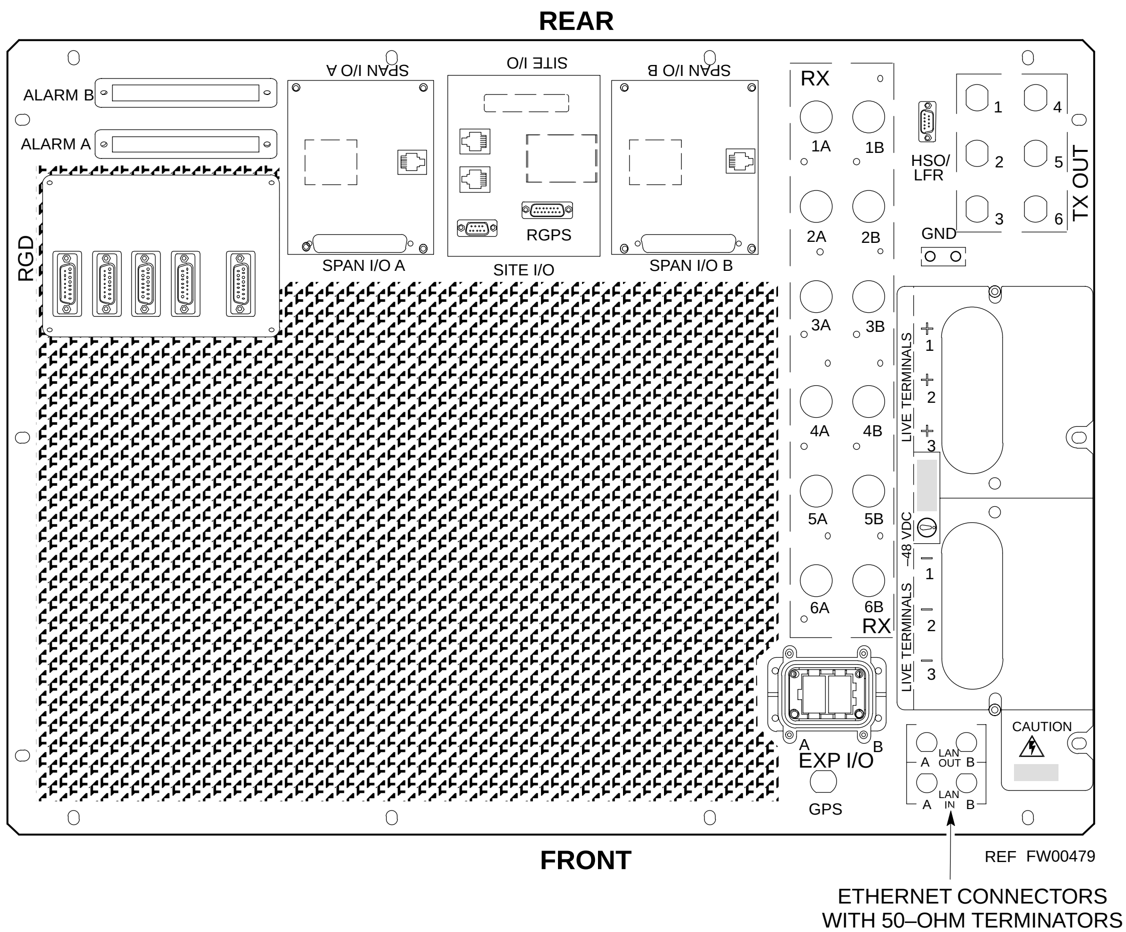
Figure 3-6: –48 V SC 4812T Starter Frame I/O Plate



Basic LMF Operation

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

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

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

Basic operation of the LMF GUI includes the following:

- Selecting and deselecting BTS devices
- Enabling devices
- Disabling devices
- Resetting devices
- Obtaining device status
- Sorting a status report window

For detailed information on performing these and other LMF operations, refer to the *CDMA LMF Operator's Guide, 68P64114A78*.

Graphical User Interface Overview

The LMF uses a GUI, which works in the following way:

- Select the device or devices.
- Select the action to apply to the selected device(s).
- While action is in progress, a status report window displays the action taking place and other status information.
- The status report window indicates when the the action is complete and displays other pertinent information.
- Clicking the **OK** button closes the status report window.

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 that you want to start the application?

This window also contains **yes** and **no** buttons. Selecting **yes** starts the application. Selecting **no** terminates the application.

CLI Format Conventions

The CLI command can be broken down in the following way:

- 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> **rssi channel=6 sector=5**

Refer to *LMF CLI Commands, R15.x* 68P09251A59 for a complete explanation of the CLI commands and their use.

Logging into a BTS

IMPORTANT

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

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

Before attempting to log into the BTS, confirm the CDMA LMF is properly connected to the BTS (see Figure 3-2).

Prerequisites

Before attempting to login to a BTS**,** ensure the following have been completed:

- The LMF operating system is correctly installed and prepared.
- A ***bts-nnn*** folder with the correct CDF and CBSC file exists.
- The LMF is correctly installed and prepared, and the LMF computer is connected to the BTS before starting the Windows operating system and LMF software. If necessary, restart the computer after connecting it to the BTS (see Table 3-2 and Figure 3-2).

BTS Login from the GUI Environment

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

Table 3-7: BTS GUI Login Procedure

Step	Action

1	Start the CDMA LMF GUI environment by 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).

. . . continued on next page

Table 3-7: BTS GUI Login Procedure	
Step	**Action**
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.
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. **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	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.
9	Click on the **Use a Tower Top Amplifier**, if applicable.
10	Click on **Login**. A BTS tab with the BTS 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.

3

BTS Login from the CLI Environment

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

IMPORTANT

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 logout has occurred.

Table 3-8: BTS CLI Login Procedure

Step	Action
1	Double click the WinLMF CLI desktop icon (if the LMF CLI environment is not already running). **NOTE** If a BTS was logged into under a GUI session when 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–**<*bts#*> **host=**<*host*> **port=**<*port*> 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).

Logging Out

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

IMPORTANT

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 logout has occurred.

Logging Out of a BTS from the GUI Environment

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

. . . continued on next page

Table 3-9: BTS GUI Logout Procedure	
Step	**Action**
1	Click on **Select** on the BTS tab menu bar.
2	Click the **Logout** item in the pull–down menu (a **Confirm Logout** pop–up message appears).
3	Click on **Yes** or press the **<Enter>** key to confirm logout. You are returned to the **Login** tab. **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, perform the following actions: – Click **OK.** – Select **File>Exit** in the window menu bar. – Click **Yes** in the **Confirm Logout** pop–up. – Click **Yes** in the **Logout Error** pop–up which appears again.
5	If further work is to be done in the GUI, restart it.

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 3-10: BTS CLI Logout Procedure

Step	Action

1	*** IMPORTANT**
	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.
	Logout of a BTS by entering the following command:
	logout bts–<*bts#*>
	A response similar to the following is displayed:
	`LMF>`
	`12:22:58.028 Command Received and Accepted`
	`Command=logout bts–33`
	`12:22:58.028 Command Received and Accepted`
	`12:22:58.028 Command Successfully Completed`
	`REASON_CODE=”No Reason”`

2	If desired, close the CLI interface by entering the following command: **exit** A response similar to the following is displayed before the window closes: `Killing background processes....`

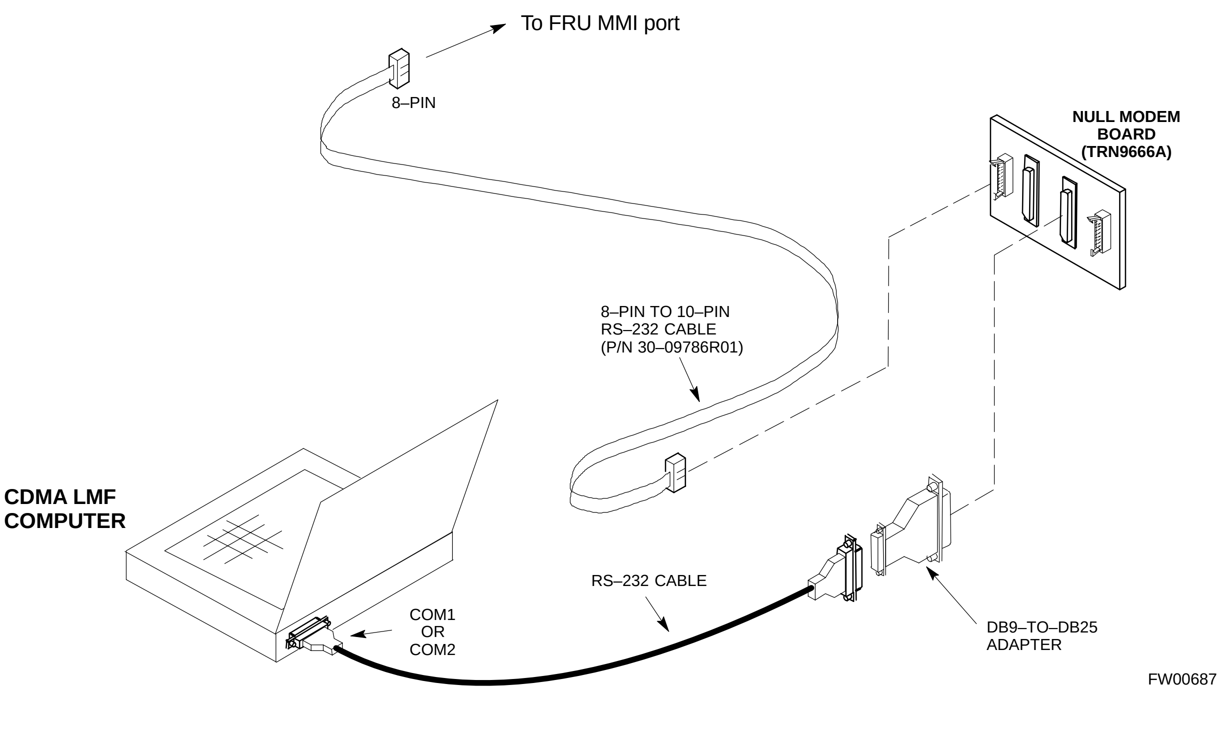
Establishing an MMI Communication Session

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

Table 3-11: 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	Start the named HyperTerminal connection for MMI sessions by double clicking on its desktop shortcut. **NOTE** If a desktop shortcut was not created for the MMI connection, access the connection from the Start menu by selecting: **Programs>Accessories>Hyperterminal>HyperTerminal><*Named HyperTerminal Connection (e.g., MMI Session)*.**
3	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 3-7: CDMA LMF Computer Common MMI Connections



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. 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, refer to Appendix H.

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.

RAM Code

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

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

Download Code to Devices

Code can be downloaded to a device that is in any state. After the download starts, the device being downloaded changes to OOS_ROM (blue). If the download is completed successfully, the device changes to OOS_RAM with code loaded (yellow). Prior to downloading a device, a code file must exist. The code file is selected automatically if the code file is in the */lmf/cdma/n.n.n.n/code* folder (where *n.n.n.n* is the version number of the download code that matches the “NextLoad” parameter in the CDF file). The code file in the code folder must have the correct hardware bin number. Code can be automatically or manually selected.

The following are the devices to be downloaded:

- Span Configuration
  - Master Group Line Interface (MGLI2)
  - Slave Group Line Interface (SGLI2)
- Clock Synchronization Module (CSM)
- Multi Channel Card (MCC24E, MCC8E or MCC–1X)
- Broadband Transceiver (BBX)
- Test Subscriber Interface Card (TSIC) – if RFDS is installed

IMPORTANT

The MGLI *must* be successfully downloaded with code and data, and put INS *before* 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.

Follow the procedure in Table 3-12 to download the firmware application code for the MGLI2. The download code action downloads data and also enables the MGLI2.

Prerequisite

Prior to performing this procedure, ensure a code file exists for each of the devices to be downloaded.

. . . continued on next page

3

WARNING

R9 RAM code must NOT be downloaded to a device that has R8 ROM code and R8 RAM code must NOT be downloaded to a device that has R9 ROM code. All devices in a BTS must have the same R–level ROM and RAM code before the optimization and ATP procedures can be performed. If a newly installed R8 BTS is to be upgraded to R9, the optimization and ATPs should be accomplished with the R8 code. Then the site should be upgraded to R9 by the CBSC. The optimization and ATP procedures do not have to be performed again after the R9 upgrade. If a replacement R8 device needs to be used in a R9 BTS, the device ROM code can be changed with use of the LMF before the optimization and ATPs are performed for the BTS. Refer to the Download ROM Code section. A R9 device can not be converted back to a R8 device in the field without Motorola assistance.

Table 3-12: Download and Enable MGLI2

✓	Step	Action
	1	Select **Util>Tools>Update Next Load** function to ensure the Next Load parameter is set to the correct code version level.
	2	Download code to the primary MGLI2 by clicking on the MGLI2. – From the **Device** pull down menu, select **Download Code**. A status report confirms change in the device(s) status. – Click **OK** to close the status window. *(The MGLI2 should automatically be downloaded with data and enabled.)*
	3	Download code and data to the redundant MGLI2 but do not enable at this time.

Download Code and Data to Non–MGLI2 Devices

Non–MGLI2 devices can be downloaded individually or all equipped devices can be downloaded with one action. Follow the procedure in Table 3-13 to download code and data to the non–MGLI2 devices.

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.

Table 3-13: Download Code and Data to Non–MGLI Devices

✓	Step	Action
	1	**Select** all devices to be downloaded.
	2	From the **Device** pull down menu, select **Download Code**. A status report displays the result of the download for each selected device. Click **OK** to close the status window. **NOTE** After the download has started, the device being downloaded changes to blue. If the download is completed successfully, the device changes to yellow (OOS-RAM with code loaded). 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.
	3	To download the firmware application data to each device, select the target device and select: **Device>Download Data**

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
- Remote GPS
- HSO (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=INS_ACT

CSM= OOS_RAM or INS_ACT

. . . continued on next page

Follow the procedure in Table 3-14 to select a CSM Clock Source.

Table 3-14: Select CSM Clock Source

Step	Action
1	Select the applicable CSM(s).
2	Click on the **Device** menu.
3	Click on the **Clock Source** menu item.
4	Click on the **Select** menu item. A clock source selection window is displayed.
5	Select the applicable clock source in the **Clock Reference Source** pick lists. Uncheck the related check box if you do not want the displayed pick list item to be used.
6	Click on the **OK** button. A status report window displays the results of the selection action.
7	Click on the **OK** button to close the status report window.

Enable CSMs

Each BTS CSM system features two CSM boards per site. In a typical operation, the primary CSM locks its Digital Phase Locked Loop (DPLL) circuits to GPS signals. These signals are generated by either an on–board GPS module (RF–GPS) or a remote GPS receiver (R–GPS). The 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, or HSO 10 MHz Rubidium source, which the CSM can use as a secondary timing reference. In all cases, the CSM monitors and determines what reference to use at a given time.

IMPORTANT

- 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.
- For non–RGPS sites only, verify the CSM configured with the GPS receiver “daughter board” is installed in the CSM–1 slot before continuing.
- The CSM(s) and MCC(s) to be enabled must have been downloaded with code (Yellow, OOS–RAM) and data.

. . . continued on next page

Follow the procedure in Table 3-15 to enable the CSMs.

Table 3-15: Enable CSMs

✓	Step	Action
	1	Verify the CSM(s) have been downloaded with code (Yellow, OOS–RAM) and data.
	2	Click on the target CSM. From the **Device** pull down, select **Enable**. **NOTE** If equipped with two CSMs, enable CSM–2 first and then CSM–1. A status report confirms change in the device(s) status. Click **OK** to close the status window. **NOTE** FAIL may be shown in the status table for enable action. If Waiting For Phase Lock is shown in the Description field, the CSM changes to the enabled state after phase lock is achieved. CSM–1 houses the GPS receiver. The enable sequence can take up to ***one hour*** to complete. *** 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 an installed GPS receiver has not been updated for a number of weeks, it may take up to one 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.)
	3	**NOTE** If equipped with two CSMs, the LMF should display CSM-1 as bright GREEN (INS–ACT) and CSM–2 as dark green (INS–STB). After the CSMs have been successfully enabled, the PWR/ALM LEDs are steady green (alternating green/red indicates the card is in an alarm state). If more than an hour has passed, refer to Table 3-19 and Table 3-20 to determine the cause.

Enable MCCs

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

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

IMPORTANT

The MGLI2, and primary CSM must be downloaded and enabled (IN–SERVICE ACTIVE), before downloading and enabling the MCC.

Table 3-16: Enable MCCs

✓	Step	Action
	1	Verify the MCC(s) have been downloaded with code (Yellow, OOS–RAM) and data.
	2	Select the MCCs to be enabled or from the **Select** pulldown menu choose **All MCCs**.
	3	From the **Device** menu, select **Enable** A status report confirms change in the device(s) status.
	4	Click on **OK** to close the status report window.

Enable Redundant GLIs

Follow the procedure in Table 3-17 to enable the redundant GLI(s).

Table 3-17: 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 and 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 3-19). The source selection can also be overridden via the LMF or by the system software.

All boards are mounted in the C–CCP shelf at the top of the BTS frame. Figure 3-9 on page 3-36 illustrates the location of the boards in the BTS frame. The diagram also shows the CSM front panel.

Low Frequency Receiver/ High Stability Oscillator

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

The LFR requires an active external antenna to receive LORAN RF signals. Timing pulses are derived from this signal, which is synchronized to Universal Time Coordinates (UTC) and GPS time. The LFR can maintain system time indefinitely after initial GPS lock.

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

Upgrades and Expansions: LFR2/HSO2/HSOX

LFR2/HSO2 (second generation cards) both export a timing signal to the expansion or logical BTS frames. The associated expansion or logical frames require an HSO–expansion (HSOX) whether the starter frame has an LFR2 or an HSO2. The HSOX accepts input from the starter frame and interfaces with the CSM cards in the expansion frame. LFR and LFR2 use the same source code in source selection (see Table 3-18). HSO, HSO2, and HSOX use the same source code in source selection (see Table 3-18).

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.

Front Panel LEDs

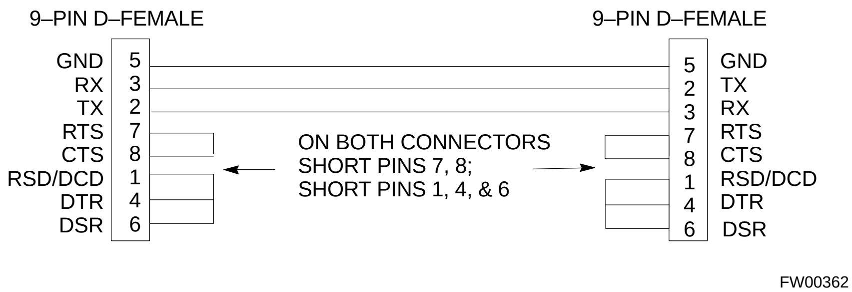
The status of the LEDs on the CSM boards are as follows:

- 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.

Null Modem Cable

A null modem cable is required. It is connected between the LMF COM1 port and the RS232–GPIB Interface box. Figure 3-8 shows the wiring detail for the null modem cable.

Figure 3-8: Null Modem Cable Detail



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.

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.

Test Equipment Setup: GPS & LFR/HSO Verification

Follow the procedure in Table 3-18 to set up test equipment while referring to Figure 3-9 as required.

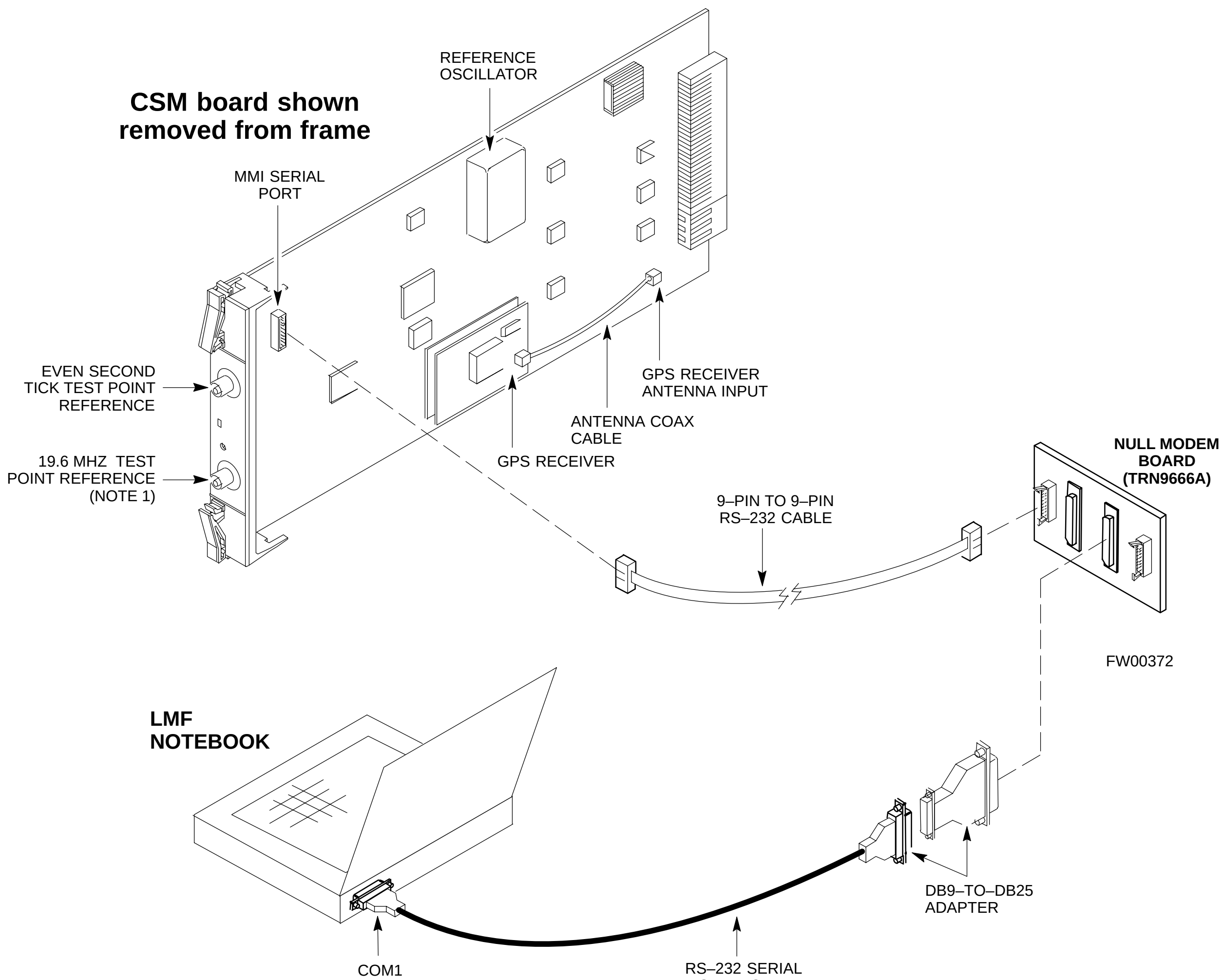
Table 3-18: Test Equipment Setup (GPS & LFR/HSO Verification)

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. **NOTE** 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 **NOTE** This is verified by checking the board ejectors for kit number **SGLN4132CC** (or subsequent).
2	Remove CSM–2 (if installed) and connect a serial cable from the LMF COM 1 port (via null modem board) to the MMI port on CSM–1.

. . . continued on next page

Table 3-18: Test Equipment Setup (GPS & LFR/HSO Verification)	
Step	**Action**
3	Reinstall CSM–2.
4	Start an MMI communication session with CSM–1 by using the Windows desktop shortcut icon (see Table 3-5) **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 3-9: CSM MMI terminal connection



NOTES:
1. 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 3-19 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 3-9).
- 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 *antenna* and/or *receiver* can result if the GPS antenna is inadvertently connected to any other RF connector.

Table 3-19: 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:
	`CSM Status INS:ACTIVE Slot A Clock MASTER.`
	`BDC_MAP:000, This CSM's BDC Map:0000`
	`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`

2	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.
	*** IMPORTANT** 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 ***Wait for this to occur before continuing !*** – 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

. . . continued on next page

Table 3-19: GPS Initialization/Verification

Step	Action
3	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.

4	Enter the following command at the `CSM>` prompt to verify that the GPS receiver is in tracking mode.
	gstatus
	– Observe the following typical response:
	`24:06:08 GPS Receiver Control Task State: tracking satellites.`
	`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 8 satellites tracked, receiving 8 satellites, 8 satellites visible.`
	`24:06:08 Current Dilution of Precision (PDOP or HDOP): 0.`
	`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.`

5	**Verify** the following GPS information (shown above in underlined text): – At least 4 satellites are tracked, and 4 satellites are visible. – GPS Receiver Control Task State is "tracking satellites". ***Do not continue until this occurs!*** – Dilution of Precision indication is not more that 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).

. . . continued on next page

<table>
<tr><th colspan="2">Table 3-19: GPS Initialization/Verification</th></tr>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>6</td><td>If steps 1 through 5 pass, the GPS is good.</td></tr>
<tr><td></td><td>* IMPORTANT
If any of the above mentioned areas fail, verify that:
– If Initial position accuracy 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 Initial position accuracy 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.</td></tr>
<tr><td>7</td><td>Enter the following commands at the <code>CSM></code> 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) (If warmed–up proceed to step 8)
<code>CSM>DPLL Task Wait. 884 seconds left.</code>
<code>DPLL Task Wait. 882 seconds left.</code>
<code>DPLL Task Wait. 880 seconds left. ....etc.</code></td></tr>
<tr><td></td><td>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.</td></tr>
<tr><td>8</td><td>Observe the following typical response if the CSM is warmed up.
<code>c:17486 off: <u>–11</u>, 3, <u>6</u> <u>TK SRC:0</u> S0: 3 S1:–2013175,–2013175</code>
<code>c:17486 off: <u>–11</u>, 3, <u>6</u> <u>TK SRC:0</u> S0: 3 S1:–2013175,–2013175</code>
<code>c:17470 off: <u>–11</u>, 1, <u>6</u> <u>TK SRC:0</u> S0: 1 S1:–2013175,–2013175</code>
<code>c:17486 off: <u>–11</u>, 3, <u>6</u> <u>TK SRC:0</u> S0: 3 S1:–2013175,–2013175</code>
<code>c:17470 off: <u>–11</u>, 1, <u>6</u> <u>TK SRC:0</u> S0: 1 S1:–2013175,–2013175</code>
<code>c:17470 off: <u>–11</u>, 1, <u>6</u> <u>TK SRC:0</u> S0: 1 S1:–2013175,–2013175</code></td></tr>
<tr><td>9</td><td>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.</td></tr>
<tr><td>10</td><td>Enter the following commands at the <code>CSM></code> prompt to exit the debug mode display.
debug dpllp</td></tr>
</table>

3

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 ηs strobe to the CSM

If the BTS is equipped with an LFR, follow the procedure in Table 3-20 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.

. . . continued on next page

Table 3-20: 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:
	
	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>
		This must be greater than 100 before LFR becomes a valid source.
		
		This shows the LFR is locked to the selected PLL station.
		
		This search list and PLL data must match the configuration for the geographical location of the cell site.

. . . continued on next page

Table 3-20: LFR Initialization/Verification		
Step	**Action**	**Note**
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.
	`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`	

4	LORAN–C LFR information (highlighted above in **boldface** type) is usually the #1 reference source (verified from left to right). *** IMPORTANT** 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 underlined 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 3-21 to configure the HSO.

Table 3-21: HSO Initialization/Verification

Step	Action
1	At the BTS, slide the HSO card into the cage. **NOTE** The LED on the HSO should light *red* for no longer than 15-minutes, then switch to *green*. 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:
	`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`
	`Current reference source number: 0`
	When the CSM is locked to GPS, verify that the HSO “Good” field is *Yes* and the “Valid” field is *Yes*.

3	If source “1” is **not** configured as HSO, enter at the **CSM**> prompt: **ss 1 12 <cr>** Check for *Good* in the Status field.
4	At the **CSM**> prompt, enter **sources <cr>**. Verify the HSO valid field is *Yes*. If not, repeat this step until the “Valid” status of *Yes* is returned. The HSO should be valid within one (1) minute, assuming the DPLL is locked and the HSO Rubidium oscillator is fully warmed.

Connecting Test Equipment to the BTS

All test equipment is controlled by the LMF via an IEEE–488/GPIB bus. The LMF requires each piece of test equipment to have a factory set GPIB address. If there is a communications problem between the LMF and any piece of test equipment, verify that the GPIB addresses have been set correctly (normally 13 for a power meter and 18 for a CDMA analyzer).

The following equipment is required to perform optimization:

- LMF
- Test set
- Directional coupler and attenuator
- RF cables and connectors

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

- Figure 3-11 and Figure 3-12 show the test set connections for TX calibration.
- Figure 3-13 and Figure 3-14 show the test set connections for optimization/ATP tests.
- Figure 3-15 and Figure 3-16 show typical TX and RX ATP setup with a directional coupler (shown with and without RFDS).

Supported Test Sets

Optimization and ATP testing 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
- Spectrum Analyzer (HP8594E) – *optional*
- Rubidium Standard Timebase – *optional*

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.

Test Equipment Reference Chart

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

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

Table 3-22: Test Equipment Setup

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

Equipment Warm-up

IMPORTANT

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

Calibrating Cables

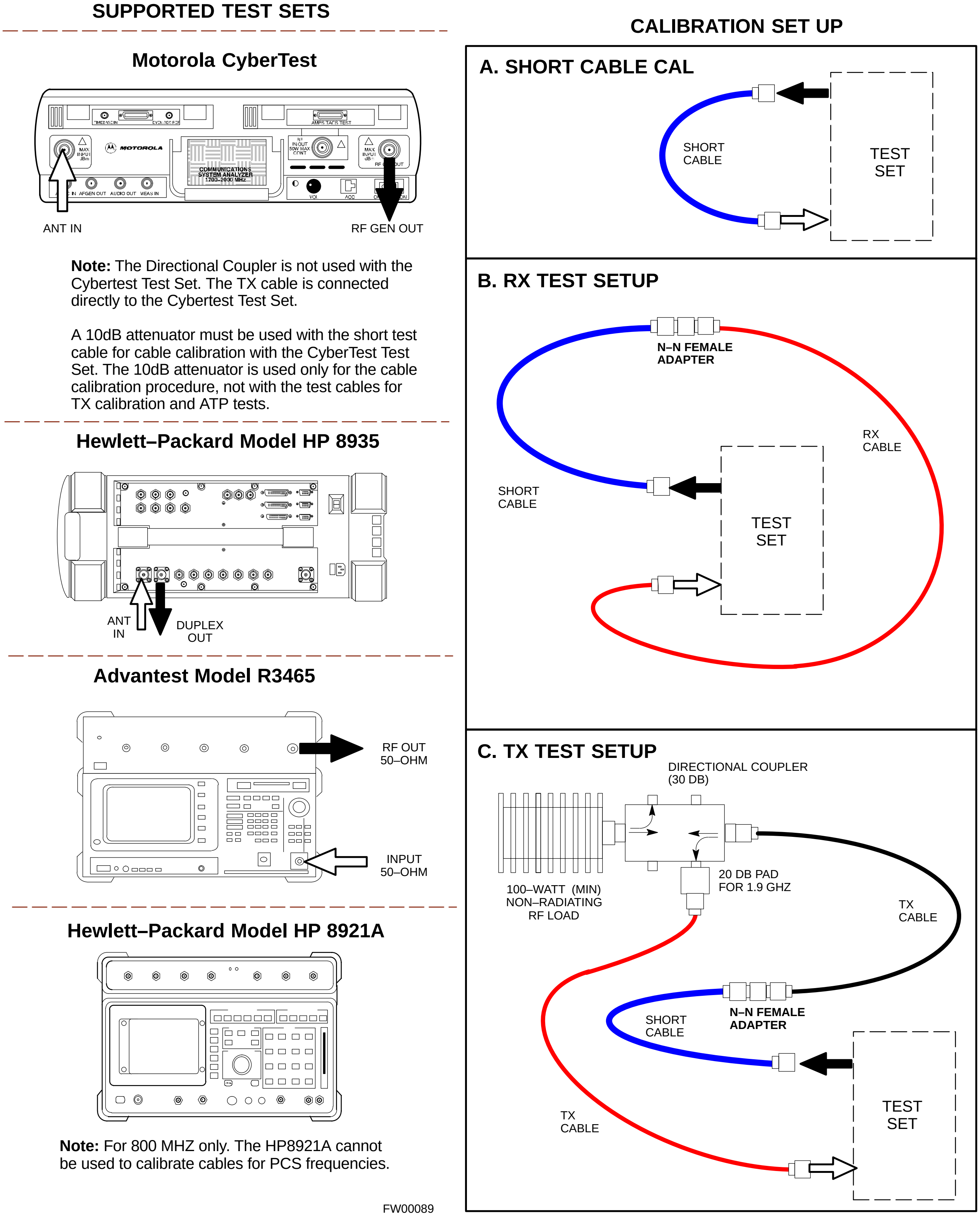
Figure 3-10 shows the cable calibration setup for various supported test sets. The left side of the diagram depicts the location of the input and output ports of each test set, and the right side details the set up for each test.

WARNING

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

. . . continued on next page

Figure 3-10: Cable Calibration Test Setup



Setup for TX Calibration

Figure 3-11 and Figure 3-12 show the test set connections for TX calibration.

