for each set.

Test Equipment Set-up for RF Path Calibration

Follow the procedure in Table 3-35 to set up test equipment.

Table 3-35: Set Up Test Equipment for RF Path Calibration	
Step	Action
1	<i>If it has not already been done</i> , refer to the procedure in Table 3-5 (on page 3-17) to interface the LMF computer terminal to the frame LAN A connector.
2	<i>If it has not already been done</i> , refer to Table 3-6 (on page 3-26) to start a <i>GUI</i> LMF session.
3	If required, calibrate the test equipment per the procedure in Table 3-27 (on page 3-78).
	NOTE Verify the GPIB controller is properly connected and turned on.
4	! CAUTION To prevent damage to the test equipment, all transmit (TX) test connections must be via the 30 dB directional coupler for 800 MHz with an additional 20 dB in-line attenuator for 1.7/1.9 GHz. <i>For TX path calibration</i> , connect the test equipment as shown in Figure 3-16, Figure 3-17, or Figure 3-19, depending on the communications analyzer being used.

Transmit (TX) Path Calibration Description

The assigned channel frequency and power level (as measured at the top of the frame) for transmit calibration are derived from the site CDF files. For each BBX, the channel frequency is specified in the `ChannelList` CDF file parameter and the power is specified in the `SIFPilotPwr` CDF file parameter for the sector associated with the BBX (located under the `ParentSECTOR` field of the `ParentCARRIER` CDF file parameter).

NOTE	If both the <code>BTS-x.cdf</code> and <code>CBSC-x.cdf</code> files are current, all information will be correct on the LMF. If not, the carrier and channel will have to be set for each test.
-------------	--

The calibration procedure attempts to adjust the 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 Bay Level Offset at sites **WITHOUT** the directional coupler option, is approximately 42.0 dB ± 3.0 dB.

- At sites **WITHOUT** RFDS option, BLO is approximately 42.0 dB ± 4.0 dB. A typical example would be TX output power measured at BTS (36.0 dBm) minus the BBX TX output level (approximately -6.0 dBm) would equate to 42 dB BLO.

The TX Bay Level Offset at sites **WITH** the directional coupler option, is approximately 41.4 dB ± 3.0 dB. TX BLO = Frame Power Output minus BBX output level.

- Example: TX output power measured at RFDS TX coupler (39.4 dBm) minus the BBX TX output level (approximately -2.0 dBm) and RFDS directional coupler/cable (approximately -0.6 dBm) would equate to 41.4 dB BLO.

TX Calibration and the LMF

The LMF **Tests > TX > TX Calibration...** and **Tests > All Cal/Audit...** selections perform TX BLO calibration testing for installed BBX(s). The **All Cal/Audit...** selection initiates a series of actions to perform TX calibration, and if calibration is successful, download BLO and perform TX audit. The **TX Calibration...** selection performs only TX calibration. When **TX Calibration...** is used, BLO download and TX audit *must be performed as separate activities*. The CDMA Test Parameters window which opens when **TX Calibration...** or **All Cal/Audit...** is selected contains several user-selectable features which are described in the following subsections.

Rate Set Drop-down Pick List

The Rate Set Drop-down Box is enabled if at least one MCC card is selected for the test. The available options for TX tests are **1** = 9600, and **3** = 9600 1X. Option **3** is only available if 1X cards are selected for the test. The available transfer rate options for RX tests are **1** = 9600 and **2** = 14400. Option **2** is only available if no 1X cards are selected.

Verify BLO

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.

Single-Sided BLO Checkbox

Another option that appears in the pull-down menu is **Single-sided BLO**. Normally valid BLO values are some value plus-or-minus some offset. The ranges that we currently use for calibration are wider than necessary to accommodate the redundant BBX. The lower half of that range is where non-redundant BBXs should be. When **Single-sided BLO** is selected, the result is only considered a success if it is in the lower half of the range. If it was normally a success from 37–47 (which is 42 ± 5), **Single-sided BLO** would make it a success only if the result was from 37–42. To get the more stringent conditions, the operator checks **Single-sided BLO** when calibrating non-redundant transceivers. **Single-sided BLO** carries the likelihood of more failures. This option should only be used by experienced CFEs.

Test Pattern Drop-down Pick List

The **Tests > TX > TX Calibration...** menu window has a **Test Pattern** pull-down menu. This menu has the following choices:

- **Pilot** (default) – performs tests using a pilot signal only. This pattern should be used when running in-service tests. It only requires a BBX to do the test.
- **Standard** – performs the tests using pilot, synch, paging and six traffic channels. This pattern should be used on all non-in-service tests. **Standard** requires a BBX and an MCC. **Standard** uses gain values specified by the IS97 standard.
- **CDFPilot** – performs the tests using the pilot signal, however, the gain is specified in the CDF file. Advanced users may use **CDFPilot** to generate a Pilot pattern using the value specified by the PilotGain parameter in the CDF file instead of a pre-determined value.
- **CDF** – performs the tests using pilot, synch, paging and six traffic channels, however, the gain for the channel elements is specified in the CDF file. Advanced users may use **CDF** to generate a standard pattern. Instead of using the values specified by IS97, the settings for the following CDF parameters are used:
 - PilotGain
 - PchGain
 - SchGain
 - NomGain1Way

Set-up for TX Calibration

The workaround in Table 3-36 allows the user to manually set the BLO limits to ensure that the redundant BBX BLO test does not fail due to the preset offset being incorrectly set for the frame under test. A future LMF release will correct this problem.

Table 3-36: Initial Set-up for TX Calibration		
✓	Step	Action
	1	Delete the existing calibration file (if any) from the BTS folder on LMF laptop from the location C:\wlmf\cdma\bts-# , where # is the BTS number.
	2	To edit the nominal TX BLO, from the Util menu, select Edit > TX Nominal Offset . In the TX Cal Parameter window, make any necessary changes to ensure the Tx BLO Nominal Offset (in dB) is correct: – For 800 MHz, the value is 45.0 (dB), OR – For 1900 MHz, the value is 43.0 (dB).
	3	Download the data, which includes BLO values, to all the BBXs. From the Device menu, select Download > Data

TX Calibration

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

CAUTION Always wear an approved anti-static wrist strap while handling any circuit card or module. If this is not done, there is a high probability that the card or module could be damaged by ESD.

All Cal/Audit and TX Calibration Procedure

The LMF All Cal/Audit and TX calibration procedures are essentially identical, except for the step that selects the type of procedure desired (Refer to Step 4 in Table 3-37).

Prerequisites

Before running this procedure, be sure that the following have been done:

- The card in slot CSM 1, GLIs, MCCs, and BBXs have correct code and data loads.
- Primary CSM and MGLI are INS_ACT (bright green).
- All BBXs are OOS_RAM (yellow).
- If running calibration or audit using a test pattern *other than Pilot*, MCCs are INS_ACT (bright green).
- Test equipment and test cables are calibrated and connected for TX calibration.
- LMF is logged into the BTS in the GUI environment.

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

All Cal Audit/TX Path Calibration procedure

Follow the procedure in Table 3-37 to perform the All Cal/Audit and TX path calibration test.

Table 3-37: All Cal/Audit and TX Calibration Procedure		
✓	Step	Action
	1	If it has not already been done, configure test equipment for TX calibration by following the procedure in Table 3-35.
	2	Click on the BBX(s) to be calibrated.
	3	If the Test Pattern to be used is Standard , CDFPilot , or CDF , select at least one MCC (refer to “Test Pattern Drop-down Pick List” under “TX Calibration and the LMF” in this section).

... continued on next page

Table 3-37: All Cal/Audit and TX Calibration Procedure

✓	Step	Action
	4	For All Cal Audit... - Click Tests in the BTS menu bar, and select TX > All Cal/Audit... from the pull-down menus. A CDMA Test Parameters window will appear. For TX Calibration - Click Tests in the BTS menu bar, and select TX > TX Calibration from the pull-down menus. A CDMA Test Parameters window will appear.
	5	Select the appropriate carrier(s) and sector(s) (carrier-bts#-sector#-carrier#) from those displayed in the Channels/Carrier pick list. NOTE To select multiple items, hold down the Shift or Ctrl key while clicking on pick list items to select multiple carrier(s)–sector(s).
	6	Verify that the correct channel number for the selected carrier is shown in the Carrier # Channels box. If it is not, obtain the latest bts-#.cdf (or bts-#.necf) and cbse-#.cdf files from the CBSC. NOTE If necessary, the correct channel number may be manually entered into the Carrier # Channels box.
	7	If at least one MCC was selected in Step 3, select the appropriate transfer rate (1 = 9600, 3 = 9600 1X) from the drop-down list in the Rate Set box. NOTE The rate selection of 3 is only available if 1X cards are selected for the test.
	8	If Verify BLO is to be used during the calibration, leave the checkbox checked (default).
	9	If Single-Sided BLO is to be used during the calibration, click on the checkbox. * IMPORTANT Single-Sided BLO should only be used for primary BBXs. Do not check the box when calibrating the <i>redundant</i> BBX.
	10	In the Test Pattern box, select the test pattern to use for the calibration from the drop-down list (refer to “Test Pattern Drop-down Pick List” under “TX Calibration and the LMF” in this section – see page 3-91).
	11	Click OK to display the status report window followed by a Directions pop-up window.
	12	Follow cable connection directions as they are displayed. When the calibration process is completed, results will be displayed in the status report window.
	13	Click on the Save Results or Dismiss button, as desired, 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 BBXs. BLO data is extracted from the CAL file for the Base Transceiver Subsystem (BTS) and downloaded to the selected BBX 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 is successfully completed.

Follow the steps in Table 3-38 to download the BLO data to the BBXs.

Table 3-38: Download BLO		
✓	Step	Action
	1	Select the BBX(s) to be downloaded.
	2	Click Device in the BTS menu bar, and select Download > BLO from the pull-down menus. A status report window displays the result of the download. NOTE Selected device(s) do not change color when BLO is downloaded.
	3	Click on OK to close the status report window.

Calibration Audit Introduction

The BLO calibration audit procedure confirms the successful generation and storage of the BLO calibration offsets. The calibration audit procedure measures the path gain or loss of every BBX 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.

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

TX Path Audit

Perform the calibration audit of the TX paths of all equipped BBX slots per the procedure in Table 3-39

WARNING	<i>Before</i> installing any test equipment directly to any TX OUT connector, <i>first verify there are no CDMA BBX channels keyed</i> . 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 .
-------------	--

3

TX Audit Test

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

Prerequisites

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

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

TX Path Audit procedure

After a TX calibration has been performed, or if verification of BLO data in the CAL file is required, follow the procedure in Table 3-39 to perform a BTS TX path audit.

Table 3-39: BTS TX Path Audit

✓	Step	Action
	1	<i>If it has not already been done</i> , configure test equipment for TX path audit by following the procedure in Table 3-35 (TX audit uses the same configuration as TX calibration).
	2	Select the BBX(s) to be audited.
	3	If the Test Pattern to be used is Standard , CDFPilot or CDF , select at least one MCC (refer to “Test Pattern Drop–down Pick List” under “TX Calibration and the LMF” in this section).
	4	Click Tests in the BTS menu bar, and select TX>TX Audit... from the pull–down menus. A CDMA Test Parameters window will appear.
	5	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) from those displayed in the Channels/Carrier pick list. NOTE To select multiple items, hold down the Shift or Ctrl key while clicking on pick list items to select multiple carrier(s)–sector(s).
	6	Verify that the correct channel number for the selected carrier is shown in the Carrier # Channels box. If it is not, obtain the latest bts–#.cdf (or bts–#.necf) and cbse–#.cdf files from the CBSC. NOTE The correct channel number may be manually entered into the Carrier # Channels box.
	7	If at least one MCC was selected in Step 2, select the appropriate transfer rate (1 = 9600, 3 = 9600 1X) from the drop–down list in the Rate Set box. NOTE The rate selection of 3 is only available if 1X cards are selected for the test.
	8	Select Verify BLO (default) or Single–sided BLO . NOTE Single–sided BLO is only used when checking non–redundant transceivers.
	9	In the Test Pattern box, select the test pattern from the drop–down list (refer to “Test Pattern Drop–down Pick List” – see page 3-91).
	10	Click OK to display the status report window followed by a Directions pop-up window.
	11	Follow the cable connection directions as they are displayed. When the calibration process is completed, results will be displayed in the status report window.
	12	Click on the Save Results or Dismiss button, as desired, 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*.

All Cal/Audit Test

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

NOTE If the TX calibration portion of the test passes, the BLO data is automatically downloaded to the BBX(s) before the audit portion of the test is run.

Prerequisites

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

- CSM–1, GLIs, BBXs have correct code and data loads.
- Primary CSM and MGLI are INS.
- All BBXs are OOS_RAM.
- Test equipment and test cables are calibrated and connected for TX BLO calibration.
- LMF is logged into the BTS.

Follow the procedure in Table 3-40 to perform the All Cal/Audit test.

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

Table 3-40: All Cal/Audit Test

✓	Step	Action
	1	Select the BBX(s) to be tested. NOTE If STANDARD , CDFPilot , or CDF is selected for the TEST PATTERN , then at least one MCC must be also selected.
	2	From the Tests menu, select All Cal/Audit .
	3	Select the appropriate carrier(s) displayed in the Channels/Carrier pick list. Press and hold the <Shift> or <Ctrl> key to select multiple items.
	4	Type the appropriate channel number in the Carrier n Channels box.
	5	If at least one MCC was selected in Step1 select the appropriate transfer rate (1 = 9600, 3 = 9600 1X) from the drop–down list in the Rate Set box. NOTE The rate selection of 3 is only available if 1X cards are selected for the test.
	6	Select Verify BLO or Single–sided BLO . NOTE Single–sided BLO is only used when checking non–redundant transceivers.
	7	In the Test Pattern box, select the test pattern from the drop–down list (refer to “Test Pattern Drop–down Pick List” – see page 3-91).
	8	Click on OK .

... continued on next page

Table 3-40: All Cal/Audit Test

✓	Step	Action
	9	Follow the cable connection directions as they are displayed. A status report window displays the test results.
	10	Click on Save Results or Dismiss to close the status report window.

Create CAL File

3

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 exists. Note the following:

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

WARNING The user is not encouraged to edit the CAL file 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 is lost.

Prerequisites

Before running this test, the following should be done:

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

Creating a CAL File

Table 3-41: Create CAL File

✓	Step	Action
	1	Select the applicable BBXs. NOTE The CAL file is only updated for the selected BBXs.
	2	Click on the Device menu.
	3	Click on the Create Cal File menu item. A status report window displays the results of the action.
	4	Click OK to close the status report window.

RFDS Set–up and Calibration

RFDS Description

NOTE	The RFDS is not available for the –48 V BTS at the time of this publication.
-------------	--

The optional RFDS performs RF tests of the site from the CBSC or from an LMF. The RFDS consists of the following elements:

- Antenna Select Unit (ASU)
- Fixed Wireless Terminal 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 on–line documentation*.

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 3-42 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
(9600 system 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. Because the bts-#.cdf file is generated on a Unix system, a more sophisticated editor, such as <i>MicroSoft WordPad</i> , will display file content in a more easily–read format than many simple text editors.
-------------	---

Checking and Setting RFDS Parameters

Follow the procedure in Table 3-42 to review and/or edit RFDS parameters.

Table 3-42: RFDS Parameter Settings

Step	Action
1	Important! Log out of the BTS prior to performing this procedure.
2	Using a text editor, verify the following fields are set correctly in the bts-#.cdf file: EXAMPLE: <pre> Asu1Equip = 1 Asu2Equip = 0 (1 if system is non-duplexed) Mc1Equip = 0 Mc2Equip = 0 Mc3Equip = 0 Mc4Equip = 0 RfdsEquip = 2 TestOrigDN = '123456789' TsuEquip = 1 </pre> NOTE The above is an example of entries extracted from the bts-#.cdf 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.
3	Save changes and/or quit the editor.
4	Log into the BTS using an LMF <i>GUI</i> session (refer to Table 3-6).
5	If <i>no</i> changes were made to the bts-#.cdf file fields listed in Step 2, proceed to Step 6. If changes <i>were</i> made, continue with Step 8.
	NOTE To make certain the complete data download is accepted, the MGLI should be OOS_RAM (yellow) when RFDS parameter settings are downloaded.
6	When changes are made to RFDS parameters in the bts-#.cdf file, data must be downloaded to the MGLI by performing the following:
6a	– To be sure it does not take control when the MGLI is disabled, <i>manually</i> disable the redundant GLI card by unseating it from the backplane connectors and sliding it partially out of the shelf slot.
6b	– Click on the MGLI.
6c	– Click on Device in the BTS menu bar, and select Disable from the pull-down menu. A status report window shows the status of the operation.
6d	– When the operation is complete, click OK to close the status report window.
6e	– Click on the MGLI (now OOS_RAM (yellow)).
6f	– Click on Device in the BTS menu bar, and select Download > Data from the pull-down menus (<i>selected devices do not change color when data is downloaded</i>). A status report window shows the status of the download.
6g	– Click OK to close the status report window.
6h	– Click on the MGLI.