Figure 3-11: TX Calibration Test Setup (CyberTest, HP 8935, and Advantest)

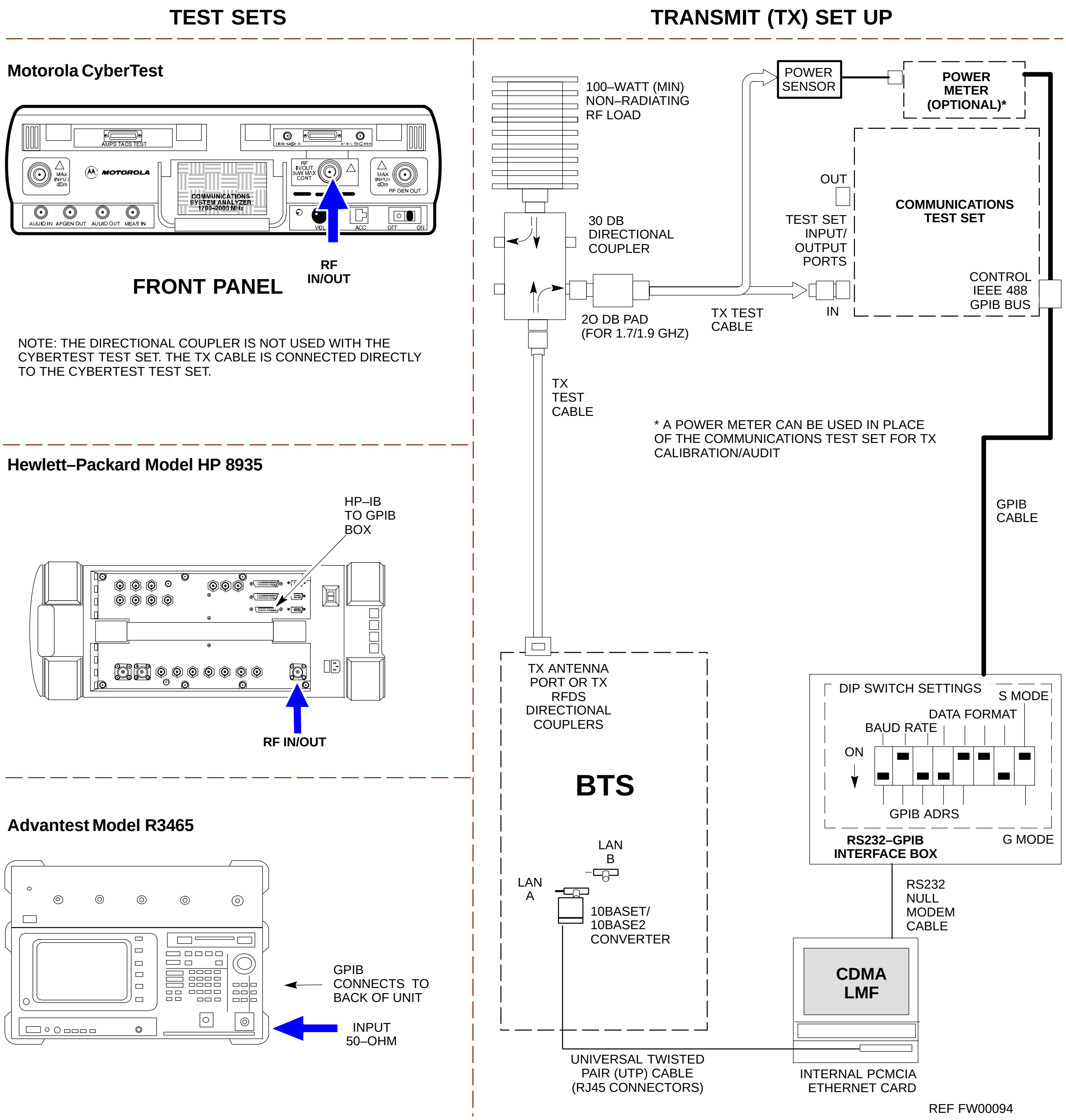
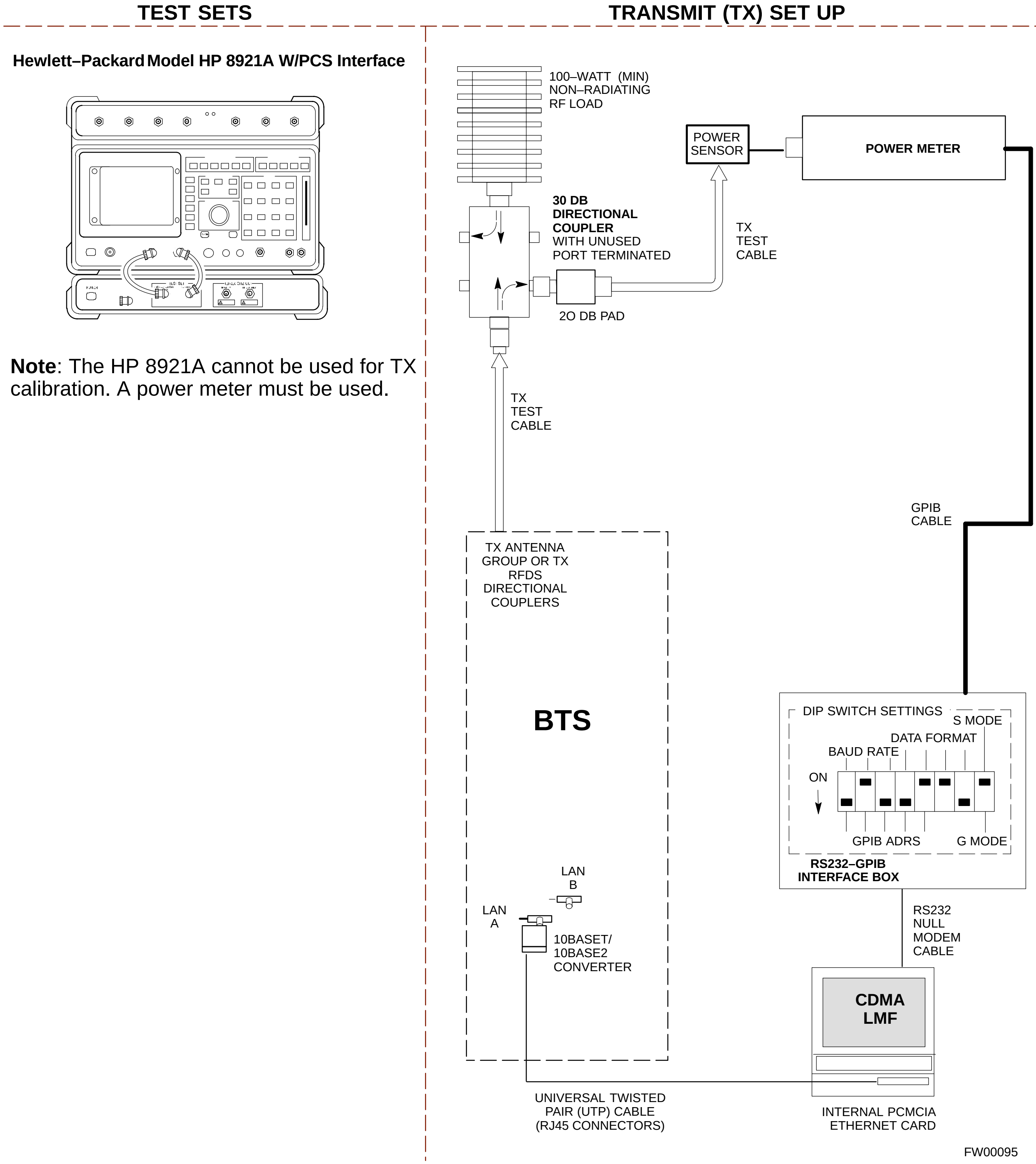


Figure 3-12: TX Calibration Test Setup HP 8921A W/PCS for 1.7/1.9 GHz



Setup for Optimization/ATP

Figure 3-13 and Figure 3-14 show the test set connections for optimization/ATP tests.

Figure 3-13: Optimization/ATP Test Setup Calibration (CyberTest, HP 8935 and Advantest)

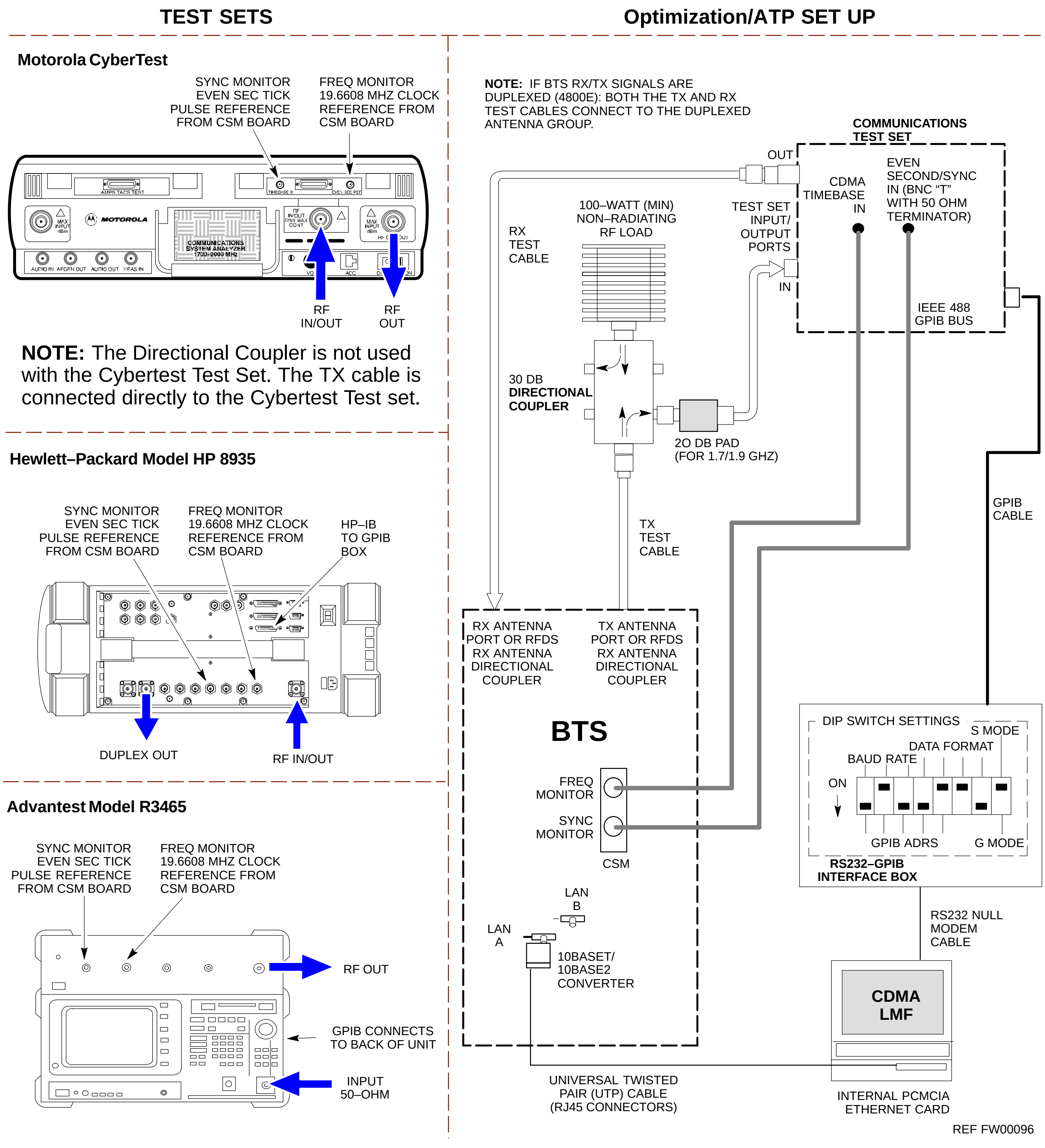
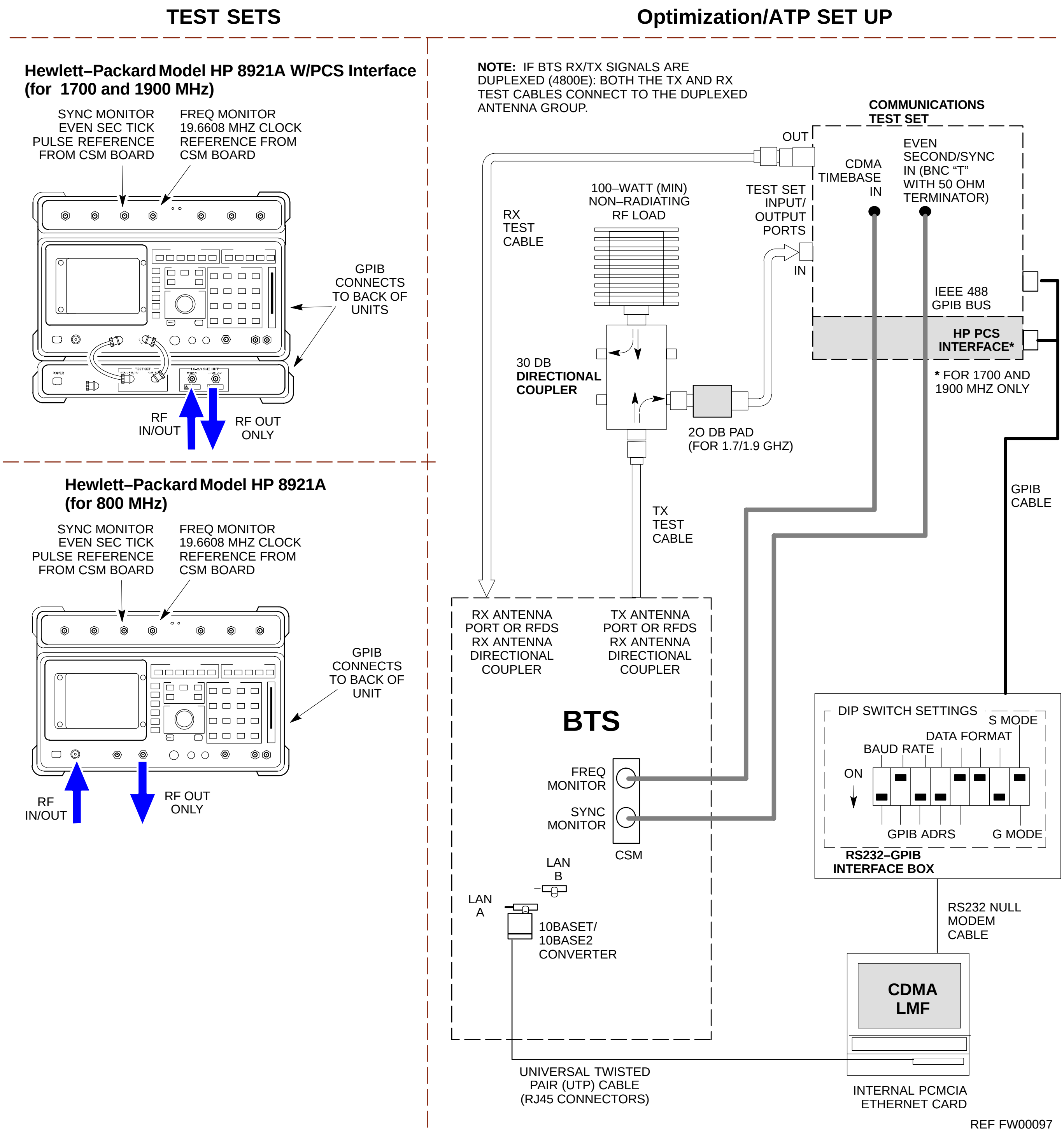


Figure 3-14: Optimization/ATP Test Setup HP 8921A



3

Figure 3-15: Typical TX ATP Setup with Directional Coupler (shown with and without RFDS)

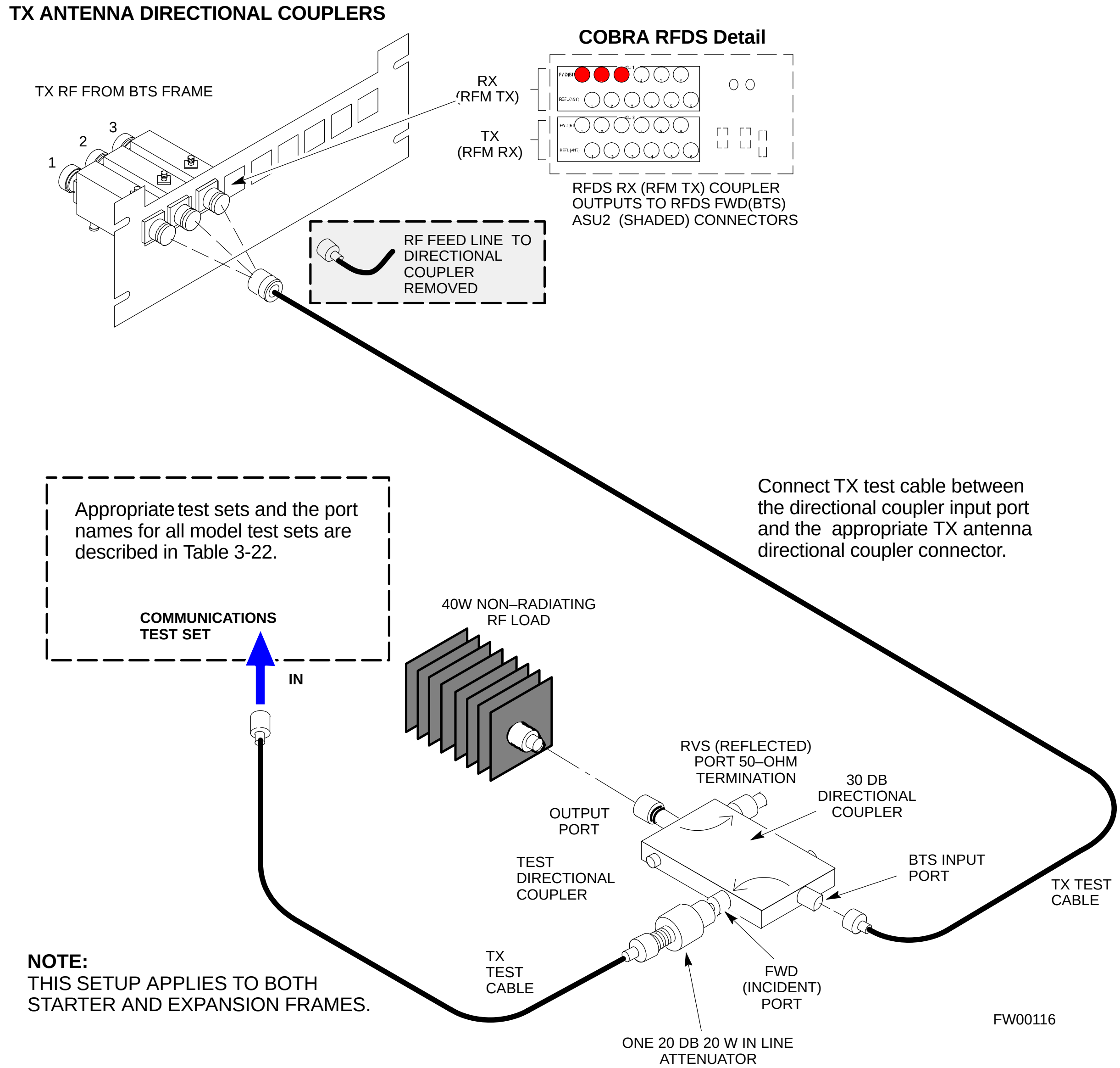
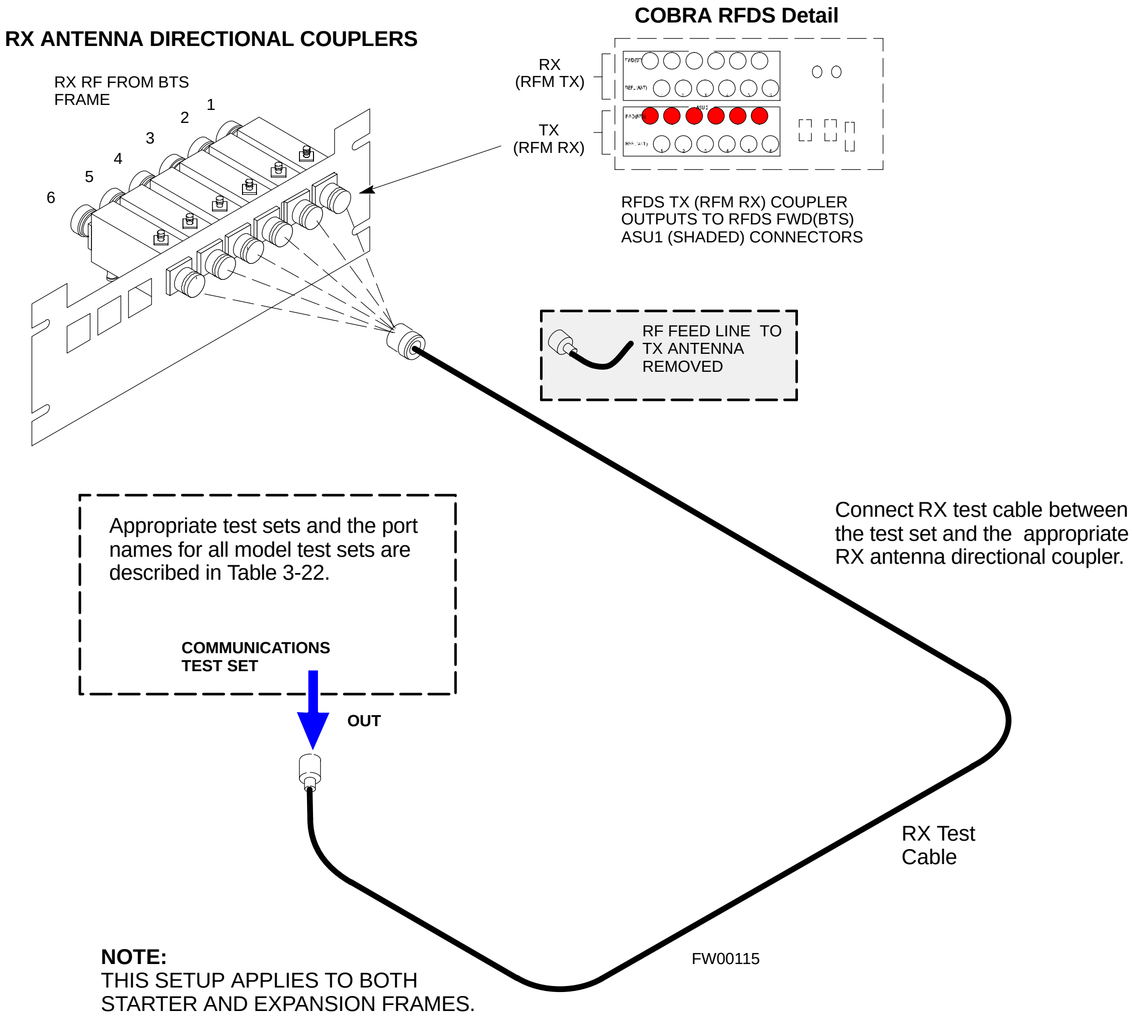


Figure 3-16: Typical RX ATP Setup with Directional Coupler (shown with or without RFDS)



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 test set being used to interface with the BTS has been calibrated and maintained as a set, this procedure does not need to be performed. (Test Set includes LMF terminal, communications test set, additional test equipment, associated test cables, and adapters.)

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 test equipment set, has been replaced, re-calibration must be performed. Failure to do so can introduce measurement errors, resulting in incorrect measurements and degradation to system performance.

IMPORTANT

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

Purpose of Test Set Calibration

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

Selecting Test Equipment

Use **LMF Options** from the **Options** menu list to select test equipment automatically (using the autodetect feature) or manually.

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

Prerequisites

Ensure the following prerequisites have been met before proceeding:

- Test equipment is correctly connected and turned on.
- CDMA LMF computer serial port and test equipment are connected to the GPIB box.

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 3-23 to select test equipment manually.

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

✓	Step	Action
	1	From the **Options** menu, select **LMF Options**. 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. ***Recommended Addresses*** 13=Power Meter 18=CDMA Analyzer
	7	Click on **Apply**. (The button darkens until the selection has been committed.) **NOTE** With manual selection, the LMF does not detect the test equipment to see if it is connected and communicating with the LMF.
	8	Click on **Dismiss** to close the test equipment window.

3

Automatically Selecting Test Equipment in a 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 3-24 to use the auto-detect feature.

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

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

Calibrating Test Equipment

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

Use the **Calibrate Test Equipment** menu item from the **Util** menu to calibrate test equipment. The test equipment must be selected before calibration can begin. Follow the procedure in Table 3-25 to calibrate the test equipment.

Prerequisites

Ensure the following prerequisites have been met before proceeding:

- Test equipment to be calibrated has been connected correctly for tests that are to be run.
- Test equipment has been selected.

Table 3-25: Test Equipment Calibration

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

Calibrating Cables

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

- *Measuring the loss of a short cable* – This is required to compensate for any measurement error of the analyzer. The short cable (used only for the calibration process) is used in series with both the TX and RX cable configuration when measuring. The measured loss of the short cable is deducted from the measured loss of the TX and RX cable configuration to determine the actual loss of the TX and RX cable configurations. The result is then adjusted out of both the TX and RX measurements to compensate for the measured loss.
- *The short cable plus the RX cable configuration loss is measured* – The RX cable configuration normally consists only of a coax cable with type-N connectors that is long enough to reach from the BTS RX port of the test equipment.

. . . continued on next page

- *The short cable plus the TX cable configuration loss is measured* – The TX cable configuration normally consists of two coax cables with type-N connectors and a directional coupler, a load, and an additional attenuator (if required by the specified BTS). The total loss of the path loss of the TX cable configuration must be as required for the BTS (normally 30 or 50 dB).

Calibrating Cables with a CDMA Analyzer

Cable Calibration is used to calibrate both TX and RX test cables. Follow the procedure in Table 3-26 to calibrate the cables. Figure 3-10 illustrates the cable calibration test equipment setup. Appendix F covers the procedures for manual cable calibration.

NOTE

LMF cable calibration for PCS systems (1.7/1.9 GHz) cannot be accomplished using an HP8921 analyzer with PCS interface or an Advantest analyzer. A different analyzer type or the signal generator and spectrum analyzer method must be used (refer to Table 3-27 and Figure 3-17). Cable calibration values are then manually entered.

Prerequisites

Ensure the following prerequisites have been met before proceeding:

- Test equipment to be calibrated has been connected correctly for cable calibration.
- Test equipment has been selected and calibrated.

Table 3-26: Cable Calibration

✓	Step	Action
	1	From the **Util** menu, select **Cable Calibration**. A **Cable Calibration** window is displayed.
	2	Enter a channel number(s) in the **Channels** box. **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**. Follow the direction displayed for each step. A status report window displays the results of the cable calibration.

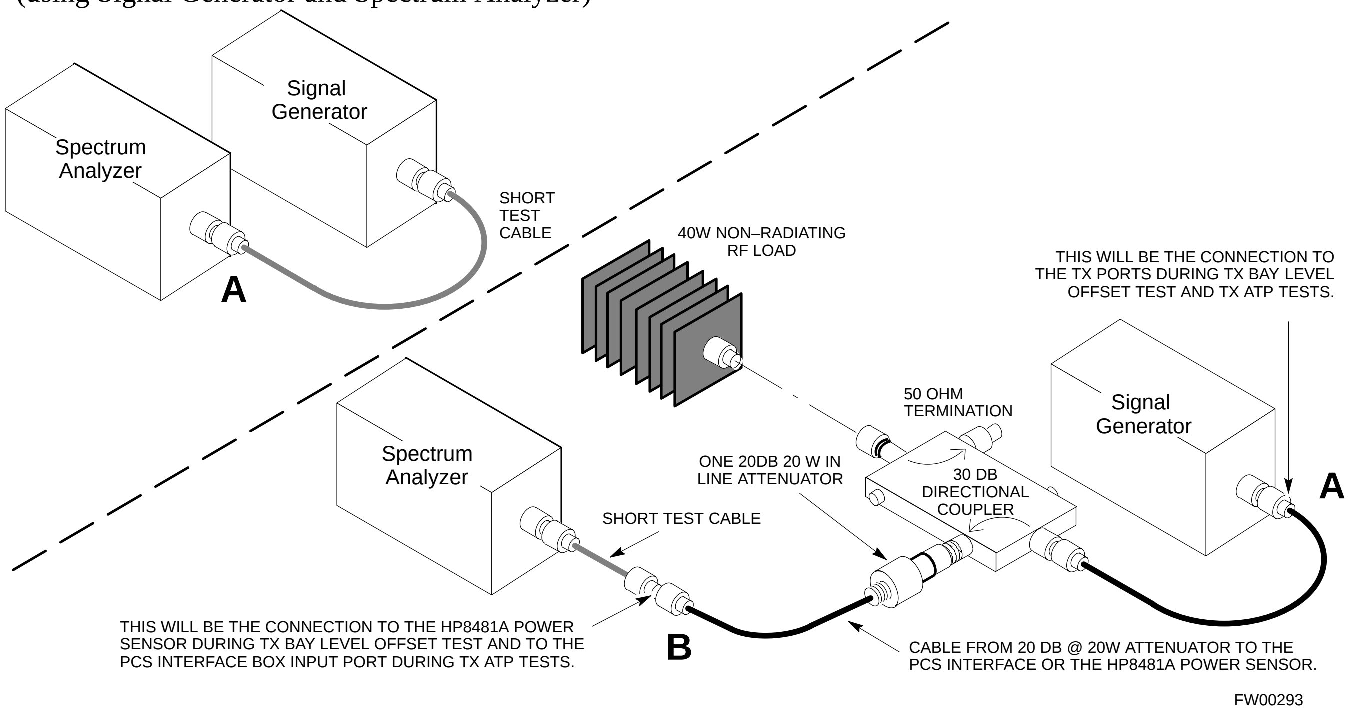
Calibrating TX Cables Using a Signal Generator and Spectrum Analyzer

Follow the procedure in Table 3-27 to calibrate the TX cables using a signal generator and spectrum analyzer. Refer to Figure 3-17 for a diagram of the signal generator and spectrum analyzer.

Table 3-27: Calibrating TX Cables Using Signal Generator and Spectrum Analyzer

✓	Step	Action
	1	Connect a short test cable between the spectrum analyzer and the signal generator.
	2	Set signal generator to 0 dBm at the customer frequency of: – 869–894 MHz for 800 MHz CDMA – 1930–1990 MHz for North American PCS. – 1840–1870 MHz for KoreaN PCS
	3	Use a spectrum analyzer to measure signal generator output (see Figure 3-17, **A**) and 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 800 MHz CDMA – 1930–1990 MHz for North American PCS. – 1840–1870 MHz for Korean PCS Record the value at point **B**.
	5	Calibration factor = A – B Example: Cal = –1 dBm – (–53.5 dBm) = 52.5 dB **NOTE** The short cable is used for *calibration only*. It is *not* part of the final test setup. After calibration is completed, *do not* re-arrange any cables. Use the equipment setup, as is, to ensure test procedures use the correct calibration factor.

Figure 3-17: Calibrating Test Equipment Setup for TX BLO and TX ATP Tests (using Signal Generator and Spectrum Analyzer)



Calibrating RX Cables Using a Signal Generator and Spectrum Analyzer

Follow the procedure in Table 3-28 to calibrate the RX cables using the signal generator and spectrum analyzer. Refer to Figure 3-18, if required.

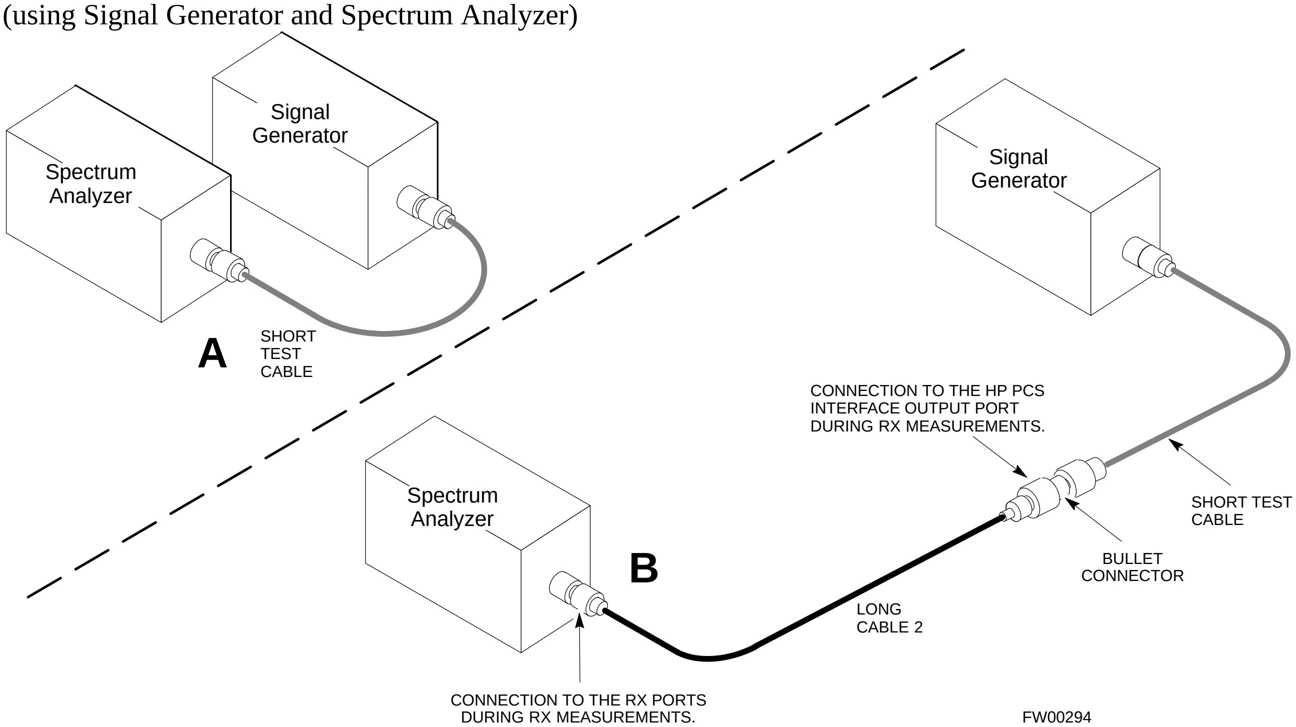
Table 3-28: Calibrating RX Cables Using a Signal Generator and Spectrum Analyzer

✓	Step	Action
	1	Connect a short test cable to the spectrum analyzer and connect the other end to the Signal Generator.
	2	Set signal generator to –10 dBm at the customer's RX frequency of: – 824–849 for 800 MHz CDMA – 1850–1910 MHz band for North American PCS – 1750–1780 MHz for Korean PCS
	3	Use spectrum analyzer to measure signal generator output (see Figure 3-18, **A**) and record the value for **A**.
	4	Connect the test setup, as shown in the lower portion of the diagram to measure the output at the customer's RX frequency of: – 824–849 for 800 MHz CDMA – 1850–1910 MHz band for North American PCS – 1750–1780 MHz for Korean PCS Record the value at point **B**.

. . . continued on next page

Table 3-28: Calibrating RX Cables Using a Signal Generator and Spectrum Analyzer		
✓	**Step**	**Action**
	5	Calibration factor = A – B Example: Cal = –12 dBm – (–14 dBm) = 2 dBm **NOTE** The short test cable is used for test equipment setup calibration *only*. It is not be part of the final test setup. After calibration is completed, *do not* re-arrange any cables. Use the equipment setup, as is, to ensure test procedures use the correct calibration factor.

Figure 3-18: Calibrating Test Equipment Setup for RX ATP Test (using Signal Generator and Spectrum Analyzer)



Setting Cable Loss Values

Cable loss values for the TX and RX test cable configurations are normally set by accomplishing cable calibration using the applicable test equipment. The resulting values are stored in the cable loss files. The cable loss values can also be set/changed manually. Follow the procedure in Table 3-29 to set cable loss values.

Prerequisites

- Logged into the BTS

Table 3-29: Setting Cable Loss Values

Step	Action
1	Click on the **Util** menu.
2	Select **Edit>Cable Loss>TX** or **RX**. A data entry pop–up window appears.
3	To add a new channel number, click on the **Add Row** button, then click in the **Channel #** and **Loss (dBm)** columns and enter the desired values.
4	To edit existing values, click in the data box to be changed and change the value.
5	To delete a row, click on the row and then click on the **Delete Row** button.
6	To save displayed values, click on the **Save** button.
7	To exit the window, click on the **Dismiss** button. Values entered/changed after the **Save** button was used are not saved. **NOTE** • If cable loss values exist for two different channels, the LMF will interpolate for all other channels. • Entered values are used by the LMF as soon as they are saved. You do not have to logout and login.

Setting TX Coupler Loss Value

If an in–service TX coupler is installed, the coupler loss (e.g., 30 dB) must be manually entered so it will be included in the LMF TX calibration and audit calculations. Follow the procedure in Table 3-30 to set TX coupler loss values.

Prerequisites

- Logged into the BTS.

Table 3-30: Setting TX Coupler Loss Value

Step	Action
1	Click on the **Util** menu.
2	Select **Edit>TX Coupler Loss**. A data entry pop–up window appears.
3	Click in the **Loss (dBm)** column for each carrier that has a coupler and enter the appropriate value.
4	To edit existing values click in the data box to be changed and change the value.
5	Click on the **Save** button to save displayed values.
6	Click on the **Dismiss** button to exit the window. Values entered/changed after the **Save** button was used are not saved. **NOTE** • The **In–Service Calibration** check box in the **Options>LMF Options>BTS Options** tab must checked before entered TX coupler loss values are used by the TX calibration and audit functions. • Entered values are used by the LMF as soon as they are saved. You do not have to logout and login.

Introduction to Bay Level Offset Calibration

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

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 LPA, 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 though the LPA, 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 LPA, 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 LPA backplane RF cable
  - LPA backplane
  - LPA

. . . continued on next page

– 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.

IMPORTANT

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.

3

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 3-31: 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.

. . . continued on next page

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

Table 3-32: 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]
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]
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).

. . . continued on next page

- 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 Setup: RF Path Calibration

Follow the procedure in Table 3-33 to set up test equipment.

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

Step	Action
	NOTE Verify the GPIB controller is properly connected and turned on.
	! 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.
1	Connect the LMF computer terminal to the BTS LAN A connector on the BTS (if you have not already done so). Refer to the procedure in Table 3–2 on page 3-6. • If required, calibrate the test equipment per the procedure in Table 3-25 on page 3-57. • Connect the test equipment as shown in Figure 3-11 and Figure 3-12 starting on page 3-48.

TX Path Calibration

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 BTS–x.cdf and CBSC–x.cdf 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.

The LMF **Tests** menu list items, **TX Calibration** and **All Cal/Audit**, perform the TX BLO Calibration test for a XCVR(s). The **All Cal/Audit** menu item performs TX calibration, downloads BLO, and performs TX audit if the TX calibration passes. 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, MCCs, 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.

. . . continued on next page

Connect the test equipment as shown in Figure 3-11 and Figure 3-12 and follow the procedure in Table 3-34 to perform the TX calibration test.

WARNING

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

IMPORTANT

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.

Follow the procedure in Table 3-34 to perform the TX calibration test.

Table 3-34: BTS TX Path Calibration

✓	Step	Action
	1	Select the BBX(s) to be calibrated.
	2	From the **Tests** menu, select **TX Calibration** or **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	Click on **OK**.
	6	Follow the cable connection directions as they are displayed. A status report window displays the test results.
	7	Click on **Save Results** or **Dismiss** to close the status report window.

Exception Handling

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

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

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 procedure in Table 3-35 to download the BLO data to the BBXs.

Table 3-35: Download BLO

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

IMPORTANT

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 3-36

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.

NOTE

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

TX Audit Test

The **Tests** menu item, **TX Audit**, performs the TX BLO Audit test for a 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, GLI2s, 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.

Connect the test equipment as shown in Figure 3-11 and Figure 3-12. Follow the procedure in Table 3-36 to perform the BTS TX Path Audit test.

. . . continued on next page

Table 3-36: BTS TX Path Audit		
✓	**Step**	**Action**
	1	Select the BBX(s) to be audited.
	2	From the **Tests** menu, select **TX 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	Click on **OK**.
	6	Follow the cable connection directions as they are displayed. A status report window displays the test results.
	7	Click on **Save Results** or **Dismiss** to close the status report window.

Exception Handling

In the event of a failure, the calibration procedure displays a **FAIL** message in the Status Report window and provides information in the **Description** field. Recheck the test setup and connection and re–run the test. If the tests fail again, note specifics about the failure, and refer to Chapter 6, *Troubleshooting*.

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.

. . . continued on next page

Prerequisites

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

- CSM–1, GLI2s, BBXs have correct code and data loads.
- Primary CSM and MGLI2 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 3-37 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 3-37: All Cal/Audit Test

	Step	Action
	1	Select the BBX(s) to be tested.
	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	Click on **OK**.
	6	Follow the cable connection directions as they are displayed. A status report window displays the test results.
	7	Click on **Save Results** or **Dismiss** to close the status report window.

Create CAL File

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

Table 3-38: 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 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)
- FWT Interface Card (FWTIC)
- Subscriber Unit Assembly (SUA)

For complete information regarding the RFDS, refer to the *CDMA RFDS Hardware Installation* manual and *CDMA RFDS User's Guide*.

The LMF provides the following functions for RFDS equipment:

- TX and RX Calibration
- Dekey Test Subscriber Unit (TSU)
- Download Test Subscriber Interface Card (TSIC)
- Forward Test
- Key TSU
- Measure TSU Receive Signal Strength Indication (RSSI)
- Ping TSU
- Program TSU Number Assignment Module (NAM)
- Reverse Test
- RGLI actions (for GLI based RFDS units)
- Set ASU
- Status TSU

RFDS Parameter Settings

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

- **RfdsEquip** – valid inputs are 0 through 2.
  0 = (default) RFDS is not equipped
  1 = Non-Cobra/Patzer box RFDS
  2 = Cobra RFDS
- **TsuEquip** – valid inputs are 0 or 1
  0 = (default) TSU not equipped
  1 = TSU is equipped in the system
- **MC1....4** – valid inputs are 0 or 1
  0 = (default) Not equipped
  1 = Multicouplers equipped in RFDS system
  (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 supporting the LMF may be used to open any text files to verify, view, or modify data.

. . . continued on next page

Table 3-39: RFDS Parameter Settings

Step	Action
	*** IMPORTANT** Log out of the BTS prior to performing this procedure.

1	Using a text editor, verify the following fields are set correctly in the `bts–#.cdf` file
	(1 = GLI based RFDS; 2 = Cobra RFDS).
	EXAMPLE:
	`RfdsEquip = 2`
	`TsuEquip = 1`
	`MC1Equip = 0`
	`MC2Equip = 0`
	`MC3Equip = 0`
	`MC4Equip = 0`
	`Asu1Equip = 1`
	`Asu2Equip = 0` (1 if system is non-duplexed)
	`TestOrigDN = ’123456789’’`
	NOTE
	The above is an example of the `bts-#.cdf` file that should have been generated by the OMC and copied to the LMF. These fields will have been set by the OMC if the RFDSPARM database is modified for the RFDS.

2	Save and/or quit the editor. If any changes were made to these fields, data will need to be downloaded to the GLI2 (see Step 3, otherwise proceed to Step 4).
3	To download to the GLI2, click on the **Device** menu and select the **Download Data** menu item *(selected devices do not change color when data is downloaded).* A status report window displays the status of the download. Click **OK** to close the status report window. **! CAUTION** After downloading data to the GLI2, the RFDS LED slowly begins flashing red and green for approximately 2–3 minutes. **DO NOT** attempt to perform any functions with the RFDS until the LED remains green.
4	Status the RFDS TSU. A status report window displays the software version number for the TSIC and SUA. *** IMPORTANT** If the LMF yields an error message, check the following: • Ensure the AMR cable is correctly connected from the BTS to the RFDS. • Verify the RFDS has power. • Verify the RFDS status LED is green. • Verify fields in the `bts-#.cdf` file are correct (see Step 1). • Status the MGLI and ensure the device is communicating (via Ethernet) with the LMF, and the device is in the proper state (INS).

RFDS TSU NAM Programming

The 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. The TSU NAM should be configured the same way that any local mobile subscriber would use.

NOTE

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

The NAM must be programmed into the SUA before it can receive and process test calls, or be used for any type of RFDS test.

Explanation of Parameters used when Programming the TSU NAM

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

Table 3-40: Definition of Parameters

Access_Overload_Code Slot_Index System ID Network ID	These parameters are obtained from the switch.
Primary_Channel_A Primary_Channel_B Secondary_Channel_A Secondary_Channel B	These parameters are the channels used in operation of the system.
Lock_Code Security_Code Service_Level Station_Class_Mark	Do ***not*** change.
IMSI_11_12 IMSI_MCC	These fields can be 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_1 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 TestOrigDN field in the **bts.cdf** file. The MIN is the phone number of the RFDS subscriber, and the TestOrigDN is the number is subscriber calls.

3

Valid NAM Ranges

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

Table 3-41: Valid NAM Field Ranges

NAM Field Name	Valid Range	
	Minimum	**Maximum**
Access_Overload_Code	0	15
Slot_Index	0	7
System ID	0	32767
Network ID	0	32767
Primary_Channel_A	25	1175
Primary_Channel_B	25	1175
Secondary_Channel_A	25	1175
Secondary_Channel_B	25	1175
Lock_Code	0	999
Security_Code	0	999999
Service_Level	0	7
Station_Class_Mark	0	255
IMSI_11_12	0	99
IMSI_MCC	0	999
MIN Phone Number	N/A	N/A

Set Antenna Map Data

The antenna map data is only used for RFDS tests and is required if an RFDS is installed. Antenna map data does not have to be entered if an RFDS is not installed. The antenna map data must be entered manually. Perform the procedure in Table 3-42 to set the Antenna Map Data.

Prerequisite

- Logged into the BTS

Table 3-42: Set Antenna Map Data

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

Set RFDS Configuration Data

If an RFDS is installed, the RFDS configuration data must be manually entered. Perform the procedure in Table 3-43 to set the RFDS Configuration Data.

Prerequisite

- Logged into the BTS.

IMPORTANT

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

Table 3-43: Set RFDS Configuration Data

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

RFDS Calibration

The RFDS TX and RX antenna paths must be calibrated to ensure peak performance. The RFDS calibration option calibrates the RFDS TX and RX paths.

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

For an RX antenna path calibration, the RFDS is keyed at a pre–determined power level and the power input level is measured by the BTS XCVR. A CDMA signal at the same power level measured by the BTS XCVR is then injected at the RX antenna directional coupler by the RFDS keyed power level and the power level measured at the BTS XCVR is the RFDS RX calibration offset value.

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

Prerequisites

Ensure the following prerequisites have been met before proceeding:

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

Follow the procedure in Table 3-44 to calibrate the TX and RX antenna paths.

Table 3-44: RFDS Calibration Procedure

✓	Step	Action
	1	Select the **RFDS** tab.
	2	Select the **RFDS** menu.
	3	Select the **RFDS Calibration** menu item.
	4	Select the appropriate direction (**TX** or **RX**) in the **Direction** pick list.
	5	Type the appropriate channel number(s) in the **Channel** box. **NOTE** Separate channel numbers with a comma or dash (no spaces) if using more than one channel number (e.g., **247,585,742** or **385–395** for numbers through and including).

Table 3-44: RFDS Calibration Procedure		
✓	**Step**	**Action**
	6	Select the appropriate carrier(s) in the **Carriers** pick list. **NOTE** Use the **<Shift>** or **<Ctrl>** key to select multiple carriers.
	7	Select the appropriate Rx branch (**Main**, **Diversity** or **Both**) in the **RX Branch** pick list.
	8	Select the appropriate baud rate (**1**=9600, **2**=14400) in the **Rate Set** pick list.
	9	Click **OK**. A status report window is displayed, followed by a **Directions** pop-up window.
	10	Follow the cable connection directions as they are displayed. A status report window displays the results of the actions.
	11	Click on the **OK** button to close the status report window.
	12	Click on the **BTS** tab.
	13	Click on the **MGLI**.
	14	Download the CAL file which has been updated with the RFDS offset data to the selected GLI device by clicking on **Device>Download Data** from the tab menu bar and pulldown. **NOTE** The MGLI automatically transfers the RFDS offset data from the CAL file to the RFDS.

Program TSU NAM

Follow the procedure in Table 3-45 to program the TSU NAM. The NAM must be programmed before it can receive and process test calls, or be used for any type of RFDS test.

Prerequisites

Ensure the following prerequisites have been met before proceeding:

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

Table 3-45: 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 the **TSU** menu.
4	Click on the **Program TSU NAM** menu item.
5	Enter the appropriate information in the boxes (see Table 3-40 and Table 3-41).
6	Click on the **OK** button to display the status report.
7	Click on the **OK** button to close the status report window.

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 3-48. Miscellaneous Alarm Tests (BTS Frame)
- Table 3-49. BBX Redundancy Tests (BTS Frame)
- Table 3-50. CSM, GPS, & LFR/HSO Redundancy Alarm Tests
- Table 3-51. LPA Redundancy Test
- Table 3-52. 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)
- LPA modules in the BTS frame
- AMR Customer defined input/output tests

3

Test Equipment Setup

Follow the procedure in Table 3-46 to set up test equipment:

NOTE

All alarm tests are performed using TX antenna 1

Table 3-46: 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 3-2, page 3-5).
2	Login to the BTS.
3	Set up test equipment for TX Calibration at TXOUT1 (see Figure 3-11 or Figure 3-12). *** IMPORTANT** ***If site is not equipped for redundancy***, remove all GLI2 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>Customer Alarm Inputs>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 3-47 to verify redundancy of the power supply modules. Alarms reported by the master GLI (displayed via the alarm monitor) are also verified.

Table 3-47: Power Supply/Converter Redundancy (BTS Frame)

Step	Action
1	Select the MGLI (highlight) and from the pulldown menu select: **Device>Set Redundant Sector>None/0** **Device>Set Pilot>Only>Carrier–#–1-1** **Device>Set Pilot>Only>Carrier–#-1-1** and **Pilot Gain = 262**
2	Select (highlight) BBX–1 and from the pulldown menu select **Device>Key XCVR**.
3	Set XCVR gain to 40 and enter the correct XCVR channel number.
4	Remove PS–1 from the power distribution shelf (see Figure 3-19). – 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 3-20). – 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>Dekey XCVR**

Figure 3-19: SC 4812T C–CCP Shelf

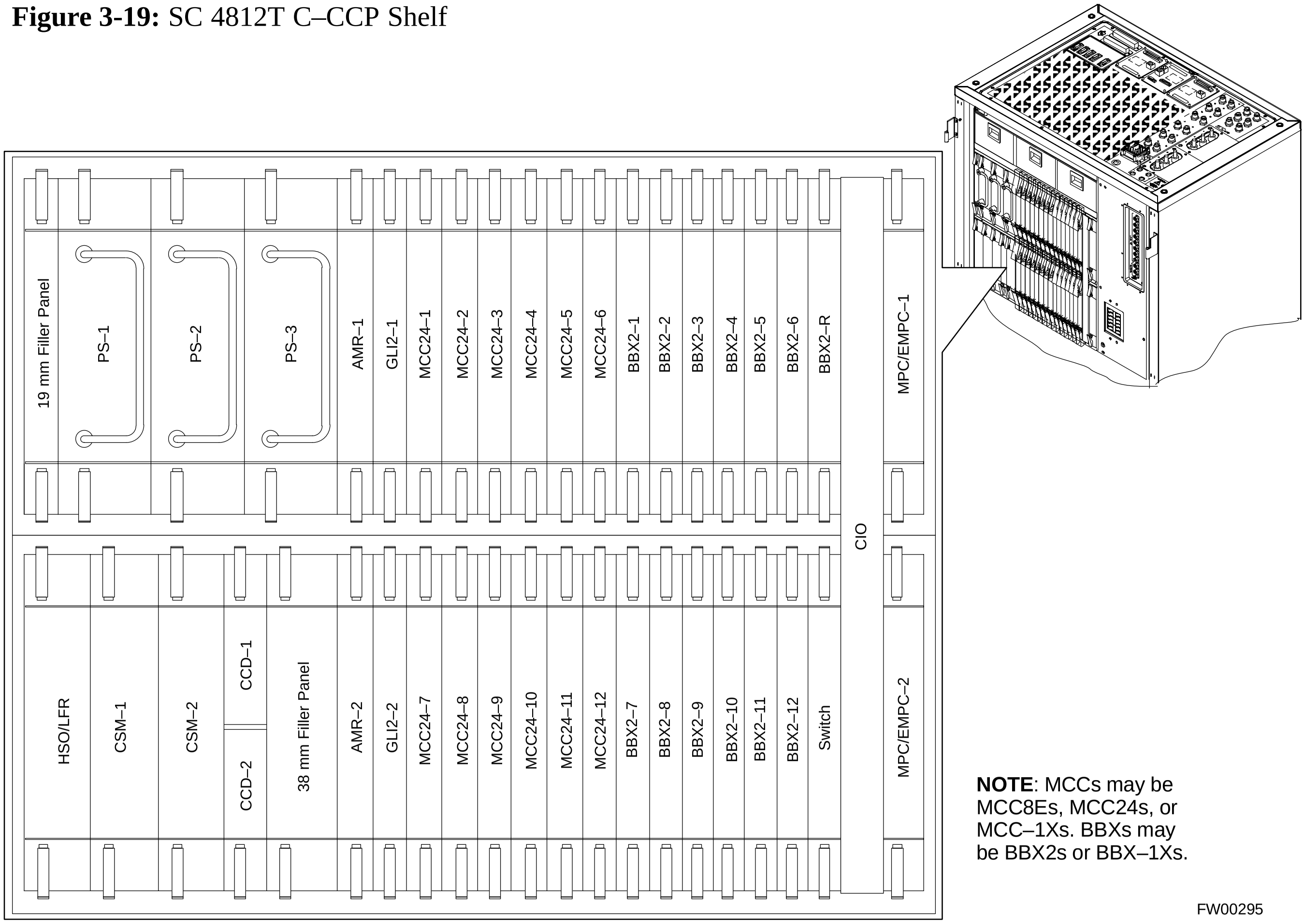
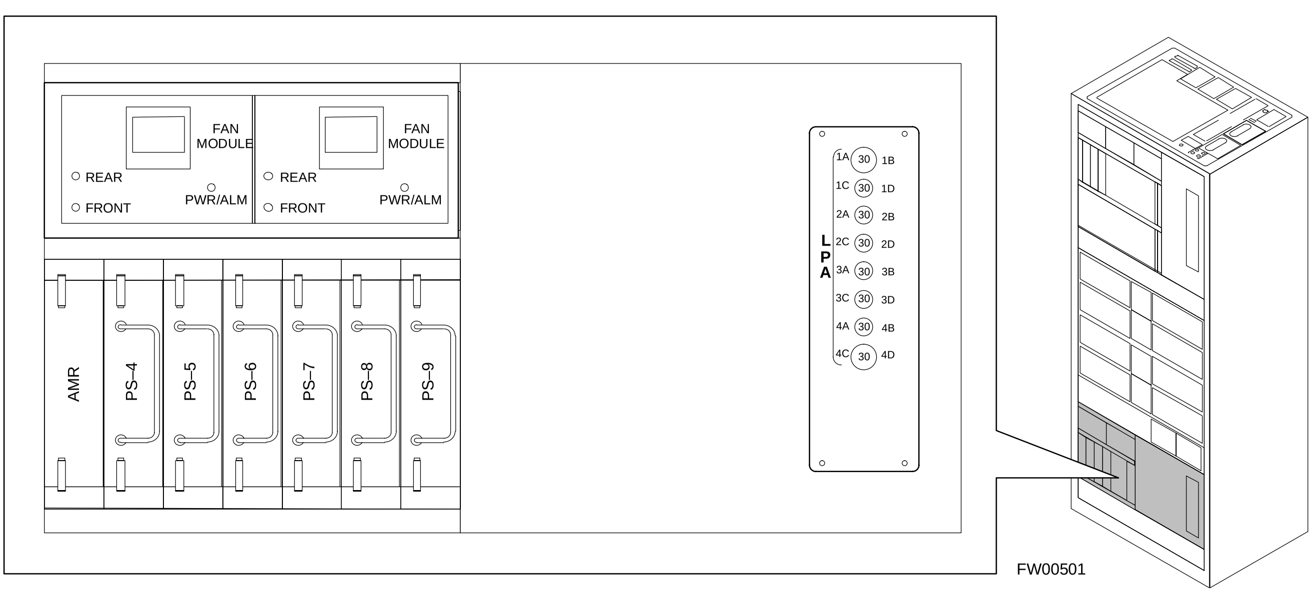


Figure 3-20: –48 V BTS Power Conversion Shelf



Miscellaneous Alarm/Redundancy Tests

Follow the steps in Table 3-48 to verify alarms reported by the master GLI are displayed via the alarm monitor if a BTS frame module failure occurs.

Table 3-48: 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 3-21 or Figure 3-22). • 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	*Starter Frames Only:* Perform the following to verify MPC module alarms. • Unseat MPC modules (see Figure 3-19) 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	*Expansion Frames Only:* Perform the following to verify EMPC module alarms. • Unseat EMPC modules (see Figure 3-19) 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 3-19). • 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.

3

Figure 3-21: +27 V BTS C-CCP Fan Modules

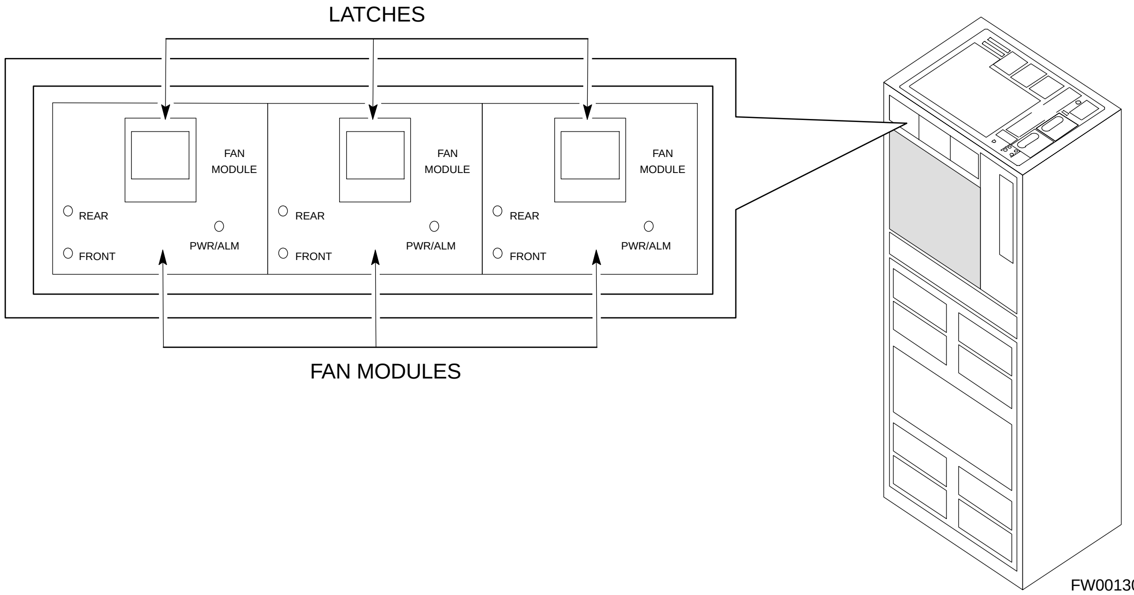
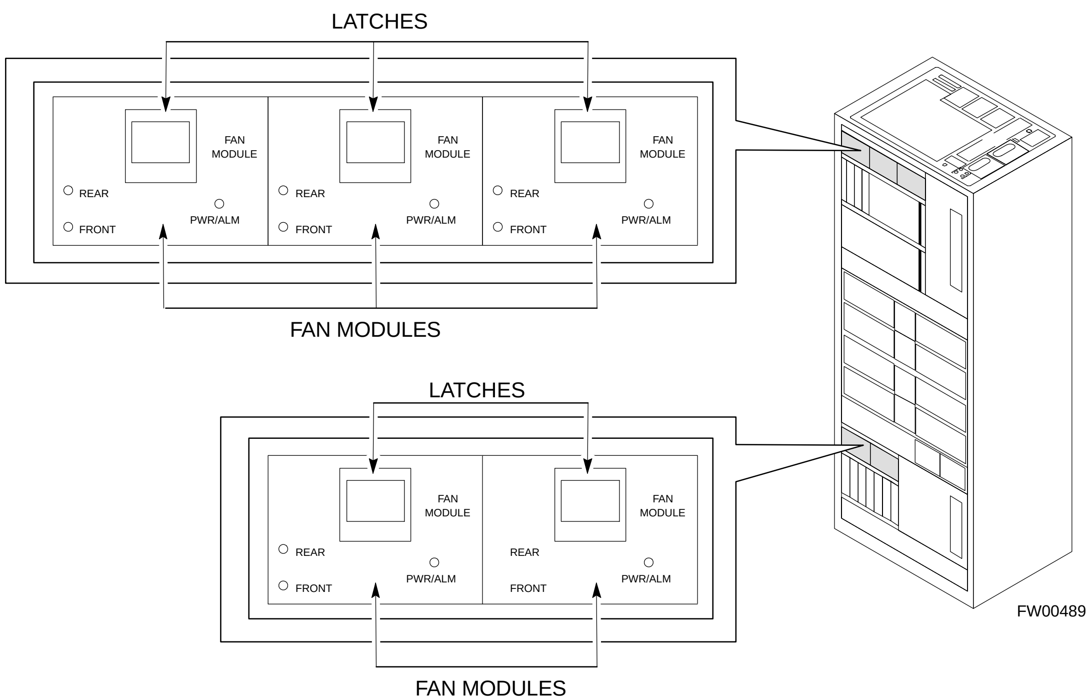


Figure 3-22: –48 V BTS C-CCP and Power Conversion Shelf Fan Modules



BBX Redundancy

Follow the steps in Table 3-49 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 3-49: BBX Redundancy Alarms

Step	Action
	△ **WARNING** Any BBXs enabled will immediately key-up. Before enabling any BBX, *always verify* 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>Key Xcvr**.
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 Xcvr by selecting **Device>Dekey Xcvr**.
12	Repeat Steps 1 through 11 for additional BBXs/antennas, if equipped.

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

Follow the procedure in Table 3-50 to verify the *manual* redundancy of the CSM, GPS, and LFR/HSO boards. Verification of alarms reported is also covered.

IMPORTANT

DO NOT perform the procedure in Table 3-50, unless the site is configured with a LORAN–C or HSO timebase as a backup for the GPS.

Table 3-50: CSM, GPS, & LFR/HSO, Redundancy/Alarm Tests

Step	Action
	△ **WARNING** Any BBXs enabled will immediately key-up. Before enabling any BBX, *always verify* 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>Key Xcvr**.
2	Disconnect the GPS antenna cable, located on top of the BTS frame (see Figure 3-23). 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.

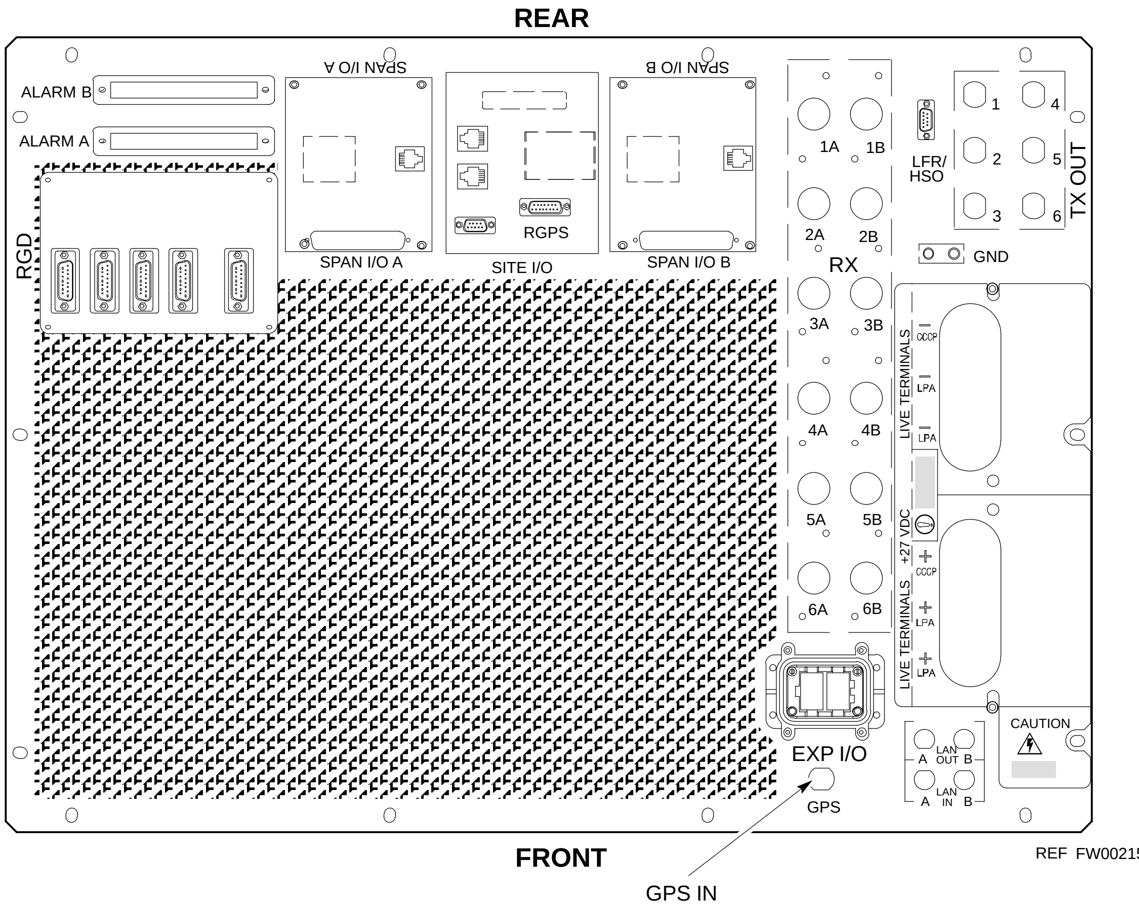
. . . continued on next page

Table 3-50: CSM, GPS, & LFR/HSO, Redundancy/Alarm Tests

Step	Action
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.
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>Dekey Xcvr**.
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.

3

Figure 3-23: +27 V SC 4812T Starter Frame I/O Plate



LPA Redundancy Test

Follow the procedure in Table 3-51 to verify redundancy of the LPAs.

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 3-51: LPA Redundancy Test

Step	Action
1	From the pulldown menu select: **Device > Set Redundant Sector > None/0** **Device > Set Pilot > Only > Carrier–#–1-1** **Device > Set Pilot > Only > Carrier–#-1-1 and Pilot Gain = 262**
2	Key-up the BBX assigned to the LPAs 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 3-13 for test equipment setup, if required.
4	Push-in and release the breaker supplying the 1st LPA 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 LPA. The overall gain decreases by approximately 6 dB. The process must be complete before proceeding.
5	Verify: • The other LPA module did not go OOS due to the loss of the LPA. • The overall carrier amplitude is reduced by approximately 6 dB and IM suppression on the analyzer display remains basically unchanged. • LPA fault message is reported via the MGLI and displayed on the alarm monitor.
6	Re-apply power to the LPA 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 LPA of the pair.
8	De-key the BBX.
9	**△ WARNING** ***First verify there are no BBX channels keyed when*** 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 LPAs 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.

3

MGLI/GLI Redundancy Test

CAUTION

This test can *only* 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 3-52: 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 *currently* **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.

Alarm Test Overview

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 3-24). 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 3-25). 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.

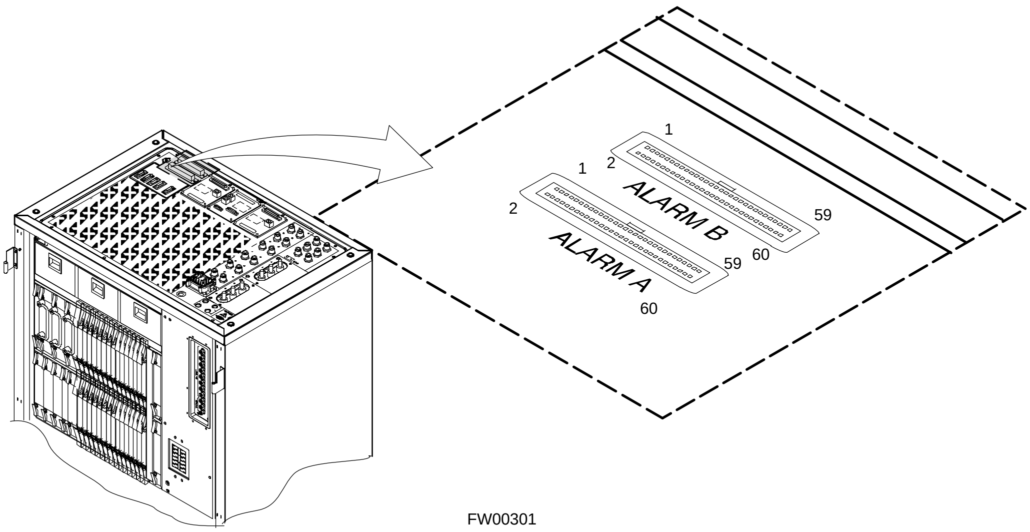
Alarm Reporting Display

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 3-24: 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*.

IMPORTANT

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

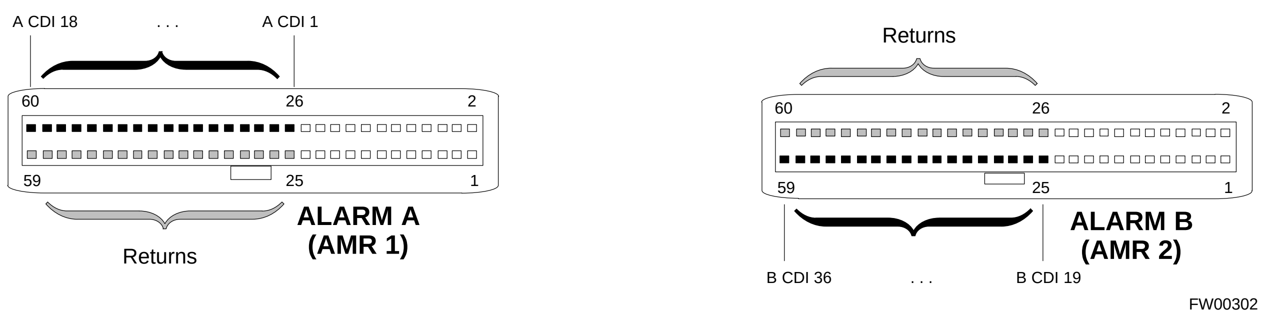
. . . continued on next page

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 3-25: AMR Connector Pin Numbering



NOTE

The preferred method to verify alarms is to follow the Alarms Test Box Procedure, Table 3-53. If not using an Alarm Test Box, follow the procedure listed in Table 3-54.

CDI Alarm Input Verification with Alarms Test Box

Table 3-53 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 3-53: 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.

. . . continued on next page

Table 3-53: CDI Alarm Input Verification Using the Alarms Test Box

Step	Action
3	Click on the **Device** menu.
4	Click on the **Customer Alarm Inputs** menu item.
5	Click on **N.O. Inputs**. 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 3-24).
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
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 **Customer Alarm Inputs** menu item.
19	Click on **N.C. Inputs**. 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.

. . . continued on next page

Table 3-53: CDI Alarm Input Verification Using the Alarms Test Box	
Step	**Action**
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 **Customer Alarm Inputs** 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.
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 3-54 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 3-54: 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 **Customer Alarm Inputs** menu item.
5	Click on **N.O. Inputs**. A status report window displays the results of the action.
6	Click on **OK** to close the status report window.
7	Refer to Figure 3-25 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 3-25 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 **Customer Alarm Inputs** menu item.
12	Click on **N.C. Inputs**. 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.

. . . continued on next page

Table 3-54: CDI Alarm Input Verification Without the Alarms Test Box	
Step	**Action**
14	Refer to Figure 3-25 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 3-25 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 **Customer Alarm Inputs** 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 3-25 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 3-25 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 3-55 lists the pins and signal names for Alarms A and B.

Table 3-55: Pin and Signal Information for Alarm Connectors							
ALARM A				**ALARM B**			
Pin	**Signal Name**	**Pin**	**Signal Name**	**Pin**	**Signal Name**	**Pin**	**Signal Name**
1	A CDO1 NC	31	Cust Retn 4	1	B CDO9 NC	31	B CDI 22
2	A CDO1 Com	32	A CDI 4	2	B CDO9 Com	32	Cust Retn 22
3	A CDO1 NO	33	Cust Retn 5	3	B CDO9 NO	33	B CDI 23
4	A CDO2 NC	34	A CDI 5	4	B CDO10 NC	34	Cust Retn 23
5	A CDO2 Com	35	Cust Retn 6	5	B CDO10 Com	35	B CDI 24
6	A CDO2 NO	36	A CDI 6	6	B CDO10 NO	36	Cust Retn 24

. . . continued on next page

3

Table 3-55: Pin and Signal Information for Alarm Connectors							
ALARM A				ALARM B			
Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
7	A CDO3 NC	37	Cust Retn 7	7	B CDO11 NC	37	B CDI 25
8	A CDO3 Com	38	A CDI 7	8	B CDO11 Com	38	Cust Retn 25
9	A CDO3 NO	39	Cust Retn 8	9	B CDO11 NO	39	B CDI 26
10	A CDO4 NC	40	A CDI 8	10	B CDO12 NC	40	Cust Retn 26
11	A CDO4 Com	41	Cust Retn 9	11	B CDO12 Com	41	B CDI 27
12	A CDO4 NO	42	A CDI 9	12	B CDO12 NO	42	Cust Retn 27
13	A CDO5 NC	43	Cust Retn 10	13	B CDO13 NC	43	B CDI 28
14	A CDO5 Com	44	A CDI 10	14	B CDO13 Com	44	Cust Retn 28
15	A CDO5 NO	45	Cust Retn 11	15	B CDO13 NO	45	B CDI 29
16	A CDO6 NC	46	A CDI 11	16	B CDO14 NC	46	Cust Retn 29
17	A CDO6 Com	47	Cust Retn 12	17	B CDO14 Com	47	B CDI 30
18	A CDO6 NO	48	A CDI 12	18	B CDO14 NO	48	Cust Retn 30
19	A CDO7 NC	49	Cust Retn 13	19	B CDO15 NC	49	B CDI 31
20	A CDO7 Com	50	A CDI 13	20	B CDO15 Com	50	Cust Retn 31
21	A CDO7 NO	51	Cust Retn 14	21	B CDO15 NO	51	B CDI 32
22	A CDO8 NC	52	A CDI 14	22	B CDO16 NC	52	Cust Retn 32
23	A CDO8 Com	53	Cust Retn 15	23	B CDO16 Com	53	B CDI 33
24	A CDO8 NO	54	A CDI 15	24	B CDO16 NO	54	Cust Retn 33
25	Cust Retn 1	55	Cust Retn 16	25	B CDI 19	55	B CDI 34
26	A CDI 1	56	A CDI 16	26	Cust Retn 19	56	Cust Retn 34
27	Cust Retn 2	57	Cust Retn 17	27	B CDI 20	57	B CDI 35
28	A CDI 2	58	A CDI 17	28	Cust Retn 20	58	Cust Retn 35
29	Cust Retn 3	59	Cust Retn 18	29	B CDI 21 (+27 V) Converter Alarm (–48 V)	59	B CDI 36
30	A CDI 3	60	A CDI 18	30	Cust Retn 21 (+27 V) Converter Retn (–48V)	60	Cust Retn 36

NOTE

CDO = Customer Defined Output

CDI = Customer Defined Input

Chapter 4: Automated Acceptance Test Procedure (ATP)

Table of Contents

Notes

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 commmands 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, R15.X (68P09251A59).*

IMPORTANT

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.