... continued on next page

Table 3-42: RFDS Parameter Settings

Step	Action
6i	– Click on Device in the BTS menu bar, and select Enable from the pull-down menu. A status report window shows the status of the operation.
6j	– When the operation is complete, click OK to close the status report window.
	! CAUTION When the MGLI changes to INS_ACT, data will automatically be downloaded to the RFDS. During this process, 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 steady green.
6k	– Re-seat the redundant GLI card into the backplane connectors and lock it in place with the ejector tabs.
6l	– Once the redundant GLI initializes, download data to it by selecting the card and, in the BTS menu bar, clicking Device and selecting Download > Data from the pull-down menus.
7	Any MCCs that were INS_ACT when the MGLI was disabled must be disabled, downloaded with data, and re-enabled as follows:
7a	– Select the devices to be reset by clicking on them or using Select from the BTS menu bar and clicking on MCCs in the pull-down menu.
7b	– In the BTS menu bar, click on Device and select Disable from the pull-down menu. A status report window shows the status of the operation.
7c	– Click OK to close the status report window.
7d	– Repeat Step 7a to select the MCCs.
7e	– Click on Device in the BTS menu bar and select Download > Data from the pull-down menu. (Selected devices do not change color when data is downloaded.)
	– A status report window shows the status of the download.
7f	– Click on OK to close the status report window.
7g	– When data download is complete, enable the MCCs by following the procedure in Table 3-17.
8	Click on the RFDS tab.
9	Status the RFDS TSU by performing the following:
9a	– Click on the SUA to select it.
9b	– Click on TSU in the BTS menu bar, and select Status TSU from the pull-down menu. A status report shows the software version number for the TSIC and SUA.
9c	– Click OK to close the status report window.
	NOTE If the LMF displays an error message, check the following: • Ensure AMR cable is correctly connected from the BTS to the RFDS. • Verify RFDS has power. • Verify RFDS status LED is green. • Verify entries in RFDS fields of the bts-#.cdf file are correct (refer to Step 2). • Status the MGLI and ensure it is communicating (by Ethernet) with the LMF, and is in the proper state (INS_ACT (bright green)).

RFDS TSU NAM Programming

The Number Assignment Module (NAM) 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 3-43 defines the parameters used when editing the tsu.nam file.

Table 3-43: 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 used in operation of the system.
Lock_Code Security_Code Service_Level Station_Class_Mark	Do <i>not</i> change.
IMSI_11_12 IMSI_MCC	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	This field is the phone number assigned to the mobile. The ESN and MIN should 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.

Valid NAM Ranges

Table 3-44 provides the valid NAM field ranges. If any of the fields are missing or out of range, the RFDS errors out.

Table 3-44: 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 need to be entered if an RFDS is not installed. The antenna map data is only used for RFDS tests and is required if an RFDS is installed.

Prerequisite

- Logged into the BTS

Follow the procedure in Table 3-45 to set antenna map data for the RFDS.

Table 3-45: Set Antenna Map Data

Step	Action
1	Click on Util in the BTS menu bar, and select Edit > Antenna Map... from the pull-down menus. A <i>tabbed</i> data entry pop-up window will appear.
2	In the data entry pop-up window, click on the TX Antenna Map or RX Antenna Map tab to select the antenna map to be edited.
3	Locate the carrier and sector number for which data is to be entered or edited, and click in the column where entry or editing is needed.
4	Enter/edit Antenna # and Antenna Label column data as needed for each carrier. NOTE Refer to the CDMA Help > Utility Menu > Edit-Antenna Map... section of <i>LMF Help function on-line documentation</i> for antenna map examples.
5	<i>For each tab with changes</i> , click on the Save button to save displayed values.
6	Click on the Dismiss button to close the window. NOTE • Values entered or changed after the Save button was used will be lost when the window is dismissed. • Entered values will be used by the LMF as soon as they are saved. It is not necessary to log out and log back into the LMF for changes to take effect.

Set RFDS Configuration Data

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

Prerequisite

- LMF is logged into the BTS

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

Follow the procedure in Table 3-46 to set the RFDS Configuration Data.

Table 3-46: Set RFDS Configuration Data	
Step	Action
1	Click on Util in the BTS menu bar, and select Edit > RFDS Configuration... from the pull-down menus. A <i>tabbed</i> data entry pop-up window will appear.
2	In the data entry pop-up window, click on the TX RFDS Configuration or RX RFDS Configuration tab, as required.
3	To add a new antenna number, perform the following:
3a	– Click on the Add Row button.
3b	– Click in the Antenna # , Cal Antenna , Scap Antenna , or Populate [Y/N] columns, as required.
3c	– 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 CDMA Help > Utility Menu > Edit–RFDS Configuration... section of <i>LMF Help function on-line documentation</i> for RFDS configuration data examples.
5	To delete a row, click on the row and then click on the Delete Row button.
6	<i>For each tab with changes</i> , click on the Save button to save displayed values.
7	Click on the Dismiss button to close the window. NOTE • Values entered or changed after the Save button was used will be lost when the window is dismissed. • Entered values will be used by the LMF as soon as they are saved. It is not necessary to log out and log back into the LMF for changes to take effect.

RFDS Calibration

The RFDS Calibration option is used to calibrate the RFDS TX and RX paths.

TX Path Calibration – 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.

RX Path Calibration – 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 BBX. A CDMA signal at the same power level measured by the BTS BBX is then injected at the RX antenna directional coupler by the communications system analyzer. The difference (offset) between the RFDS-keyed power level and power level measured at the BTS BBX is the RFDS RX calibration offset value.

RFDS calibration and the CAL file – The TX and RX RFDS calibration offset values are written to the CAL file in the slot[385] Block.

TSIC channel frequency – 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 3-47.

Table 3-47: RFDS TSIC Calibration Channel Frequencies	
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 channels keyed**. Failure to do so can result in serious personal injury and/or equipment damage.

Prerequisites

- Test equipment has been selected.
- Test equipment and test cables have been calibrated.
- TX calibration has been performed and BLO data has been downloaded to the BBXs.
- Test equipment and test cables are connected for TX calibration.
- Antenna map data has been entered for the site.
- BBXs are OOS-RAM.

RFDS Calibration Procedure

Follow the procedure in Table 3-48 to perform RFDS calibration.

Table 3-48: RFDS Calibration Procedure	
Step	Action
1	In the LMF, select the CDMA BTS–xxx tab.
2	<i>If the BTS Control button is not selected (no black dot showing), click on the B button in the BTS menu bar to select it.</i>
3	Select the BBX(s) assigned to the carrier(s) and sector(s) which will be used in RFDS calibration (refer to Table 1-6 for BBX carrier and sector assignments).
4	Click on RFDS in the BTS menu bar, and select RFDS Calibration... from the pull-down menu. An RFDS Calibration set-up window will be displayed.
5	In the Tests to Perform box, select TX Calibration or RX Calibration , as required
6	Enter the appropriate channel number(s) (refer to Table 3-47) in the Channel Field box. To enter more than one channel number, use the following methods: – Separate <i>non</i>–sequential channel numbers with a comma and <i>no spaces</i>; for example: 247,585,742. – Enter a range of sequential channels by typing the first and last channel numbers in the range separated by a dash and <i>no spaces</i>; for example: 385–395.
7	If the frame is equipped with TX combiners, click in the Has Combiners checkbox.
8	Select the appropriate carrier(s) and sector(s) from the Carriers pick list (hold down the Shift or Ctrl key while clicking on pick list items to select multiple carrier(s)–sector(s)).
9	Select the appropriate Rx branch (Main , Diversity or Both) in the drop-down list if performing RX calibration.
10	Click on the OK button. A status report window is displayed, followed by a Directions pop-up window.
11	Follow the cable connection directions as they are displayed.
12	When the test is completed, test results are displayed in the status report window.
13	Click on the OK button to close the status report window.
14	Click on the Frame tab.
15	Select the MGLI by clicking on it.
16	Download updated RFDS offset data to the MGLI (see Step 6 in Table 3-42).

Program 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

Ensure the following prerequisites have been met before proceeding:

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

Program NAM Procedure

Follow the procedure in Table 3-49 to program the TSU NAM.

Table 3-49: Program the TSU NAM	
Step	Action
1	Select the RFDS tab.
2	Select the SUA (Cobra RFDS) or TSU (GLI based RFDS).
3	Click on TSU in the BTS menu bar, and select Program TSU NAM from the pull-down menu. A NAM programming window will appear.
4	Enter the appropriate information in the boxes (see Table 3-43 and Table 3-44).
5	Click on the OK button to display the status report.
6	Click on the OK button to close the status report window.

BTS Redundancy/Alarm Testing

Objective

This section tests the redundancy options that could be included in the cell site. These tests verify, under a fault condition, that all modules equipped with redundancy switch operations to their redundant partner and resume operation. An example would be to pull the currently active CSM and verify the standby CSM takes over distribution of the CDMA reference signal.

Redundancy covers many BTS modules. Confirm the redundant options included in the BTS, and proceed as required. If the BTS has *only* basic power supply redundancy, the tests and procedures detailed in the following tables should be bypassed.

- Table 3-52. Miscellaneous Alarm Tests (BTS Frame)
- Table 3-53. BBX Redundancy Tests (BTS Frame)
- Table 3-54. CSM, GPS, & LFR/HSO Redundancy Alarm Tests
- Table 3-55. PA Redundancy Test
- Table 3-56. MGLI/GLI Redundancy Test

During redundancy verification of the test, alarms reported by the master GLI (displayed via the alarm monitor) will also be verified/noted.

Test Equipment

The following pieces of test equipment are required to perform this test:

- LMF
- Communications Test Set

Redundancy/Alarm Test

Perform each of the following tests to verify BTS redundancy and to confirm all alarms are received and reported by the BTS equipment. The procedures should be performed on the following modules/boards:

- Power supply/converter modules in all frames
- Distribution shelf modules in the BTS frame
- C–CCP shelf modules in the BTS frame (except MCCs)
- PA modules in the BTS frame
- AMR Customer defined input/output tests

Test Equipment Setup

Follow the procedure in Table 3-50 to set up test equipment:

NOTE	All alarm tests are performed using TX antenna 1
-------------	--

Table 3-50: Test Equipment Setup for Redundancy/Alarm Tests

Step	Action
1	Interface the LMF computer to the BTS LAN A connector on the BTS frame (refer to Table 3-5, page 3-17).
2	Login to the BTS.
3	Set up test equipment for TX Calibration at TXOUT1 (see Figure 3-16). NOTE <i>If site is not equipped for redundancy</i> , remove all GLI and BBX boards installed in any redundant slot positions at this time.
4	Display the alarm monitor by selecting Util>Alarm Monitor .
5	Unequip all customer defined AMR alarms reported via the AMR Alarm connector (A & B) by clicking on MGLI , then selecting Device>Set Alarm Relays>Unequipped . NOTE During configuration of MGLI alarm reporting, spurious alarms may report. Allow the BTS to stabilize for 10 seconds. If any alarms are actively being reported after the BTS has stabilized, determine the cause before proceeding further.

Power Supply Redundancy

Follow the steps in Table 3-51 to verify redundancy of the power supply modules. Alarms reported by the master GLI (displayed via the alarm monitor) are also verified.

Table 3-51: Power Supply/Converter Redundancy (BTS Frame)

Step	Action
1	Select the MGLI (highlight) and from the pulldown menu select: Device>BBX/MAWI>Set Redundant Sector>Carrier-#-1-1 Device>BBX/MAWI>Set Pilot Only>Carrier-#-1-1 Device>BBX/MAWI>Set Pilot Gain>Carrier-#-1-1 and Pilot Gain = 262
2	Select (highlight) BBX-1 and from the pulldown menu select Device>BBX/MAWI>Key .
3	Set XCVR gain to 40 and enter the correct XCVR channel number.
4	Remove PS-1 from the power distribution shelf (see Figure 3-27). - Observe that an alarm message is reported via the MGLI as displayed on the alarm monitor. - Verify no other modules went OOS.
5	Re-install PS-1. Observe the alarm clears on the alarm monitor.
6	Repeat steps 4 and 5 for PS-2 and PS-3. NOTE For +27 V systems, skip to step 7 through step 10.
7	On -48 V systems, remove PS-4 (see Figure 3-28). - Observe that an alarm message is reported via the MGLI as displayed on the alarm monitor. - Verify no other modules went OOS.
8	Re-install PS-4. Observe the alarm clears on the alarm monitor.
9	Repeat steps 7 and 8 for PS-5 through PS-9.
10	Verify that all PWR/ALM LEDs are GREEN.
11	Select BBX-1 and Device>BBX/MAWI>Dekey

Figure 3-27: SC 4812T C-CCP Shelf

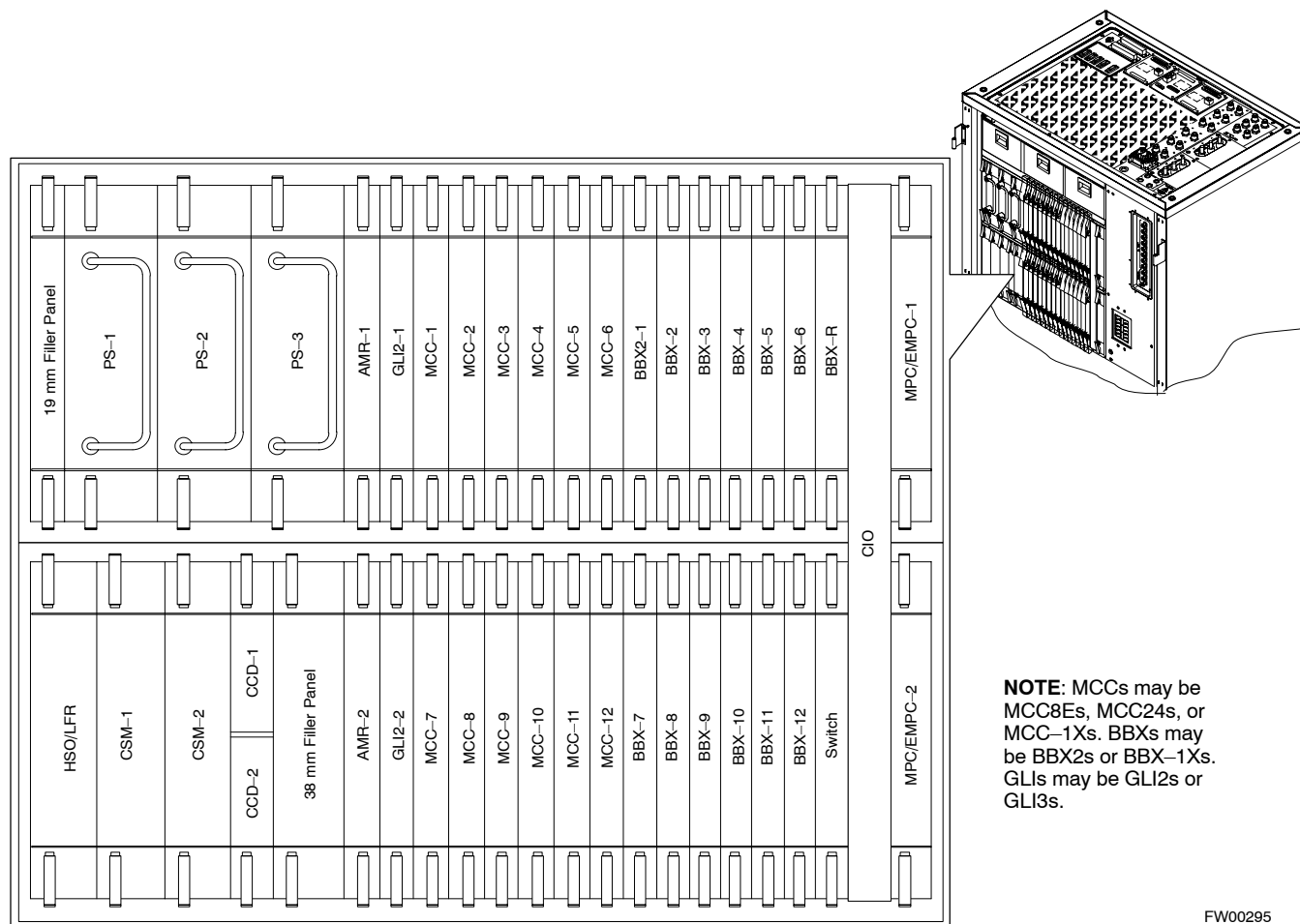
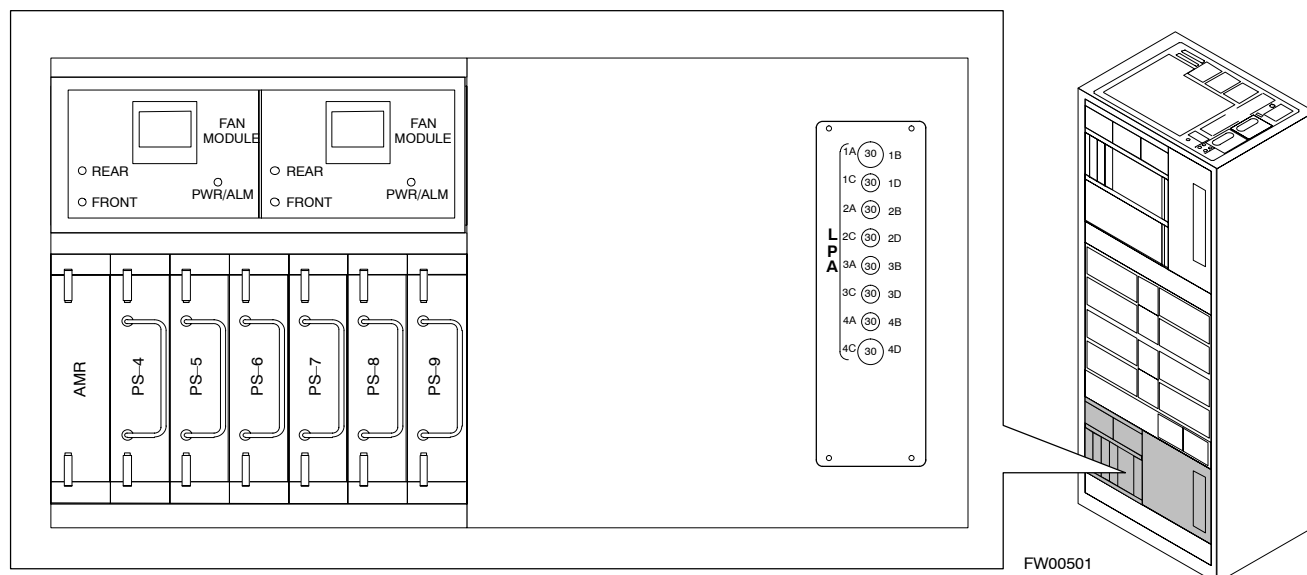


Figure 3-28: -48 V BTS Power Conversion Shelf

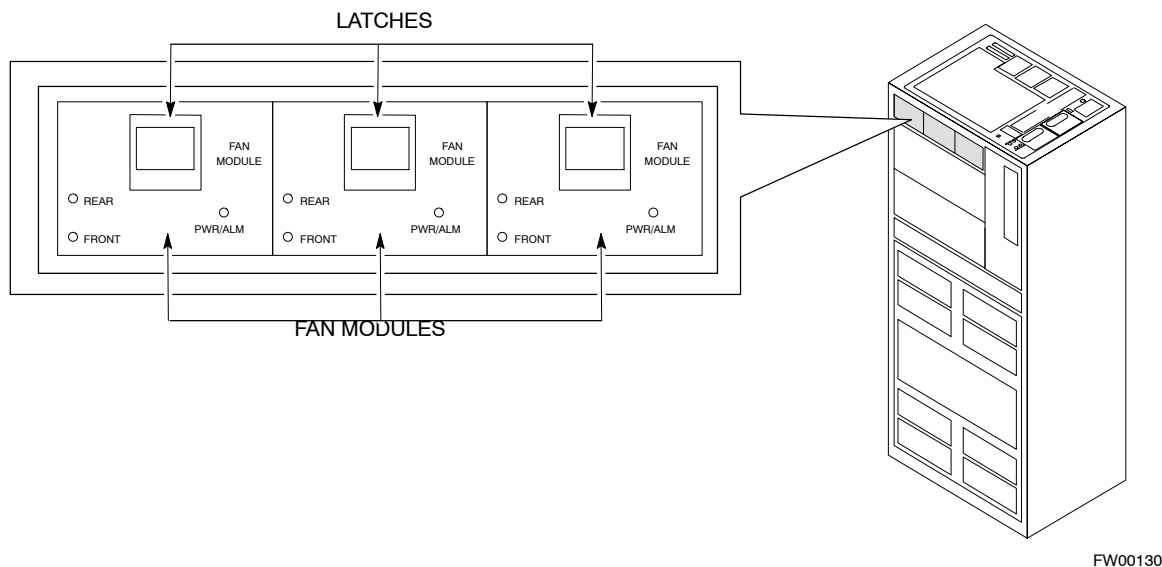
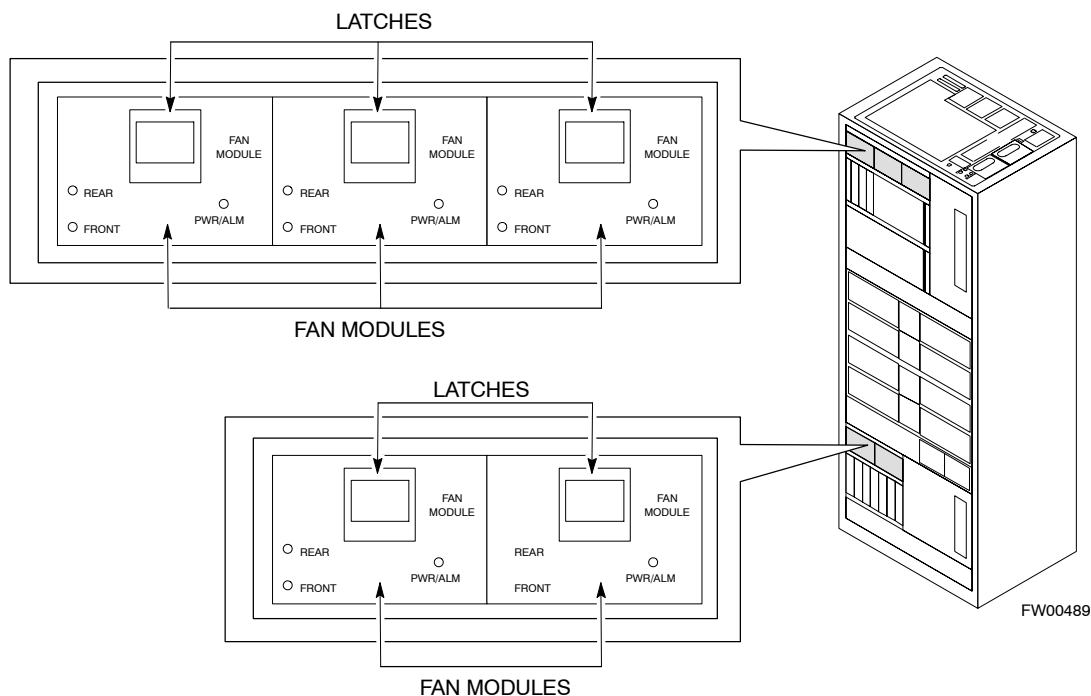


Miscellaneous Alarm/Redundancy Tests

Follow the steps in Table 3-52 to verify alarms reported by the master GLI are displayed via the alarm monitor if a BTS frame module failure occurs.

Table 3-52: Miscellaneous Alarm Tests

Step	Action
1	Select Util>Alarm Monitor to display the alarm monitor window.
2	Perform the following to verify fan module alarms: • Unseat a fan module (see Figure 3-29 or Figure 3-30). • Observe an alarm message was reported via the MGLI (as displayed on the alarm monitor). • Replace fan module and verify the alarm monitor reports that the alarm clears. • Repeat for all other fan modules in the BTS frame.
	NOTE Follow Step 3 for Starter Frames and Step 4 for Expansion Frames.
3	<i>Starter Frames Only: Perform the following to verify MPC module alarms.</i> • Unseat MPC modules (see Figure 3-27) one at a time. • Observe that an alarm message was reported via the MGLI as displayed on the alarm monitor. • Replace the MPC modules and verify the alarm monitor reports the alarm clears.
4	<i>Expansion Frames Only: Perform the following to verify EMPC module alarms.</i> • Unseat EMPC modules (see Figure 3-27) one at a time • Observe that an alarm message was reported via the MGLI as displayed on the alarm monitor. • Replace the EMPC modules and verify the alarm monitor reports that the alarm clears.
5	If equipped with AMR redundancy, perform the following to verify AMR module redundancy/alarms. • Unseat AMR 2 (see Figure 3-27). • Observe that an alarm message is reported via the MGLI (as displayed on the alarm monitor). • Repeat Steps 1 through 3 and/or 4. • Replace the AMR module and verify the alarm monitor reports that the alarm clears. • Unseat AMR 1 and observe an alarm message was reported via the MGLI (as displayed on the alarm monitor). • Replace the AMR module and verify the LMF reports the alarm has cleared.
	NOTE All PWR/ALM LEDs should be GREEN at the completion of this test.

Figure 3-29: +27 V BTS C-CCP Fan Modules**Figure 3-30: -48 V BTS C-CCP and Power Conversion Shelf Fan Modules**

BBX Redundancy

Follow the steps in Table 3-53 to verify redundancy of the BBXs in the C-CCP shelf. Alarms reported by the master GLI (displayed via the alarm monitor) are also verified. *This test can be repeated for additional sectors at the customer's discretion.*

Table 3-53: BBX Redundancy Alarms

Step	Action
	⚠ WARNING Any BBXs enabled will immediately key-up. Before enabling any BBX, <i>always verify</i> that the TX output assigned to the BBX is terminated into a 50 W non-radiating RF load! Failure to do so could result in serious personal injury and/or damage to the equipment.
1	Enable the primary , then the redundant BBX assigned to ANT 1 by selecting the BBX and Device>BBX/MAWI>Key .
2	Observe that primary BBXs key up, and a carrier is present at each respective frequency.
3	Remove the primary BBX.
4	Observe a carrier is still present. The Redundant BBX is now the active BBX for Antenna 1.
5	Replace the primary BBX and reload the BBX with code and data.
6	Re-enable the primary BBX assigned to ANT 1 and observe that a carrier is present at each respective frequency.
7	Remove the redundant BBX and observe a carrier is still present.
8	The Primary BBX is now the active BBX for ANT 1.
9	Replace the redundant BBX and reload the BBX with code and data.
10	Re-enable the redundant BBX assigned to ANT 1 and observe that a carrier is present at each respective frequency:
11	De-key the Xcvt by selecting Device>BBX/MAWI>Dekey .
12	Repeat Steps 1 through 11 for additional BBXs/antennas, if equipped.

CSM, GPS, & LFR/HSO Redundancy/Alarm Tests

Follow the procedure in Table 3-54 to verify the *manual* redundancy of the CSM, GPS, and LFR/HSO boards. Verification of alarms reported is also covered.

NOTE

DO NOT perform the procedure in Table 3-54, unless the site is configured with a LORAN–C or HSO timebase as a backup for the GPS.

Table 3-54: CSM, GPS, & LFR/HSO, Redundancy/Alarm Tests

Step	Action
	△ WARNING Any BBXs enabled will immediately key-up. Before enabling any BBX, <i>always verify</i> that the TX output assigned to the BBX is terminated into a 50 W non-radiating RF load! Failure to do so could result in serious personal injury and/or damage to the equipment.
1	Enable the primary , then the redundant BBXs assigned to ANT 1 by selecting the BBX and Device>BBX/MAWI>Key .
2	Disconnect the GPS antenna cable, located on top of the BTS frame. This forces the LORAN–C LFR or HSO board timebase to become the CDMA timing source.
3	Observe a CDMA timing reference alarm and source change is reported by the alarm monitor.
4	Allow the LFR/HSO to become the active timing source. • Verify the BBXs remain keyed and INS. • Verify no other modules went OOS due to the transfer to LFR/HSO reference. • Observe the PWR/ALM LEDs on the CSM 1 front panel are steady GREEN.
5	Reconnect the GPS antenna cable.
6	Allow the GPS to become the active timing source. • Verify the BBXs remain keyed and INS. • Verify no other modules went OOS due to the transfer back to the GPS reference. • Observe the PWR/ALM LEDs on CSM 1 are steady GREEN.
7	Disable CSM 1 and enable CSM 2. • Various CSM source and clock alarms are now reported and the site comes down. • Alarms clear when the site comes back up.
8	Allow the CSM 2 board to go INS_ACT. • Verify the BBXs are dekeyed and OOS, and the MCCs are OOS_RAM. • Verify no other modules went OOS due to the transfer to CSM 2 reference. • Observe the PWR/ALM LEDs on CSM 2 front panels are steady GREEN. NOTE It can take up to 20 minutes for the CSM to re-establish the GPS link and go INS. MCCs go OOS_RAM.
9	Key BBXs 1 and R and observe a carrier is present.
10	Repeat Steps 2 through 6 to verify CSM source redundancy with CSM 2.

... continued on next page

Table 3-54: CSM, GPS, & LFR/HSO, Redundancy/Alarm Tests

Step	Action
11	* IMPORTANT DO NOT ENABLE the redundant CSM. Disable CSM 2 and enable CSM 1. • Various CSM Source and Clock alarms are reported and the site comes down. • Alarms clear when the site comes back up.
12	De-key the Xcvr by selecting Device>BBX/MAWI>Dekey .
13	Allow the CSM 1 board to go INS_ACT. • Verify the BBXs are de-keyed and OOS. • Verify no other modules went OOS due to the transfer to CSM 1 reference. • Observe PWR/ALM LEDs on the CSM 1 front panels are steady GREEN.
14	Disable the primary and redundant BBXs.

Power Amplifier (PA) Redundancy Test

Follow the procedure in Table 3-55 to verify redundancy of the Power Amplifiers (PA).

WARNING *First verify there are no BBX channels keyed BEFORE* moving the antenna connection. Failure to do so can result in serious personal injury and/or equipment damage.

Table 3-55: Power Amplifier Redundancy Test

Step	Action
1	From the pulldown menu select: Device>BBX/MAWI>Set Redundant Sector>Carrier-#-1-1 Device>BBX/MAWI>Set Pilot Only>Carrier-#-1-1 Device>BBX/MAWI>Set Pilot Gain> Carrier-#-1-1 and Pilot Gain = 262
2	Key-up the BBX assigned to the PAs associated with the sector under test (gain = 40).
3	Adjust the communications test set spectrum analyzer, as required, to observe the overall carrier amplitude and IM Shelf and note for reference . These figures will be required later. NOTE See Figure 3-19 for test equipment setup, if required.
4	Push-in and release the breaker supplying the 1st PA of the pair. NOTE After power is removed, IM suppression takes a few seconds to settle out while compensating for the removal of the 1st PA. The overall gain decreases by approximately 6 dB. The process must be complete before proceeding.
5	Verify: • The other PA module did not go OOS due to the loss of the PA. • The overall carrier amplitude is reduced by approximately 6 dB and IM suppression on the analyzer display remains basically unchanged. • PA fault message is reported via the MGLI and displayed on the alarm monitor.
6	Re-apply power to the PA module and observe the alarm has cleared on the alarm monitor. NOTE All PWR/ALM LEDs should be GREEN at completion of test.
7	Repeat Steps 4 through 6 to verify the 2nd PA of the pair.
8	De-key the BBX.
9	△ WARNING <i>First verify there are no BBX channels keyed when</i> moving the antenna connection. Failure to do so can result in serious personal injury and/or equipment damage. Repeat Steps 1 through 8 to verify PAs assigned to sectors 2 and 3 (if equipped). Move the test cable on top of the BTS to TX OUT 2 and TX OUT 3 antenna connectors as required.