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 to are to be performed, and the craftsperson selects the appropriate ATP tests to run.

The tests can be run individually or as one of the following groups:

- **All TX:** 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 filters, and RF cables.
- **All RX:** RX tests verify the performance of the BTS receiver line up. These include the MPC (for starter frames), EMPC (for expansion frames), CIO, BBX, MCC, and GLI cards and the passive components including RX filters (starter frame only), and RF cables.

. . . continued on next page

- **All TX/RX:** Executes all the TX and RX tests.
- **Full Optimization:** Executes the TX calibration, downloads the BLO, and executes the TX audit before running all of the TX and RX tests.

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.
- BBXs are calibrated and BLOs are downloaded.
- BBXs are OOS_RAM.
- Test cables are calibrated.
- Test equipment is connected for ATP tests (see Figure 3-13 through Figure 3-16 starting on page 3-50).
- Test equipment has been warmed up 60 minutes and calibrated.
- GPIB is on.

WARNING

Before performing the FER, be sure that all LPAs 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

IMPORTANT

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.

ATP Test Procedure

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.

- ATP Testing Option 1
  - All **TX/RX**
- ATP Testing Option 2
  - All **TX**
  - All **RX**
- ATP Testing Option 3
  - **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 before all the TX and RX tests are run.

IMPORTANT

If manual testing has been performed with the HP analyzer, remove the manual control/system memory card from the card slot and set the **I/O Config** to the **Talk & Lstn** mode before starting the automated testing.

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

NOTE

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

Table 4-1: ATP Test Procedure

✓	Step	Action
	1	Select the device(s) to be tested.
	2	From the **Tests** menu, select the test you want to run.
	3	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) displayed in the **Channels/Carrier** pick list. **NOTE** To select multiple items, hold down the **<Shift>** or **<Ctrl>** key while making the selections.

. . . continued on next page

Table 4-1: ATP Test Procedure

✓	Step	Action
	4	Enter the appropriate channel number in the **Carrier n Channels** box. The default channel number displayed is determined by the **CdmaChans[n]** number in the **cbsc–n.cdf** file for the BTS.
	5	Click on the **OK** button. The status report window and a **Directions** pop-up are displayed.
	6	Follow the cable connection directions as they are displayed. The test results are displayed in the status report window.
	7	Click on **Save Results** or **Dismiss**. **NOTE** If **Dismiss** is used, the test results **will not** be saved in the test report file.

Individual Acceptance 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).

4

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 sector/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).

Tx Mask Test

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

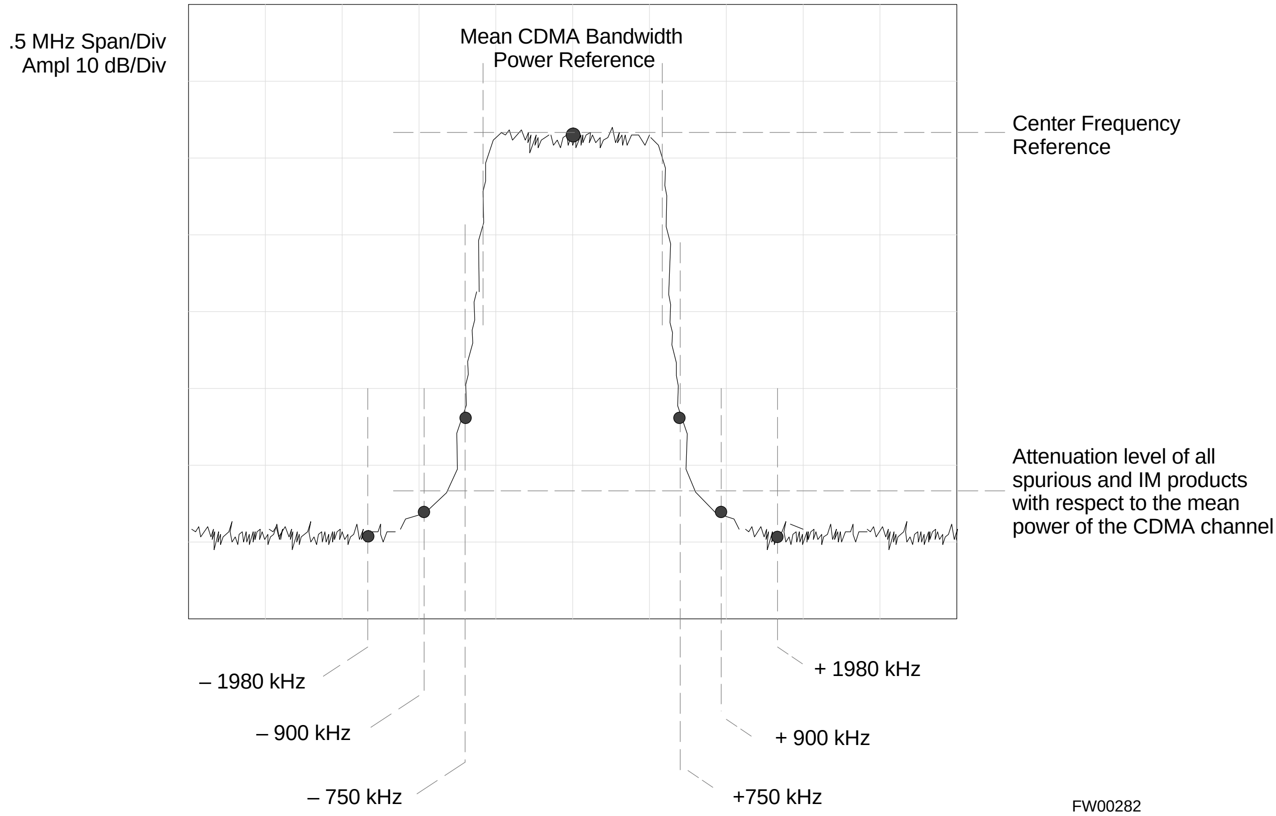
TX output power is set to +40 dBm by setting BTS power level to +33.5 dBm to compensate for 6.5 dB increase from pilot gain set to 541.

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.

Figure 4-1: TX Mask Verification Spectrum Analyzer Display



4

Rho 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 (–0.4 dB)**.

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 be repeated.

Pilot 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 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 Time Offset in µs, verifying results meet system tolerances:

- Pilot Time Offset should be within ≤ **3 µs** 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.

Code Domain Power 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.

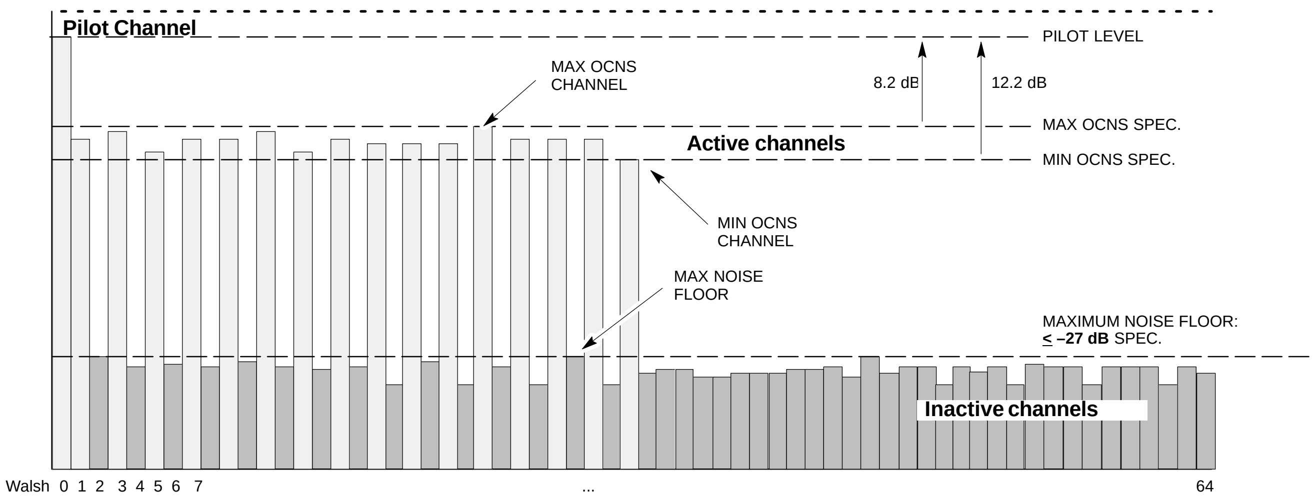
For each sector/antenna under test, the Pilot Gain is set to 262. All MCC channel elements under test are configured to generate Orthogonal Channel Noise Source (OCNS) on different odd Walsh codes and to be assigned a full–rate gain of 81. The maximum number of MCC/CEs to be tested an any one time is 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).

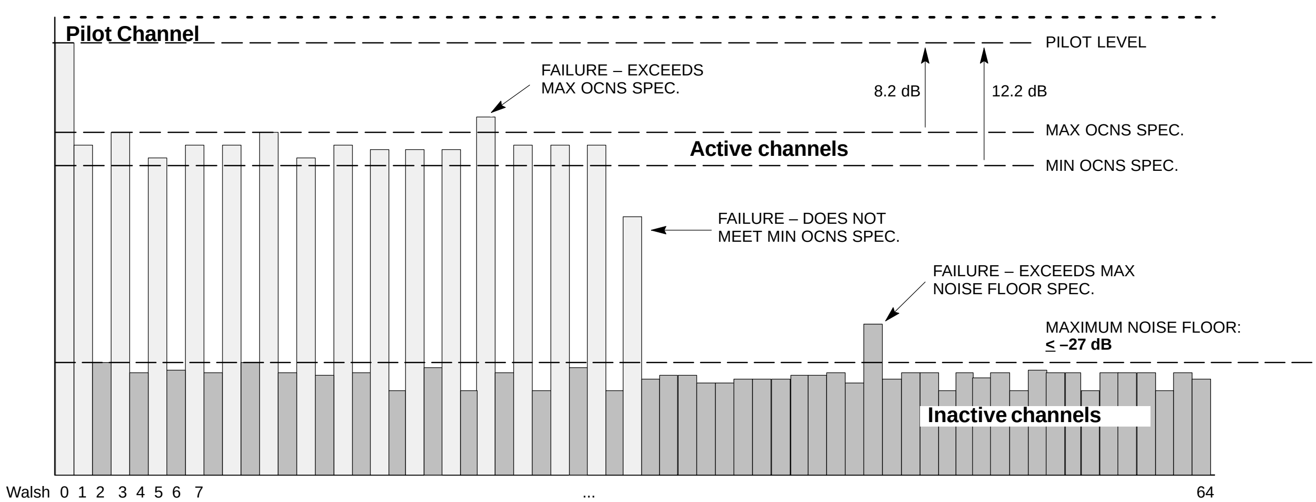
You verify the code domain power levels, which have been set for all ODD numbered Walsh channels, using the OCNS command. This is done by verifying that Pilot Power (dBm) minus OCNS Power (dBm) is equal to **10.2 ± 2 dB** and that the noise floor of all "OFF" Walsh channels measures ≤ **–27 dB** (with respect to total CDMA channel power).

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, OCNS is disabled on the specified MCC/CE.

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



Showing all OCNS Passing



Indicating Failures

FW00283

4

FER 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 bbxlvl 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.

Generate 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.

DRAFT

Notes

Chapter 5: Prepare to Leave the Site

Table of Contents

Notes

External Test Equipment Removal

Perform the procedure in Table 5-1 to disconnect the test equipment and configure the BTS for active service.

Table 5-1: 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 *italics* 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 *CDMA LMF User Guide.*

Reset All Devices

Reset all devices by cycling power before leaving the site. The configuration data and code loads could be different from data and code on the LMF. By resetting all devices, the CBSC can load the proper data and code when the span is active again.

Follow the procedure in Table 5-2 ***as required*** to bring all processor modules from the OOS to INS mode.

IMPORTANT

Have the CBSC/MM bring up the site and enable all devices at the BTS.

Table 5-2: Enabling Devices

✓	Step	Action
	1	On the LMF, select the device(s) you wish to enable. **NOTE** The MGLI and CSM must be INS before an MCC can be put INS.
	2	Click on **Device** from the menu bar.
	3	Click on **Enable** from the **Device** menu. A status report window is displayed.
		NOTE If a BBX2 is selected, a **Transceiver Parameters** window is displayed to collect keying information. Do not enable the BBX2.
	4	Click **OK** to close the **Transceiver Parameters** window. A status report window displays the status of the device.
	5	Click **OK** to close the status report window. The selected devices that successfully change to INS change color to green.

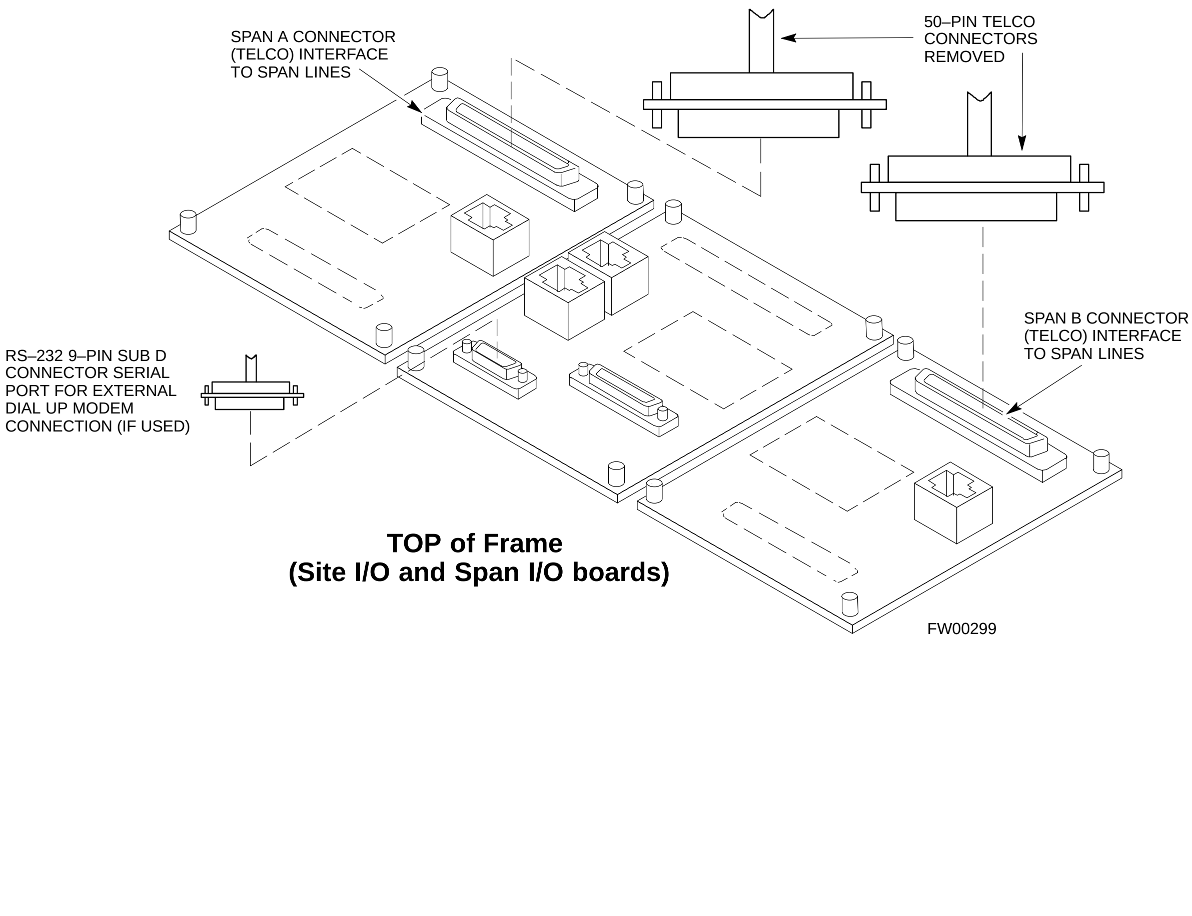
Re–connect BTS T1 Spans and Integrated Frame Modem

Before leaving the site, connect any T1 span TELCO connectors that were removed to allow the LMF to control the BTS. Refer to Table 5-3 and Figure 5-1 as required.

Table 5-3: 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. *** IMPORTANT** Verify that you connect both SPAN cables (if removed previously), and the Integrated Frame Modem (IFM) "TELCO" connector.

Figure 5-1: Site and Span I/O Boards T1 Span Connections



5

BTS Site Span Configuration Verification

Perform the procedure in Table 5-4 to verify the current Span Framing Format and Line Build Out (LBO) parameters. *ALL* MGLI2/SGLI2 boards in all C–CCP shelves that terminate a T1/E1 span should be verified.

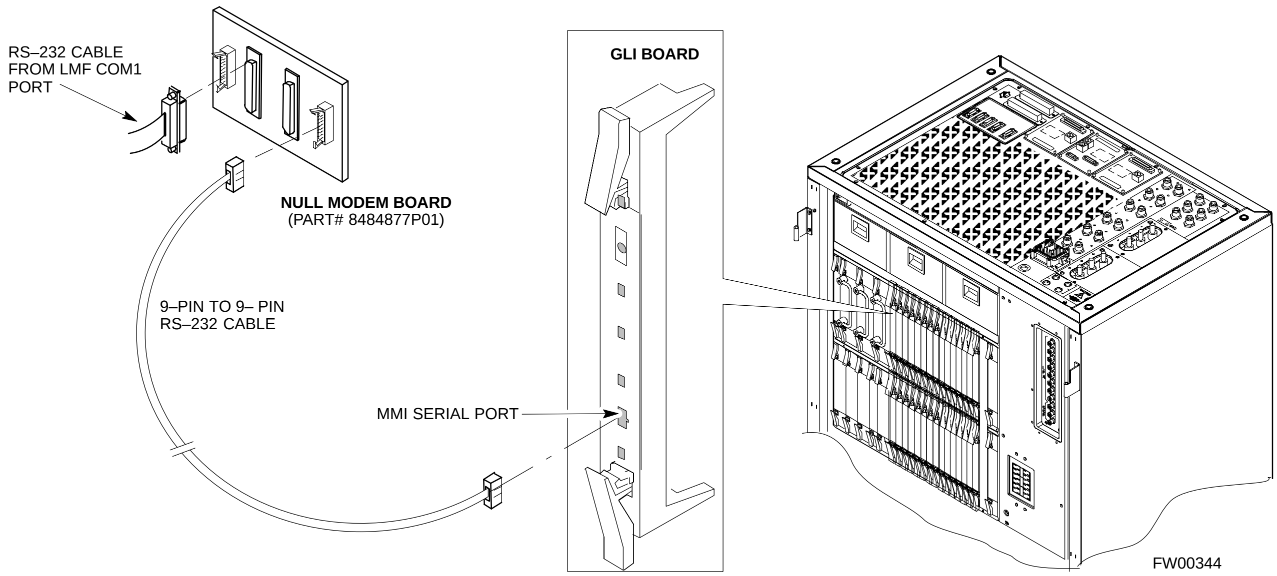
Table 5-4: BTS Span Parameter Configuration

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 5-2).
2	Start an MMI communication session with CSM–1 by using the Windows desktop shortcut icon (see Table 3-5 on page 3-11). **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/SGLI2 framing format and line code configuration (in bold type):
	span view <cr>
	Observe a display similar to the options shown below:
	`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`
	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/SGLI2 framing format and line code configuration does not display the correct choice, proceed to Table 5-5.

Table 5-4: BTS Span Parameter Configuration	
Step	**Action**
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 dropdown menu.

Figure 5-2: MGLI2/SGLI2 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/SGLI2 boards in all C–CCP shelves that terminate a T1/E1 span must be configured.

IMPORTANT

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 5-2).
2	Start an MMI communication session with CSM–1 by using the Windows desktop shortcut icon (see Table 3-5 on page 3-11). **NOTE** The LMF program must not be running when a Hyperterminal session is started if COM1 is being used for the MMI session.

3	*If required only*, enter the following MMI command for each span line to set the BTS span parameters to match that of the physical spans *a – f* run to the site:
	span_config *<option#1> <option#2> <option#3> <option#4> <option#5>*
	option#1 = the span to change (**a** – **f**)
	option#2 = 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)
	option#3 = the link speed (**56** or **64**) Kbps
	option#4 = 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)
	option#5 = the slot that has LAPD channel (**0** – **31**)
	Example for setting span configuration to E1_2, 64 Kbps, E1_120–Ohm, LAPD channel 1:
	`span_config a 1 64 7 1`
	.
	.
	`span_config f 1 64 7 1`
	Example for setting span configuration to T1_2, 64 Kbps, T1_4 (0–131 feet), LAPD channel 0:
	`span_config a 5 64 4 0`
	.
	.
	`span_config f 5 64 4 0`

. . . continued on next page

Table 5-5: Set BTS Span Parameter Configuration	
Step	**Action**
	*** IMPORTANT** Make sure that spans *a – f* 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/SGLI2 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.
5	This completes the site specific BTS Span setup for this GLI. Move the MMI cable to the next SGLI2 and repeat steps 1 and 4 for *ALL* MGLI2/SGLI2 boards.
6	Terminate the Hyperterm session and disconnect the LMF from the MGLI/SGLI.

Updating CBSC LMF Files

Updated calibration (CAL) file information must be moved from the LMF Windows environment back to the CBSC, which resides in a Unix environment. The procedures that follow detail how to move files from one environment to the other.

5

Backup CAL Data to a Diskette

The BLO calibration files should be backed up to a diskette (per BTS). Follow the procedure in Table 5-6 to copy CAL files from a CDMA LMF computer to a diskette.

Table 5-6: Backup CAL Data to a Diskette		
✓	**Step**	**Action**
	1	Insert a diskette into the LMF A drive. **NOTE** If your diskette has not been formatted, format it using Windows. The diskette must be DOS formatted before copying any files. Consult your Windows/DOS documentation or on–line help on how to format diskettes.
	2	Click on the **Start** button and launch the **Windows Explorer** program from the **Programs** menu.
	3	Click on your **C:** drive.
	4	Double Click on the **wlmf** folder.
	5	Double Click on the **CDMA** folder.
	6	Click on the **bts–#** folder for the calibration file you want to copy.
	7	Drag the **BTS–#.cal** file to the 3–1/2 floppy (A:) icon on the top left of the screen and release the mouse button.
	8	Repeat steps 6 and 7 until you have copied each file desired.
	9	Close the Windows Explorer program by selecting **Close** from the **File** menu option.

LMF Removal

CAUTION

DO NOT power down the LMF without performing the procedure indicated below. Corrupted/lost data files may result, and in some cases, the LMF may lock up.

Follow the procedure in Table 5-7 to terminate the LMF session and remove the terminal.

Table 5-7: LMF Termination and Removal

✓	Step	Action
	1	From the CDMA window select **File>Exi**t.
	2	From the Windows Task Bar click **Start>Shutdown**. Click **Yes** when the Shut Down Windows message appears.
	3	Disconnect the LMF terminal Ethernet connector from the BTS cabinet.
	4	Disconnect the LMF serial port, the RS-232 to GPIB interface box, and the GPIB cables as required for equipment transport.

Copying CAL Files from Diskette to the CBSC

Follow the procedure in Table 5-8 to copy CAL files from a diskette to the CBSC.

Table 5-8: Procedures to Copy CAL Files from Diskette to the CBSC

✓	Step	Action
	1	Login to the CBSC on the workstation using your account name and password. **NOTE** Enter the information that appears in **bold t**ext.
	2	Place your diskette containing CAL file(s) in the CBSC workstation diskette drive.
	3	Type **eject –q** and press the **<Enter>** key.
	4	Type **mount** and press the **<Enter>** key. Verify that `floppy/no_name` is displayed.
		NOTE If the **eject** command has been previously entered, `floppy/no_name` will be appended with a <u>number</u>. Use the explicit `floppy/no_name` reference displayed.
	5	Enter **cd /floppy/no_name** and press the **<Enter>** key.
	6	Enter **ls –lia** and press the **<Enter>** key. Verify that the **bts–#.cal** file is on the diskette.
	7	Enter **cd** and press the **<Enter>** key.

. . . continued on next page

Table 5-8: Procedures to Copy CAL Files from Diskette to the CBSC		
✓	**Step**	**Action**
	8	Enter **pwd** and press the **<Enter>** key. Verify that you are in your home directory (/home/<name>).
	9	Enter **dos2unix /floppy/no_name/bts–#.cal bts–#.cal** and press the **<Enter>** key (where # is the BTS number).
	10	Enter **ls –l *.cal** and press the **<Enter>** key. Verify that the CAL file was successfully copied.
	11	Type **eject** and press the **<Enter>** key.
	12	Remove the diskette from the workstation.

Re–establish OMC–R Control/ Verifying T1/E1

IMPORTANT

After all activities at the site have been completed, and after disconnecting the LMF, place a phone call to the OMC–R and request the BTS be placed under control of the OMC–R.

DRAFT

Notes

Chapter 6: Basic Troubleshooting

Table of Contents

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 form experience in Motorola labs and classrooms.

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 MGLI2 LED is solid RED, it implies a hardware failure. Reset MGLI2 by re-seating it. If this persists, install a known good MGLI2 card in MGLI2 slot and retry. A Red LED may also indicate no Ethernet termination at top of frame.
	2	Verify that T1 is disconnected (see Table 3-1 on page 3-4). If T1 is still connected, verify the CBSC has disabled the BTS.
	3	Try *pinging* the MGLI2 (see Table 3-6 on page 3-15).
	4	Verify the LMF is connected to the **Primary** LMF port (LAN A) in the front of the BTS (see Table 3-2 on page 3-5).
	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 3-4 on page 3-14).
	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 MGLI2 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 *13*.
	4	Verify the GPIB adapter DIP switch settings are correct. Refer to the Test Equipment setup section 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 power-cycle the GPIB Box and retry.
	6	Verify that the Com1 port is not used by another application.
	7	Verify that the communications analyzer is in Talk&Listen, not Control mode.

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 the analyzer is connected to the LMF with GPIB adapter.
	2	Verify the cable setup.
	3	Verify the GPIB address is set to 18.
	4	Verify the GPIB adapter DIP switch settings are correct. Refer to the Test Equipment setup section starting on page 3–34 for details.
	5	Verify the GPIB adapter is not locked up. Under normal conditions, only 2 green LEDs must be ‘ON’ (Power and Ready). If any other LED is continuously ‘ON’, then power-cycle the GPIB Box and retry.
	6	Verify that the Com1 port is not used by another application.
	7	If a Hyperterm window is open for MMI, close it.

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 MGLI2 must first be established before trying to talk to any other BTS device. The MGLI2 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 BBX reports a failure message and is OOS_RAM, the code load was OK.
	8	If the download portion completes and the reset portion fails, reset the device by selecting the device and **Reset**.

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 3-5 on page 3-11).
	2	Enter **ALARMS** in the Hyperterminal window. The resulting LMF display may provide an indication of the problem. (Call Field Support for further assistance.)

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.

Cannot Perform TX Mask Measurement

Follow the procedure in Table 6-10 to troubleshoot a TX mask measurement failure.

Table 6-10: 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 6-11 to troubleshoot a rho or pilot time offset measurement failure.

Table 6-11: 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 *INS* and may need to be re-initialized.

Cannot Perform Code Domain Power and Noise Floor Measurement

Perform the procedure in Table 6-12 to troubleshoot a code domain and noise floor measurement failure.

Table 6-12: 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).

Cannot Perform Carrier Measurement

Perform the procedure in Table 6-13 to troubleshoot a carrier measurement failure.

Table 6-13: Troubleshooting Carrier Measurement Failure

✓	Step	Action
	1	Perform the test manually, using the spread CDMA signal.
	2	Verify High Stability 10 MHz Rubidium Standard is warmed up (60 minutes) and properly connected to test set-up.

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.

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 l, 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 GLI2 to all other GLI2s in the modem frame. Their basic function is to provide clock synchronization from the master GLI2 to all other GLI2s 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 GLI2 to cell site modem.
- Interface between GLI2s and the AMR (for reporting BTS alarms).

Span Line Connector

The span line input is an 8–pin RJ–45 connector that provides a primary and secondary (if used) span line interface to each GLI2 in the C–CCP shelf. The span line is used for MM/EMX switch control of the Master GLI2 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 GLI2s and all BBXs in the backplane. The signals are used to phase lock loop all clock circuits on the GLI2s 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.

. . . continued on next page

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.

GLI2 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 GLI2s in the C–CCP backplane.

GLI2 Ethernet “A” and “B” Connections

These BNC connectors are located on the C–CCP backplane and routed to the GLI2 board. This interface provides all the control and data communications between the master GLI2 and the other GLI2, 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.

. . . continued on next page

IMPORTANT

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

Digital Control Problems

No GLI2 Control via LMF (all GLI2s)

Follow the procedure in Table 6-15 to troubleshoot a GLI2 control via LMF failure.

Table 6-15: No GLI2 Control via LMF (all GLI2s)

✓	Step	Action
	1	Check the ethernet 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 GLI2 connector (both board and backplane) for damage.
	4	Replace the master GLI2 with a known good GLI2.

No GLI2 Control through Span Line Connection (All GLI2s)

Follow the procedures in Table 6-16 and Table 6-17 to troubleshoot GLI2 control failures.

Table 6-16: No GLI2 Control through Span Line Connection (Both GLI2s)

Step	Action
1	Verify the C–CCP backplane Shelf ID DIP switch is set correctly.
2	Verify that the BTS and GLI2s are correctly configured in the OMCR/CBSC data base.
3	Visually check the master GLI2 connector (both board and backplane) for damage.
4	Replace the master GLI2 with a known good GLI2.
5	Check the span line inputs from the top of the frame to the master GLI2 for proper connection and damage.
6	Check the span line configuration on the MGLI2 (see Table 5-4 on page 5-4).

Table 6-17: MGLI2 Control Good – No Control over Co–located GLI2

Step	Action
1	Verify that the BTS and GLI2s are correctly configured in the OMCR CBSC data base.
2	Check the ethernet for proper connection, damage, shorts, or opens.
3	Visually check all GLI2 connectors (both board and backplane) for damage.
4	Replace the remaining GLI2 with a known good GLI2.

No AMR Control (MGLI2 good)

Perform the procedure in Table 6-18 to troubleshoot an AMR control failure when the MGLI control is good.

Table 6-18: MGLI2 Control Good – No Control over AMR

Step	Action
1	Visually check the master GLI2 connector (both board and backplane) for damage.
2	Replace the master GLI2 with a known good GLI2.
3	Replace the AMR with a known good AMR.

No BBX Control in the Shelf – (No Control over Co–located GLI2s)

Perform the procedure in Table 6-19 to troubleshoot a BBX control in the shelf failure.

Table 6-19: No BBX Control in the Shelf – No Control over Co–located GLI2s

Step	Action
1	Visually check all GLI2 connectors (both board and backplane) for damage.
2	Replace the remaining GLI2 with a known good GLI2.
3	Visually check BBX connectors (both board and backplane) for damage.
4	Replace the BBX with a known good BBX.

No (or Missing) Span Line Traffic

Perform the procedure in Table 6-20 to troubleshoot a span line traffic failure.

Table 6-20: MGLI2 Control Good – No (or Missing) Span Line Traffic

Step	Action
1	Visually check all GLI2 connectors (both board and backplane) for damage.
2	Replace the remaining GLI2 with a known good GLI2.
3	Visually check all span line distribution (both connectors and cables) for damage.
4	If the problem seems to be limited to one BBX, replace the MGLI2 with a known good MGLI2.
5	Perform the BTS Span Parameter Configuration (see Table 5-4 on page 5-4).
6	Ensure that ISB cabling is correct.

No (or Missing) MCC Channel Elements

Perform the procedure in Table 6-21 to troubleshoot a channel elements failure.

Table 6-21: No MCC Channel Elements

Step	Action
1	Verify CEs on a co–located MCC (MCC24 TYPE=2)
2	If the problem seems to be limited to one MCC, replace the MCC with a known good MCC. – Check connectors (both board and backplane) for damage.
3	If no CEs on any MCC: – Verify clock reference to CIO.
4	Check the CDF for MCCTYPE=2 (MCC24) or MCCTYPE=0 (MCC8).

6

DC Power Problems

Perform the procedure in Table 6-22 to troubleshoot a DC input voltage to power supply module failure.

WARNING

Potentially lethal voltage and current levels are routed to the BTS equipment. This test must be carried out with a second person present, acting in a safety role. Remove all rings, jewelry, and wrist watches prior to beginning this test.

No DC Input Voltage to Power Supply Module

Table 6-22: No DC Input Voltage to Power Supply Module

Step	Action
1	Verify DC power is applied to the BTS frame.
2	Verify there are no breakers tripped. *** IMPORTANT** If a breaker has tripped, remove all modules from the applicable shelf supplied by the breaker and attempt to reset it. – If the breaker trips again, there is probably a cable or breaker problem within the frame. – If the breaker does not trip, there is probably a defective module or sub–assembly within the shelf.
3	Verify that the C–CCP shelf breaker on the BTS frame breaker panel is functional.
4	Use a voltmeter to determine if the input voltage is being routed to the C–CCP backplane by measuring the DC voltage level on the PWR_IN cable. – If the voltage is not present, there is probably a cable or breaker problem within the frame. – If the voltage is present at the connector, reconnect and measure the level at the “VCC” power feed clip on the distribution backplane. – If the voltage is correct at the power clip, inspect the clip for damage.
5	If everything appears to be correct, visually inspect the power supply module connectors.
6	Replace the power supply module with a known good module.
7	If steps 1 through 5 fail to indicate a problem, a C–CCP backplane failure (possibly an open trace) has occurred.

No DC Voltage (+5, +6.5, or +15 Volts) to a Specific GLI2, BBX, or Switchboard

Perform the procedure in Table 6-23 to troubleshoot a DC input voltage to GLI2, BBX, or Switchboard failure.

Table 6-23: No DC Input Voltage to any C–CCP Shelf Module

Step	Action
1	Verify the steps in Table 6-22 have been performed.
2	Inspect the defective board/module (both board and backplane) connector for damage.
3	Replace suspect board/module with known good board/module.

TX and RX Signal Routing Problems

Perform the procedure in Table 6-24 to troubleshoot TX and RX signal routing problems.

Table 6-24: TX and RX Signal Routing Problems

Step	Action
1	Inspect all Harting Cable connectors and back–plane connectors for damage in all the affected board slots.
2	Perform steps in the RF path troubleshooting flowchart in this manual.

Module Status Indicators

Each of the non-passive plug-in modules has a bi-color (green & red) LED status indicator located on the module front panel. The indicator is labeled PWR/ALM. If both colors are turned on, the indicator is yellow.

Each plug-in module, except for the fan module, has its own alarm (fault) detection circuitry that controls the state of the PWR/ALM LED.

The fan TACH signal of each fan module is monitored by the AMR. Based on the status of this signal, the AMR controls the state of the PWR/ALM LED on the fan module.

LED Status Combinations for All Modules (except GLI2, CSM, BBX, MCC)

PWR/ALM LED

The following list describes the states of the module status indicator.

- Solid GREEN – module operating in a normal (fault free) condition.
- Solid RED – module is operating in a fault (alarm) condition due to electrical hardware failure.

Note that a fault (alarm) indication may or may not be due to a complete module failure and normal service may or may not be reduced or interrupted.

DC/DC Converter LED Status Combinations

The PWR CNVTR has alarm (fault) detection circuitry that controls the state of the PWR/ALM LED. This is true for both the C–CCP and LPA power converters.

PWR/ALM LED

The following list describes the states of the bi-color LED.

- Solid GREEN – module operating in a normal (fault free) condition.
- Solid RED – module is operating in a fault (alarm) condition due to electrical hardware problem.

CSM LED Status Combinations

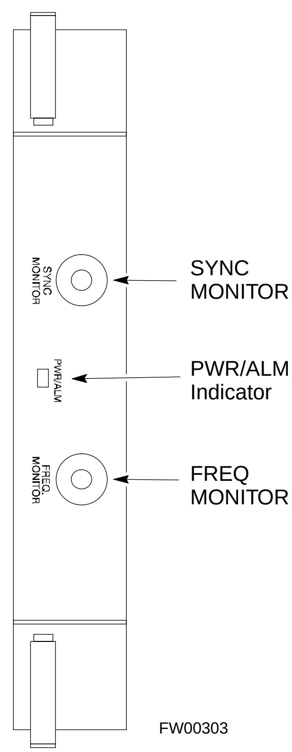
PWR/ALM LED

The CSMs include on-board alarm detection. Hardware and software/firmware alarms are indicated via the front panel indicators.

After the memory tests, the CSM loads OOS–RAM code from the Flash EPROM, if available. If not available, the OOS–ROM code is loaded from the Flash EPROM.

- Solid GREEN – module is INS_ACT or INS_STBY no alarm.
- Solid RED – Initial power up or module is operating in a fault (alarm) condition.
- Slowly Flashing GREEN – OOS_ROM no alarm.
- Long RED/Short GREEN – OOS_ROM alarm.
- Rapidly Flashing GREEN – OOS_RAM no alarm or INS_ACT in DUMB mode.
- Short RED/Short GREEN – OOS_RAM alarm.
- Long GREEN/Short RED – INS_ACT or INS_STBY alarm.
- Off – no DC power or on-board fuse is open.
- Solid YELLOW – After a reset, the CSMs begin to boot. During SRAM test and Flash EPROM code check, the LED is yellow. (If SRAM or Flash EPROM fail, the LED changes to a solid RED and the CSM attempts to reboot.)

Figure 6-1: CSM Front Panel Indicators & Monitor Ports



. . . continued on next page

FREQ Monitor Connector

A test port provided at the CSM front panel via a BNC receptacle allows monitoring of the 19.6608 MHz clock generated by the CSM. When both CSM 1 and CSM 2 are in an in-service (INS) condition, the CSM 2 clock signal frequency is the same as that output by CSM 1.

The clock is a sine wave signal with a minimum amplitude of +2 dBm (800 mVpp) into a 50 Ω load connected to this port.

SYNC Monitor Connector

A test port provided at the CSM front panel via a BNC receptacle allows monitoring of the "Even Second Tick" reference signal generated by the CSMs.

At this port, the reference signal is a TTL active high signal with a pulse width of 153 nanoseconds.

MMI Connector – Only accessible behind front panel. The RS–232 MMI port connector is intended to be used primarily in the development or factory environment, but may be used in the field for debug/maintenance purposes.

GLI2 LED Status Combinations

The GLI2 module has indicators, controls and connectors as described below and shown in Figure 6-2.

The operating states of the 5 LEDs are:

ACTIVE

Solid GREEN – GLI2 is active. This means that the GLI2 has shelf control and is providing control of the digital interfaces.

Off – GLI2 is not active (i.e., Standby). The mate GLI2 should be active.

MASTER

- Solid GREEN – GLI2 is Master (sometimes referred to as MGLI2).
- Off – GLI2 is non-master (i.e., Slave).

ALARM

- Solid RED – GLI2 is in a fault condition or in reset.
- While in reset transition, STATUS LED is OFF while GLI2 is performing ROM boot (about 12 seconds for normal boot).
- While in reset transition, STATUS LED is ON while GLI2 is performing RAM boot (about 4 seconds for normal boot).
- Off – No Alarm.

STATUS

- Flashing GREEN– GLI2 is in service (INS), in a stable operating condition.
- On – GLI2 is in OOS RAM state operating downloaded code.
- Off – GLI2 is in OOS ROM state operating boot code.

SPANS

- Solid GREEN – Span line is connected and operating.
- Solid RED – Span line is disconnected or a fault condition exists.

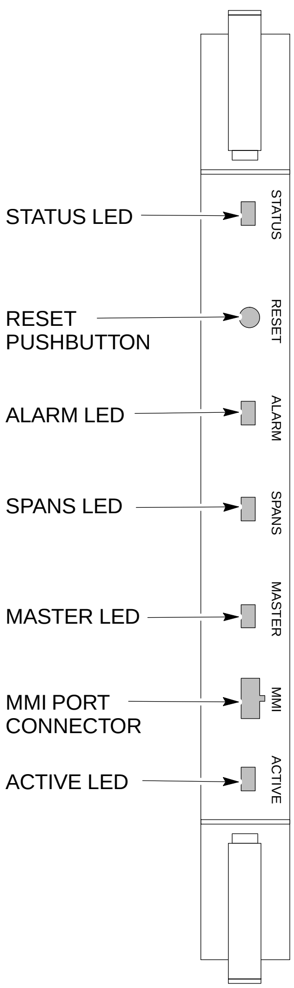
GLI2 Pushbuttons and Connectors

RESET Pushbutton – Depressing the RESET pushbutton causes a partial reset of the CPU and a reset of all board devices. The GLI2 is placed in the OOS_ROM state

MMI Connector – The RS–232MMI port connector is intended to be used primarily in the development or factory environment but may be used in the field for debug/maintenance purposes.

LAN Connectors (A & B) – The two 10BASE2 Ethernet circuit board mounted BNC connectors are located on the bottom front edge of the GLI2; one for each LAN interface, A & B. Ethernet cabling is connected to tee connectors fastened to these BNC connectors.

Figure 6-2: GLI2 Front Panel



LED	OPERATING STATUS
STATUS	OFF – operating normally ON – briefly during power-up when the Alarm LED turns OFF. SLOW GREEN – when the GLI2 is INS (in-service)
RESET	All functions on the GLI2 are reset when pressing and releasing the switch.
ALARM	OFF – operating normally ON – briefly during power-up when the Alarm LED turns OFF. SLOW GREEN – when the GLI2 is INS (in-service)
SPANS	OFF – card is powered down, in initialization, or in standby GREEN – operating normally YELLOW – one or more of the equipped initialized spans is receiving a remote alarm indication signal from the far end RED – one or more of the equipped initialized spans is in an alarm state
MASTER	The pair of GLI2 cards include a redundant status. The card in the top shelf is designated by hardware as the active card; the card in the bottom shelf is in the standby mode. ON – operating normally in active card OFF – operating normally in standby card
MMI PORT CONNECTOR	An RS-232, serial, asynchronous communications link for use as an MMI port. This port supports 300 baud, up to a maximum of 115,200 baud communications.
ACTIVE	Shows the operating status of the redundant cards. The redundant card toggles automatically if the active card is removed or fails ON – active card operating normally OFF – standby card operating normally

FW00225

BBX LED Status Combinations

PWR/ALM LED

The BBX module has its own alarm (fault) detection circuitry that controls the state of the PWR/ALM LED.

The following list describes the states of the bi-color LED:

- Solid GREEN – INS_ACT no alarm
- Solid RED Red – initializing or power-up alarm
- Slowly Flashing GREEN – OOS_ROM no alarm
- Long RED/Short GREEN – OOS_ROM alarm
- Rapidly Flashing GREEN – OOS_RAM no alarm
- Short RED/Short GREEN – OOS_RAM alarm
- Long GREEN/Short RED – INS_ACT alarm

MCC LED Status Combinations

The MCC module has LED indicators and connectors as described below (see Figure 6-3). Note that the figure does not show the connectors as they are concealed by the removable lens.

The LED indicators and their states are as follows:

PWR/ALM LED

- RED – fault on module

ACTIVE LED

- Off – module is inactive, off-line, or not processing traffic.
- Slowly Flashing GREEN – OOS_ROM no alarm.
- Rapidly Flashing Green – OOS_RAM no alarm.
- Solid GREEN – module is INS_ACT, on-line, processing traffic.

PWR/ALM and ACTIVE LEDs

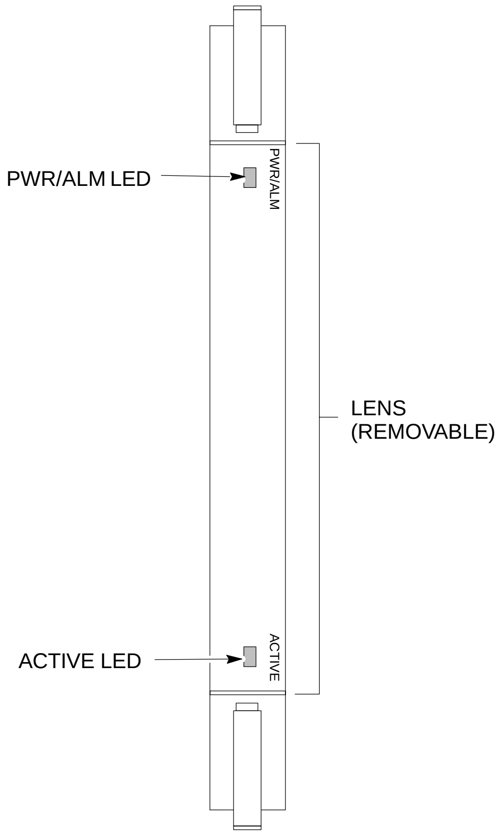
- Solid RED – module is powered but is in reset or the BCP is inactive.

MMI Connectors

- The RS–232 MMI port connector (four-pin) is intended to be used primarily in the development or factory environment but may be used in the field for debugging purposes.
- The RJ–11 ethernet port connector (eight-pin) is intended to be used primarily in the development environment but may be used in the field for high data rate debugging purposes.

. . . continued on next page

Figure 6-3: MCC Front Panel



LED	COLOR	OPERATING STATUS
PWR/ALM	RED	OFF – operating normally ON – briefly during power-up and during failure conditions
An alarm is generated in the event of a failure		
ACTIVE	GREEN	RAPIDLY BLINKING – Card is code-loaded but not enabled SLOW BLINKING – Card is not code-loaded ON – card is code-loaded and enabled (INS_ACTIVE)
	RED	ON – fault condition SLOW FLASHING (alternating with green) – CHI bus inactive on power-up

FW00224

LPA Shelf LED Status Combinations

LPA Module LED

Each LPA module contains a bi–color LED just above the MMI connector on the front panel of the module. Interpret this LED as follows:

- GREEN — LPA module is active and is reporting no alarms (Normal condition).
- Flashing GREEN/RED — LPA module is active but is reporting an low input power condition. If no BBX is keyed, this is normal and does not constitute a failure.

Span Problems (No Control Link)

Perform the procedure in Table 6-25 to troubleshoot a control link failure.

Table 6-25: Troubleshooting Control Link Failure

✓	Step	Action
	1	Verify the span settings using the `span_view` command on the active master GLI2 MMI port. If these are correct, verify the edlc parameters using the `show` command. Any alarms conditions indicate that the span is not operating correctly. – Try looping back the span line from the DSX panel back to the Mobility Manager (MM) and verify that the looped signal is good. – Listen for control tone on appropriate timeslot from Base Site and MM.
	2	If no traffic channels in groomed MCCs (or in whole C–CCP shelf) can process calls, verify that the ISB cabling is correct and that ISB A and ISB B cables are not swapped.

Notes

Appendix A: Data Sheets

Appendix Content

Notes

Optimization (Pre–ATP) Data Sheets

Verification of Test Equipment Used

Table A-1: Verification of Test Equipment Used

Manufacturer	Model	Serial Number

Comments:____

____

Site Checklist

Table A-2: Site Checklist			
OK	**Parameter**	**Specification**	**Comments**
❑	Deliveries	Per established procedures	
❑	Floor Plan	Verified	
	Inter Frame Cables:		
❑	Ethernet	Per procedure	
❑	Frame Ground	Per procedure	
❑	Power	Per procedure	
	Factory Data:		
❑	BBX	Per procedure	
❑	Test Panel	Per procedure	
❑	RFDS	Per procedure	
❑	Site Temperature		
❑	Dress Covers/Brackets		

Preliminary Operations

Table A-3: Preliminary Operations			
OK	**Parameter**	**Specification**	**Comments**
❑	Shelf ID Dip Switches	Per site equipage	
❑	BBX Jumpers	Verified per procedure	
❑	Ethernet LAN verification	Verified per procedure	

Comments:____

Pre–Power and Initial Power Tests

Table A-4: Pre–power Checklist

OK	Parameter	Specification	Comments
❑	Pre–power–up tests	Verify power supply output voltage at the top of each BTS frame is within specifications	
	Internal Cables:		
❑	ISB (all cages)	verified	
❑	CSM (all cages)	verified	
❑	Power (all cages)	verified	
	Ethernet Connectors		
❑	LAN A ohms	verified	
❑	LAN B ohms	verified	
❑	LAN A shield	isolated	
❑	LAN B shield	isolated	
❑	Ethernet Boots	installed	
❑	Air Impedance Cage (single cage)	installed	
❑	Initial power–up tests	Verify power supply output voltage at the top of each BTS frame is within specifications:	

Comments:____

General Optimization Checklist

Table A-5: Pre–power Checklist

OK	Parameter	Specification	Comments
❑	LEDs	illuminated	
❑	Frame fans	operational	
	LMF to BTS Connection		
❑	Preparing the LMF	per procedure	
❑	Log into the LMF PC	per procedure	
❑	Create site specific BTS directory	per procedure	
❑	Create master–bts–cdma directory	per procedure	
❑	Download device loads	per procedure	
❑	Moving/Linking files	per procedure	
❑	Ping LAN A	per procedure	
❑	Ping LAN B	per procedure	
❑	Download/Enable MGLI2s	per procedure	
❑	Download/Enable GLI2s	per procedure	
❑	Set Site Span Configuration	per procedure	
❑	Download CSMs	per procedure	
❑	Download	per procedure	
❑	Enable CSMs	per procedure	
❑	Download/Enable MCCs	per procedure	
❑	Download BBXs	per procedure	
❑	Download TSU (in RFDS)	per procedure	
❑	Program TSU NAM	per procedure	
❑	Test Set Calibration	per procedure	

Comments:____

GPS Receiver Operation

Table A-6: GPS Receiver Operation

OK	Parameter	Specification	Comments
❑	GPS Receiver Control Task State: **tracking satellites**	Verify parameter	
❑	Initial Position Accuracy:	Verify Estimated or Surveyed	
❑	Current Position: **lat** **lon** **height**	RECORD in ms and cm also convert to deg min sec	
❑	Current Position: satellites tracked Estimated: **(>4) satellites tracked,(>4) satellites visible** Surveyed: **(≥1) satellite tracked,(>4) satellites visible**	Verify parameter as appropriate:	
❑	GPS Receiver Status:Current Dilution of Precision (PDOP or HDOP): (<**30)**	Verify parameter	
❑	Current reference source: **Number: 0; Status: Good; Valid: Yes**	Verify parameter	

Comments:____

LFR Receiver Operation

Table A-7: LFR Receiver Operation

OK	Parameter	Specification	Comments
❑	Station call letters M X Y Z assignment.	as specified in site documentation	
❑	SN ratio is > 8 dB		
❑	LFR Task State: 1fr **locked to station xxxx**	Verify parameter	
❑	Current reference source: **Number: 1; Status: Good; Valid: Yes**	Verify parameter	

Comments:____

LPA IM Reduction

Table A-8: LPA IM Reduction

OK	Parameter					Specification	Comments
	LPA #	CARRIER					
		4:1 & 2:1 3–Sector	2:1 6–Sector	Dual BP 3–Sector	Dual BP 6–Sector		
❑	1A	C1	C1	C1	C1	No Alarms	
❑	1B	C1	C1	C1	C1	No Alarms	
❑	1C	C1	C1	C1	C1	No Alarms	
❑	1D	C1	C1	C1	C1	No Alarms	
❑	2A	C2	C2	C2		No Alarms	
❑	2B	C2	C2	C2		No Alarms	
❑	2C	C2	C2	C2		No Alarms	
❑	2D	C2	C2	C2		No Alarms	
❑	3A	C3	C1		C1	No Alarms	
❑	3B	C3	C1		C1	No Alarms	
❑	3C	C3	C1		C1	No Alarms	
❑	3D	C3	C1		C1	No Alarms	
❑	4A	C4	C2			No Alarms	
❑	4B	C4	C2			No Alarms	
❑	4C	C4	C2			No Alarms	
❑	4D	C4	C2			No Alarms	

Comments:____

Cx – denotes physical carriers

For applied frequency requirements, see Appendix E.

LPA Convergence

Table A-9: LPA Convergence

OK	Parameter	Specification	Data
	LPA # Converged		
❑	1A	Verify per procedure & upload convergence data	
❑	1B		
❑	1C		
❑	1D		
❑	2A	Verify per procedure & upload convergence data	
❑	2B		
❑	2C		
❑	2D		
❑	3A	Verify per procedure & upload convergence data	
❑	3B		
❑	3C		
❑	3D		
❑	4A	Verify per procedure & upload convergence data	
❑	4B		
❑	4C		
❑	4D		

TX Bay Level Offset/Power Output Verification for 3–Sector Configurations

1–Carrier
2–Carrier Non–adjacent Channels
4–Carrier Non–adjacent Channels

Table A-10: TX BLO Calibration (3–Sector: 1–Carrier, 2–Carrier and 4–Carrier Non–adjacent Channels)

OK	Parameter	Specification	Comments
❑	Calibrate carrier 1	TX Bay Level Offset = 42 dB (±4 dB) prior to calibration	BBX–1, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–2, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–3, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑	Calibrate carrier 2	TX Bay Level Offset = 42 dB (±4 dB) prior to calibration	BBX–7, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–8, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–9, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑	Calibrate carrier 3	TX Bay Level Offset = 42 dB (±4 dB) prior to calibration	BBX–4, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–5, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–6, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑	Calibrate carrier 4	TX Bay Level Offset = 42 dB (±4 dB) prior to calibration	BBX–10, ANT–1 = ___dB BBX–r, ANT–1 = ____dB
❑			BBX–11, ANT–2 = ___dB BBX–r, ANT–2 = ____dB
❑			BBX–12, ANT–3 = ___dB BBX–r, ANT–3 = ____dB

. . . continued on next page

Table A-10: TX BLO Calibration (3–Sector: 1–Carrier, 2–Carrier and 4–Carrier Non–adjacent Channels)			
OK	**Parameter**	**Specification**	**Comments**
❑	Calibration Audit carrier 1	0 dB (±0.5 dB) for gain set resolution post calibration	BBX–1, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–2, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–3, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑	Calibration Audit carrier 2	0 dB (±0.5 dB) for gain set resolution post calibration	BBX–7, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–8, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–9, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑	Calibration Audit carrier 3	0 dB (±0.5 dB) for gain set resolution post calibration	BBX–4, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–5, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–6, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑	Calibration Audit carrier 4	0 dB (±0.5 dB) for gain set resolution post calibration	BBX–10, ANT–1 = ___dB BBX–r, ANT–1 = ____dB
❑			BBX–11, ANT–2 = ___dB BBX–r, ANT–2 = ____dB
❑			BBX–12, ANT–3 = ___dB BBX–r, ANT–3 = ____dB

Comments:____

____

2–Carrier Adjacent Channel

Table A-11: TX Bay Level Offset Calibration (3–Sector: 2–Carrier Adjacent Channels)

OK	Parameter	Specification	Comments
❑	Calibrate carrier 1	TX Bay Level Offset = 42 dB (typical), 38 dB (minimum) prior to calibration	BBX–1, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–2, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–3, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑	Calibrate carrier 2	TX Bay Level Offset = 42 dB (typical), 38 dB (minimum) prior to calibration	BBX–7, ANT–4 = ____dB BBX–r, ANT–4 = ____dB
❑			BBX–8, ANT–5 = ____dB BBX–r, ANT–5 = ____dB
❑			BBX–9, ANT–6 = ____dB BBX–r, ANT–6 = ____dB
❑	Calibration Audit carrier 1	0 dB ($\pm$0.5 dB) for gain set resolution post calibration	BBX–1, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–2, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–3, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑	Calibration Audit carrier 2	0 dB ($\pm$0.5 dB) for gain set resolution post calibration	BBX–7, ANT–4 = ____dB BBX–r, ANT–4 = ____dB
❑			BBX–8, ANT–5 = ____dB BBX–r, ANT–5 = ____dB
❑			BBX–9, ANT–6 = ____dB BBX–r, ANT–6 = ____dB

Comments:____

____

3–Carrier Adjacent Channels
4–Carrier Adjacent Channels

Table A-12: TX Bay Level Offset Calibration (3–Sector: 3 or 4–Carrier Adjacent Channels)

OK	Parameter	Specification	Comments
❑	Calibrate carrier 1	TX Bay Level Offset = 42 dB (±4 dB) prior to calibration	BBX–1, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–2, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–3, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑	Calibrate carrier 2	TX Bay Level Offset = 42 dB (±4 dB) prior to calibration	BBX–7, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–8, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–9, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑	Calibrate carrier 3	TX Bay Level Offset = 42 dB (±4 dB) prior to calibration	BBX–4, ANT–4 = ____dB BBX–r, ANT–4 = ____dB
❑			BBX–5, ANT–5 = ____dB BBX–r, ANT–5 = ____dB
❑			BBX–6, ANT–6 = ____dB BBX–r, ANT–6 = ____dB
❑	Calibrate carrier 4	TX Bay Level Offset = 42 dB (±4 dB) prior to calibration	BBX–10, ANT–4 = ___dB BBX–3, ANT–4 = ____dB
❑			BBX–11, ANT–5 = ___dB BBX–r, ANT–5 = ____dB
❑			BBX–12, ANT–6 = ___dB BBX–r, ANT–6 = ____dB
❑	Calibration Audit carrier 1	0 dB (±0.5 dB) for gain set resolution post calibration	BBX–1, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–2, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–3, ANT–3 = ____dB BBX–r, ANT–3 = ____dB

. . . continued on next page

Table A-12: TX Bay Level Offset Calibration (3–Sector: 3 or 4–Carrier Adjacent Channels)			
OK	**Parameter**	**Specification**	**Comments**
❑	Calibration Audit carrier 2	0 dB (±0.5 dB) for gain set resolution post calibration	BBX–7, ANT–1 = ____dB BBX–r, ANT–1 = _____dB
❑			BBX–8, ANT–2 = ____dB BBX–r, ANT–2 = _____dB
❑			BBX–9, ANT–3 = ____dB BBX–r, ANT–3 = _____dB
❑	Calibration Audit carrier 3	0 dB (±0.5 dB) for gain set resolution post calibration	BBX–4, ANT–4 = ____dB BBX–r, ANT–4 = _____dB
❑			BBX–5, ANT–5 = ____dB BBX–r, ANT–5 = _____dB
❑			BBX–6, ANT–6 = ____dB BBX–r, ANT–6 = _____dB
❑	Calibration Audit carrier 4	0 dB (±0.5 dB) for gain set resolution post calibration	BBX–10, ANT–4 = ___dB BBX–r, ANT–4 = _____dB
❑			BBX–11, ANT–5 = ___dB BBX–r, ANT–5 = _____dB
❑			BBX–12, ANT–6 = ___dB BBX–r, ANT–6 = _____dB

Comments:____

____

TX Bay Level Offset/Power Output Verification for 6–Sector Configurations

1–Carrier
2–Carrier Non–adjacent Channels

Table A-13: TX BLO Calibration (6–Sector: 1–Carrier, 2–Carrier Non–adjacent Channels)

OK	Parameter	Specification	Comments
❑	Calibrate carrier 1	TX Bay Level Offset = 42 dB (typical), 38 dB (minimum) prior to calibration	BBX–1, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–2, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–3, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑			BBX–4, ANT–4 = ____dB BBX–r, ANT–4 = ____dB
❑			BBX–5, ANT–5 = ____dB BBX–r, ANT–5 = ____dB
❑			BBX–6, ANT–6 = ____dB BBX–r, ANT–6 = ____dB
❑	Calibrate carrier 2	TX Bay Level Offset = 42 dB (typical), 38 dB (minimum) prior to calibration	BBX–7, ANT–1 = ____dB BBX–r, ANT–1 = ____dB
❑			BBX–8, ANT–2 = ____dB BBX–r, ANT–2 = ____dB
❑			BBX–9, ANT–3 = ____dB BBX–r, ANT–3 = ____dB
❑			BBX–10, ANT–4 = ___dB BBX–3, ANT–4 = ____dB
❑			BBX–11, ANT–5 = ___dB BBX–r, ANT–5 = ____dB
❑			BBX–12, ANT–6 = ___dB BBX–r, ANT–5 = ____dB

. . . continued on next page

Table A-13: TX BLO Calibration (6–Sector: 1–Carrier, 2–Carrier Non–adjacent Channels)			
OK	**Parameter**	**Specification**	**Comments**
❑	Calibration Audit carrier 1	0 dB (±0.5 dB) for gain set resolution post calibration	BBX–1, ANT–1 = ____dB BBX–r, ANT–1 = _____dB
❑			BBX–2, ANT–2 = ____dB BBX–r, ANT–2 = _____dB
❑			BBX–3, ANT–3 = ____dB BBX–r, ANT–3 = _____dB
❑			BBX–4, ANT–4 = ____dB BBX–r, ANT–4 = _____dB
❑			BBX–5, ANT–5 = ____dB BBX–r, ANT–5 = _____dB
❑			BBX–6, ANT–6 = ____dB BBX–r, ANT–6 = _____dB
❑	Calibration Audit carrier 2	0 dB (±0.5 dB) for gain set resolution post calibration	BBX–7, ANT–1 = ____dB BBX–r, ANT–1 = _____dB
❑			BBX–8, ANT–2 = ____dB BBX–r, ANT–2 = _____dB
❑			BBX–9, ANT–3 = ____dB BBX–r, ANT–3 = _____dB
❑			BBX–10, ANT–4 = ___dB BBX–r, ANT–4 = _____dB
❑			BBX–11, ANT–5 = ___dB BBX–r, ANT–5 = _____dB
❑			BBX–12, ANT–6 = ___dB BBX–r, ANT–6 = _____dB

Comments:____

____

BTS Redundancy/Alarm Tests

Table A-14: BTS Redundancy/Alarm Tests

OK	Parameter	Specification	Data
❑	SIF: Misc. alarm tests	Verify per procedure	
❑	MGLI2 redundancy test	Verify per procedure	
❑	GLI2 redundancy test	Verify per procedure	
❑	Power supply/converter redundancy	Verify per procedure	
❑	Misc. alarm tests	Verify per procedure	
❑	CSM, GPS, & LFR redundancy/alarm tests	Verify per procedure	
❑	LPA redundancy test	Verify per procedure	

Comments:____

____

TX Antenna VSWR

Table A-15: TX Antenna VSWR

OK	Parameter	Specification	Data
❑	VSWR – Antenna 1	< (1.5 : 1)	
❑	VSWR – Antenna 2	< (1.5 : 1)	
❑	VSWR – Antenna 3	< (1.5 : 1)	
❑	VSWR – Antenna 4	< (1.5 : 1)	
❑	VSWR – Antenna 5	< (1.5 : 1)	
❑	VSWR – Antenna 6	< (1.5 : 1)	

Comments:____

____

RX Antenna VSWR

Table A-16: RX Antenna VSWR

OK	Parameter	Specification	Data
❑	VSWR – Antenna 1	< (1.5 : 1)	
❑	VSWR – Antenna 2	< (1.5 : 1)	
❑	VSWR – Antenna 3	< (1.5 : 1)	
❑	VSWR – Antenna 4	< (1.5 : 1)	
❑	VSWR – Antenna 5	< (1.5 : 1)	
❑	VSWR – Antenna 6	< (1.5 : 1)	

Comments:____

AMR Verification

Table A-17: AMR CDI Alarm Input Verification

OK	Parameter	Specification	Data
❑	Verify CDI alarm input operation (“ALARM A” (numbers 1 –18)	BTS Relay #XX – Contact Alarm Sets/Clears	
❑	Verify CDI alarm input operation (“ALARM B” (numbers 19 –36)	BTS Relay #XX – Contact Alarm Sets/Clears	

Comments:____

Site Serial Number Check List

Date ____________________ Site ____________________

C–CCP Shelf

Site I/O A & B	______________
C–CCP Shelf	______________
CSM–1	______________
CSM–2	______________
HSO	______________
CCD–1	______________
CCD–2	______________
AMR–1	______________
AMR–2	______________
MPC–1	______________
MPC–2	______________
Fans 1–3	______________
GLI2–1	______________
GLI2–2	______________
BBX–1	______________
BBX–2	______________
BBX–3	______________
BBX–4	______________
BBX–5	______________
BBX–6	______________
BBX–7	______________
BBX–8	______________
BBX–9	______________
BBX–10	______________
BBX–11	______________
BBX–12	______________
BBX–r	______________
MCC–1	______________
MCC–2	______________
MCC–3	______________
MCC–4	______________
MCC–5	______________
MCC–6	______________
MCC–7	______________
MCC–8	______________
MCC–9	______________

. . . continued on next page

Site Serial Number Check List – continued

MCC–1–10	____________
MCC–11	____________
MCC–1–12	____________
CIO	____________
SWITCH	____________
PS–1	____________
PS–2	____________
PS–3	____________

LPAs

LPA 1A	____________
LPA 1B	____________
LPA 1C	____________
LPA 1D	____________
LPA 2A	____________
LPA 2B	____________
LPA 2C	____________
LPA 2D	____________
LPA 3A	____________
LPA 3B	____________
LPA 3C	____________
LPA 3D	____________
LPA 4A	____________
LPA 4B	____________
LPA 4C	____________
LPA 4D	____________

Power Conversion Shelf (–48 V BTS Only)

AMR	____________
PS 4	____________
PS 5	____________
PS 6	____________
PS 7	____________
PS 8	____________
PS 9	____________

Notes

Appendix B: PN Offset/I & Q Offset Register Programming Information

B

Appendix Content

B

Notes

PN Offset Background

All channel elements transmitted from a BTS in a particular 1.25 MHz CDMA channel are orthonogonally spread by 1 of 64 possible Walsh code functions; additionally, they are also spread by a quadrature pair of PN sequences unique to each sector.

Overall, the mobile uses this to differentiate multiple signals transmitted from the same BTS (and surrounding BTS) sectors, and to synchronize to the next strongest sector.

The PN offset per sector is stored on the BBXs, where the corresponding I & Q registers reside.

The PN offset values are determined on a per BTS/per sector(antenna) basis as determined by the appropriate cdf file content. A breakdown of this information is found in Table B-1.

PN Offset Usage

Only the 14–chip delay is currently in use. It is important to determine the RF chip delay to be able to test the BTS functionality. This can be done by ascertaining if the CDF file `FineTxAdj` value was set to "on" when the MCC was downloaded with "image data". The `FineTxAdj` value is used to compensate for the processing delay (approximately 20 μS) in the BTS using any type of mobile meeting IS–97 specifications.

If the `FineTxAdj` value in the cdf file is 213 (D5 HEX), FineTxAdj has been set for the *14 chip table*.

IMPORTANT

CDF file I and Q values can be represented in DECIMAL or HEX. If using HEX, add 0x before the HEX value. If necessary, convert HEX values in Table B-1 to decimal before comparing them to cdf file I & Q value assignments.