MGLI/GLI Redundancy Test

CAUTION	This test can <i>only</i> be performed when the MM path is established by the MM (not just with LAPD link connected). Attempting to force the GLIs to “hot swap” under alarm monitor control, when isolated from the MM, causes MGLIs to hang up.
----------------	---

Table 3-56: MGLI/GLI Redundancy Test (with MM Connection Established)

Step	Action
	NOTE - This test assumes the alarm monitor is NOT connected to the BTS and the T1/E1 span is connected and communication is established with the MM. - BOTH GLIs must be INS before continuing.
1	Verify the BBXs are enabled and a CDMA carrier is present.
2	Identify the primary and redundant MGLI pairs.
3	Pull the MGLI that is <i>currently</i> INS–ACT and has cage control.
4	Observe the BBX remains GREEN, and the redundant MGLI is now active .
5	Verify no other modules go OOS due to the transfer of control to the redundant module.
6	Verify that the BBXs are enabled and a CDMA carrier is present.
7	Reinstall the MGLI and have the OMCR/CBSC place it back in-service.
8	Repeat Steps 1 through 7 to verify the other MGLI/GLI board.

Alarms Testing

Alarm Verification

ALARM connectors provide Customer Defined Alarm Inputs and Outputs. The customer can connect BTS site alarm input sensors and output devices to the BTS, thus providing alarm reporting of active sensors as well controlling output devices.

The SC 4812T is capable of concurrently monitoring 36 input signals coming into the BTS. These inputs are divided between 2 Alarm connectors marked '**ALARM A**' and '**ALARM B**' located at the top of the frame (see Figure 3-31). The **ALARM A** connector is always functional; **ALARM B** is functional when an AMR module is equipped in the AMR 2 slot in the distribution shelf. **ALARM A** port monitors input numbers 1 through 18, while **ALARM B** port monitors input numbers 19 through 36 (see Figure 3-32). State transitions on these input lines are reported to the LMF and OMCR as MGLI Input Relay alarms.

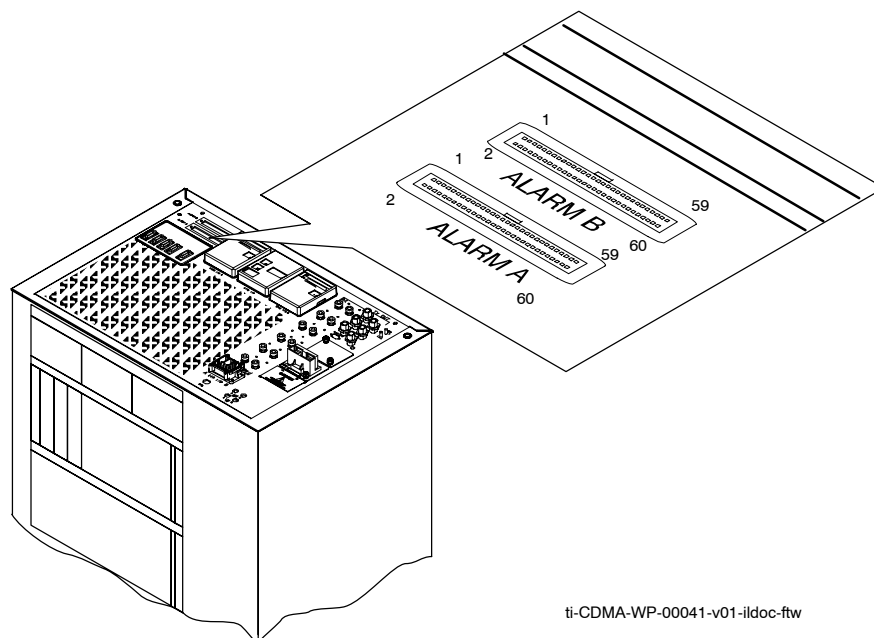
ALARM A and **ALARM B** connectors each provide 18 inputs and 8 outputs. If both **A** and **B** are functional, 36 inputs and 16 outputs are available. They may be configured as redundant. The configuration is set by the CBSC.

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**, and **Major**) 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 pauses/stops the display of alarms. When the **Pause** button is clicked the name of the button changes to **Continue**. When the **Continue** button is clicked, the display of alarms continues. Alarms that occur between the time the **Pause** button is clicked and the **Continue** button is clicked are not displayed.
- The **Clear** button clears the Alarm Monitor display. New alarms that occur after the **Clear** button is clicked are displayed.
- The **Dismiss** button dismisses/closes the Alarm Monitor display.

Figure 3-31: Alarm Connector Location and Connector Pin Numbering

Purpose

The following procedures verify the customer defined alarms and relay contacts are functioning properly. These tests are performed on all AMR alarms/relays in a sequential manner until all have been verified. Perform these procedures periodically to ensure the external alarms are reported properly. Following these procedures ensures continued peak system performance.

Study the site engineering documents and perform the following tests only after **first** verifying that the AMR cabling configuration required to interconnect the BTS frame with external alarm sensors and/or relays meet requirements called out in the *SC 4812T Series BTS Installation Manual*.

NOTE

Motorola **highly** recommends that you read and understand this procedure in its entirety before starting this procedure.

Test Equipment

The following test equipment is required to perform these tests:

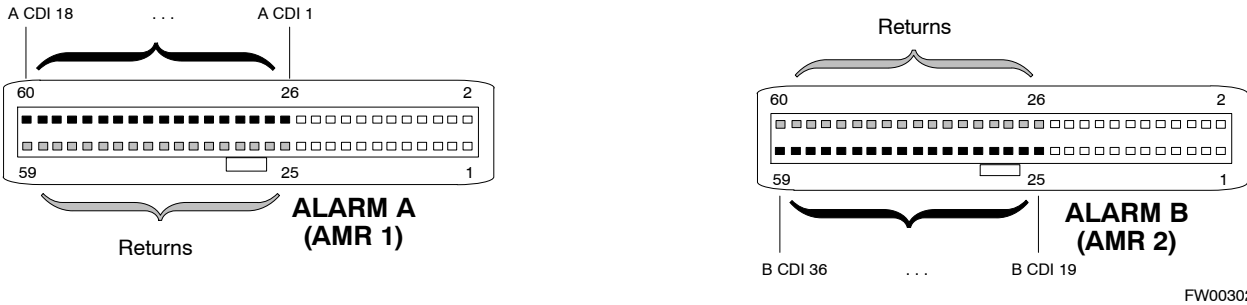
- LMF
- Alarms Test Box (CGDSCMIS00014) –optional

NOTE

Abbreviations used in the following figures and tables are defined as:

- NC = normally closed
- NO = normally open
- COM or C = common
- CDO = Customer Defined (Relay) Output
- CDI = Customer Defined (Alarm) Input

Figure 3-32: AMR Connector Pin Numbering



NOTE The preferred method to verify alarms is to follow the Alarms Test Box Procedure, Table 3-57. If not using an Alarm Test Box, follow the procedure listed in Table 3-58.

CDI Alarm Input Verification with Alarms Test Box

Table 3-57 describes how to test the CDI alarm input verification using the Alarm Test Box. Follow the steps as instructed and compare results with the LMF display.

NOTE It may take a few seconds for alarms to be reported. The default delay is 5 seconds. Leave the alarms test box switches in the new position until the alarms have been reported.

Table 3-57: CDI Alarm Input Verification Using the Alarms Test Box	
Step	Action
1	Connect the LMF to the BTS and log into the BTS.
2	Select the MGLI.
3	Click on the Device menu.
4	Click on the Set Alarm Relays menu item.
5	Click on Normally Open . A status report window displays the results of the action.
6	Click on the OK button to close the status report window.
7	Set all switches on the alarms test box to the Open position.
8	Connect the alarms test box to the ALARM A connector (see Figure 3-31).
9	Set all of the switches on the alarms test box to the Closed position. An alarm should be reported for each switch setting.
10	Set all of the switches on the alarms test box to the Open position. A clear alarm should be reported for each switch setting.
11	Disconnect the alarms test box from the ALARM A connector.
12	Connect the alarms test box to the ALARM B connector.
13	Set all switches on the alarms test box to the Closed position. An alarm should be reported for each switch setting

... continued on next page

Table 3-57: CDI Alarm Input Verification Using the Alarms Test Box

Step	Action
14	Set all switches on the alarms test box to the Open position. A clear alarm should be reported for each switch setting.
15	Disconnect the alarms test box from the ALARM B connector.
16	Select the MGLI.
17	Click on the Device menu.
18	Click on the Set Alarm Relays menu item.
19	Click on Normally Closed . A status report window displays the results of the action.
20	Click OK to close the status report window. Alarms should be reported for alarm inputs 1 through 36.
21	Set all switches on the alarms test box to the Closed position.
22	Connect the alarms test box to the ALARM A connector. Alarms should be reported for alarm inputs 1 through 18.
23	Set all switches on the alarms test box to the Open position. An alarm should be reported for each switch setting.
24	Set all switches on the alarms test box to the Closed position. A clear alarm should be reported for each switch setting.
25	Disconnect the alarms test box from the ALARM A connector.
26	Connect the alarms test box to the ALARM B connector. A clear alarm should be reported for alarm inputs 19 through 36.
27	Set all switches on the alarms test box to the Open position. An alarm should be reported for each switch setting.
28	Set all switches on the alarms test box to the Closed position. A clear alarm should be reported for each switch setting.
29	Disconnect the alarms test box from the ALARM B connector.
30	Select the MGLI.
31	Click on the Device menu.
32	Click on the Set Alarm Relays menu item.
33	Click on Unequipped . A status report window displays the results of the action.
34	Click on the OK button to close the status report window.
35	Connect the alarms test box to the ALARM A connector.
36	Set all switches on the alarms test box to both the Open and the Closed position. No alarm should be reported for any switch settings.

. . . continued on next page

Table 3-57: CDI Alarm Input Verification Using the Alarms Test Box

Step	Action
37	Disconnect the alarms test box from the ALARM A connector.
38	Connect the alarms test box to the ALARM B connector.
39	Set all switches on the alarms test box to both the Open and the Closed position. No alarm should be reported for any switch settings.
40	Disconnect the alarms test box from the ALARM B connector.
41	Load data to the MGLI to reset the alarm relay conditions according to the CDF file.

CDI Alarm Input Verification without Alarms Test Box

Table 3-58 describes how to test the CDI alarm input verification without the use of the Alarms Test Box. Follow the steps as instructed and compare results with the LMF display.

NOTE

It may take a few seconds for alarms to be reported. The default delay is 5 seconds. When shorting alarm pins wait for the alarm report before removing the short.

Table 3-58: CDI Alarm Input Verification Without the Alarms Test Box

Step	Action
1	Connect the LMF to the BTS and log into the BTS.
2	Select the MGLI.
3	Click on the Device menu.
4	Click on the Set Alarm Relays menu item.
5	Click on Normally Open . A status report window displays the results of the action.
6	Click on OK to close the status report window.
7	Refer to Figure 3-32 and sequentially short the ALARM A connector CDI 1 through CDI 18 pins (25–26 through 59–60) together. An alarm should be reported for each pair of pins that are shorted. A clear alarm should be reported for each pair of pins when the short is removed.
8	Refer to Figure 3-32 and sequentially short the ALARM B connector CDI 19 through CDI 36 pins (25–26 through 59–60) together. An alarm should be reported for each pair of pins that are shorted. A clear alarm should be reported for each pair of pins when the short is removed.
9	Select the MGLI.
10	Click on the Device menu.
11	Click on the Set Alarm Relays menu item.

... continued on next page

Table 3-58: CDI Alarm Input Verification Without the Alarms Test Box

Step	Action
12	Click on Normally Closed . A status report window displays the results of the action.
13	Click on OK to close the status report window. Alarms should be reported for alarm inputs 1 through 36.
14	Refer to Figure 3-32 and sequentially short the ALARM A connector CDI 1 through CDI 18 pins (25–26 through 59–60) together. A clear alarm should be reported for each pair of pins that are shorted. An alarm should be reported for each pair of pins when the short is removed.
15	Refer to Figure 3-32 and sequentially short the ALARM B connector CDI 19 through CDI 36 pins (25–26 through 59–60) together. A clear alarm should be reported for each pair of pins that are shorted. An alarm should be reported for each pair of pins when the short is removed.
16	Select the MGLI.
17	Click on the Device menu.
18	Click on the Set Alarm Relays menu item.
19	Click on Unequipped . A status report window displays the results of the action.
20	Click on OK to close the status report window.
21	Refer to Figure 3-32 and sequentially short the ALARM A connector CDI 1 through CDI 18 pins (25–26 through 59–60) together. No alarms should be displayed.
22	Refer to Figure 3-32 and sequentially short the ALARM B connector CDI 19 through CDI 36 pins (25–26 through 59–60) together. No alarms should be displayed.
23	Load data to the MGLI to reset the alarm relay conditions according to the CDF file.

Pin and Signal Information for Alarm Connectors

Table 3-59 lists the pins and signal names for Alarms A and B.

Table 3-59: Pin and Signal Information for Alarm Connectors							
Pin	Wire Color	Signal Name		Pin	Wire Color	Signal Name	
		Alarm A	Alarm B			Alarm A	Alarm B
1	Blu/Wht	A CDO1 NC	B CDO9 NC	31	Blu/Yel	Cust Retn 4	B CDI 22
2	Wht/Blu	A CDO1 Com	B CDO9 Com	32	Yel/Blu	A CDI 4	Cust Retn 22
3	Org/Wht	A CDO1 NO	B CDO9 NO	33	Org/Yel	Cust Retn 5	B CDI 23
4	Wht/Org	A CDO2 NC	B CDO10 NC	34	Yel/Org	A CDI 5	Cust Retn 23
5	Grn/Wht	A CDO2 Com	B CDO10 Com	35	Grn/Yel	Cust Retn 6	B CDI 24
6	Wht/Grn	A CDO2 NO	B CDO10 NO	36	Yel/Grn	A CDI 6	Cust Retn 24
7	Brn/Wht	A CDO3 NC	B CDO11 NC	37	Brn/Yel	Cust Retn 7	B CDI 25
8	Wht/Brn	A CDO3 Com	B CDO11 Com	38	Yel/Brn	A CDI 7	Cust Retn 25
9	Slt/Wht	A CDO3 NO	B CDO11 NO	39	Slt/Yel	Cust Retn 8	B CDI 26
10	Wht/Slt	A CDO4 NC	B CDO12 NC	40	Yel/Slt	A CDI 8	Cust Retn 26
11	Blu/Red	A CDO4 Com	B CDO12 Com	41	Blu/Vio	Cust Retn 9	B CDI 27
12	Red/Blu	A CDO4 NO	B CDO12 NO	42	Vio/Blu	A CDI 9	Cust Retn 27
13	Org/Red	A CDO5 NC	B CDO13 NC	43	Org/Vio	Cust Retn 10	B CDI 28
14	Red/Org	A CDO5 Com	B CDO13 Com	44	Vio/Blu	A CDI 10	Cust Retn 28
15	Grn/Red	A CDO5 NO	B CDO13 NO	45	Grn/Vio	Cust Retn 11	B CDI 29
16	Red/Grn	A CDO6 NC	B CDO14 NC	46	Vio/Grn	A CDI 11	Cust Retn 29
17	Brn/Red	A CDO6 Com	B CDO14 Com	47	Brn/Vio	Cust Retn 12	B CDI 30
18	Red/Brn	A CDO6 NO	B CDO14 NO	48	Vio/Brn	A CDI 12	Cust Retn 30
19	Slt/Red	A CDO7 NC	B CDO15 NC	49	Slt/Vio	Cust Retn 13	B CDI 31
20	Red/Slt	A CDO7 Com	B CDO15 Com	50	Vio/Slt	A CDI 13	Cust Retn 31
21	Blu/Blk	A CDO7 NO	B CDO15 NO	51	Red/Wht	Cust Retn 14	B CDI 32
22	Blk/Blu	A CDO8 NC	B CDO16 NC	52	Wht/Red	A CDI 14	Cust Retn 32
23	Org/Blk	A CDO8 Com	B CDO16 Com	53	Blk/Wht	Cust Retn 15	B CDI 33
24	Blk/Org	A CDO8 NO	B CDO16 NO	54	Wht/Blk	A CDI 15	Cust Retn 33
25	Grn/Blk	Cust Retn 1	B CDI 19	55	Yel/Wht	Cust Retn 16	B CDI 34
26	Blk/Grn	A CDI 1	Cust Retn 19	56	Wht/Yel	A CDI 16	Cust Retn 34
27	Brn/Blk	Cust Retn 2	B CDI 20	57	Vio/Wht	Cust Retn 17	B CDI 35
28	Blk/Brn	A CDI 2	Cust Retn 20	58	Wht/Vio	A CDI 17	Cust Retn 35
29	Slt/Blk	Cust Retn 3	B CDI 21 +27V * <u>Pwr Conv Alm -48V</u>	59	Blk/Red	Cust Retn 18	B CDI 36
30	Blk/Slt	A CDI 3	Cust Retn 21 +27V * <u>Pwr Conv Retn -48V</u>	60	Red/Blk	A CDI 18	Cust Retn 36

NOTE

*For -48V, reserved for Power Supply Module Alarm signal. NOT for use as CDOs or CDIs.

All Cust Rtn 1–18 are electronically tied together at the RFMF.

All Cust Rtn 19–36 are electronically tied together at the RFMF.

CDO = Customer Defined Output; **CDI** = Customer Defined Input;

NC – normally closed, **NO** – normally open, **Com** – common

The “A CDI” numbering is from the LMF/OMCR/CBSC perspective. LMF/OMCR/CBSC starts the numbering at 19 (giving 19 – 36). Actual cable hardware starts the numbering at 0 (giving 0–17)

Chapter 4

Automated Acceptance Test Procedure

Automated Acceptance Test Procedures

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 Local Maintenance Facility (LMF) and supported test equipment per the current Cell Site Data File (CDF) assignment.

The results of these tests (at the option of the operator) are written to a file that can be printed. All tests are controlled from the LMF platform using the GPIB interface, therefore, only recommended test equipment supported by the LMF can be used.

This chapter describes the tests run from the GUI environment, which is the recommended method. The GUI provides the advantages of simplifying the LMF user interface, reducing the potential for miskeying commands and associated parameters, and speeding up the execution of complex operations involving multiple command strings. If you feel the command line interface (CLI) will provide additional insight into the progress of ATPs and problems that could possibly be encountered, refer to *LMF CLI Commands*.

NOTE

- Before performing any tests, use an editor to view the “Caveats” section of the “readme.txt” file in the c:\wlmf folder for any applicable information.
- The ATP test is to be performed on out-of-service (OOS) sectors *only*.
- DO NOT substitute test equipment not supported by the LMF.

Refer to Chapter 3 for detailed interconnection information needed for calibrating equipment, cables, and other test equipment set components.

Reduced ATP

NOTE

Equipment has been factory–tested for FCC compliance. If license–governing bodies require documentation supporting SITE compliance with regulations, a full ATP may be necessary. Perform the Reduced ATP only if reports for the specific BTS site are NOT required.

After downloading the proper operational software to the BTS, the CFE must perform these procedures (minimal recommendation):

1. Verify the TX/RX paths by performing TX Calibration, TX Audit, and FER tests.
2. Retrieve Calibration Data required for normal site operation.

Should failures occur while performing the specified tests, refer to the Basic Troubleshooting section of this manual for help in determining the failure point. Once the point of failure has been identified and corrected, refer to the BTS Optimization and ATP Test Matrix (Table C-3) to determine the applicable test that must be performed.

In the unlikely event that the BTS passes these tests but has a forward link problem during normal operation, the CFE should then perform the additional TX tests for troubleshooting: TX spectral mask, TX rho, and TX code domain.

NOTE

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

Customer requirements determine which ATP tests are to be performed and the field engineer selects the appropriate ATP tests to run.

ATP Test Options

There are three different ATP testing options that can be performed to completely test a BTS. Depending on your requirements, one of the following ATP testing options should be run. Table 4-1 provides the procedure to execute an ATP test. To completely test a BTS, run the ATP tests according to one of the following ATP testing options:

ATP Testing Option 1

- **All TX/RX test** – Executes all the TX and RX tests as described in testing option 2.

ATP Testing Option 2

- **All TX test** – TX tests verify the performance of the BTS transmit line up. These include the GLI, MCC, BBX, and CIO cards, the LPAs and passive components including splitters, combiners, bandpass filter, and RF cables.
- **All RX test** – RX tests verify the performance of the BTS receiver line up. These includes the MPC (for starter frames), EMPC (for expansion frames), CIO, BBX, MCC, and GLI cards and the passive components including RX filter (starter frame only), and RF cables.

ATP Testing Option 3

These tests can be run individually:

- **TX Mask test**
- **Rho test**
- **Pilot Time Offset test**
- **Code Domain Power test**
- **FER test**

NOTE	The Full Optimization test can be run if you want the TX path calibrated, BLO downloaded, and TX audited before all the TX and RX tests are run.
-------------	--

NOTE	If manual testing has been performed with the HP analyzer, remove the manual control/system memory card from the card slot and set the IO CONFIG to the Talk & Listen mode before starting the automated testing.
-------------	---

NOTE	The STOP button can be used to stop the testing process.
-------------	---

ATP Test Prerequisites

Before attempting to run any ATP tests, ensure the following have been completed:

- BTS has been optimized and calibrated (see Chapter 3).
- LMF is logged into the BTS.
- CSMs, GLIs, BBXs, MCCs, and TSU (if the RFDS is installed) have correct code load and data load.
- Primary CSM, GLI, and MCCs are INS_ACT (bright green).
- BBXs are calibrated and BLOs are downloaded.
- No BBXs are keyed (transmitting).
- BBXs are OOS_RAM (yellow).
- Test cables are calibrated.
- Test equipment is connected for ATP tests (see Figure 3-19 through Figure 3-24 starting on page 3-68).
- Test equipment has been warmed up 60 minutes and calibrated.
- GPIB is on.
- BTS transmit connectors are properly terminated for the test(s) to be performed.

WARNING

Before performing the FER, be sure that all PAs are turned OFF (circuit breakers pulled) or that all transmitter ports are properly terminated.

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

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

TX OUT Connection

NOTE

Many of the acceptance test procedures require taking measurements at the **TX OUT** (BTS/RFDS) connector. At sites without RFDS installed, all measurements will be via the BTS **TX OUT** connector. At sites with RFDS installed, all measurements will be via the RFDS directional coupler **TX OUT** connector.

Required Test Equipment

The following test equipment is required:

- LMF
- Power meter (used with HP8921A/600 and Advantest R3465)
- Communications system analyzer
- Signal generator for FER testing (required for *all* communications system analyzers for 1X FER)

WARNING	– <i>Before</i> installing any test equipment directly to any BTS TX OUT connector, <i>verify that there are no CDMA channels keyed.</i> – At active sites, have the OMCR/CBSC place the carrier assigned to the PAs under test OOS. Failure to do so can result in serious personal injury and/or equipment damage.
----------------	--

NOTE	The test equipment must be re-calibrated before using it to perform the TX Acceptance Tests.
-------------	--

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 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 equipment. All measurements are made at the appropriate BTS **TX OUT** connector(s).

TX tests verify TX operation of the entire CDMA forward link using selected BBXs assigned to respective sector antennas. Each BBX is keyed up to generate a CDMA carrier (using both `bbxlevel` and `BLO`) at the CDF file–specified carrier output power level.

RX Testing

RX testing verifies receive antenna paths for BBXs selected for the test. All tests are performed using the external, calibrated test equipment to inject a CDMA RF carrier with all zero longcode at the specified RX frequency at the appropriate BTS **RX IN** connector(s).

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

Individual Tests

The following individual tests can be used to verify the results of specific tests.

Spectral Purity TX Mask (Primary & Redundant BBX)

This test verifies that the transmitted CDMA carrier waveform generated on each sector meets the transmit spectral mask specification 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 ANSI-J STD–019. “*Rho*” represents the correlation between actual and perfect CDMA modulation spectrum. A rho value of 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, Pilot Gain = 262, PN Offset = 0).

Code Domain Power (Primary & Redundant BBX)

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).

Frame Error Rate

The Frame Error Rate (FER) test verifies RX operation of the entire CDMA Reverse Link using all equipped MCCs assigned to all respective sectors/antennas. This test verifies the BTS sensitivity on all traffic channel elements currently configured on all equipped MCCs at an RF input level of -119 dBm (or -116 dBm if using TMPC).

ATP Test Procedure

Follow the procedure in Table 4-1 to perform any ATP test.

Table 4-1: ATP Test Procedure	
Step	Action
1	Be sure that all prerequisites described on page 4-5 have been met.
	NOTE If the LMF has been logged into the BTS with a different Multi-Channel Preselector setting than the one to be used for this test, the LMF <i>must be logged out of the BTS and logged in again</i> with the new Multi-Channel Preselector setting. Using the wrong MPC setting can cause a false test failure.
2	Select the device(s) to be tested.
3	From the Tests menu, select the desired test from the pulldown menu: – All TX/RX ATP... / All TX ATP... / All RX ATP... or – TX > (TX Mask... / Rho... / Pilot Time Offset... / Code Domain Power...) or – RX > FER...
4	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) displayed in the Channels/Carrier pick list. To select multiple items, hold down the <Shift> or <Ctrl> key while making the selections.
5	Verify that the correct channel number for the selected carrier is shown in the Carrier # Channels box. If it is not, obtain the latest bts-#.cdf (or bts-#.necf) and cbsc-#.cdf files from the CBSC. NOTE If necessary, the correct channel number may be manually entered into the Carrier # Channels box.
6	If applicable, select Verify BLO (default) or Single-sided BLO . NOTE Single-sided BLO is only used when checking non-redundant transceivers.
7	For RX select the appropriate RX branch (Both, Main, or Diversity) in the drop-down list.
8	In the Rate Set box, select the appropriate data rate (1 =9600, 2 =14400, 3 =9600 1X) from the drop-down list. NOTE The Rate Set selection of 1 is only available if non-1X cards are selected for the test. The Rate Set selection of 2 is only available if non-1X cards are selected for the test. The Rate Set selection of 3 is only available if 1X cards are selected for the test.
9	Enter the channel elements to be tested for the RX ATP in the Channel Element(s) box. By default, all channel elements are specified. Use one of the following methods to enter more than one channel element: – Enter non-sequential channel elements separated by a comma and no spaces (for example; 0,5,15). – Enter a range of sequential channel elements by typing the first and last channel elements separated by two periods (for example; 0..15). NOTE The channel element numbers are 0 based; that is the first channel element is 0.

... continued on next page

Table 4-1: ATP Test Procedure

Step	Action
10	If applicable, select a test pattern from the Test Pattern pick list. NOTE • Selecting Pilot (default) performs tests using only a pilot signal. • Selecting Standard performs tests using pilot, synch, paging and 6 traffic channels. This requires an MCC to be selected. • Selecting CDFPilot performs tests using only a pilot signal, however, the gain for the channel elements is specified in the CDF file. • Selecting CDF performs tests using pilot, synch, paging and 6 traffic channels, however, the gain for the channel elements is specified in the CDF file.
11	Click on the OK button. The status report window and a Directions pop-up are displayed.
12	Follow the cable connection directions as they are displayed, and click the Continue button to begin testing. The test results are displayed in the status report window.
13	Click on Save Results or Dismiss . If Dismiss is used, the test results will not be saved in the test report file.

Individual ATP Test Background Information

TX Spectral Purity Transmit Mask Acceptance Test (Tx Mask)

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** (BTS/RFDS) connector.

The Pilot Gain is set to 541 for each antenna, and all channel elements from the MCCs are forward-link disabled. The BBX is keyed up, using both `bbxlvl` and bay level offsets, to generate a CDMA carrier (with pilot channel element only). BBX power output is set to obtain +40 dBm as measured at the **TX OUT** connector (on either the BTS or RFDS directional coupler).

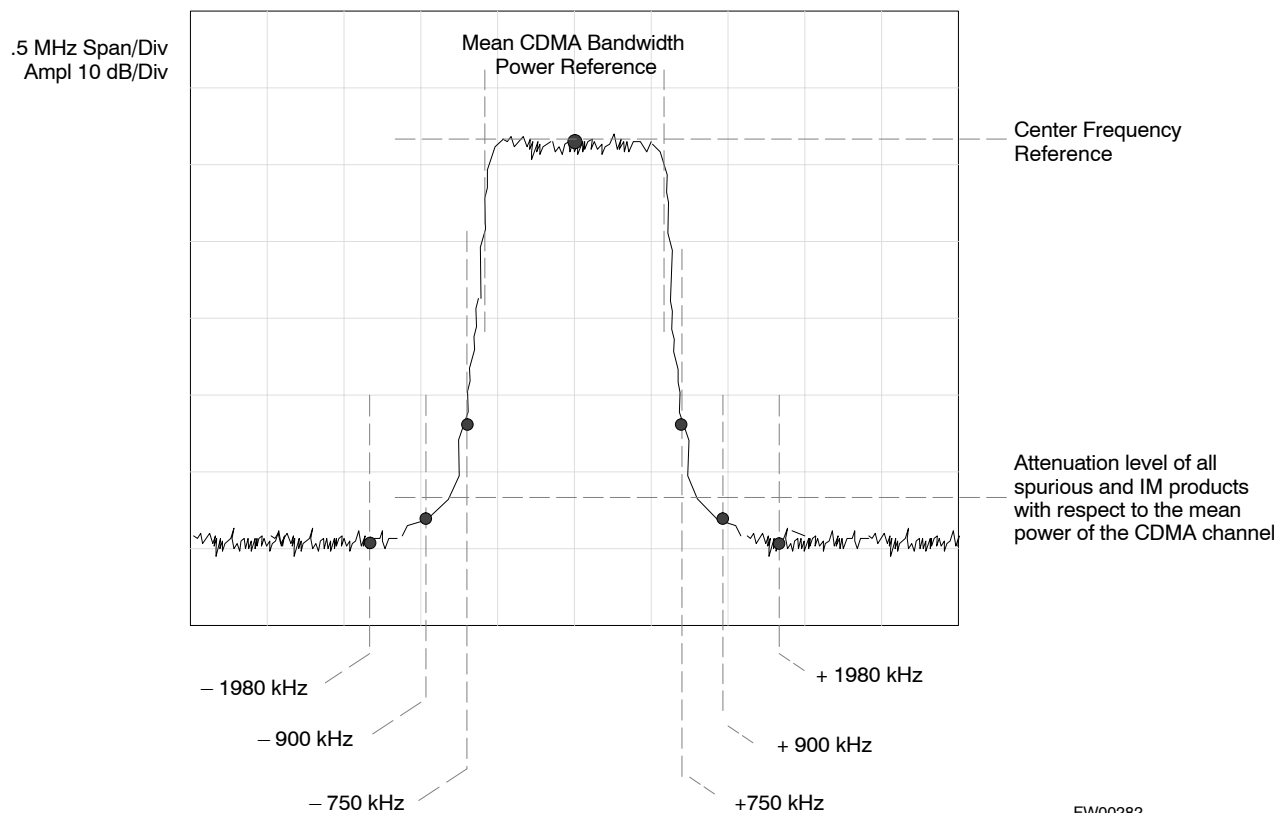
NOTE	TX output power is set to +40 dBm by setting BTS power level to +33.5 dBm to compensate for 6.5 dB increase from pilot gain set to 541.
-------------	---

The calibrated communications test set measures and returns the attenuation level of all spurious and IM products in a 30 kHz resolution bandwidth. With respect to the mean power of the CDMA channel measured in a 1.23 MHz bandwidth in dB, verify that results meet system tolerances at the following test points:

- 1.7/1.9 GHz:
 - at least **–45 dB @ + 900 kHz** from center frequency
 - at least **–45 dB @ – 900 kHz** from center frequency
- 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

The BBX then de-keys, and, if selected, the MCC is re-configured to assign the applicable redundant BBX to the current TX antenna path under test. The test is then repeated.