B

Table B-1: PnMask I and PnMask Q Values for PilotPn

Pilot PN	I (Dec.) 14–Chip Delay	Q (Dec.)	I (Hex.)	Q (Hex.)
0	17523	23459	4473	5BA3
1	32292	32589	7E24	7F4D
2	4700	17398	125C	43F6
3	14406	26333	3846	66DD
4	14899	4011	3A33	0FAB
5	17025	2256	4281	08D0
6	14745	18651	3999	48DB
7	2783	1094	0ADF	0446
8	5832	21202	16C8	52D2
9	12407	13841	3077	3611
10	31295	31767	7A3F	7C17
11	7581	18890	1D9D	49CA
12	18523	30999	485B	7917
13	29920	22420	74E0	5794
14	25184	20168	6260	4EC8
15	26282	12354	66AA	3042
16	30623	11187	779F	2BB3
17	15540	11834	3CB4	2E3A
18	23026	10395	59F2	289B
19	20019	28035	4E33	6D83
20	4050	27399	0FD2	6B07
21	1557	22087	0615	5647
22	30262	2077	7636	081D
23	18000	13758	4650	35BE
24	20056	11778	4E58	2E02
25	12143	3543	2F6F	0DD7
26	17437	7184	441D	1C10
27	17438	2362	441E	093A
28	5102	25840	13EE	64F0
29	9302	12177	2456	2F91
30	17154	10402	4302	28A2
31	5198	1917	144E	077D
32	4606	17708	11FE	452C
33	24804	10630	60E4	2986
34	17180	6812	431C	1A9C
35	10507	14350	290B	380E
36	10157	10999	27AD	2AF7
37	23850	25003	5D2A	61AB
38	31425	2652	7AC1	0A5C
39	4075	19898	0FEB	4DBA
40	10030	2010	272E	07DA
41	16984	25936	4258	6550
42	14225	28531	3791	6F73
43	26519	11952	6797	2EB0
44	27775	31947	6C7F	7CCB
45	30100	25589	7594	63F5
46	7922	11345	1EF2	2C51
47	14199	28198	3777	6E26
48	17637	13947	44E5	367B
49	23081	8462	5A29	210E
50	5099	9595	13EB	257B

. . . continued on next page

Table B-1: PnMask I and PnMask Q Values for PilotPn

Pilot PN	14–Chip Delay I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
51	32743	4670	7FE7	123E
52	7114	14672	1BCA	3950
53	7699	29415	1E13	72E7
54	19339	20610	4B8B	5082
55	28212	6479	6E34	194F
56	29587	10957	7393	2ACD
57	19715	18426	4D03	47FA
58	14901	22726	3A35	58C6
59	20160	5247	4EC0	147F
60	22249	29953	56E9	7501
61	26582	5796	67D6	16A4
62	7153	16829	1BF1	41BD
63	15127	4528	3B17	11B0
64	15274	5415	3BAA	1527
65	23149	10294	5A6D	2836
66	16340	17046	3FD4	4296
67	27052	7846	69AC	1EA6
68	13519	10762	34CF	2A0A
69	10620	13814	297C	35F6
70	15978	16854	3E6A	41D6
71	27966	795	6D3E	031B
72	12479	9774	30BF	262E
73	1536	24291	0600	5EE3
74	3199	3172	0C7F	0C64
75	4549	2229	11C5	08B5
76	17888	21283	45E0	5323
77	13117	16905	333D	4209
78	7506	7062	1D52	1B96
79	27626	7532	6BEA	1D6C
80	31109	25575	7985	63E7
81	29755	14244	743B	37A4
82	26711	28053	6857	6D95
83	20397	30408	4FAD	76C8
84	18608	5094	48B0	13E6
85	7391	16222	1CDF	3F5E
86	23168	7159	5A80	1BF7
87	23466	174	5BAA	00AE
88	15932	25530	3E3C	63BA
89	25798	2320	64C6	0910
90	28134	23113	6DE6	5A49
91	28024	23985	6D78	5DB1
92	6335	2604	18BF	0A2C
93	21508	1826	5404	0722
94	26338	30853	66E2	7885
95	17186	15699	4322	3D53
96	22462	2589	57BE	0A1D
97	3908	25000	0F44	61A8
98	25390	18163	632E	46F3
99	27891	12555	6CF3	310B
100	9620	8670	2594	21DE

. . . continued on next page

B

Table B-1: PnMask I and PnMask Q Values for PilotPn				
14–Chip Delay				
Pilot PN	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
101	6491	1290	195B	050A
102	16876	4407	41EC	1137
103	17034	1163	428A	048B
104	32405	12215	7E95	2FB7
105	27417	7253	6B19	1C55
106	8382	8978	20BE	2312
107	5624	25547	15F8	63CB
108	1424	3130	0590	0C3A
109	13034	31406	32EA	7AAE
110	15682	6222	3D42	184E
111	27101	20340	69DD	4F74
112	8521	25094	2149	6206
113	30232	23380	7618	5B54
114	6429	10926	191D	2AAE
115	27116	22821	69EC	5925
116	4238	31634	108E	7B92
117	5128	4403	1408	1133
118	14846	689	39FE	02B1
119	13024	27045	32E0	69A5
120	10625	27557	2981	6BA5
121	31724	16307	7BEC	3FB3
122	13811	22338	35F3	5742
123	24915	27550	6153	6B9E
124	1213	22096	04BD	5650
125	2290	23136	08F2	5A60
126	31551	12199	7B3F	2FA7
127	12088	1213	2F38	04BD
128	7722	936	1E2A	03A8
129	27312	6272	6AB0	1880
130	23130	32446	5A5A	7EBE
131	594	13555	0252	34F3
132	25804	8789	64CC	2255
133	31013	24821	7925	60F5
134	32585	21068	7F49	524C
135	3077	31891	0C05	7C93
136	17231	5321	434F	14C9
137	31554	551	7B42	0227
138	8764	12115	223C	2F53
139	15375	4902	3C0F	1326
140	13428	1991	3474	07C7
141	17658	14404	44FA	3844
142	13475	17982	34A3	463E
143	22095	19566	564F	4C6E
144	24805	2970	60E5	0B9A
145	4307	23055	10D3	5A0F
146	23292	15158	5AFC	3B36
147	1377	29094	0561	71A6
148	28654	653	6FEE	028D
149	6350	19155	18CE	4AD3
150	16770	23588	4182	5C24

. . . continued on next page

B

Table B-1: PnMask I and PnMask Q Values for PilotPn				
14–Chip Delay				
Pilot PN	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
151	14726	10878	3986	2A7E
152	25685	31060	6455	7954
153	21356	30875	536C	789B
154	12149	11496	2F75	2CE8
155	28966	24545	7126	5FE1
156	22898	9586	5972	2572
157	1713	20984	06B1	51F8
158	30010	30389	753A	76B5
159	2365	7298	093D	1C82
160	27179	18934	6A2B	49F6
161	29740	23137	742C	5A61
162	5665	24597	1621	6015
163	23671	23301	5C77	5B05
164	1680	7764	0690	1E54
165	25861	14518	6505	38B6
166	25712	21634	6470	5482
167	19245	11546	4B2D	2D1A
168	26887	26454	6907	6756
169	30897	15938	78B1	3E42
170	11496	9050	2CE8	235A
171	1278	3103	04FE	0C1F
172	31555	758	7B43	02F6
173	29171	16528	71F3	4090
174	20472	20375	4FF8	4F97
175	5816	10208	16B8	27E0
176	30270	17698	763E	4522
177	22188	8405	56AC	20D5
178	6182	28634	1826	6FDA
179	32333	1951	7E4D	079F
180	14046	20344	36DE	4F78
181	15873	26696	3E01	6848
182	19843	3355	4D83	0D1B
183	29367	11975	72B7	2EC7
184	13352	31942	3428	7CC6
185	22977	9737	59C1	2609
186	31691	9638	7BCB	25A6
187	10637	30643	298D	77B3
188	25454	13230	636E	33AE
189	18610	22185	48B2	56A9
190	6368	2055	18E0	0807
191	7887	8767	1ECF	223F
192	7730	15852	1E32	3DEC
193	23476	16125	5BB4	3EFD
194	889	6074	0379	17BA
195	21141	31245	5295	7A0D
196	20520	15880	5028	3E08
197	21669	20371	54A5	4F93
198	15967	8666	3E5F	21DA
199	21639	816	5487	0330
200	31120	22309	7990	5725

. . . continued on next page

DRAFT

B

Table B-1: PnMask I and PnMask Q Values for PilotPn				
14–Chip Delay				
Pilot PN	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
201	3698	29563	0E72	737B
202	16322	13078	3FC2	3316
203	17429	10460	4415	28DC
204	21730	17590	54E2	44B6
205	17808	20277	4590	4F35
206	30068	19988	7574	4E14
207	12737	6781	31C1	1A7D
208	28241	32501	6E51	7EF5
209	20371	6024	4F93	1788
210	13829	20520	3605	5028
211	13366	31951	3436	7CCF
212	25732	26063	6484	65CF
213	19864	27203	4D98	6A43
214	5187	6614	1443	19D6
215	23219	10970	5AB3	2ADA
216	28242	5511	6E52	1587
217	6243	17119	1863	42DF
218	445	16064	01BD	3EC0
219	21346	31614	5362	7B7E
220	13256	4660	33C8	1234
221	18472	13881	4828	3639
222	25945	16819	6559	41B3
223	31051	6371	794B	18E3
224	1093	24673	0445	6061
225	5829	6055	16C5	17A7
226	31546	10009	7B3A	2719
227	29833	5957	7489	1745
228	18146	11597	46E2	2D4D
229	24813	22155	60ED	568B
230	47	15050	002F	3ACA
231	3202	16450	0C82	4042
232	21571	27899	5443	6CFB
233	7469	2016	1D2D	07E0
234	25297	17153	62D1	4301
235	8175	15849	1FEF	3DE9
236	28519	30581	6F67	7775
237	4991	3600	137F	0E10
238	7907	4097	1EE3	1001
239	17728	671	4540	029F
240	14415	20774	384F	5126
241	30976	24471	7900	5F97
242	26376	27341	6708	6ACD
243	19063	19388	4A77	4BBC
244	19160	25278	4AD8	62BE
245	3800	9505	0ED8	2521
246	8307	26143	2073	661F
247	12918	13359	3276	342F
248	19642	2154	4CBA	086A
249	24873	13747	6129	35B3
250	22071	27646	5637	6BFE

. . . continued on next page

Table B-1: PnMask I and PnMask Q Values for PilotPn

14–Chip Delay				
Pilot PN	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
251	13904	1056	3650	0420
252	27198	1413	6A3E	0585
253	3685	3311	0E65	0CEF
254	16820	4951	41B4	1357
255	22479	749	57CF	02ED
256	6850	6307	1AC2	18A3
257	15434	961	3C4A	03C1
258	19332	2358	4B84	0936
259	8518	28350	2146	6EBE
260	14698	31198	396A	79DE
261	21476	11467	53E4	2CCB
262	30475	8862	770B	229E
263	23984	6327	5DB0	18B7
264	1912	7443	0778	1D13
265	26735	28574	686F	6F9E
266	15705	25093	3D59	6205
267	3881	6139	0F29	17FB
268	20434	22047	4FD2	561F
269	16779	32545	418B	7F21
270	31413	7112	7AB5	1BC8
271	16860	28535	41DC	6F77
272	8322	10378	2082	288A
273	28530	15065	6F72	3AD9
274	26934	5125	6936	1405
275	18806	12528	4976	30F0
276	20216	23215	4EF8	5AAF
277	9245	20959	241D	51DF
278	8271	3568	204F	0DF0
279	18684	26453	48FC	6755
280	8220	29421	201C	72ED
281	6837	24555	1AB5	5FEB
282	9613	10779	258D	2A1B
283	31632	25260	7B90	62AC
284	27448	16084	6B38	3ED4
285	12417	26028	3081	65AC
286	30901	29852	78B5	749C
287	9366	14978	2496	3A82
288	12225	12182	2FC1	2F96
289	21458	25143	53D2	6237
290	6466	15838	1942	3DDE
291	8999	5336	2327	14D8
292	26718	21885	685E	557D
293	3230	20561	0C9E	5051
294	27961	30097	6D39	7591
295	28465	21877	6F31	5575
296	6791	23589	1A87	5C25
297	17338	26060	43BA	65CC
298	11832	9964	2E38	26EC
299	11407	25959	2C8F	6567
300	15553	3294	3CC1	0CDE

. . . continued on next page

PN Offset Programming Information – continued

Table B-1: PnMask I and PnMask Q Values for PilotPn

14–Chip Delay				
Pilot PN	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
301	17418	30173	440A	75DD
302	14952	15515	3A68	3C9B
303	52	5371	0034	14FB
304	27254	10242	6A76	2802
305	15064	28052	3AD8	6D94
306	10942	14714	2ABE	397A
307	377	19550	0179	4C5E
308	14303	8866	37DF	22A2
309	24427	15297	5F6B	3BC1
310	26629	10898	6805	2A92
311	20011	31315	4E2B	7A53
312	16086	19475	3ED6	4C13
313	24374	1278	5F36	04FE
314	9969	11431	26F1	2CA7
315	29364	31392	72B4	7AA0
316	25560	4381	63D8	111D
317	28281	14898	6E79	3A32
318	7327	23959	1C9F	5D97
319	32449	16091	7EC1	3EDB
320	26334	9037	66DE	234D
321	14760	24162	39A8	5E62
322	15128	6383	3B18	18EF
323	29912	27183	74D8	6A2F
324	4244	16872	1094	41E8
325	8499	9072	2133	2370
326	9362	12966	2492	32A6
327	10175	28886	27BF	70D6
328	30957	25118	78ED	621E
329	12755	20424	31D3	4FC8
330	19350	6729	4B96	1A49
331	1153	20983	0481	51F7
332	29304	12372	7278	3054
333	6041	13948	1799	367C
334	21668	27547	54A4	6B9B
335	28048	8152	6D90	1FD8
336	10096	17354	2770	43CA
337	23388	17835	5B5C	45AB
338	15542	14378	3CB6	382A
339	24013	7453	5DCD	1D1D
340	2684	26317	0A7C	66CD
341	19018	5955	4A4A	1743
342	25501	10346	639D	286A
343	4489	13200	1189	3390
344	31011	30402	7923	76C2
345	29448	7311	7308	1C8F
346	25461	3082	6375	0C0A
347	11846	21398	2E46	5396
348	30331	31104	767B	7980
349	10588	24272	295C	5ED0
350	32154	27123	7D9A	69F3

. . . continued on next page

B

Table B-1: PnMask I and PnMask Q Values for PilotPn

Pilot PN	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
	14–Chip Delay			
351	29572	5578	7384	15CA
352	13173	25731	3375	6483
353	10735	10662	29EF	29A6
354	224	11084	00E0	2B4C
355	12083	31098	2F33	797A
356	22822	16408	5926	4018
357	2934	6362	0B76	18DA
358	27692	2719	6C2C	0A9F
359	10205	14732	27DD	398C
360	7011	22744	1B63	58D8
361	22098	1476	5652	05C4
362	2640	8445	0A50	20FD
363	4408	21118	1138	527E
364	102	22198	0066	56B6
365	27632	22030	6BF0	560E
366	19646	10363	4CBE	287B
367	26967	25802	6957	64CA
368	32008	2496	7D08	09C0
369	7873	31288	1EC1	7A38
370	655	24248	028F	5EB8
371	25274	14327	62BA	37F7
372	16210	23154	3F52	5A72
373	11631	13394	2D6F	3452
374	8535	1806	2157	070E
375	19293	17179	4B5D	431B
376	12110	10856	2F4E	2A68
377	21538	25755	5422	649B
378	10579	15674	2953	3D3A
379	13032	7083	32E8	1BAB
380	14717	29096	397D	71A8
381	11666	3038	2D92	0BDE
382	25809	16277	64D1	3F95
383	5008	25525	1390	63B5
384	32418	20465	7EA2	4FF1
385	22175	28855	569F	70B7
386	11742	32732	2DDE	7FDC
387	22546	20373	5812	4F95
388	21413	9469	53A5	24FD
389	133	26155	0085	662B
390	4915	6957	1333	1B2D
391	8736	12214	2220	2FB6
392	1397	21479	0575	53E7
393	18024	31914	4668	7CAA
394	15532	32311	3CAC	7E37
395	26870	11276	68F6	2C0C
396	5904	20626	1710	5092
397	24341	423	5F15	01A7
398	13041	2679	32F1	0A77
399	23478	15537	5BB6	3CB1
400	1862	10818	0746	2A42

. . . continued on next page

B

Table B-1: PnMask I and PnMask Q Values for PilotPn				
14–Chip Delay				
Pilot PN	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
401	5850	23074	16DA	5A22
402	5552	20250	15B0	4F1A
403	12589	14629	312D	3925
404	23008	29175	59E0	71F7
405	27636	13943	6BF4	3677
406	17600	11072	44C0	2B40
407	17000	29492	4268	7334
408	21913	5719	5599	1657
409	30320	7347	7670	1CB3
410	28240	12156	6E50	2F7C
411	7260	25623	1C5C	6417
412	17906	27725	45F2	6C4D
413	5882	28870	16FA	70C6
414	22080	31478	5640	7AF6
415	12183	28530	2F97	6F72
416	23082	24834	5A2A	6102
417	17435	9075	441B	2373
418	18527	32265	485F	7E09
419	31902	3175	7C9E	0C67
420	18783	17434	495F	441A
421	20027	12178	4E3B	2F92
422	7982	25613	1F2E	640D
423	20587	31692	506B	7BCC
424	10004	25384	2714	6328
425	13459	18908	3493	49DC
426	13383	25816	3447	64D8
427	28930	4661	7102	1235
428	4860	31115	12FC	798B
429	13108	7691	3334	1E0B
430	24161	1311	5E61	051F
431	20067	16471	4E63	4057
432	2667	15771	0A6B	3D9B
433	13372	16112	343C	3EF0
434	28743	21062	7047	5246
435	24489	29690	5FA9	73FA
436	249	10141	00F9	279D
437	19960	19014	4DF8	4A46
438	29682	22141	73F2	567D
439	31101	11852	797D	2E4C
440	27148	26404	6A0C	6724
441	26706	30663	6852	77C7
442	5148	32524	141C	7F0C
443	4216	28644	1078	6FE4
444	5762	10228	1682	27F4
445	245	23536	00F5	5BF0
446	21882	18045	557A	467D
447	3763	25441	0EB3	6361
448	206	27066	00CE	69BA
449	28798	13740	707E	35AC
450	32402	13815	7E92	35F7

. . . continued on next page

Table B-1: PnMask I and PnMask Q Values for PilotPn

14–Chip Delay				
Pilot PN	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
451	13463	3684	3497	0E64
452	15417	23715	3C39	5CA3
453	23101	15314	5A3D	3BD2
454	14957	32469	3A6D	7ED5
455	23429	9816	5B85	2658
456	12990	4444	32BE	115C
457	12421	5664	3085	1620
458	28875	7358	70CB	1CBE
459	4009	27264	0FA9	6A80
460	1872	28128	0750	6DE0
461	15203	30168	3B63	75D8
462	30109	29971	759D	7513
463	24001	3409	5DC1	0D51
464	4862	16910	12FE	420E
465	14091	20739	370B	5103
466	6702	10191	1A2E	27CF
467	3067	12819	0BFB	3213
468	28643	19295	6FE3	4B5F
469	21379	10072	5383	2758
470	20276	15191	4F34	3B57
471	25337	27748	62F9	6C64
472	19683	720	4CE3	02D0
473	10147	29799	27A3	7467
474	16791	27640	4197	6BF8
475	17359	263	43CF	0107
476	13248	24734	33C0	609E
477	22740	16615	58D4	40E7
478	13095	20378	3327	4F9A
479	10345	25116	2869	621C
480	30342	19669	7686	4CD5
481	27866	14656	6CDA	3940
482	9559	27151	2557	6A0F
483	8808	28728	2268	7038
484	12744	25092	31C8	6204
485	11618	22601	2D62	5849
486	27162	2471	6A1A	09A7
487	17899	25309	45EB	62DD
488	29745	15358	7431	3BFE
489	31892	17739	7C94	454B
490	23964	12643	5D9C	3163
491	23562	32730	5C0A	7FDA
492	2964	19122	0B94	4AB2
493	18208	16870	4720	41E6
494	15028	10787	3AB4	2A23
495	21901	18400	558D	47E0
496	24566	20295	5FF6	4F47
497	18994	1937	4A32	0791
498	13608	17963	3528	462B
499	27492	7438	6B64	1D0E
500	11706	12938	2DBA	328A

. . . continued on next page

Table B-1: PnMask I and PnMask Q Values for PilotPn

14–Chip Delay				
Pilot PN	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
501	14301	19272	37DD	4B48
502	23380	29989	5B54	7525
503	11338	8526	2C4A	214E
504	2995	18139	0BB3	46DB
505	23390	3247	5B5E	0CAF
506	14473	28919	3889	70F7
507	6530	7292	1982	1C7C
508	20452	20740	4FE4	5104
509	12226	27994	2FC2	6D5A
510	1058	2224	0422	08B0
511	12026	6827	2EFA	1AAB

Appendix C: FRU Optimization/ATP Test Matrix

Appendix Content

C

C

Notes

Usage & Background

Periodic maintenance of a site may also may mandate re–optimization of specific portions of the site. An outline of some basic guidelines is included in the following tables.

IMPORTANT

Re–optimization steps listed for any assembly detailed in the tables below must be performed *anytime* an RF cable associated with it is replaced.

BTS Frame

Table C-1: When RF Optimization Is required on the BTS

Item Replaced	Optimize:
C–CCP Shelf	All sector TX and RX paths to all Combined CDMA Channel Processor (C–CCP) shelves.
Multicoupler/ Preselector Card	The three or six affected sector RX paths for the C–CCP shelf in the BTS frames.
Preselector I/O	All sector RX paths.
BBX board	RX and TX paths of the affected C–CCP shelf / BBX board.
CIO Card	All RX and TX paths of the affected CDMA carrier.
Any LPA Module	The affected sector TX path.
LPA Backplane	The affected sector TX path.
LPA Filter	The affected sector TX path.

Ancillary Frame

Item Replaced	Optimize:
Directional Coupler	All affected sector RX and TX paths to all BTS frame shelves.
Site filter	All affected RX sector paths in all shelves in all BTS frames.
Any RFDS component or TSU.	The RFDS calibration RX & TX paths (MONFWD/GENFWD).

. . . continued on next page

Inter-frame Cabling

Optimization must be performed after the replacement of any RF cabling between BTS frames.

Table C-2: When to Optimize Inter–frame Cabling

Item Replaced	Optimize:
Ancillary frame to BTS frame (RX) cables	The affected sector/antenna RX paths.
BTS frame to ancillary frame (TX) cables	The affected sector/antenna TX paths.

C

Detailed Optimization/ATP Test Matrix

Table C-3 outlines in more detail the tests that would need to be performed if one of the BTS components were to fail and be replaced. It is also assumed that all modules are placed OOS–ROM via the LMF until full redundancy of all applicable modules is implemented.

The following guidelines should also be noted when using this table.

IMPORTANT

Not every procedure required to bring the site back on line is indicated in Table C-3. It is meant to be used as a guideline ONLY. The table assumes that the user is familiar enough with the BTS Optimization/ATP procedure to understand which test equipment set ups, calibrations, and BTS site preparation will be required before performing the Table # procedures referenced.

Various passive BTS components (such as the TX and RX directional couplers, Preselector IO, CIO; etc.) only call for a TX or RX calibration audit to be performed in lieu of a full path calibration. If the RX or TX path calibration audit fails, the entire RF path calibration will need to be repeated. If the RF path calibration fails, further troubleshooting is warranted.

Whenever any C–CCP BACKPLANE is replaced, it is assumed that only power to the C–CCP shelf being replaced is turned off via the breaker supplying that shelf.

Whenever any DISTRIBUTION BACKPLANE is replaced it is assumed that the power to the entire RFM frame is removed and the Preselector I/O is replaced. The modem frame should be brought up as if it were a new installation.

. . . continued on next page

NOTE

If any significant change in signal level results from any component being replaced in the RX or TX signal flow paths, it would be identified by re–running the RX and TX calibration audit command.

C

When the CIO is replaced, the C–CCP shelf remains powered up. The BBX boards may need to be removed, then re–installed into their original slots, and re–downloaded (code and BLO data). RX and TX calibration audits should then be performed.

. . . continued on next page

C

Table C-3: SC 4812T BTS Optimization and ATP Test Matrix

Doc Tbl #	page	Description	Directional Coupler (RX)	Directional Coupler (TX)	RX Filter	RX Cables	TX Cables	Multicoupler/Preselector	CIO	C–CCP Backplane	BBX2	MCC24/MCC8E	CSM	LFR/HSO	GPS	GLI2	LPA	LPA Filter Bandpass	Power Converters (See Note)	SWITCH CARD	LPA Combiner Filter 2:1	LPA Combiner Filter 4:1	LPA Backplane
Table 2-1	2-2	Initial Boards/Modules Install, Preliminary Operations, CDF Site Equipage; etc.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Table 2-2 Table 2-5	2-5 2-13	DC Power Pre-Test Physical Inspect			•					•													
Table 2-7	2-14	Initial Power-up			•					•													
Table 3-6	3-15	Ping the Processors								•	•	•	•			•				•			
Table 3-12	3-28	Download/Enable MGLI2s								•						•							
Table 3-12	3-28	Download/Enable GLIs								•						•							
Table 3-13	3-29	Download CSMs								•			•		•								
Table 3-13	3-29	Download MCCs,								•			•		•								
Table 3-13	3-29	Download BBXs								•	•												
Table 3-15	3-31	Enable CSMs								•			•										
Table 3-16	3-32	Enable MCCs								•		•											
Table 3-19	3-37	GPS Initialization / Verification								•			•		•								
Table 3-20	3-41	LFR Initialization / Verification								•				•									
Table 3-21	3-43	HSO Initialization/Verification								•				•									
Table 3-34	3-70	TX Path Calibration								•	•									•			
Table 3-35	3-71	Download Offsets to BBX						•		•	•												
Table 3-36	3-73	TX Path Calibration Audit		•			•		•	•	•						•	•		•	•	•	•
Table 4-1	4-3	Spectral Purity TX Mask ATP								•	•						•	•		•	•	•	•
Table 4-1	4-3	Waveform Quality (rho) ATP							•	•	•		•		•		•	•			•	•	•
Table 4-1	4-3	Pilot Time Offset ATP							•	•	•		•		•		•	•			•	•	•
Table 4-1	4-3	Code Domain Power / Noise Floor								•	•	•											
Table 4-1	4-3	FER Test						•	•	•	•	•											

NOTE
Replace power converters one card at a time so that power to the C–CCP or LPA shelf is not lost. If power to the C–CCP shelf is lost, all cards in the shelf must be downloaded again.

Appendix D: BBX Gain Set Point vs. BTS Output Considerations

Appendix Content

D

Notes

BBX Gain Set Point vs. BTS Output Considerations

Usage & Background

Table D-1 outlines the relationship between the *total* of all code domain channel element gain settings (digital root sum of the squares) and the BBX Gain Set Point between 33.0 dBm and 44.0 dBm. The resultant RF output (as measured at the top of the BTS in dBm) is shown in the table. The table assumes that the BBX Bay Level Offset (BLO) values have been calculated.

As an illustration, consider a BBX keyed up to produce a CDMA carrier with only the Pilot channel (no MCCs forward link enabled). Pilot gain is set to 262. In this case, the BBX Gain Set Point is shown to correlate exactly to the actual RF output anywhere in the 33 to 44 dBm output range. (This is the level used to calibrate the BTS).

Table D-1: BBX Gain Set Point vs. Actual BTS Output (in dBm)

dBm➧ Gain➘	44	43	42	41	40	39	38	37	36	35	34	33
541	–	–	–	–	–	–	–	43.3	42.3	41.3	40.3	39.3
533	–	–	–	–	–	–	–	43.2	42.2	41.2	40.2	39.2
525	–	–	–	–	–	–	44	43	42	41	40	39
517	–	–	–	–	–	–	43.9	42.9	41.9	40.9	39.9	38.9
509	–	–	–	–	–	–	43.8	42.8	41.8	40.8	39.8	38.8
501	–	–	–	–	–	–	43.6	42.6	41.6	40.6	39.6	38.6
493	–	–	–	–	–	–	43.5	42.5	41.5	40.5	39.5	38.5
485	–	–	–	–	–	–	43.4	42.4	41.4	40.4	39.4	38.4
477	–	–	–	–	–	–	43.2	42.2	41.2	40.2	39.2	38.2
469	–	–	–	–	–	–	43.1	42.1	41.1	40.1	39.1	38.1
461	–	–	–	–	–	43.9	42.9	41.9	40.9	39.9	38.9	37.9
453	–	–	–	–	–	43.8	42.8	41.8	40.8	39.8	38.8	37.8
445	–	–	–	–	–	43.6	42.6	41.6	40.6	39.6	38.6	37.6
437	–	–	–	–	–	43.4	42.4	41.4	40.4	39.4	38.4	37.4
429	–	–	–	–	–	43.3	42.3	41.3	40.3	39.3	38.3	37.3
421	–	–	–	–	–	43.1	42.1	41.1	40.1	39.1	38.1	37.1
413	–	–	–	–	44	43	42	41	40	39	38	37
405	–	–	–	–	43.8	42.8	41.8	40.8	39.8	38.8	37.8	36.8
397	–	–	–	–	43.6	42.6	41.6	40.6	39.6	38.6	37.6	36.6
389	–	–	–	–	43.4	42.4	41.4	40.4	39.4	38.4	37.4	36.4

. . . continued on next page

Table D-1: BBX Gain Set Point vs. Actual BTS Output (in dBm)

dBm➧ Gain➘	44	43	42	41	40	39	38	37	36	35	34	33
381	–	–	–	–	43.3	42.3	41.3	40.3	39.3	38.3	37.3	36.3
374	–	–	–	–	43.1	42.1	41.1	40.1	39.1	38.1	37.1	36.1
366	–	–	–	43.9	42.9	41.9	40.9	39.9	38.9	37.9	36.9	35.9
358	–	–	–	43.7	42.7	41.7	40.7	39.7	38.7	37.7	36.7	35.7
350	–	–	–	43.5	42.5	41.5	40.5	39.5	38.5	37.5	36.5	35.5
342	–	–	–	43.3	42.3	41.3	40.3	39.3	38.3	37.3	36.3	35.3
334	–	–	–	43.1	42.1	41.1	40.1	39.1	38.1	37.1	36.1	35.1
326	–	–	43.9	42.9	41.9	40.9	39.9	38.9	37.9	36.9	35.9	34.9
318	–	–	43.7	42.7	41.7	40.7	39.7	38.7	37.7	36.7	35.7	34.7
310	–	–	43.5	42.5	41.5	40.5	39.5	38.5	37.5	36.5	35.5	34.5
302	–	–	43.2	42.2	41.2	40.2	39.2	38.2	37.2	36.2	35.2	34.2
294	–	44	43	42	41	40	39	38	37	36	35	34
286	–	43.8	42.8	41.8	40.8	39.8	38.8	37.8	36.8	35.8	34.8	33.8
278	–	43.5	42.5	41.5	40.5	39.5	38.5	37.5	36.5	35.5	34.5	33.5
270	–	43.3	42.3	41.3	40.3	39.3	38.3	37.3	36.3	35.3	34.3	33.3
262	44	43	42	41	40	39	38	37	36	35	34	33
254	43.7	42.7	41.7	40.7	39.7	38.7	37.7	36.7	35.7	34.7	33.7	–
246	43.4	42.4	41.4	40.4	39.4	38.4	37.4	36.4	35.4	34.4	33.4	–
238	43.2	42.2	41.2	40.2	39.2	38.2	37.2	36.2	35.2	34.2	33.2	–
230	42.9	41.9	40.9	39.9	38.9	37.9	36.9	35.9	34.9	33.9	–	–
222	42.6	41.6	40.6	39.6	38.6	37.6	36.6	35.6	34.6	33.6	–	–
214	42.2	41.2	40.2	39.2	38.2	37.2	36.2	35.2	34.2	33.2	–	–

D

Appendix E: CDMA Operating Frequency Information

Appendix Content

E

Notes

CDMA Operating Frequency Programming Information – North American PCS Bands

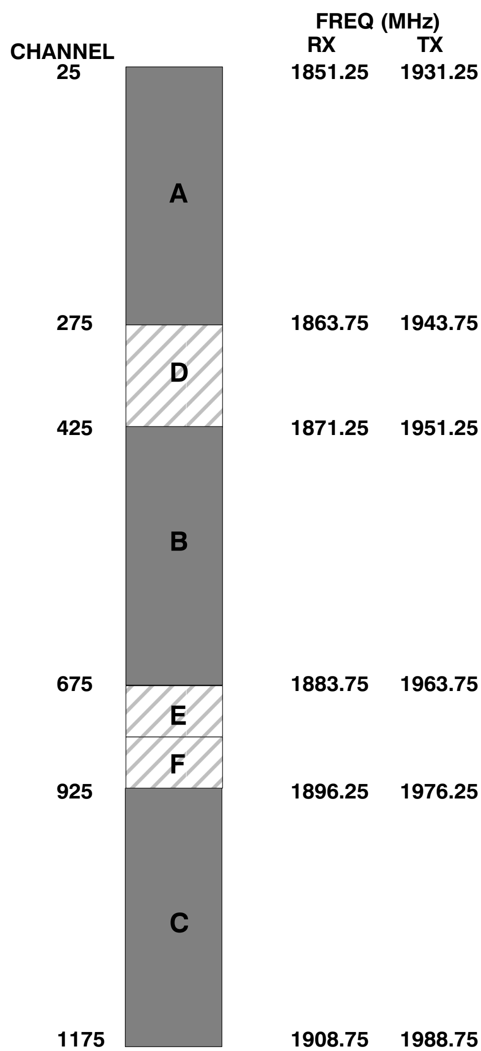
Introduction

Programming of each of the BTS BBX synthesizers is performed by the BTS GLIs via the CHI bus. This programming data determines the transmit and receive transceiver operating frequencies (channels) for each BBX.

1900 MHz PCS Channels

Figure E-1 shows the valid channels for the North American PCS 1900 MHz frequency spectrum. There are 10 CDMA wireline or non–wireline band channels used in a CDMA system (unique per customer operating system).

Figure E-1: North American PCS 1900 MHz Frequency Spectrum (CDMA Allocation)



E

. . . continued on next page

Calculating 1900 MHz Center Frequencies

Table E-1 shows selected 1900 MHz CDMA candidate operating channels, listed in both decimal and hexadecimal, and the corresponding transmit, and receive frequencies. Center frequencies (in MHz) for channels not shown in the table may be calculated as follows:

- TX = 1930 + 0.05 * Channel#
  Example: Channel 262
  TX = 1930 + 0.05*262 = 1943.10 MHz
- RX = TX – 80
  Example: Channel 262
  RX = 1943.10 – 80 = 1863.10 MHz

Actual frequencies used depend on customer CDMA system frequency plan.

Each CDMA channel requires a 1.77 MHz frequency segment. The actual CDMA carrier is 1.23 MHz wide, with a 0.27 MHz guard band on both sides of the carrier.

Minimum frequency separation required between any CDMA carrier and the nearest NAMPS/AMPS carrier is 900 kHz (center-to-center).

Table E-1: 1900 MHz TX and RX Frequency vs. Channel

Channel Number Decimal	Hex	Transmit Frequency (MHz) Center Frequency	Receive Frequency (MHz) Center Frequency
25	0019	1931.25	1851.25
50	0032	1932.50	1852.50
75	004B	1933.75	1853.75
100	0064	1935.00	1855.00
125	007D	1936.25	1856.25
150	0096	1937.50	1857.50
175	00AF	1938.75	1858.75
200	00C8	1940.00	1860.00
225	00E1	1941.25	1861.25
250	00FA	1942.50	1862.50
275	0113	1943.75	1863.75
300	012C	1945.00	1865.00
325	0145	1946.25	1866.25
350	015E	1947.50	1867.50
375	0177	1948.75	1868.75
400	0190	1950.00	1870.00
425	01A9	1951.25	1871.25
450	01C2	1952.50	1872.50
475	01DB	1953.75	1873.75
500	01F4	1955.00	1875.00

. . . continued on next page

E

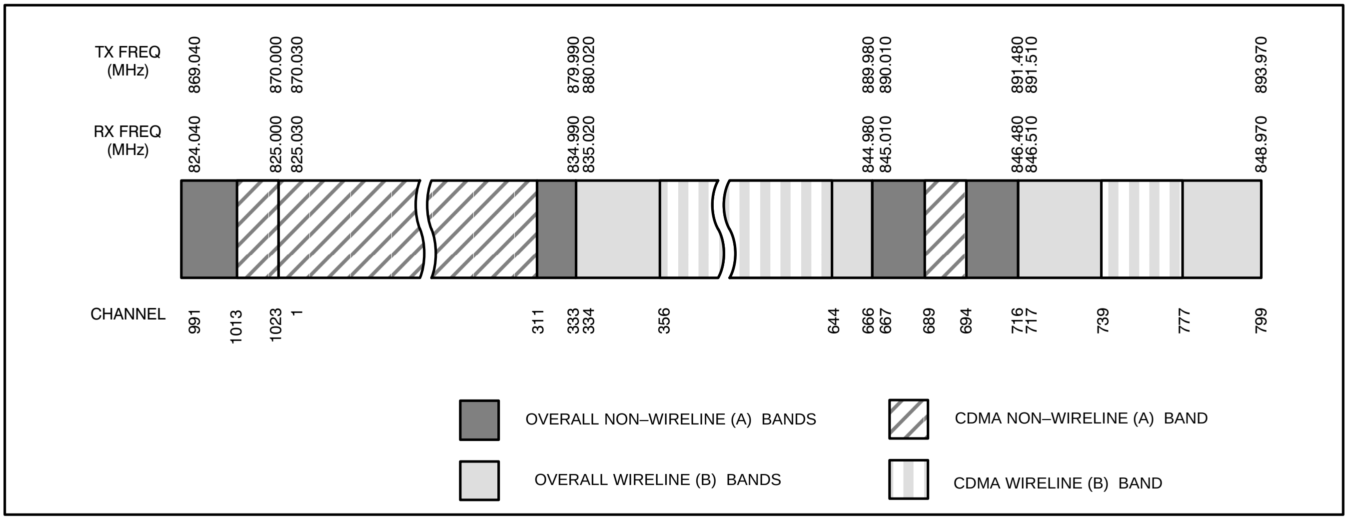
Table E-1: 1900 MHz TX and RX Frequency vs. Channel			
Channel Number Decimal	Hex	Transmit Frequency (MHz) Center Frequency	Receive Frequency (MHz) Center Frequency
525	020D	1956.25	1876.25
550	0226	1957.50	1877.50
575	023F	1958.75	1878.75
600	0258	1960.00	1880.00
625	0271	1961.25	1881.25
650	028A	1962.50	1882.50
675	02A3	1963.75	1883.75
700	02BC	1965.00	1885.00
725	02D5	1966.25	1886.25
750	02EE	1967.50	1887.50
775	0307	1968.75	1888.75
800	0320	1970.00	1890.00
825	0339	1971.25	1891.25
850	0352	1972.50	1892.50
875	036B	1973.75	1893.75
900	0384	1975.00	1895.00
925	039D	1976.25	1896.25
950	03B6	1977.50	1897.50
975	03CF	1978.75	1898.75
1000	03E8	1980.00	1900.00
1025	0401	1981.25	1901.25
1050	041A	1982.50	1902.50
1075	0433	1983.75	1903.75
1100	044C	1985.00	1905.00
1125	0465	1986.25	1906.25
1150	047E	1987.50	1807.50
1175	0497	1988.75	1908.75

CDMA Operating Frequency Programming Information – North American Bands – continued

800 MHz CDMA Channels

Figure E-2 shows the valid channels for the North American cellular telephone frequency spectrum. There are 10 CDMA wireline or non–wireline band channels used in a CDMA system (unique per customer operating system).