See Table 4-1 to perform this test.

Figure 4-1: TX Mask Verification Spectrum Analyzer Display

TX Waveform Quality (rho) Acceptance Test

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** (BTS/RFDS) connector.

The Pilot Gain is set to 262 for each antenna, and all channel elements from the MCCs are forward link disabled. The BBX is keyed up, using both `bbxlvl` and bay level offsets, to generate a CDMA carrier (with pilot channel element only, Walsh code 0). BBX power output is set to 40 dBm as measured at the **TX OUT** connector (on either the BTS or RFDS directional coupler).

The calibrated communications test set measures and returns the Pilot channel element digital waveform quality (rho) in dB, verifying that the result meets system tolerances:

- Waveform quality (rho) should be ≥ 0.912 (–0.4dB).

The BBX then de-keys and, if selected, the MCC is re-configured to assign the applicable redundant BBX to the current TX antenna path under test. The test is then repeated.

See Table 4-1 to perform this test.

TX Pilot Time Offset Acceptance Test

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 are performed using the external calibrated test set controlled by the same command. All measurements are via the appropriate **TX OUT** (BTS/RFDS) connector.

The Pilot Gain is set to 262 for each antenna, and all TCH elements from the MCCs are forward link disabled. The BBX is keyed up, using both `bbxlv1` and bay level offsets, to generate a CDMA carrier (with pilot channel element only, Walsh code 0). BBX power output is set to 40 dBm as measured at the **TX OUT** connector (on either the BTS or RFDS directional coupler).

The calibrated communications test set measures and returns the Pilot Time Offset in μs , verifying results meet system tolerances:

- Pilot Time Offset should be within $\leq 3 \mu\text{s}$ of the target PT Offset (**0 μs**).

The BBX then de-keys, and if selected, the MCC is re-configured to assign the applicable redundant BBX to the current TX antenna path under test. The test is then repeated.

See Table 4-1 to perform this test.

TX Code Domain Power/Noise Floor Acceptance Test

This test verifies the Code Domain Power/Noise 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** (BTS/RFDS) connector.

For each sector/antenna under test, the Pilot Gain is set to 262. All MCC channel elements under test are configured to generate Orthogonal Channel Noise Source (OCNS) on different odd Walsh codes and to be assigned a full-rate gain of 81. The maximum number of MCC/CEs to be tested in any one time is 32 (32 odd Walsh codes). If more than 32 CEs exist, then multiple sets of measurements are made; so all channel elements are verified on all sectors.

BBX power output is set to 40 dBm as measured at the **TX OUT** connector (on either the BTS or RFDS directional coupler).

Verify 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 Pilot Power (dBm) minus OCNS Power (dBm) is equal to **10.2 $\pm$ 2 dB** and that the noise floor of all “OFF” Walsh channels measures $\leq -27 \text{ dB}$ (with respect to total CDMA channel power).

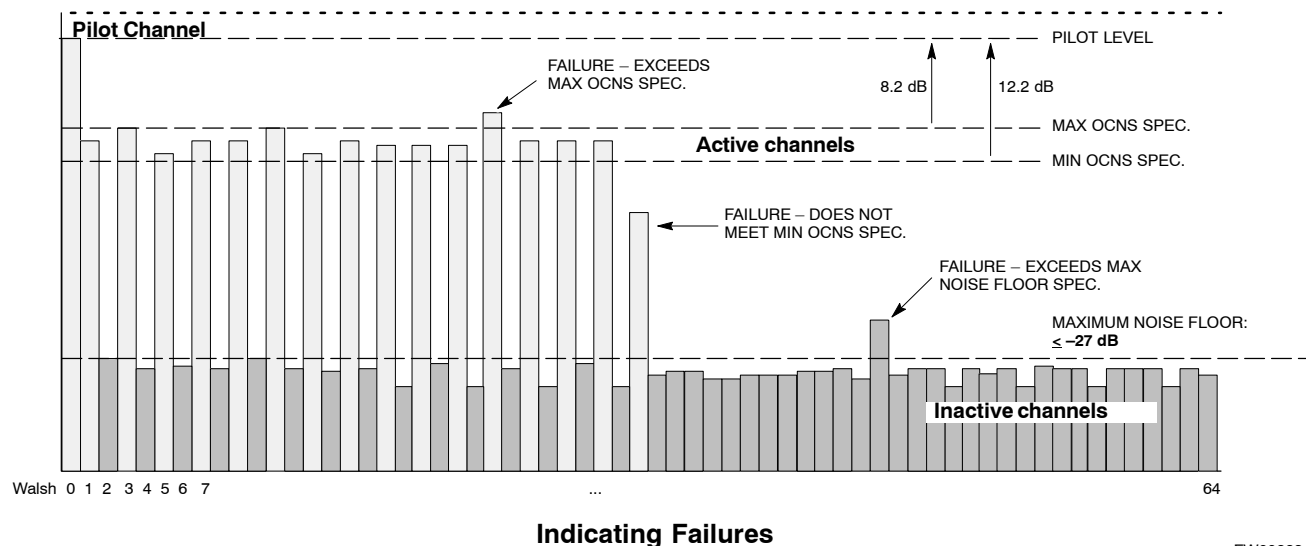
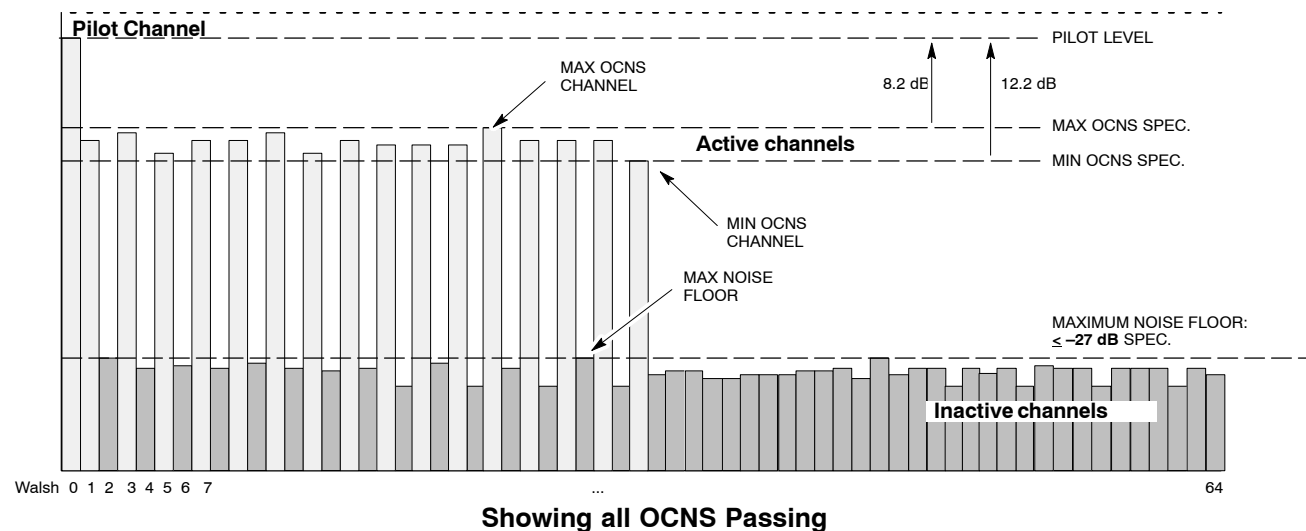
NOTE

When performing this test using the LMF and the MCC is an MCC8E or MCC24E, the redundant BBX may fail or show marginal performance. This is due to a timing mismatch that the LMF does not address. Performing this test from the CBSC will not have this timing problem.

The BBX then de-keys and, if selected, the MCC is re-configured to assign the applicable redundant BBX to the current TX antenna path under test. The test is then repeated. Upon completion of the test, the OCNS is disabled on the specified MCC/CE.

See Table 4-1 to perform this test.

Figure 4-2: Code Domain Power and Noise Floor Levels



FW00283

RX Frame Error Rate (FER) Acceptance Test

This test verifies the BTS FER on *all* traffic channel elements currently configured on *all* equipped MCCs (full rate at 1% FER) at an RF input level of -119 dBm [or -116 dBm if using Tower Top Amplifier (TMPC)]. 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.

The Pilot Gain is set to 262 for each TX antenna, and all channel elements from the MCCs are forward-link disabled. The BBX is keyed

up, using only bblvl level offsets, to generate a CDMA carrier (with pilot channel element only). BBX power output is set to –20 dBm as measured at the **TX OUT** connector (on either the BTS or RFDS directional coupler). The BBX must be keyed to enable the RX receive circuitry.

The LMF prompts the MCC/CE under test to measure all zero longcode and provide the FER report on the selected active MCC on the reverse link for both the main and diversity RX antenna paths, verifying that results meet the following specification:

- FER returned less than **1%** and total frames measured is **1500**

All MCC/CEs selected are tested on the specified RX antenna path. The BBX then de-keys and, if selected, the MCC is re-configured to assign the applicable redundant BBX to the current RX antenna paths under test. The test is then repeated.

See Table 4-1 to perform this test.

Generating an ATP Report

Background

Each time an ATP test is run, an ATP report is updated to include the results of the most recent ATP tests if the **Save Results** button is used to close the status report window. The ATP report *is not* updated if the status reports window is closed using the **Dismiss** button.

ATP Report

Each time an ATP test is run, a separate report is created for each BTS and includes the following for each test:

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

The report can be printed if the LMF computer is connected to a printer. Follow the procedure in the Table 4-2 to view and/or print the ATP report for a BTS.

Table 4-2: 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 sort the report.
	5	– If not desiring a printable file copy, click on the Dismiss button. – If requiring a printable file copy, select the desired file type in the picklist and click on the Save button.

Chapter 5

Prepare to Leave the Site

Updating Calibration Data Files

Software Release caveats

With Software Release 2.16.1.x, the packet BTS will NOT detect a new calibration file on the OMC-R. A manual workaround is available in bulletin `cdma_g_bts_059`. This will be corrected in Software Release 2.16.3.

Software Release 2.16.3 will allow the user to load the calibration file from the LMF directly onto the MGLI. The MGLI will then ftp the new calibration file to the OMC-R, thereby eliminating the need for the user to place the calibration file at the OMC-R.

Copy and Load Cal File to to CBSC

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 Diskette

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

Table 5-1: Copying CAL Files to a Diskette

Step	Action
1	With <i>Windows</i> running on the LMF computer, insert a disk into Drive A:\.
2	Launch the Windows Explorer application program from the Start > Programs menu list.
3	Select the applicable <code><x>:\<lmf home directory>\cdma\bts-#</code> 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 procedure in Table 5-2 to copy CAL files from a diskette to the CBSC.

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

Step	Action
1	Log into the CBSC on the OMC–R Unix workstation using your account name and password.
2	Place the diskette containing calibration files (cal files) in the workstation diskette drive.
3	Type eject –q and press the Enter key.
4	Type mount and press the Enter key. Verify that <code>floppy/no_name</code> is displayed.
	NOTE If the eject command has been previously entered, <code>floppy/no_name</code> will be appended with a <u>number</u> . Use the explicit <code>floppy/no_name</code> 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 the bts–#.cal file filename appears in the displayed directory listing.
7	Type in cd and press the Enter key.
8	Type in pwd and press the Enter key. Verify the displayed response shows the correct home directory (<code>/home/<user's name></code>).
9	With <i>Solaris versions of Unix</i> , create a Unix–formatted version of the bts–#.cal file in the home directory by performing the following:
9a	– Type in dos2unix /floppy/no_name/bts–#.cal bts–#.cal and press the Enter key. Where: # = BTS number for which the CAL file was created NOTE Other versions of Unix do not support the <code>dos2unix</code> command. In these cases, use the Unix cp (copy) command. The <i>copied</i> files will contain DOS line feed characters which must be edited out with a Unix text editor.
10	Type in ls –l *.cal and press the Enter key. Verify the CAL files have been copied. Verify all CAL files to be transferred appear in the displayed listing.
11	Type eject and press the Enter key.
12	Remove the diskette from the workstation.

Prepare to Leave the Site

External Test Equipment Removal

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

Table 5-3: External Test Equipment Removal	
Step	Action
1	Disconnect all external test equipment from all TX and RX connectors on the top of the frame.
2	Reconnect and visually inspect all TX and RX antenna feed lines at the top of the frame.

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.
----------------	---

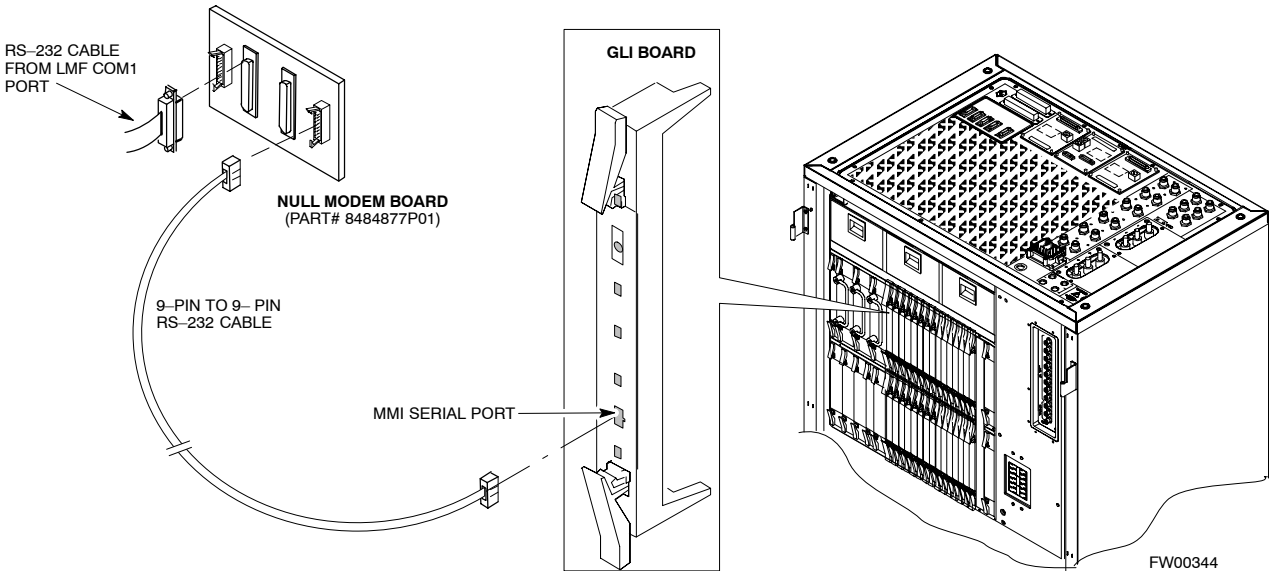
NOTE	Each module or device can be in any state prior to downloading. Each module or device will be in an OOS_RAM state after downloading has completed. – For all LMF commands, information in <i>italics</i> represents valid ranges for that command field. – Only those fields requiring an input will be specified. Default values for other fields will be assumed. – For more complete command examples (including system response details), refer to the <i>CDMA LMF User Guide</i>.
-------------	---

BTS Site Span Configuration Verification

Table 5-4 describes how to verify the current Span Framing Format and Line Build Out (LBO) parameters. *ALL* MGLI2/GLI2 boards in all C–CCP shelves that terminate a T1/E1 span should be verified.

Table 5-4: BTS Span Parameter Configuration	
Step	Action
1	Connect a serial cable from the LMF COM1 port (via null modem board) to the front panel of the MGLI2 MMI port (see Figure 5-1).
2	Start an MMI communication session with MGLI2 by using the Windows desktop shortcut icon (see Table 3-3 on page 3-13). NOTE The LMF program must not be running when a Hyperterminal session is started if COM1 is being used for the MMI session.
3	Enter the following MMI command to display the current MGLI2/GLI2 framing format and line code configuration (in bold type): span view <cr> Observe a display similar to the options shown below: <pre>COMMAND ACCEPTED: span view The parameter in NVM is set to T1_2. The frame format in flash is set to use T1_2. Equalization: Span A – Default (0–131 feet for T1/J1, 120 Ohm for E1) Span B – Default (0–131 feet for T1/J1, 120 Ohm for E1) Span C – Default (0–131 feet for T1/J1, 120 Ohm for E1) Span D – Default (0–131 feet for T1/J1, 120 Ohm for E1) Span E – Default (0–131 feet for T1/J1, 120 Ohm for E1) Span F – Default (0–131 feet for T1/J1, 120 Ohm for E1) Linkspeed: Default (56K for T1 D4 AMI, 64K otherwise) Currently, the link is running at the default rate The actual rate is 0 Clock Alarms (0000): DPLL is locked and has a reference source. GPS receiver self test result: passed Time since reset 0:33:11, time since power on: 0:33:11 3-40</pre>
	NOTE – Defaults for span equalization are 0–131 feet for T1/J1 spans and 120 Ohm for E1. – Default linkspeed is 56K for T1 D4 AMI spans and 64K for all other types. – There is no need to change from defaults unless the OMC–R/CBSC span configuration requires it. – If the current MGLI2/GLI2 framing format and line code configuration does not display the correct choice, proceed to Table 5-5.
4	Repeat steps 1 through 3 for all remaining GLIs.
5	Exit the GLI MMI session and HyperTerminal connection by selecting File from the connection window menu bar, and then Exit from the drop–down menu.

Figure 5-1: MGLI2/GLI2 MMI Port Connection



Set BTS Site Span Configuration

Perform the procedure in Table 5-5 to configure the Span Framing Format and Line Build Out (LBO) parameters. *ALL* MGLI2/GLI2 boards in all C-CCP shelves that terminate a T1/E1 span must be configured.

NOTE Perform the following procedure *ONLY* if span configurations loaded in the MGLI2/GLI2s do not match those in the OMCR/CBSC data base, *AND ONLY* when the exact configuration data is available. Loading incorrect span configuration data will render the site inoperable.

Table 5-5: Set BTS Span Parameter Configuration

Step	Action
1	If not already done, connect a serial cable from the LMF COM1 port (via null modem board) to the front panel of the MGLI2 MMI port (see Figure 5-1).
2	Start an MMI communication session with CSM-1 by using the Windows desktop shortcut icon (see Table 3-3 on page 3-13).
	NOTE The LMF program must not be running when a Hyperterminal session is started if COM1 is being used for the MMI session.

... continued on next page

Table 5-5: Set BTS Span Parameter Configuration

Step	Action
3	<i>If required only</i>, enter the following MMI command for each span line to set the BTS span parameters to match that of the physical spans <i>a – f</i> run to the site: span_config <option#1> <option#2> <option#3> <option#4> <option#5> <i>option#1</i> = the span to change (a – f) <i>option#2</i> = the span type (0 – 8): 0 – E1_1 (HDB3, CCS, CRC-4) 1 – E1_2 (HDB3, CCS) 2 – E1_3 (HDB3, CAS, CRC-4, TS16) 3 – E1_4 (HDB3, CAS, TS16) 4 – T1_1 (AMI, DS1 AT&T D4, without ZCS, 3 to 1 packing, Group 0 unusable) 5 – T1_2 (B8ZS, DS1 AT&T ESF, 4 to 1 packing, 64K link) 6 – J1_1 (B8ZS, J1 AT&T ESF, Japan CRC6, 4 to 1 packing) 7 – J1_2 (B8ZS, J1 AT&T ESF, US CRC6, 4 to 1 packing) 8 – T1_3 (AMI, DS1 AT&T D4, with ZCS, 3 to 1 packing, Group 0 unusable) <i>option#3</i> = the link speed (56 or 64) Kbps <i>option#4</i> = the span equalization (0 – 7): 0 – T1_6 (T1,J1:long haul) 1 – T1_4 (T1,J1:393–524 feet) 2 – T1_4 (T1,J1:131–262 feet) 3 – E1_75 (E1:75 Ohm) 4 – T1_4 (T1,J1:0–131 feet) 5 – T1_4 (T1,J1:524–655 feet) 6 – T1_4 (T1,J1:262–393 feet) 7 – E1_120 (E1:120 Ohm) <i>option#5</i> = the slot that has LAPD channel (0 – 31) <i>Example for setting span configuration to E1_2, 64 Kbps, E1_120–Ohm, LAPD channel 1:</i> <pre>span_config a 1 64 7 1 . . span_config f 1 64 7 1</pre> <i>Example for setting span configuration to T1_2, 64 Kbps, T1_4 (0–131 feet), LAPD channel 0:</i> <pre>span_config a 5 64 4 0 . . span_config f 5 64 4 0</pre> NOTE Make sure that spans <i>a – f</i> are set to the same span type and link speed. The equalization may be different for each individual span. After executing the span_config command, the affected MGLI2/GLI2 board MUST be reset and re-loaded for changes to take effect. Although defaults are shown, always consult site specific documentation for span type and rate used at the site.
4	Press the RESET button on the GLI2 for changes to take effect.

... continued on next page

Table 5-5: Set BTS Span Parameter Configuration

Step	Action
5	This completes the site specific BTS Span setup for this GLI. Move the MMI cable to the next GLI2 and repeat steps 1 and 4 for <i>ALL</i> MGLI2/GLI2 boards.
6	Terminate the Hyperterm session and disconnect the LMF from the MGLI/SGLI.

LMF Removal

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

Table 5-6: Terminate the LMF Session and Remove the LMF

Step	Action
	! CAUTION DO NOT power down the CDMA LMF without performing the procedure indicated below. Corrupted/lost data files may result, and in some cases, the CDMA LMF may lock up.
1	Log out of all BTS sessions and exit LMF by clicking on File in the LMF window menu bar and selecting Logout and Exit from the pull-down list.
2	From the Windows Task Bar click Start>Shutdown . Click Yes when the Shut Down Windows message appears.
3	Wait for the system to shut down and the screen to go blank.
4	Disconnect the LMF terminal Ethernet connector from the BTS cabinet.
5	Disconnect the LMF serial port, the RS-232 to GPIB interface box, and the GPIB cables as required for equipment transport.

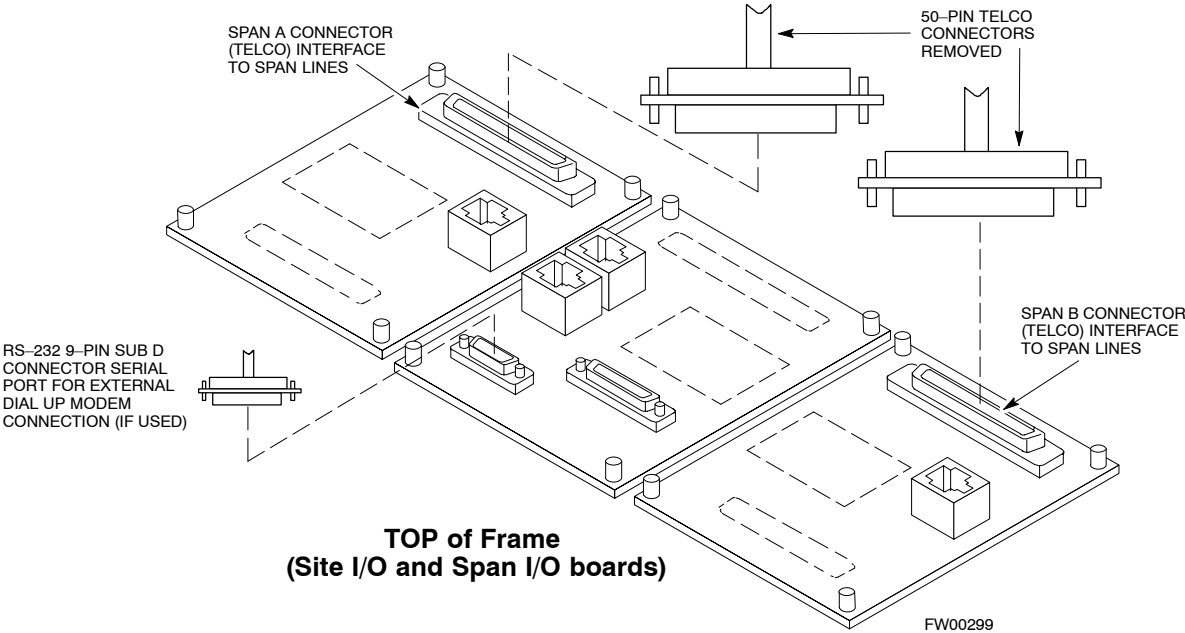
Re-connect BTS T1/E1 Spans and Integrated Frame Modem

Before leaving the site, connect any T1 span TELCO connectors that were removed to allow the LMF to control the BTS. Refer to Table 5-7 and Figure 5-2 as required.

Table 5-7: T1/E1 Span/IFM Connections

Step	Action
1	Connect the 50-pin TELCO cables to the BTS span I/O board 50-pin TELCO connectors.
2	If used, connect the dial-up modem RS-232 serial cable to the Site I/O board RS-232 9-pin sub D connector. NOTE Verify that you connect both SPAN cables (if removed previously), and the Integrated Frame Modem (IFM) "TELCO" connector.

Figure 5-2: Site and Span I/O Boards T1 Span Connections



Reset All Devices and Initialize Site Remotely

Devices in the BTS should not be left with data and code loaded from the LMF. The configuration data and code loads used for normal operation could be different from those stored in the LMF files. Perform the procedure in Table 5-8 to reset all devices and initialize site remotely.

Table 5-8: Reset BTS Devices and Remote Site Initialization

Step	Action
1	Terminate the LMF session by following the procedures in Table 5-6.
2	Reconnect spans by following the procedure in Table 5-7.
3	– If BTS is configured for circuit operation, go to Step 4. – If BTS is configured for packet operation, go to Step 5.
4	Circuit BTS Procedure:
4a	From the BTS site, contact the OMC–R and request the operator to perform a BTS reset. <i>or</i> At the BTS site: – unseat one GLI card at a time and wait for 30 seconds; – reseat the GLI and wait for it to complete its initialization (this takes about one minute); – repeat for the second GLI.
4b	Depending on the number of installed operational GLI cards, perform one of the following: – With fully redundant GLIs, contact the OMC–R and request the operator to run the ACTIVATE command for the BTS. – For a non–redundant GLI or a frame where the redundant GLI is not operational, contact the OMC–R and request the operator: • ACTIVATE the GLI to set the Nextload attribute for the GLI to the one for the current BSS software version; • Disable the GLI; • Enable the GLI to allow the MM to load the software version specified by the Nextload attribute; • Once the GLI is INS_ACT, contact the OMC–R and request the operator ACTIVATE the BTS. – Once the GLI cards are loaded with the specified code version, the active GLI will verify and update, as required, the RAM and, if it is necessary, ROM code loads for the installed CSM, MCC, and BBX cards using the DLM.

... continued on next page

Table 5-8: Reset BTS Devices and Remote Site Initialization

Step	Action
5	Packet BTS procedure:
5a	From the BTS site, contact the OMC–R and request the operator to PREACTIVATE the BTS to the required software version for the BSS. There are two types of PREACTIVATE load processes: – Rolling Upgrade: This load process is only available when the BTS cards are populated for full redundancy as applicable. – Quick Reboot: This process is used when there is not full redundancy for the BTS cards. The GLI3 will disable and reboot to the new load. This will cause all the other cards to go out of service. Once it is rebooted, the GLI3 determines which cards require a new load and then downloads the cards in the order which they establish communication with the GLI3 following their reboot. The GLI3 can reload up to 16 devices simultaneously.
6	After all activities at the site have been completed, contact the OMC–R and confirm that the BTS is under OMC–R control.

Notes

[illegible]

Chapter 6

Basic Troubleshooting

Basic Troubleshooting Overview

Overview

The information in this section addresses some of the scenarios likely to be encountered by Cellular Field Engineering (CFE) team members. This troubleshooting guide was created as an interim reference document for use in the field. It provides basic “what to do if” basic troubleshooting suggestions when the BTS equipment does not perform per the procedure documented in the manual.

Comments are consolidated from inputs provided by CFEs in the field and information gained from experience in Motorola labs and classrooms.

Troubleshooting: Installation

Cannot Log into Cell-Site

Follow the procedure in Table 6-1 to troubleshoot a login failure.

Table 6-1: Login Failure Troubleshooting Procedures		
✓	Step	Action
	1	If the MGLI LED is solid RED, it implies a hardware failure. Reset the MGLI by re-seating it. If this persists, install a known good MGLI card in the MGLI slot and retry. A Red LED may also indicate no Ethernet termination at top of frame.
	2	Verify that T1 is disconnected (see Table 3-4 on page 3-16). If T1 is still connected, verify the CBSC has disabled the BTS.
	3	Try <i>pinging</i> the MGLI (see Table 3-11 on page 3-34).
	4	Verify the LMF is connected to the Primary LMF port (LAN A) in the front of the BTS (see Table 3-5 on page 3-17).
	5	Verify the LMF was configured properly (see Preparing the LMF section starting on page 3-6).
	6	Verify the BTS-LMF cable is RG-58 [flexible black cable of less than 76 cm (2.5 feet) length].
	7	Verify the Ethernet ports are terminated properly (see Figure 3-9 on page 3-33).
	8	Verify a T-adapter is <u>not</u> used on the LMF side port if connected to the BTS front LMF primary port.
	9	Try connecting to the I/O panel (top of frame). Use BNC T-adapters at the LMF port for this connection.
	10	Re-boot the LMF and retry.
	11	Re-seat the MGLI and retry.
	12	Verify IP addresses are configured properly.

Cannot Communicate to Power Meter

Follow the procedure in Table 6-2 to troubleshoot a power meter communication failure.

Table 6-2: Troubleshooting a Power Meter Communication Failure		
✓	Step	Action
	1	Verify the Power Meter is connected to the LMF with a GPIB adapter.
	2	Verify the cable setup as specified in Chapter 3.
	3	Verify the GPIB address of the power meter is set to the same value displayed in the applicable GPIB address box of the LMF Options window Test Equipment tab. Refer to Table 3-25 or Table 3-26 and the GPIB Addresses section of Appendix F for details.
	4	Verify the GPIB adapter DIP switch settings are correct. Refer to the CDMA 2000 Test Equipment Preparation section of Appendix F for details.

... continued on next page

Table 6-2: Troubleshooting a Power Meter Communication Failure

✓	Step	Action
	5	Verify the GPIB adapter is not locked up. Under normal conditions, only two green LEDs must be ‘ON’ (Power and Ready). If any other LED is continuously ‘ON’, then cycle GPIB box power and retry.
	6	Verify the LMF computer COM1 port is not used by another application; for example, if a HyperTerminal window is open for MMI, close it.
	7	Reset all test equipment by clicking Util in the BTS menu bar and selecting Test Equipment>Reset from the pull-down lists.

Cannot Communicate to Communications Analyzer

Follow the procedure in Table 6-3 to troubleshoot a communications analyzer communication failure.

Table 6-3: Troubleshooting a Communications Analyzer Communication Failure

✓	Step	Action
	1	Verify signal generator is connected to LMF with GPIB adapter.
	2	Verify cable connections as specified in Chapter 3.
	3	Verify the signal generator GPIB address is set to the same value displayed in the applicable GPIB address box of the LMF Options window Test Equipment tab. Refer to Table 3-25 or Table 3-26 and the GPIB Address section of Appendix F for details.
	4	Verify the GPIB adapter DIP switch settings are correct. Refer to the CDMA 2000 Test Equipment Preparation section of Appendix F for details.
	5	Verify the GPIB adapter is not locked up. Under normal conditions, only two green LEDs must be ‘ON’ (Power and Ready). If any other LED is continuously ‘ON’, then cycle the GPIB box power and retry.
	6	Verify the LMF computer COM1 port is not used by another application; for example, if a HyperTerminal window is open for MMI, close it.
	7	Reset <i>all</i> test equipment by clicking Util in the BTS menu bar and selecting Test Equipment>Reset from the pull-down lists.

Troubleshooting: Download

Cannot Download CODE to Any Device (card)

Follow the procedure in Table 6-4 to troubleshoot a code download failure.