Figure E-2: North American Cellular Telephone System Frequency Spectrum (CDMA Allocation)



FW00402

Calculating 800 MHz Center Frequencies

Table E-2 shows selected 800 MHz CDMA candidate operating channels, listed in both decimal and hexadecimal, and the corresponding transmit, and receive frequencies. Center frequencies (in MHz) for channels not shown in the table may be calculated as follows:

- Channels 1–777
  TX = 870 + 0.03 * Channel#
  Example: Channel 262
  TX = 870 + 0.03*262 = 877.86 MHz
- Channels 1013–1023
  TX = 870 + 0.03 * (Channel# – 1023)
  Example: Channel 1015
  TX = 870 +0.03 *(1015 – 1023) = 869.76 MHz
- RX = TX – 45 MHz
  Example: Channel 262
  RX = 877.86 –45 = 832.86 MHz

Table E-2: 800 MHz TX and RX Frequency vs. Channel

Channel Number Decimal	Hex	Transmit Frequency (MHz) Center Frequency	Receive Frequency (MHz) Center Frequency
1	0001	870.0300	825.0300
25	0019	870.7500	825.7500

. . . continued on next page

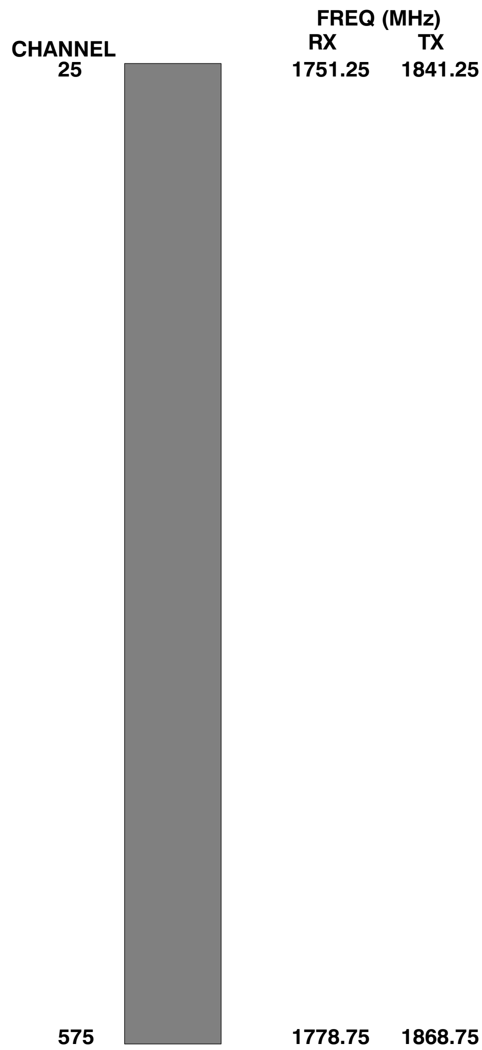
Table E-2: 800 MHz TX and RX Frequency vs. Channel			
Channel Number Decimal	Hex	Transmit Frequency (MHz) Center Frequency	Receive Frequency (MHz) Center Frequency
50	0032	871.5000	826.5000
75	004B	872.2500	827.2500
100	0064	873.0000	828.0000
125	007D	873.7500	828.7500
150	0096	874.5000	829.5000
175	00AF	875.2500	830.2500
200	00C8	876.0000	831.0000
225	00E1	876.7500	831.7500
250	00FA	877.5000	832.5000
275	0113	878.2500	833.2500
300	012C	879.0000	834.0000
325	0145	879.7500	834.7500
350	015E	880.5000	835.5000
375	0177	881.2500	836.2500
400	0190	882.0000	837.0000
425	01A9	882.7500	837.7500
450	01C2	883.5000	838.5000
475	01DB	884.2500	839.2500
500	01F4	885.0000	840.0000
525	020D	885.7500	840.7500
550	0226	886.5000	841.5000
575	023F	887.2500	842.2500
600	0258	888.0000	843.0000
625	0271	888.7500	843.7500
650	028A	889.5000	844.5000
675	02A3	890.2500	845.2500
700	02BC	891.0000	846.0000
725	02D5	891.7500	846.7500
750	02EE	892.5000	847.5000
775	0307	893.2500	848.2500
NOTE Channel numbers 778 through 1012 are not used.			
1013	03F5	869.7000	824.7000
1023	03FF	870.0000	825.0000

E

1700 MHz PCS Channels

Figure E-3 shows the valid channels for the 1700 MHz PCS frequency spectrum. The CDMA channels are spaced in increments of 25 (25, 50, 75, . . . 575) across the CDMA band.

Figure E-3: 1700 MHz PCS Frequency Spectrum (CDMA Allocation)



. . . continued on next page

Calculating 1700 MHz Center Frequencies

Center frequency for channels may be calculated as follows:

Direction	Formula	Example
TX	1840 + (0.05 * Channel#)	Channel: 1840 + (0.05 + 25) = 1841.25
RX	1750 + (0.05 * Channel#)	Channel: 1750 + (0.05 + 25) = 1751.25

– Actual frequencies used depend on customer CDMA system frequency plan.

– Each CDMA channel requires a 1.77 MHz frequency segment. The actual CDMA carrier is 1.23 MHz wide, with a 0.27 MHz guard band on both sides of the carrier

– Minimum frequency separation required between any CDMA carrier and the nearest NAMPS/AMPS carrier is 900 kHz (center to center).

Table E-3: 1700 MHz TX and RX Frequency vs. Channel (Korean Bands)

Channel Number Decimal	Hex	Transmit Frequency (MHz) Center Frequency	Receive Frequency (MHz) Center Frequency
25	0019	1841.25	1751.25
50	0032	1842.50	1752.50
75	004B	1843.75	1753.75
100	0064	1845.00	1755.00
125	007D	1846.25	1756.25
150	0096	1847.50	1757.50
175	00AF	1848.75	1758.75
200	00C8	1850.00	1760.00
225	00E1	1851.25	1761.25
250	00FA	1852.50	1762.50
275	0113	1853.75	1763.75
300	012C	1855.00	1765.00
325	0145	1856.25	1766.25
350	015E	1857.50	1767.50
375	0177	1858.75	1768.75
400	0190	1860.00	1770.00
425	01A9	1861.25	1771.25
450	01C2	1862.50	1772.50
475	01DB	1863.75	1773.75
500	01F4	1865.00	1775.00
525	020D	1866.25	1776.25
550	0226	1867.50	1777.50
575	023F	1868.75	1778.75

Notes

Appendix F: PCS Interface Setup for Manual Testing

Appendix Content

F

Notes

F

Purpose

This section covers other test equipment and peripherals not covered in Chapter 3. Procedures for the manual testing are covered here, along with procedures to calibrate the TX and RX cables using the signal generator and spectrum analyzer.

Equipment Warm up

IMPORTANT

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

CAUTION

If any piece of test equipment (i.e., test cable, RF adapter) has been replaced, re-calibration must be performed. Failure to do so could introduce measurement errors, resulting in incorrect measurements and degradation to system performance.

IMPORTANT

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

Prerequisites

Prior to performing any of these procedures, all preparations for preparing the LMF, updating LMF files, and any other pre-calibration procedures, as stated in Chapter 3, must have been completed.

HP8921A System Connectivity Test

Follow the steps in Table F-1 to verify that the connections between the PCS Interface and the HP8921A are correct, and cables are intact. The software also performs basic functionality checks of each instrument.

IMPORTANT

Disconnect other GPIB devices, especially system controllers, from the system before running the connectivity software.

Table F-1: System Connectivity

Step	Action
	*** IMPORTANT** – Perform this procedure *after* test equipment has been allowed to warm–up and stabilize for a *minimum of 60 minutes*.
1	Insert HP 83236A Manual Control/System card into memory card slot.
2	Press the **[PRESET]** pushbutton**.**
3	Press the Screen Control **[TESTS]** pushbutton to display the “Tests” Main Menu screen.
4	Position the cursor at **Select Procedure Location** and select by pressing the cursor control knob. In the Choices selection box, select **Card.**
5	Position the cursor at **Select Procedure Filename** and select by pressing the cursor control knob. In the Choices selection box, select **SYS_CONN**.
6	Position the cursor at **RUN TEST** and select it. The software will prompt you through the connectivity setup.
7	When the test is complete, position the cursor on **STOP TEST** and select it; *OR* press the **[K5]** pushbutton.
8	To return to the main menu, press the **[K5]** pushbutton.

Manual Cable Calibration using HP8921 with HP PCS Interface (HP83236)

Perform the procedure in Table F-2 to calibrate the test equipment using the HP8921 Cellular Communications Analyzer equipped with the HP83236 PCS Interface.

NOTE

This calibration method ***must be executed with great care.*** Some losses are measured close to the minimum limit of the power meter sensor (–30 dBm).

Prerequisites

Ensure the following prerequisites have been met before proceeding:

- Test equipment to be calibrated has been connected correctly for cable calibration.
- Test equipment has been selected and calibrated.

Refer to Figure F-1 for location of the components on the PCS Interface and Communications Test Set.

Table F-2: Manual Cable Calibration Test Equipment Setup (using the HP PCS Interface)

Step	Action	
	NOTE Verify that GPIB controller is turned off.	
1	Insert HP 83236A Manual Control System card into memory card slot (see Figure F-1).	
2	Press the **Preset** pushbutton.	
3	Under **Screen Controls**, press the **TESTS** pushbutton to display the **TESTS** (Main Menu) screen.	
4	Position the cursor at **Select Procedure Location** and select it. In the Choices selection box, select **CARD.**	
5	Position the cursor at **Select Procedure Filename** and select it. In the Choices selection box, select **MANUAL**.	
6	Position the cursor at **RUN TEST** and select it. HP must be in Control Mode **Select YES.**	
7	If using **HP 83236A:** Set channel number=<*chan#*>: – Position cursor at **Channel Number** and select it. – Enter the *chan#* using the numeric keypad; press **[Enter]** and the screen will go blank. – When the screen reappears, the *chan#* will be displayed on the channel number line.	If using **HP 83236B:** Set channel frequency: – Position cursor at **Frequency Band** and press **Enter**. – Select **User Defined Frequency**. – Go **Back to Previous Menu**. – Position the cursor to **83236** generator frequency and enter actual RX frequency. – Position the cursor to **83236** analyzer frequency and enter actual TX frequency.

. . . continued on next page

F

Table F-2: Manual Cable Calibration Test Equipment Setup (using the HP PCS Interface)	
Step	**Action**
8	Set RF Generator level: – Position the cursor at **RF Generator Level** and select it. – Enter **–10** using the numeric keypad; press [**Enter**] and the screen will go blank. – When the screen reappears, the value –10 dBm will be displayed on the RF Generator Level line.
9	Set the user fixed Attenuation Setting to **0 dBm:** – Position cursor at **Analyzer Attenuation** and select it – Position cursor at **User Fixed Atten Settings** and select it. – Enter 0 (zero) using the numeric keypad and press [**Enter**].
10	Select **Back to Previous Menu**.
11	Record the HP83236 Generator Frequency Level: Record the HP83236**B** Generator Frequency Level: – Position cursor at **Show Frequency and Level Details** and select it. – Under HP83236 Frequencies and Levels, record the Generator Level. – Under HP83236**B** Frequencies and Levels, record the Generator Frequency Level (1850 – 1910 MHz for 1.9 GHz or 1750 – 1780 for 1.7 GHz). – Position cursor at **Prev Menu** and select it.
12	Click on **Pause for Manual Measurement**.
13	Connect the power sensor directly to the *RF OUT ONLY* port of the PCS Interface.
14	On the HP8921A, under **To Screen,** select **CDMA GEN**.
15	Move the cursor to the **Amplitude** field and click on the Amplitude value.
16	Increase the Amplitude value until the power meter reads **0 dBm ±0.2 dB**. **NOTE** The Amplitude value can be increased coarsely until 0 dBM is reached; then fine tune the amplitude by adjusting the **Increment Set** to 0.1 dBm and targeting in on 0 dBm.
17	Disconnect the power sensor from the *RF OUT ONLY* port of the PCS Interface. *** IMPORTANT** The Power Meter sensor's lower limit is –30 dBm. Thus, only components having losses ≤30 dB should be measured using this method. **For further accuracy, always re-zero the power meter before connecting the power sensor to the component being calibrated. After connecting the power sensor to the component, record the calibrated loss immediately.**
18	Disconnect all components in the test setup and calibrate each one separately by connecting each component, one-at-a-time, between the *RF OUT ONLY PORT* and the power sensor (see Figure F-1, Setups A, B, or C). Record the calibrated loss value displayed on the power meter. • Example: (A) Test Cable(s) = –1.4 dB (B) 20 dB Attenuator = –20.1 dB (B) Directional Coupler = –29.8 dB

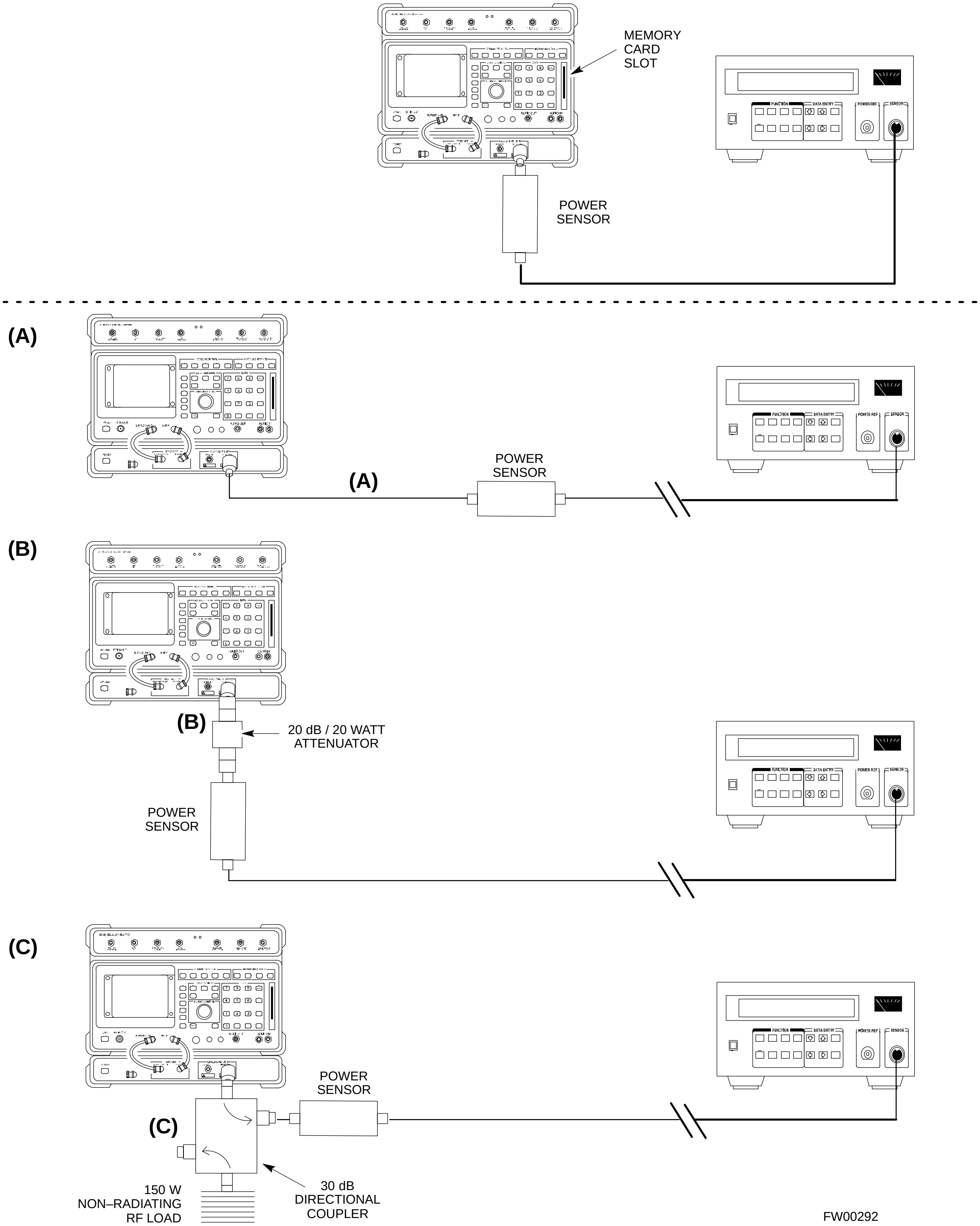
. . . continued on next page

F

Table F-2: Manual Cable Calibration Test Equipment Setup (using the HP PCS Interface)	
Step	**Action**
19	After all components are calibrated, reassemble all components together and calculate the total test setup loss by adding up all the individual losses: • Example: Total test setup loss = –1.4 –29.8 –20.1 = –51.3 dB. This calculated value will be used in the next series of tests.
20	Under **Screen Controls** press the **TESTS** button to display the **TESTS** (Main Menu) screen.
21	Select **Continue** (K2).
22	Select **RF Generator Level** and set to –119 dBm.
23	Click on **Pause for Manual Measurement**.
24	Verify the HP8921A Communication Analyzer/83203A CDMA interface setup is as follows (fields not indicated remain at default): • Verify the GPIB (HP–IB) address: – under **To Screen,** select **More** – select **IO CONFIG** – Set HP–IB Adrs to **18** – set Mode to **Talk&Lstn** • Verify the HP8921A is displaying frequency (instead of RF channel) – Press the blue **[SHIFT]** button, then press the Screen Control **[DUPLEX]** button; this switches to the **CONFIG** (CONFIGURE) screen. – Use the cursor control to set RF Display to **Freq**
25	Refer to Table 3-29 for assistance in manually setting the cable loss values into the LMF.

F

Figure F-1: Calibrating Test Setup Components



F

HP PCS Interface Test Equipment Setup for Manual Testing

Follow the procedure in Table F-3 to setup the HP PCS Interface Box for manual testing.

Table F-3: HP PCS Interface Test Equipment Setup for Manual Testing

✓	Step	Action
		NOTE Verify GPIB controller is turned off.
	1	Insert HP83236B Manual Control/System card into the memory card slot.
	2	Under **Screen Controls**, press the **[TESTS]** push-button to display the **TESTS** (Main Menu) screen.
	3	Position the cursor at **Select Procedure Location** and select. In the Choices selection box, select **CARD.**
	4	Position the cursor at **Select Procedure Filename** and select. In the Choices selection box, select **MANUAL**.
	5	Position the cursor at **RUN TEST** and select OR press the **K1** push-button.
	6	Set channel number=<*chan#*>: – Position cursor at **Channel Number** and select. – Enter the *chan#* using the numeric keypad and then press **[Enter]** (the screen will blank). – When the screen reappears, the *chan#* will be displayed on the channel number line.
		*** IMPORTANT** If using a TMPC with Tower Top Amplifier (TTA) skip Step 7.
	7	• Set RF Generator level= –119 dBm + Cal factor Example: –119 dBm + 2 dB = –117 dBm • Continue with Step 9 (skip Step 8).
	8	Set RF Generator level= –116 dBm + Cal factor. Example: –116 dBm + 2 dB = –114 dBm
	9	Set the user fixed Attenuation Setting to **0 dB**: – Position cursor at **RF Generator Level** and select. – Position cursor at **User Fixed Atten Settings** and select. – Enter 0 (zero) using the numeric keypad and press **[Enter].**
	10	Select **Back to Previous Menu.**
	11	Select **Quit,** then select **Yes.**

F

Calibrating Test Cable Setup using Advantest R3465

NOTE

Be sure the GPIB Interface is OFF for this procedure.

Perform the procedure in Table F-4 to calibrate the test cable setup using the Advantest R3465. Advantest R3465 Manual Test setup and calibration must be performed at both the TX and RX frequencies.

Table F-4: Procedure for Calibrating Test Cable Setup Using Advantest R3465

Step	Action
	*** IMPORTANT** – This procedure can only be performed *after* test equipment has been allowed to warm–up and stabilize for a *minimum of 60 minutes*.
1	Press the **SHIFT** and the **PRESET** keys located below the display
2	Press the **ADVANCE** key in the MEASUREMENT area of the control panel**.**
3	Select the **CDMA Sig** CRT menu key
4	Select the **Setup** CRT menu key
5	Using the vernier knob and the cursor keys set the following parameters **NOTE** Fields not listed remain at default **Generator Mode:** SIGNAL **Link:** FORWARD **Level Unit:** dBm **CalCorrection:** ON **Level Offset:** OFF
6	Select the **return** CRT menu key
7	Press **FREQ** key in the ENTRY area
8	Set the frequency to the desired value using the keypad entry keys
9	Verify that the **Mod** CRT menu key is highlighting OFF; if not, press the **Mod** key to toggle it OFF.
10	Verify that the **Output** CRT menu key is highlighting OFF; if not, press the **Output** key to toggle it OFF.
11	Press the **LEVEL** key in the ENTRY area.
12	Set the LEVEL to **0 dBm** using the key pad entry keys.
13	Zero power meter. Next connect the power sensor directly to the "RF OUT" port on the R3561L CDMA Test Source Unit.
14	Press the **Output** CRT menu key to toggle Output to ON.

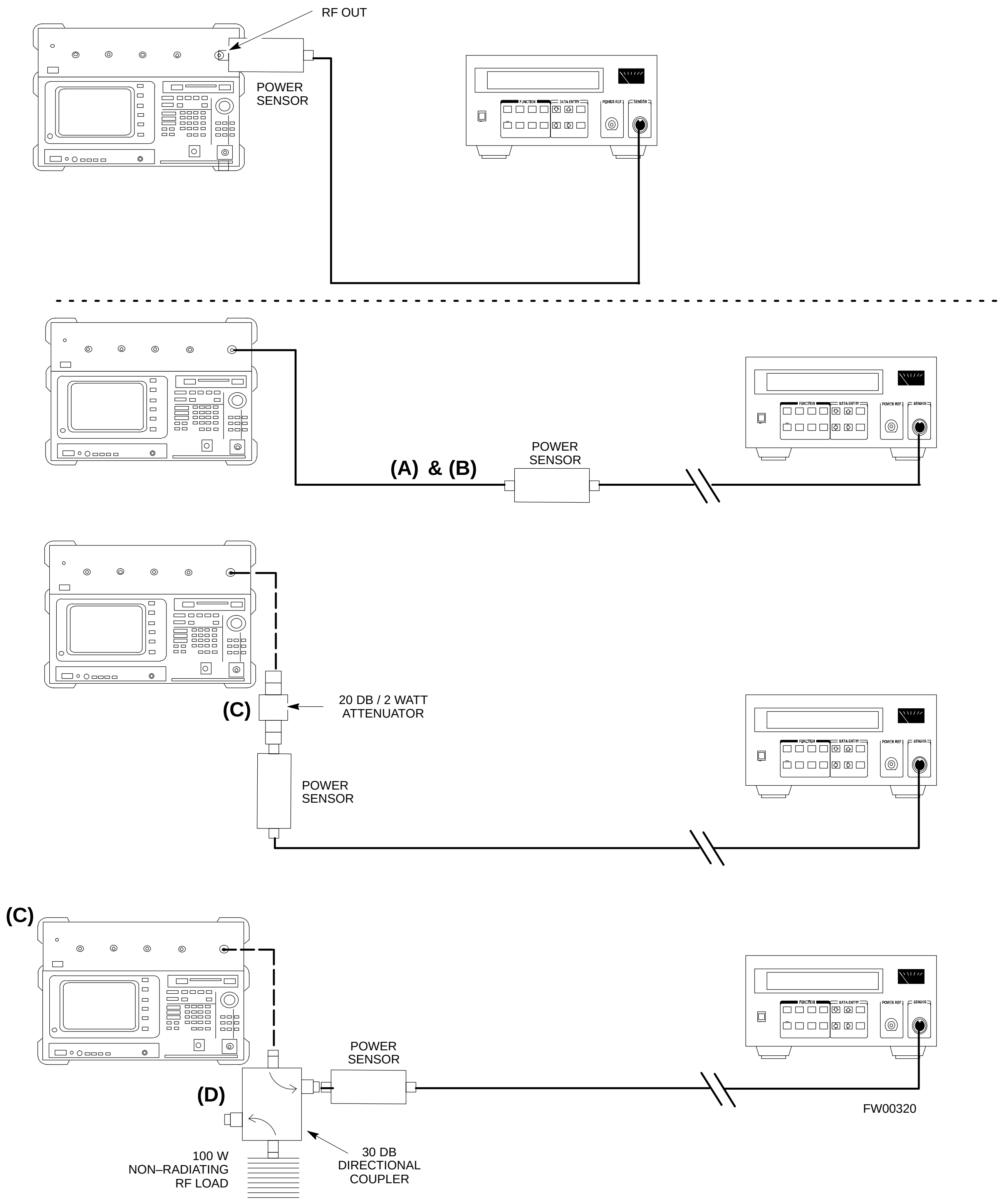
. . . continued on next page

F

Table F-4: Procedure for Calibrating Test Cable Setup Using Advantest R3465	
Step	**Action**
15	Record the power meter reading __________________________
16	Disconnect the power meter sensor from the R3561L RF OUT jack. *** IMPORTANT** The Power Meter sensor's lower limit is –30 dBm. Thus, only components having losses ≤ 30 dB should be measured using this method. **For best accuracy, always re–zero the power meter before connecting the power sensor to the component being calibrated. Then, after connecting the power sensor to the component, record the calibrated loss immediately.**
17	Disconnect all components in the the test setup and calibrate each one separately. Connect each component one–at–a–time between the "RF OUT" port and the power sensor (see Figure F-2, "Setups A, B, and C"). Record the calibrated loss value displayed on the power meter for each connection. Example: (A) 1st Test Cable = –0.5 dB (B) 2nd Test Cable = –1.4 dB (C) 20 dB Attenuator = –20.1 dB (D) 30 dB Directional Coupler = –29.8 dB
18	Press the **Output** CRT menu key to toggle Output OFF.
19	Calculate the total test setup loss by adding up all the individual losses: Example: Total test setup loss = 0.5 + 1.4 + 20.1 + 29.8 = 51.8 dB This calculated value will be used in the next series of tests.
20	Press the **FREQ** key in the ENTRY area
21	Using the keypad entry keys, set the test frequency to the RX frequency
22	Repeat steps 9 through 19 for the RX frequency.
23	Refer to Table 3-29 for assistance in manually setting the cable loss values into the LMF.

F

Figure F-2: Cable Calibration using Advantest R3465



Appendix G: VSWR

Appendix Content

G

Notes

Transmit & Receive Antenna VSWR

Purpose

The following procedures will verify that the Voltage Standing Wave Ratio (VSWR) of all antennas and associated feed lines fall within acceptable limits. The tests will be performed on all antennas in a sequential manner (i.e., ANT 1, then ANT 2) until all antennas/feedlines have been verified.

These procedures should be performed periodically by measuring each respective antenna's VSWR (reflected power) to verify that the antenna system is within acceptable limits. This will ensure continued peak system performance.

The antenna VSWR will be calculated at the CDMA carrier frequency assigned to each antenna. Record and verify that they meet the test specification of less than or equal to 1.5:1.

IMPORTANT

It is recommended that the installer be familiar with the following procedure in its entirety before beginning the actual procedure. Ensure that the entire site is currently not in service.

NOTE

This test is used to test RX antennas by substituting RX frequencies for TX frequencies.

Study the site engineering documents and perform the following tests only after **first** verifying that the RF cabling configuration required to interconnect the BTS frames and antennas meet requirements called out in the *BTS Installation Manual.*

G

Test equipment

The following pieces of test equipment will be required to perform this test:

- LMF
- Directional coupler
- Communications test set

WARNING

Prior to performing antenna tests, insure that no CDMA BBX channels are keyed. Failure to do so could result in personal injury or serious equipment damage.

Equipment Setup – HP Test Set

Follow the steps in Table G-1 to set up test equipment required to measure and calculate the VSWR for each antenna.

Table G-1: VSWR Measurement Procedure – HP Test Set

Step	Action HP TEST SET
1	***If you have not already done so***, refer to the procedure in Table 3-2 on page 3-5 to set up test equipment & interface the LMF computer to the BTS.
2	***For manual VSWR testing,*** using external directional coupler, refer to Figure G-1 (1700/1900 MHz) or Figure G-2 (800 MHz). – Connect the communications test set RF OUT ONLY port to the INPUT port of the directional coupler. – Connect the RF IN/OUT port of the communication test set to the reverse (RVS) port on the directional coupler. ***Terminate the forward port with a 50 ohm load.*** – Install the antenna feed line to the output port on the directional coupler.
	NOTE Manual Communications Analyzer test setup (fields not indicated remain at default): • Set screen to **RF GEN**. – For 1900 MHz systems, set the **RF Gen Freq** to center frequency of actual CDMA carrier between 1930–1990 MHz for TX and 1850–1910 MHz for RX. For 800 MHz systems, set the **RF Gen Freq** to center frequency of actual CDMA carrier between 869–894 MHz for TX and 824–849 MHz for RX. For 1700 MHz systems, set the **RF Gen Freq** to center frequency of actual CDMA carrier between 1840–1870 MHz for TX and 1750–1780 MHz for RX. – Set Amplitude to **–30 dBm**. – Set Output Port to **RF OUT**. – Set AFGen1 & AFGen2 to **OFF**.
3	Remove the antenna feed line and install an “RF short” onto the directional coupler output port.
	NOTE Set–up communication test set as follows (fields not indicated remain at default): • Set screen to **SPEC ANL**. – Under Controls, set input port to **ANT**. – Set Ref Level to **–40 dBm**. – Under Controls, select **Main**, select **Auxiliary**. – Under Controls, select **AVG**. Set Avg = **20**.
4	– Record the reference level on the communications analyzer and ***Note as P_S for reference***. – Replace the short with the antenna feedline. Record the reference level on the communications analyzer and ***Note for as P_A reference***. – Record the difference of the two readings in dB.

. . . continued on next page

G

Table G-1: VSWR Measurement Procedure – HP Test Set

Step	Action	HP TEST SET
5	Calculate the VSWR per the equation shown to the right. *Where:* **$R_{L(dB)}$** = **$P_{A(dBm)} – P_{S(dBm)}$** **P_A** = Power reflected from antenna **P_S** = Power reflected from short A calculated value of –13.98 dB equates to VSWR of better than **1.5:1**.	$$VSWR = \left(\frac{1 + 10^{\frac{RL}{20}}}{1 - 10^{\frac{RL}{20}}} \right)$$
6	If the readings indicate a potential problem, verify the physical integrity of all cables (including any in–line components, pads, etc.) and associated connections up to the antenna. If problem still persists, consult antenna OEM documentation for additional performance verification tests or replacement information.	
7	Repeat steps 2 through 6 for all remaining TX sectors/antennas.	
8	Repeat steps 2 through 6 for all remaining RX sectors/antennas.	

Figure G-1: Manual VSWR Test Setup Using HP8921 Test Set (1700/1900 MHz)

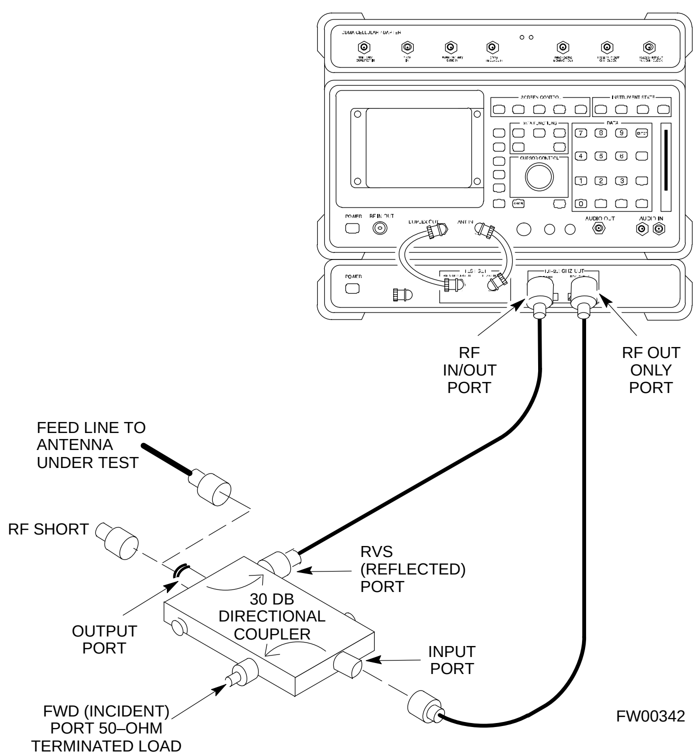
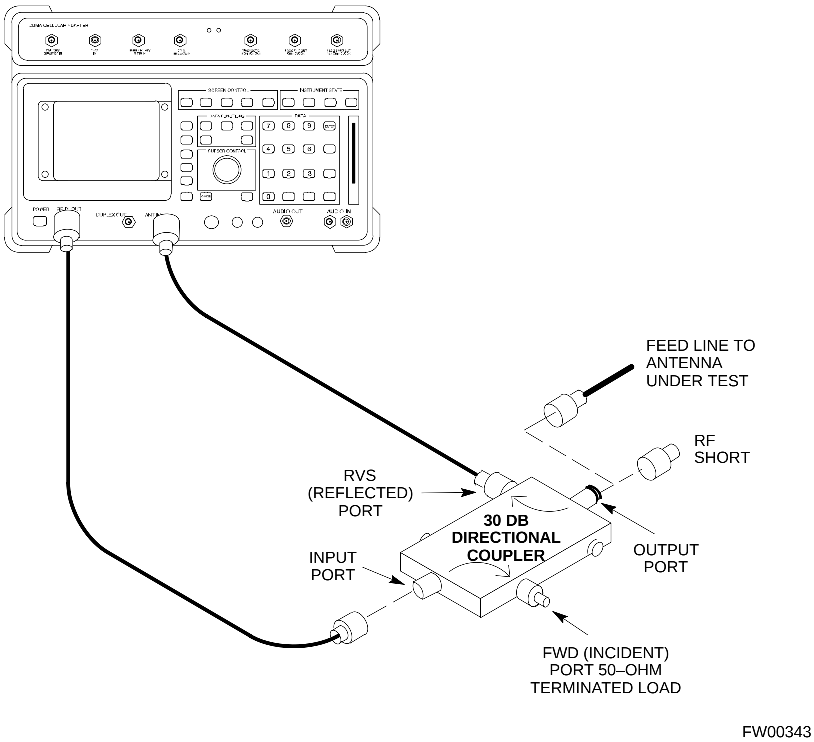


Figure G-2: Manual VSWR Test Setup Using HP8921 Test Set (800 MHz)



Equipment Setup – Advantest Test Set

Follow the steps in Table G-2 to set up test equipment required to measure and calculate the VSWR for each antenna.

Table G-2: VSWR Measurement Procedure – Advantest Test Set

Step	Action	ADVANTEST
1	***If you have not already done so,*** refer to the procedure in Table 3-2 on page 3-5 to set up test equipment and interface the LMF computer to the BTS.	
2	***For manual VSWR testing*** using external directional coupler, refer to Figure G-3. – Connect the communications test set RF OUT port to the input port of the directional coupler. – Connect the INPUT port of the communication test set to the forward port on the directional coupler. ***Terminate the forward port with a 50 Ohm load.*** – Connect the RF short to the directional coupler output port.	

. . . continued on next page

Table G-2: VSWR Measurement Procedure – Advantest Test Set		
Step	**Action**	**ADVANTEST**
3	Preform the following to instruct the calibrated test set to generate a CDMA RF carrier (RVL call) with all zero longcode at the assigned RX frequency at –10 dBm: • Push the **ADVANCE** Measurement key. • Push the **CDMA Sig** CRT menu key. • Push the **FREQ** Entry key: – For 1900 MHz systems, set **RF Gen Freq** to center frequency of actual CDMA carrier between 1930–1990 MHz for TX and 1850–1910 MHz for RX. – For 800 MHz systems, set **RF Gen Freq** to center frequency of actual CDMA carrier between 869–894 MHz for TX and 824–849 MHz for RX. – For 1700 MHz systems, set **RF Gen Freq** to center frequency of actual CDMA carrier between 1840–1870 MHz for TX and 1750–1780 MHz for RX. • Push the **LEVEL** Entry key; set to **0 dBm** (by entering **0** and pushing the **–dBm** key). • Verify that **ON** is active in the **Output** CRT menu key. • Verify that **OFF** is active in the **Mod** CRT menu key. • Push the **CW** Measurement key. • Push the **FREQ** Entry key. – Push the **more 1/2** CRT menu key. – Set **Preselect** CRT menu key to **3.0G.** • Push the **Transient** Measurement key. – Push the **Tx Power** CRT menu key. – Push the LEVEL entry key (set to 7 dBm by entering 7 and pushing the the dBm key). – Set **Avg Times** CRT menu key to **ON**. Set to **20** (by entering **20** and pushing the **Hz** ENTER key). • Push the **REPEAT** Start key to take the measurement.	
4	Record the Burst Power display on the communications analyzer and ***Note as*** $\mathbf{P_S}$ ***for reference.***	
5	Install the antenna feedline to the output port of the directional coupler.	
6	• Push the **Auto Level Set** CRT menu key. • Push the **REPEAT** Start key to take the measurement.	
7	Record the Burst Power on the communications analyzer and ***Note as*** $\mathbf{P_A}$ ***level for reference***. Record the difference of the two readings in dBm.	
8	Calculate the VSWR per the equation shown to the right. *Where:* $R_{L(dB)}$ = $P_{A(dBm)} - P_{S(dBm)}$ P_A = Power reflected from antenna P_S = Power reflected from short A calculated value of –13.98 dB equates to VSWR of better than **1.5:1**. $$VSWR = \left(\frac{1 + 10^{\frac{RL}{20}}}{1 - 10^{\frac{RL}{20}}}\right)$$	

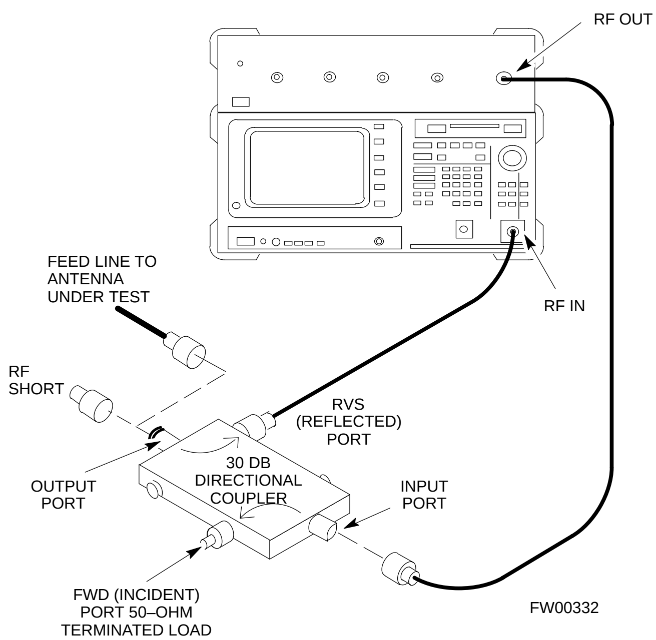
. . . continued on next page

G

DRAFT

Table G-2: VSWR Measurement Procedure – Advantest Test Set		
Step	**Action**	**ADVANTEST**
9	If the readings indicate a potential problem, verify the physical integrity of all cables (including any in–line components, pads, etc.) and associated connections up to the antenna. If problem still persists, consult antenna OEM documentation for additional performance verification tests or replacement information.	
10	Repeat steps 2 through 9 for all remaining TX sectors/antennas.	
11	Repeat steps 2 through 9 for all remaining RX sectors/antennas.	

Figure G-3: Manual VSWR Test Setup Using Advantest R3465



G

Appendix H: Download ROM Code

Appendix Content

Notes

Download ROM Code

ROM 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) and remains OOS_ROM (blue). The same R–level RAM code must then be downloaded to the device. This procedure includes steps for both the ROM code download and the RAM code download.

ROM code files cannot be selected automatically. The ROM code file must be selected manually. Follow the procedure in Table H-1 to download ROM code.

Prerequisite

- ROM and RAM code files exist for the device to be downloaded.

CAUTION

The R–level of the ROM code to be downloaded must be the same as the R–level of the ROM code for other devices in the BTS. Code must not be mixed in a BTS. This procedure should only be used to upgrade replacement devices for a BTS and it should not be used to upgrade all devices in a BTS. If a BTS is to be upgraded from one R–level to another, the optimization and ATP procedures must first be performed with the BTS in the original configuration. The upgrade should then be done by the CBSC.

Table H-1: Download ROM Code

Step	Action
	NOTE ROM code files cannot be selected automatically. The ROM code file must be selected manually.
1	Click on the device to be downloaded.
2	Click on the **Device** menu.
3	Click on the **Status** menu item. A status report window appears.
4	Make a note of the number in the **HW Bin Type** column.
5	Click on the **OK** button to dismiss the status report window.
6	Click on the **Download Code Manual** menu item. A file selection window appears.
7	Double–click on the version folder that contains the desired ROM code file.
8	Double–click on the **Code** folder. A list of ROM and RAM code files is displayed.

. . . continued on next page

H

Table H-1: Download ROM Code	
Step	**Action**
	! CAUTION A ROM code file having the correct hardware binary type (HW Bin Type) needs to be chosen. The hardware binary type (last four digits in the file name) was determined in step 4. Unpredictable results can happen and the device may be damaged (may have to be replaced) if a ROM code file with wrong binary type is downloaded.
9	Choose a ROM code file having the correct hardware binary type (HW Bin Type). The hardware binary type (last four digits in the file name) was determined in step 4.
10	Click on the ROM code file that matches the device type and HW Bin Type (e.g., bbx_rom.bin.0604 for a BBX having a HW Bin Type of 0604). The file should be highlighted.
11	Click on the **Load** button. A status report window displays the result of the download.
12	Click on the **Ok** button to close the status report window.
13	Click on the **Util** menu.
14	Select the **Tools** menu item.
15	Click on the **Update NextLoad** menu item.
16	Select the version number of the folder that was used for the ROM code download.
17	Click on the **Save** button. A pop–up message indicates that the CDF file has been updated.
18	Click on the **OK** button to dismiss the pop–up message.
19	Click on the device that was downloaded with ROM code.
20	Click on the **Device** menu.
21	Click on the **Download Code** menu item to download RAM code. A status report window displays the result of the download. **NOTE** Data is automatically downloaded to GLI devices when the RAM code is downloaded. Use the Download Data procedure to download data to other device types after they have been upgraded.
22	Click on the **Ok** button to close the status report window. The downloaded device should be OOS_RAM (yellow) unless it is a GLI in which case it should be INS (green).
23	Click on the device that was downloaded.
24	Click on the **Device** menu.
25	Click on the **Status** menu item. Verify that the status report window displays the correct ROM and RAM version numbers.
26	Click on the **Ok** button to close the status report window.

Appendix I: In–Service Calibration

Appendix Content

Notes

Introduction

Purpose

This procedure is a guide to expanding your system with multiple carriers while the system remains in service. This procedure also allows you to perform on site maintenance (replace defective boards and recalibrate) while the remainder of the site stays in service.

Motorola recommends that you perform this procedure during a maintenance window.

This procedure cannot be performed on BTSs with 4–to–1 combiners. The procedure can only be performed on one side of the BTS at one time. That is, LPAs 1, 2 ,3, 7, 8, 9 (feed antennas 1, 2, 3) can be calibrated while LPAs 6, 7, 8, 10, 11, 12 (feed antennas 4, 5, 6) remain in service and vice versa.

Equipment Warm up

IMPORTANT

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

CAUTION

If any piece of test equipment (i.e., test cable, RF adapter) has been replaced, re-calibration must be performed. Failure to do so could introduce measurement errors, causing incorrect measurements and degradation to system performance.

Power Delta Calibration Introduction

The In–service calibration procedure has several differences from a normal calibration procedure. One of these is the use of a spectrum analyzer instead of a power meter to measure power. Power meters are broadband measurement devices and cannot be used to measure power during In–service Calibration since other carriers are operating. A spectrum analyzer can be used because it measures power at a given frequency. However, measuring power using a spectrum analyzer is less accurate than using a power meter. Therefore, you must compensate for the difference (delta) between the power meter and the spectrum analyzer.

HP8921A Power Delta Calibration

Use the HP8921A Spectrum Analyzer to measure power during In–Service Calibration for 800 MHz systems. After the offset value has been calculated, add it to the TX cable loss value.

Follow the procedure in Table I-1 to perform the HP8921A Power Delta Calibration procedure.

NOTE

This procedure requires two HP8921As.

Table I-1: HP8921A Power Delta Calibration Procedure

Step	Action
	*** IMPORTANT** Perform this procedure *after* test equipment has been allowed to warm–up and stabilize for a *minimum of 60 minutes*.
1	Connect a short RF cable between the HP8921A **Duplex Out** port and the HP437B power sensor (see Figure I-1).
2	Set the HP8921A signal source as follows: – Measure mode to **CDMA Generator** – Frequency to the CDMA Calibration target frequency – CW RF Path to **IQ** – Output Port to **Dupl** – Data Source to **Random** – Amplitude to **0 dBm**
3	Measure and record the power value reading on the HP437B Power Meter.
4	Record the Power Meter reading as result **A** ________________________.

. . . continued on next page

Table I-1: HP8921A Power Delta Calibration Procedure

Step	Action
5	Turn off the source HP8921A signal output, and disconnect the HP437B. **NOTE** Leave the settings on the source HP8921A for convenience in the following steps.
6	Connect the short RF cable between the source HP8921A **Duplex Out** port and the measuring HP8921A **RF–IN** port (see Figure I-2).
7	Ensure that the source HP8921A settings are the same as in Step 2.
8	Set the measuring HP8921A as follows: – Measure mode to **CDMA Anl** – Frequency to the CDMA calibration target frequency – Input Attenuation to **0 dB** – Input port to **RF–IN** – Gain to **Auto** – Analyzer Direction to **Fwd**
9	Turn on the source HP8921A signal output.
10	Measure and record the channel power reading on the measuring HP8921A as result **B __________________________**.
11	Turn off the source HP8921A signal output and disconnect the equipment.
12	Compute the delta between HP437B and HP8921A using the following formula: **Delta = A – B** Example: Delta = –0.70 dBm – (–1.25 dBm) = 0.55 dBm Example: Delta = 0.26 dBm – 0.55 dBm = –0.29 dBm These examples are included to show the mathematics and do not represent actual readings. **NOTE** Add this delta value to the **TX Cable Loss** value during In–Service Calibration (see Step 4 in Table I-4).

Figure I-1: Delta Calibration Setup – HP8921A to HP437B

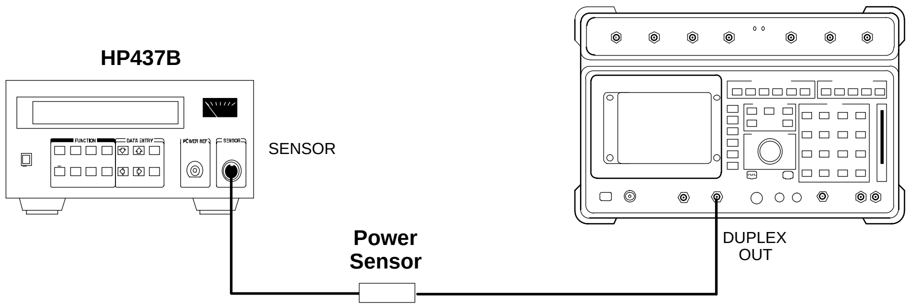
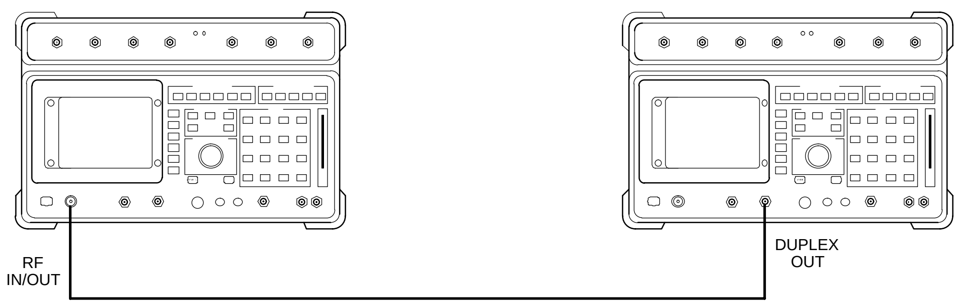


Figure I-2: Delta Calibration Setup – HP8921A to HP8921A



Advantest R3465 Power Delta Calibration

Follow the procedure in Table I-2 to perform the Advantest 3465 Power Delta Calibration procedure.

Table I-2: Advantest Power Delta Calibration Procedure

Step	Action
	*** IMPORTANT** Perform this procedure *after* test equipment has been allowed to warm–up and stabilize for a *minimum of 60 minutes*.
On the Advantest R3465:	
1	Press the **SHIF**T and the **PRESET** keys located below the CRT display.
2	Press the **ADVANCE** key in the Measurement area of the control panel.
3	Press the **CDMA Si**g CRT menu key.
4	Press the **FREQ** key in the Entry area of the control panel.

. . . continued on next page

I

Table I-2: Advantest Power Delta Calibration Procedure	
Step	**Action**
5	Set the frequency to the desired value using the keypad entry keys.
6	Press the **LEVEL** key in the Entry area of the control panel.
7	Set the **LEVEL** to **0 dBm** using the keypad entry keys.
8	Verify the **Mod** CRT menu key is highlighting **OFF**, if not press the **Mod** key to toggle it **OFF**.
9	Verify the **Output** CRT menu key is highlighting **OFF**, if not press the **Output** key to toggle it **OFF**.
On the HP 437 Power Meter:	
10	Zero the Power Meter prior to connecting the power sensor to the RF cable from the signal generator. *** IMPORTANT** For best accuracy, always re–zero the power meter before connecting the power sensor to the component being calibrated.
11	Connect the RF cable from the R3561L CDMA Test Source Unit **RF OUT** port to the power sensor, refer to Figure I-3.
12	Press the **Output** CRT menu key to toggle the Output to **ON**.
13	Record the Power Meter reading as result **A** __________________________.
14	Press the Output **CRT** menu key to toggle the Output to **OFF**.
15	Connect the RF cable from the R3561L CDMA Test Source Unit **RF OUT** port to the Spectrum Analyzer **INPUT** Port, refer to Figure I-4.
16	Press the **Output** CRT menu key to change the Output to **ON**.
17	Press the **CW** key in the Measurement area of the control panel.
18	Press the **LEVEL** key in the Entry area of the control panel.
19	Set the REF LEVEL to **10 dBm** using the keypad entry keys.
20	Press the **dB/div** CRT menu key.
21	Press the **10 dB/div** CRT menu key.
22	Press the **FREQ** key in Entry area of the control panel.
23	Set the frequency to the desired value using the keypad entry keys.
24	Press the **more 1/2** CRT menu key.
25	Press the **Preselector** CRT menu key to highlight **3.0G**.
26	Press the **FORMAT** key in the Display Control area of the control panel.
27	Press the **TRACE** CRT menu key.
28	Press the **AVG A** CRT menu key.
29	Set AVG to **20** using keypad entry keys.

. . . continued on next page

Table I-2: Advantest Power Delta Calibration Procedure	
Step	**Action**
30	Press the **return** CRT menu key.
31	Press the **SPAN** key in the Entry area of the control panel.
32	Press the **Zero Span** CRT menu key.
33	Press the **BW** key in the Entry area of the control panel.
34	Press the **RBW** CRT menu key to highlight **MNL**. using keypad entry keys enter **30 kHz**.
35	Set **RBW** to **30 kHz** using keypad entry keys.
36	Press the **VBW** CRT menu key to highlight **MNL**.
37	Set **VBW** to **1 MHz** using keypad entry keys.
38	Press the Marker **ON** key in the Display Control area of the control panel.
39	Record the Marker Level reading as result **B** ________________________.
40	Calculate the **Power Calibration Delta** value. The delta value is the power meter measurement minus the Advantest measurement. Delta = A – B Example: Delta = –0.70 dBm – (–1.25 dBm) = 0.55 dBm Example: Delta = 0.26 dBm – 0.55 dBm = –0.29 dBm These examples are included to show the mathematics and do not represent actual readings. **NOTE** Add this delta value to the **TX Cable Loss** value during In–Service Calibration (see Step 4 in Table I-4).

Figure I-3: Delta Calibration Setup – R3561L to HP437B

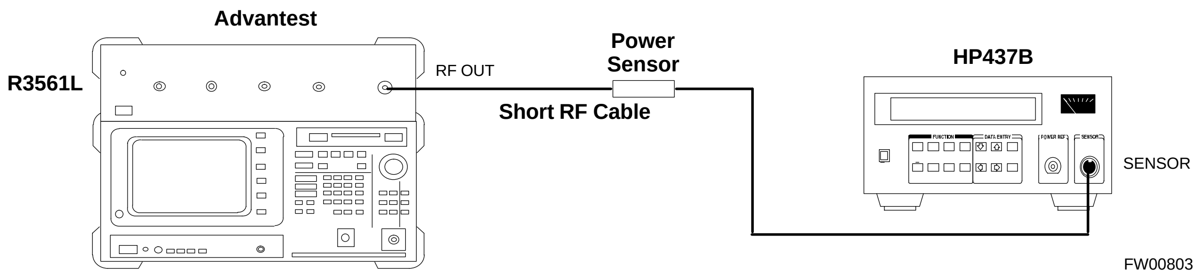
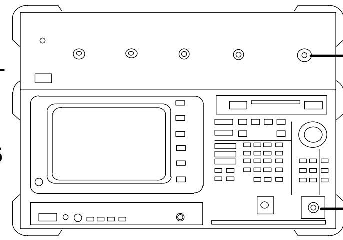


Figure I-4: Delta Calibration Setup – R3561L to R3465



HP8935 Power Delta Calibration

Follow the procedure in Table I-3 to perform the HP8935 Power Delta Calibration procedure.

Table I-3: HP8935 Power Delta Calibration Procedure

Step	Action
	*** IMPORTANT** Perform this procedure *after* test equipment has been allowed to warm–up and stabilize for a *minimum of 60 minutes*.
1	Connect a short RF cable between the HP8935 **Duplex Out** port and the HP437B power sensor (see Figure I-5).
2	Set the HP8935 signal source as follows: – Measure mode to **CDMA Gen** – Frequency to the CDMA Calibration target frequency – CW RF Path to **IQ** – Output Port to **Dupl** – Data Source to **Random** – Amplitude to **0 dBm**
3	Measure and record the power value reading on the HP437B Power Meter.
4	Record the Power Meter reading as result **A** ________________________.
5	Turn off the source HP8935 signal output, and disconnect the HP437B. **NOTE** Leave the settings on the source HP8935 for convenience in the following steps.
6	Connect the short RF cable between the source HP8935 **Duplex Out** port and the **RF–IN/OUT** port (see Figure I-6).
7	Ensure that the source HP8935 settings are the same as in Step 2.

. . . continued on next page

Table I-3: HP8935 Power Delta Calibration Procedure	
Step	**Action**
8	Set the measuring HP8935 as follows: – Measure mode to **CDMA Anl** – Frequency to the CDMA calibration target frequency – Input Attenuation to **0 dB** – Input port to **RF–IN** – Gain to **Auto** – Anl Dir to **Fwd**
9	Turn on the source HP8935 signal output.
10	Set the Chn Pwr Cal to **Calibrate** and select to calibrate.
11	Measure and record the channel power reading on the measuring HP8935 as result **B** ________________________.
12	Turn off the source HP8935 signal output and disconnect the equipment.
13	Calculate the **Power Calibration Delta** value. The delta value is the power meter measurement minus the Advantest measurement. Delta = A – B Example: Delta = –0.70 dBm – (–1.25 dBm) = 0.55 dBm Example: Delta = 0.26 dBm – 0.55 dBm = –0.29 dBm These examples are included to show the mathematics and do not represent actual readings. **NOTE** Add this delta value to the **TX Cable Loss** value during In–Service Calibration (see Step 4 in Table I-4).

Figure I-5: Delta Calibration Setup – HP8935 to HP437B

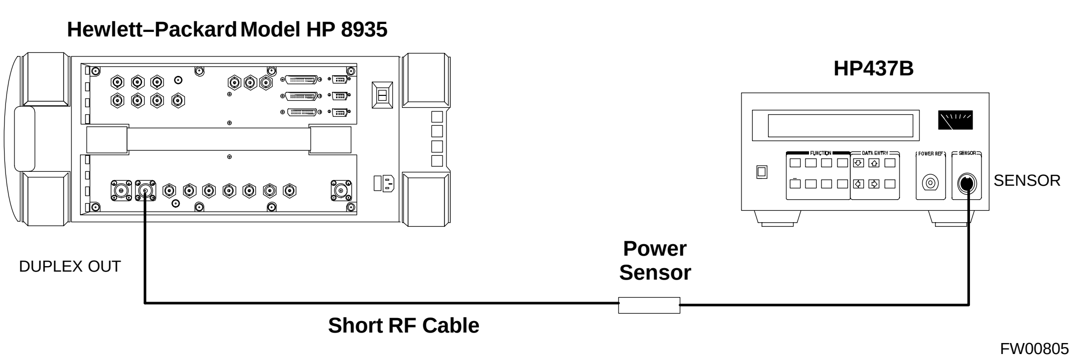
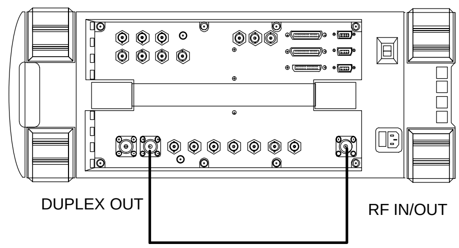


Figure I-6: Delta Calibration Setup – HP8935 to HP8935



In–Service Calibration

IMPORTANT

This feature does NOT have fault tolerance at this time. The system has no safe–guards to stop you from doing something that will take the BTS out of service. If possible, perform this procedure during a maintenance window.

Follow the procedures in this section precisely, otherwise the entire BTS will most likely go OUT OF SERVICE.

At the CBSC, only perform operations on expansion hardware when it is in the OOS_MANUAL state.

The operator must be trained in the LMF operation prior to performing this procedure.

Prerequisites

- Expansion hardware has been added in the CBSC database, and the CDF file has been generated.
- The expansion devices have been inserted into the C–CCP cage and are in the OOS_MANUAL state at the CBSC.
- The site specific cdf (with the expansion hardware) and cal files have been loaded onto the LMF.
- The LMF has the same code and dds files as the CBSC to download.

IMPORTANT

Do not download code or data to any cards other than those you are working on. Downloading code or data to other cards will take the site OUT OF SERVICE.

The code file version numbers must match the version numbers on the other cards in the frame. If the numbers do not match, the site may go OUT OF SERVICE.

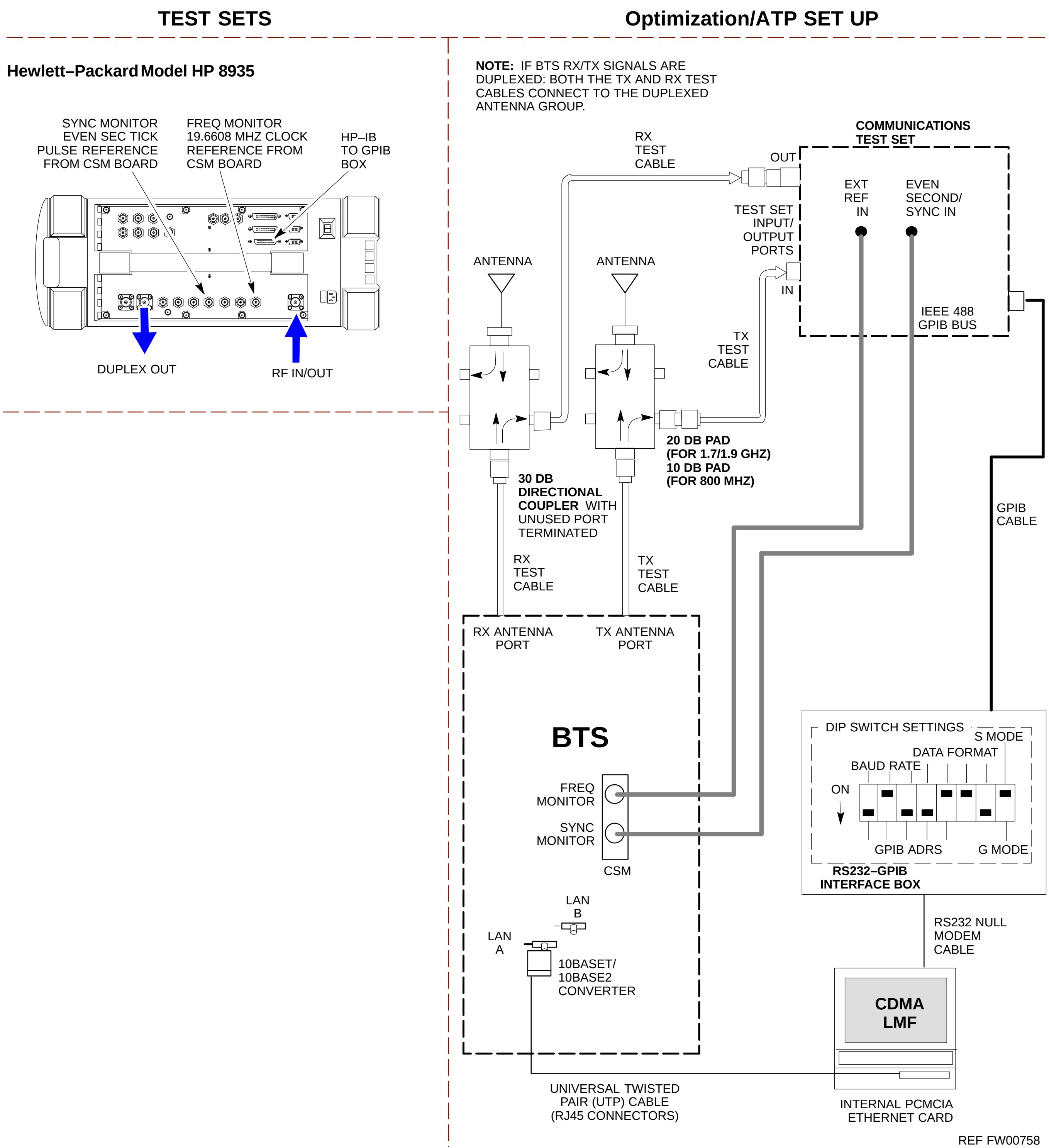
The BTS–#.cdf, CBSC–#.cdf, and CAL files for this BTS must have come from the CBSC.

- Test equipment has been configured per Figure I-7 or Figure I-8.
- An RFDS (or at a minimum a directional coupler), whose loss is already known, must be in line to perform the in–service calibration.
- Test equipment has been calibrated after 1 hour warm up.
- A short RF cable and two BNC–N adapters are available to perform Cable Calibration.

. . . continued on next page

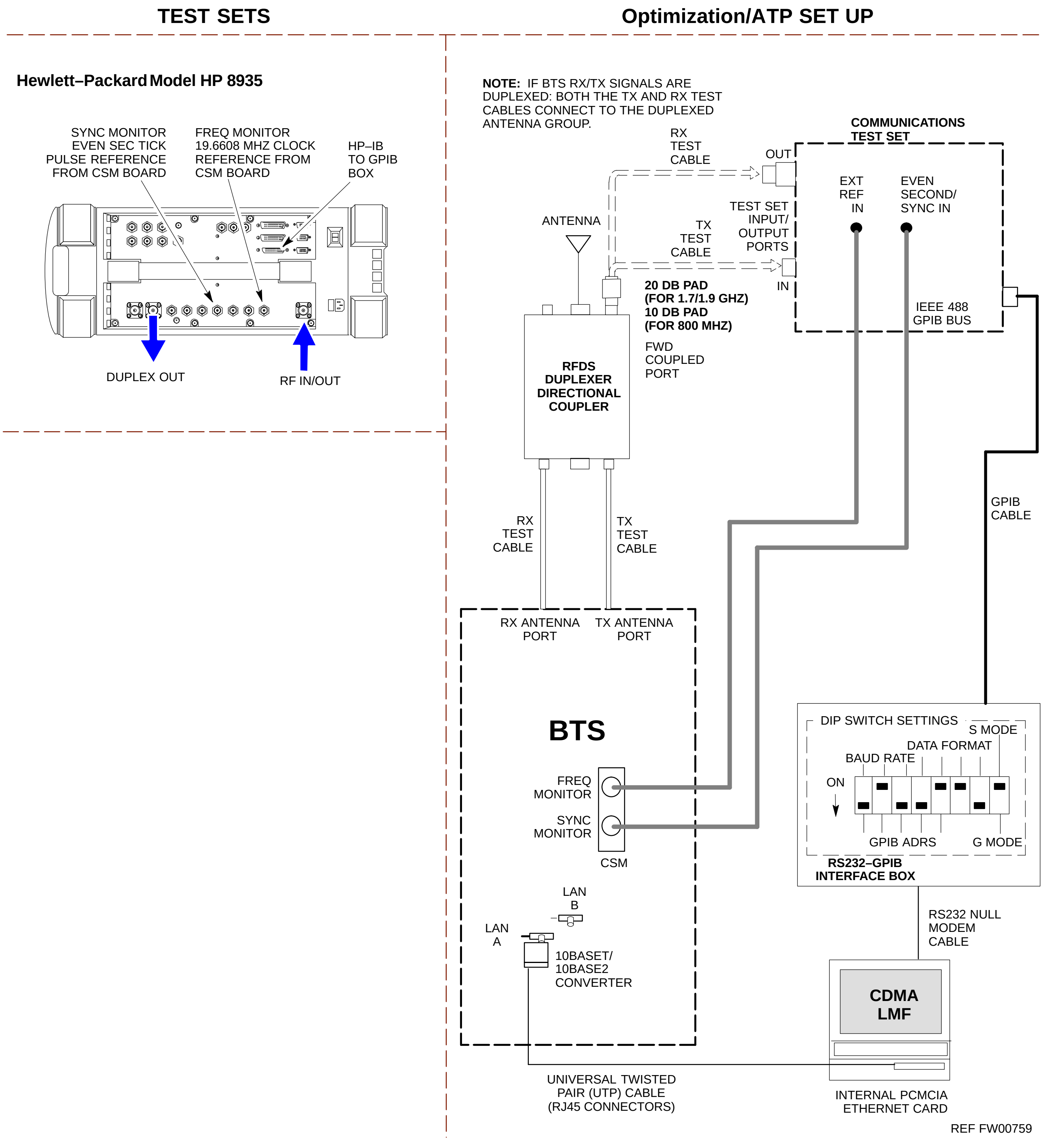
- The Power Delta Calibration has been performed (see Table I-1, Table I-2, or Table I-3).

Figure I-7: Optimization/ATP Test Setup Using Directional Coupler



I

Figure I-8: Optimization/ATP Test Setup Using RFDS



Follow the procedure in Table I-4 to perform the In–Service Calibration.

Table I-4: In–Service Calibration

Step	Action
	*** IMPORTANT** Perform this procedure *after* test equipment has been allowed to warm–up and stabilize for a *minimum of 60 minutes*.
1	Set up the LMF for In–Service Calibration: – Start the LMF by double–clicking the LMF icon on the Windows desktop. – Click **Options>LMF Options** from the menu bar at the login screen. – Check only the applicable spectrum analyzer check box on the **Test Equipment** tab. Ensure that the GPIB address is **18**. – Uncheck any other other equipment that is selected. – Click the **Apply** button. – Select the **BTS Options** tab in the LMF Option window. – Check the **In–Service Calibration** check box. – Click the **Apply** button. – Click the **Dismiss** button to close the LMF Option window.
2	Login to the target BTS: – Select the target BTS icon. – Click the **Login** button at the login screen.
3	Measure the Cable Loss using the Cable Calibration function: – Click **Util>Cable Calibration** from the menu bar at the main window. – Set the desired channel(s) and select **TX and RX CABLE CAL** at the cable calibration pop up window. – Click the **OK** button to perform cable calibration. – Follow the on–screen instructions to complete the cable loss measurement. **NOTE** – The measured value is input automatically to the cable loss file. – To view the cable loss file, click **Util>Examine>Cable Loss**.

. . . continued on next page

I

Table I-4: In–Service Calibration

Step	Action
4	Add the spectrum analyzer power delta to the **Cable Loss**. – To view the cable loss file, click **Util>Examine>Cable Loss**. – Add the value computed in Table I-1, Table I-2, or Table I-3 to the TX Cable Loss. **NOTE** Be sure to include the sign of the value. The following examples are included to show the mathematics and do not represent actual readings: – Example: 5.65 dBm + 0.55 dBm = 6.20 dBm – Example: 5.65 dBm + (–0.29 dBm) = 5.36 dBm – Example: –5.65 dBm + 0.55 dBm = –5.10 dBm – Example: –5.65 dBm + (–0.29 dBm) = –5.94 dBm
5	Input the Coupler Loss for the TX tests: – Click **Util>Edit>TX Coupler Loss** from the menu bar at the main window. – Input the appropriate coupler loss for the target carrier(s) by referring to the information taken at the time of BTS installation. – Click the **Save** button. – Click the **Dismiss** button to close the window. – To view the coupler loss file, click **Util>Examine>TX Coupler Loss**.
6	Input the Coupler Loss for the RX tests: – Click **Util>Edit>Cable Loss** from the menu bar at the main window. – Add the appropriate coupler loss to the cable loss for the target carrier(s) by referring to the information taken at the time of BTS installation and input this value in the Cable Loss field. – Click the **Save** button. – Click the **Dismiss** button to close the window. – To view the cable loss file, click **Util>Examine>Cable Loss**.
7	Have the CBSC operator put the redundant BBX OOS_MANUAL.
	! CAUTION Be sure to download OOS devices only. Loading in–service devices takes them OUT OF SERVICE and can result in dropped calls. The code file version numbers must match the version numbers on the other cards in the frame. If the numbers do not match, the site may go OUT OF SERVICE. **NOTE** Be sure to include the redundant BBX in steps 8, 9, and 10.

. . . continued on next page

Table I-4: In–Service Calibration

Step	Action
8	Download code and data to the target devices: – Click **Util>Tools>Update NextLoad** to set the code version that will be downloaded. – Check the appropriate code version in the pop up window and click the **Save** button to close. – Select the target BBX(s) on the C–CCP cage picture. – Click **Device>Download Code** to start downloading code. – Select the target BBX(s) on the C–CCP cage picture. – Click **Device>Download Data** to start downloading data.
9	**! CAUTION** Perform the All Cal/Audit procedure on OOS devices only. Run the All Cal/Audit procedure: – Select the target BBX(s) on the C–CCP cage picture. – Click **Tests>All Cal/Audit** from the menu bar at the main window. – Select the target carrier and confirm the channel number in the pop up window. – Leave the **Verify BLO** check box checked and click the **OK** button to start calibration. – Follow the on–screen instructions, except, do not connect to the BTS antenna port, connect to the directional coupler (fwd) port associated with the on screen prompt antenna port.
10	Save the result and download the BLO data to the target BBX(s): – Click the **Save Result** button on the result screen. The window closes automatically.
11	Logout from the BTS and close the LMF session: – Click **Select>Logout** to close the BTS connection. – Close the LMF window.
12	Restore the new “bts–*.cal” file to the CBSC.
13	Enable the target device(s) from the CBSC.

Notes

Index

D

E

F

G