Table 6-4: Troubleshooting Code Download Failure		
✓	Step	Action
	1	Verify T1 is disconnected from the BTS.
	2	Verify the LMF can communicate with the BTS device using the Status function.
	3	Communication to the MGLI must first be established before trying to talk to any other BTS device. The MGLI must be INS_ACT state (green).
	4	Verify the card is physically present in the cage and powered-up.
	5	If the card LED is solid RED, it implies hardware failure. Reset the card by re-seating it. If the LED remains solid red, replace with a card from another slot & retry. NOTE The card can only be replaced by a card of the same type.
	6	Re-seat the card and try again.
	7	If a BBX reports a failure message and is OOS_RAM, the code load was OK. Use the LMF Status function to verify the load.
	8	If the download portion completes and the reset portion fails, reset the device by selecting the device and Reset .
	9	If a BBX or an MCC remains OOS_ROM (blue) after code download, use the LMF Device > Status function to verify that the code load was accepted.
	10	If the code load was accepted, use LMF Device > Download > Flash to load RAM code into flash memory.

Cannot Download DATA to Any Device (Card)

Perform the procedure in Table 6-5 to troubleshoot a data download failure.

Table 6-5: Troubleshooting Data Download Failure		
✓	Step	Action
	1	Re-seat the card and repeat code and data load procedure.

Cannot ENABLE Device

Before a device can be enabled (placed in-service), it must be in the OOS_RAM state (yellow) with data downloaded to the device. The color of the device changes to green once it is enabled.

The three states that devices can be changed to are as follows:

- Enabled (green, INS)
- Disabled (yellow, OOS_RAM)
- Reset (blue, OOS_ROM)

Follow the procedure in Table 6-6 to troubleshoot a device enable failure.

Table 6-6: Troubleshooting Device Enable (INS) Failure		
✓	Step	Action
	1	Re-seat the card and repeat the code and data load procedure.
	2	If the CSM cannot be enabled, verify the CDF file has correct latitude and longitude data for cell site location and GPS sync.
	3	Ensure the primary CSM is in INS_ACT state. NOTE MCCs will not go INS without the CSM being INS.
	4	Verify the 19.6608 MHz CSM clock; MCCs will not go INS otherwise.
	5	The BBX should not be enabled for ATP tests.
	6	If MCCs give “invalid or no system time”, verify the CSM is operable.

Miscellaneous Errors

Perform the procedure in Table 6-7 to troubleshoot miscellaneous failures.

Table 6-7: Miscellaneous Failures		
✓	Step	Action
	1	If LPAs continue to give alarms, even after cycling power at the circuit breakers, then connect an MMI cable to the LPA and set up a Hyperterminal connection (see Table 3-3 on page 3-13).
	2	Enter ALARMS in the Hyperterminal window. The resulting LMF display may provide an indication of the problem. (Call Field Support for further assistance.)

Troubleshooting: Calibration

Bay Level Offset Calibration Failure

Perform the procedure in Table 6-8 to troubleshoot a BLO calibration failure.

Table 6-8: Troubleshooting BLO Calibration Failure		
✓	Step	Action
	1	Verify the Power Meter is configured correctly (see the test equipment setup section in Chapter 3) and connection is made to the proper TX port.
	2	Verify the parameters in the bts-#.cdf file are set correctly for the following bands: For 1900 MHz: Bandclass=1; Freq_Band=16; SSType=16 For 800 MHz: Bandclass=0; Freq_Band=8; SSType=8 For 1700 MHz: Bandclass=4; Freq_Band=128; SSType=16
	3	Verify that no LPA in the sector is in alarm state (flashing red LED). Reset the LPA by pulling the circuit breaker and, after 5 seconds, pushing back in.
	4	Re-calibrate the Power Meter and verify it is calibrated correctly with cal factors from the sensor head.
	5	Verify the GPIB adapter is not locked up. Under normal conditions, only two green LEDs must be 'ON' (Power and Ready). If any other LED is continuously 'ON', power-cycle (turn power off and on) the GPIB Box and retry.
	6	Verify the sensor head is functioning properly by checking it with the 1 mW (0 dBm) Power Ref signal.
	7	If communication between the LMF and Power Meter is operational, the Meter display will show "RES".

Cannot Load BLO

For Load BLO failures see Table 6-7.

Calibration Audit Failure

Follow the procedure in Table 6-9 to troubleshoot a calibration audit failure.

Table 6-9: Troubleshooting Calibration Audit Failure

✓	Step	Action
	1	Verify the Power Meter is configured correctly (refer to the test equipment setup section of Chapter 3).
	2	Re-calibrate the Power Meter and verify it is calibrated correctly with cal factors from the sensor head.
	3	Verify that no LPA is in alarm state (rapidly flashing red LED). Reset the LPA by pulling the circuit breaker and, after 5 seconds, pushing back in.
	4	Verify that no sensor head is functioning properly by checking it with the 1 mW (0 dBm) Power Ref signal.
	5	After calibration, the BLO data must be re-loaded to the BBXs before auditing. Click on the BBX(s) and select Device>Download BLO . Re-try the audit.
	6	Verify the GPIB adapter is not locked up. Under normal conditions, only two green LEDs must be “ON” (Power and Ready). If any other LED is continuously “ON”, power-cycle (turn power off and on) the GPIB Box and retry.

Troubleshooting: Transmit ATP

BTS passed Reduced ATP tests but has forward link problem during normal operation

Follow the procedure in Table 6-10 to troubleshoot a Forward Link problem during normal operation.

Table 6-10: Troubleshooting Forward Link Failure (BTS Passed Reduced ATP)		
✓	Step	Action
	1	Perform these additional TX tests to troubleshoot a forward link problem: – TX mask – TX rho – TX code domain

Cannot Perform TX Mask Measurement

Follow the procedure in Table 6-11 to troubleshoot a TX mask measurement failure.

Table 6-11: Troubleshooting TX Mask Measurement Failure		
✓	Step	Action
	1	Verify that TX audit passes for the BBX(s).
	2	If performing manual measurement, verify analyzer setup.
	3	Verify that no LPA in the sector is in alarm state (flashing red LED). Re-set the LPA by pulling the circuit breaker and, after 5 seconds, pushing it back in.

Cannot Perform Rho or Pilot Time Offset Measurement

Follow the procedure in Table 6-12 to troubleshoot a rho or pilot time offset measurement failure.

Table 6-12: Troubleshooting Rho and Pilot Time Offset Measurement Failure		
✓	Step	Action
	1	Verify presence of RF signal by switching to spectrum analyzer screen.
	2	Verify PN offsets displayed on the analyzer is the same as the PN offset in the CDF file.
	3	Re-load BBX data and repeat the test.
	4	If performing manual measurement, verify analyzer setup.
	5	Verify that no LPA in the sector is in alarm state (flashing red LED). Reset the LPA by pulling the circuit breaker and, after 5 seconds, pushing back in.
	6	If Rho value is unstable and varies considerably (e.g. .95,.92,.93), this may indicate that the GPS is still phasing (i.e., trying to reach and maintain 0 freq. error). Go to the freq. bar in the upper right corner of the Rho meter and select Hz . Press <Shift–avg> and enter 10 , to obtain an average Rho value. This is an indication the GPS has not stabilized before going <i>INS</i> and may need to be re-initialized.

Cannot Perform Code Domain Power and Noise Floor Measurement

Perform the procedure in Table 6-13 to troubleshoot a code domain and noise floor measurement failure.

Table 6-13: Troubleshooting Code Domain Power and Noise Floor Measurement Failure		
✓	Step	Action
	1	Verify presence of RF signal by switching to spectrum analyzer screen.
	2	Verify PN offset displayed on analyzer is same as PN offset being used in the CDF file.
	3	Disable and re-enable MCC (one or more MCCs based on extent of failure).

Troubleshooting: Receive ATP

Multi–FER Test Failure

Perform the procedure in Table 6-14 to troubleshoot a Multi–FER failure.

Table 6-14: Troubleshooting Multi-FER Failure		
✓	Step	Action
	1	Verify the test equipment set up is correct for an FER test.
	2	Verify the test equipment is locked to 19.6608 and even second clocks. On the HP8921A test set, the yellow LED (REF UNLOCK) must be OFF.
	3	Verify the MCCs have been loaded with data and are INS–ACT.
	4	Disable and re-enable the MCC (one or more based on extent of failure).
	5	Disable, re-load code and data, and re-enable the MCC (one or more MCCs based on extent of failure).
	6	Verify the antenna connections to frame are correct based on the directions messages.

Troubleshooting: CSM Check-list

Problem Description

Many of the Clock Synchronization Manager (CSM) board failures may be resolved in the field before sending the boards to the factory for repair. This section describes known CSM problems identified in field returns, some of which are field-repairable. Check these problems before returning suspect CSM boards.

Intermittent 19.6608 MHz Reference Clock/GPS Receiver Operation

If having any problems with CSM board kit numbers, SGLN1145 or SGLN4132, check the suffix with the kit number. If the kit has version “AB”, then replace with version “BC” or higher, and return model “AB” to the repair center.

No GPS Reference Source

Check the CSM boards for proper hardware configuration. CSM kit SGLN1145, in Slot 1, has an on-board GPS receiver; while kit SGLN4132, in Slot 2, does not have a GPS receiver. Any incorrectly configured board *must* be returned to the repair center. *Do not attempt to change hardware configuration in the field.* Also, verify the GPS antenna is not damaged and is installed per recommended guidelines.

Checksum Failure

The CSM could have corrupted data in its firmware resulting in a non-executable code. The problem is usually caused by either electrical disturbance or interruption of data during a download. Attempt another download with no interruptions in the data transfer. Return the CSM board back to the repair center if the attempt to reload fails.

GPS Bad RX Message Type

This problem is believed to be caused by a later version of CSM software (3.5 or higher) being downloaded, via LMF, followed by an earlier version of CSM software (3.4 or lower), being downloaded from the CBSC. Download again with CSM software code 3.5 or higher. Return the CSM board back to the repair center if the attempt to reload fails.

CSM Reference Source Configuration Error

This problem is caused by incorrect reference source configuration performed in the field by software download. CSM kits SGLN1145 and SGLN4132 must have proper reference sources configured (as shown below) to function correctly.

CSM Kit No.	Hardware Configuration	CSM Slot No.	Reference Source Configuration	CDF Value
SGLN1145	With GPS Receiver	1	Primary = Local GPS Backup = Either LFR or HSO	0 2 or 18
SGLN4132	Without GPS Receiver	2	Primary = Remote GPS Backup = Either LFR or HSO	1 2 or 18

Takes Too Long for CSM to Come INS

This problem may be caused by a delay in GPS acquisition. Check the accuracy flag status and/or current position. Refer to the GSM system time/GPS and LFR/HSO verification section in Chapter 3. At least one satellite should be visible and tracked for the “surveyed” mode and four satellites should be visible and tracked for the “estimated” mode. Also, verify correct base site position data used in “surveyed” mode.

C-CCP Backplane Troubleshooting

Introduction

The C-CCP backplane is a multi-layer board that interconnects all the C-CCP modules. The complexity of this board lends itself to possible improper diagnoses when problems occur.

Connector Functionality

The following connector overview describes the major types of backplane connectors along with the functionality of each. This information allows the CFE to:

- Determine which connector(s) is associated with a specific problem type.
- Isolate problems to a specific cable or connector.

Primary “A” and Redundant “B” Inter Shelf Bus Connectors

The 40 pin Inter Shelf Bus (ISB) connectors provide an interface bus from the master GLI to all other GLIs in the modem frame. Their basic function is to provide clock synchronization from the master GLI to all other GLIs in the frame.

The ISB also provides the following functions:

- Span line grooming when a single span is used for multiple cages.
- MMI connection to/from the master GLI to cell site modem.
- Interface between GLIs and the AMR (for reporting BTS alarms).

Span Line Connector

The 50-pin span line connector provides a primary and secondary (if used) span line interface to each GLI in the C-CCP shelf. The span line is used for MM/EMX switch control of the Master GLI and also all the BBX traffic.

Primary “A” and Redundant “B” Reference Distribution Module Input/Output

The Reference Distribution Module (RDM) connectors route the 3 MHz reference signals from the CSMs to the GLIs and all BBXs in the backplane. The signals are used to phase lock loop all clock circuits on the GLIs and BBX boards to produce precise clock and signal frequencies.

Power Input (Return A, B, and C connectors)

Provides a +27 volt or -48 volt input for use by the power supply modules.

Power Supply Module Interface

Each power supply module has a series of three different connectors to provide the needed inputs/outputs to the C–CCP backplane. These include a VCC/Ground input connector, a Harting style multiple pin interface, and a +15 V/Analog Ground output connector. The C–CCP Power Modules convert +27 or –48 Volts to a regulated +15, +6.5, and +5.0 Volts to be used by the C–CCP shelf cards. In the –48 V BTS, the LPA power modules convert –48 Volts to a regulated +27 Volts.

GLI Connector

This connector consists of a Harting 4SU digital connector and a 6–conductor coaxial connector for RDM distribution. The connectors provide inputs/outputs for the GLIs in the C–CCP backplane.

GLI 10Base–2 Ethernet “A” and “B” Connections

These BNC connectors are located on the C–CCP backplane and routed to the GLI board. This interface provides all the control and data communications between the master GLI and the other GLI, between gateways, and for the LMF on the LAN.

BBX Connector

Each BBX connector consists of a Harting 2SU/1SU digital connector and two 6–conductor coaxial connectors. These connectors provide DC, digital, and RF inputs/outputs for the BBXs in the C–CCP backplane.

CIO Connectors

- RX RF antenna path signal inputs are routed through RX Tri–Filters (on the I/O plate), and via coaxial cables to the two MPC modules – the six “A” (main) signals go to one MPC; the six “B” (diversity) to the other. The MPC outputs the low–noise–amplified signals via the C–CCP backplane to the CIO where the signals are split and sent to the appropriate BBX.
- A digital bus then routes the baseband signal through the BBX, to the backplane, then on to the MCC slots.
- Digital TX antenna path signals originate at the MCCs. Each output is routed from the MCC slot via the backplane appropriate BBX.
- TX RF path signal originates from the BBX, through the backplane to the CIO, through the CIO, and via multi–conductor coaxial cabling to the LPAs in the LPA shelf.

C–CCP Backplane Troubleshooting Procedure

Table 6-15 through Table 6-24 provide procedures for troubleshooting problems that appear to be related to a defective C–CCP backplane. The tables are broken down into possible problems and steps that should be taken in an attempt to find the root cause.

NOTE	Table 6-15 through Table 6-24 must be completed before replacing ANY C–CCP backplane.
-------------	---

Digital Control Problems

No GLI Control via LMF (all GLIs)

Follow the procedure in Table 6-15 to troubleshoot a GLI control via LMF failure.

Table 6-15: No GLI Control via LMF (all GLIs)		
✓	Step	Action
	1	Check the 10Base-2 ethernet connector for proper connection, damage, shorts, or opens.
	2	Verify the C-CCP backplane Shelf ID DIP switch is set correctly.
	3	Visually check the master GLI connector (both board and backplane) for damage.
	4	Replace the master GLI with a known good GLI.

No GLI Control through Span Line Connection (All GLIs)

Follow the procedures in Table 6-16 and Table 6-17 to troubleshoot GLI control failures.

Table 6-16: No GLI Control through Span Line Connection (Both GLIs)	
Step	Action
1	Verify the C-CCP backplane Shelf ID DIP switch is set correctly.
2	Verify that the BTS and GLIs are correctly configured in the OMCR/CBSC data base.
3	Visually check the master GLI connector (both board and backplane) for damage.
4	Replace the master GLI with a known good GLI.
5	Check the span line inputs from the top of the frame to the master GLI for proper connection and damage.
6	Check the span line configuration on the MGLI (see Table 5-4 on page 5-5).

Table 6-17: MGLI Control Good – No Control over Co-located GLI	
Step	Action
1	Verify that the BTS and GLIs are correctly configured in the OMCR CBSC data base.
2	Check the ethernet for proper connection, damage, shorts, or opens.
3	Visually check all GLI connectors (both board and backplane) for damage.
4	Replace the remaining GLI with a known good GLI.