Basic LMF Operation

LMF Coverage in this Publication

The LMF Application Program supports maintenance of both CDMA and SAS BTSs. All references to the LMF in this publication are to the CDMA portion of the program..

Operating Environments

The LMF Application Program allows the user to work in the two following Operating Environments that are accessed using the specified Desktop Icons.:

– Graphical User Interface (GUI) using the **WinLMF** Icon
– Command Line Interface (CLI) using the **WinLMF CDMA 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

Basic Operation of the LMF in either environment includes performing the following tasks.:

- Selecting and deselecting BTS Devices
- Enabling Devices
- Disabling Devices
- Resetting Devices
- Obtaining Device Status

The following additional Basic Operation can be performed in a GUI Environment:

- Sorting a Status Report Window

For detailed information on performing these and other LMF Operations, refer to the *LMF Help function on–line documentation*.

NOTE

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

The LMF Display and the BTS

BTS Display

When the LMF is logged into a BTS, a Frame Tab is displayed for each BTS Frame. The Frame Tab is labeled with “CDMA” and the BTS Number, a Dash, and the Frame Number (for example, **BTS–812–1** for BTS 812, RF Modem Frame 1). If there is only one frame for the BTS, there will only be one Frame Tab..

CDF/NECF Requirements

For the LMF to recognize the devices installed in the BTS, a BTS CDF/NECF File that includes Equipage Information for all the devices in the BTS must be located in the applicable **<*x*>:\<*lmf Home Directory*>\cdma\bts–#** folder. To provide the necessary Channel Assignment Data for BTS Operation, a CBSC CDF File that includes Channel Data for all BTS RF Modem Frames is also required in the folder..

RFDS Display

If an RFDS is included in the CDF/NECF File, an **RFDS** Tab labeled with “RFDS,” a Dash, and the BTS Number–Frame Number Combination (for example, **RFDS–812–1**) is displayed..

Graphical User Interface Operation

Perform the procedure in Table 3-9 to operate the LMF GUI.

Table 3-9: LMF GUI Operating Procedure

✓	Step	Action
	1	Select the device or devices upon which an action is to be performed.
	2	Select the action to apply to the selected device(s). – While the action is in progress, a Status Report Window displays the action taking place and other status information. – When the action is complete, the Status Report Window states its completion and displays other pertinent information.
	3	Click the **OK** Button to close the Status Report Window.

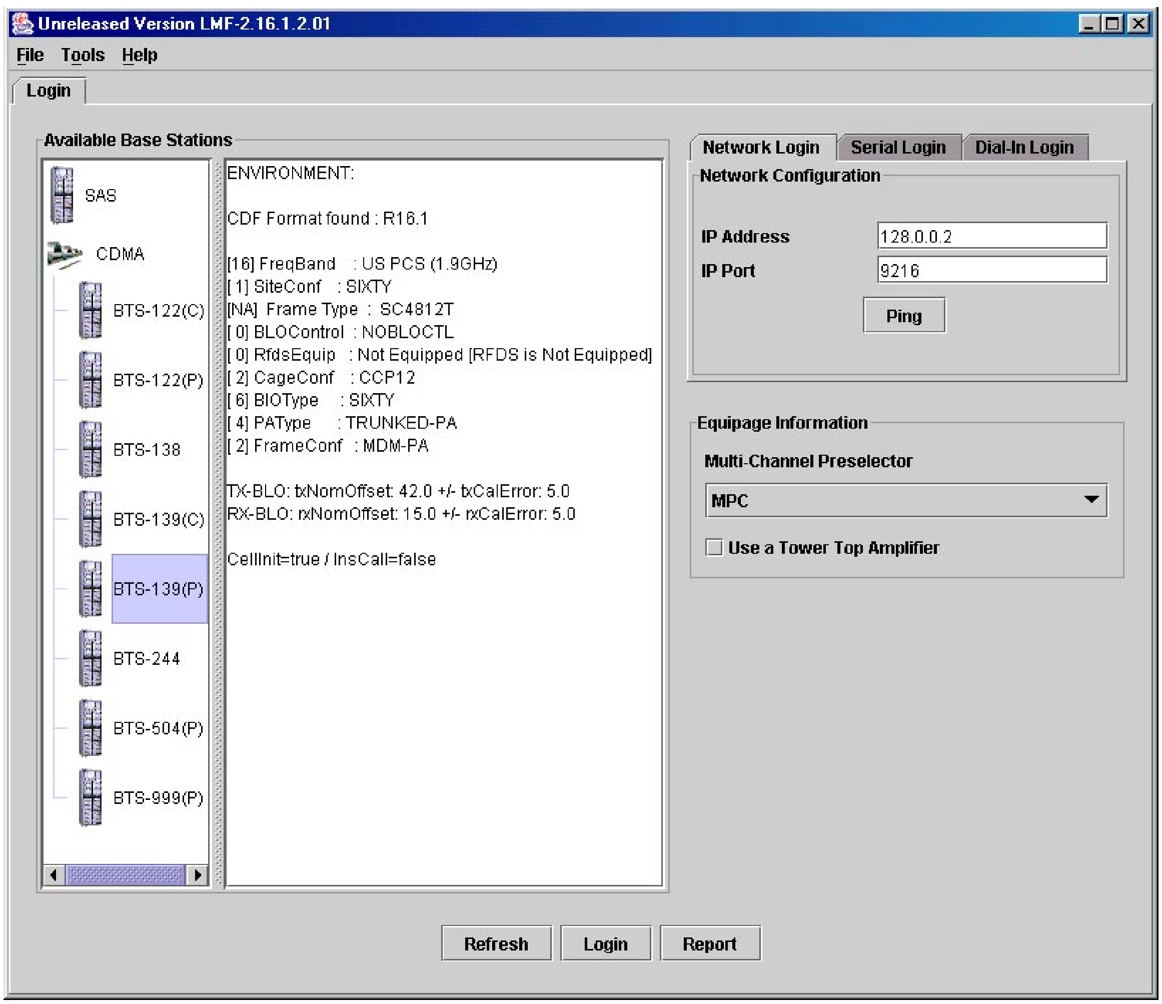
Understanding GUI Operation

The following Screen Captures are provided to help understand how the GUI operates. For detailed information on performing these and other LMF Operations, refer to the *LMF Help function on–line documentation*.

BTS Login Screen

Figure 3-5 depicts the differences between Packet and Circuit CDMA "cdf" File Identification. Note that if there is a Packet Mode Version "bts" File, the "(P)" is added as a suffix. There is a corresponding "(C)" for the Circuit Mode Version.

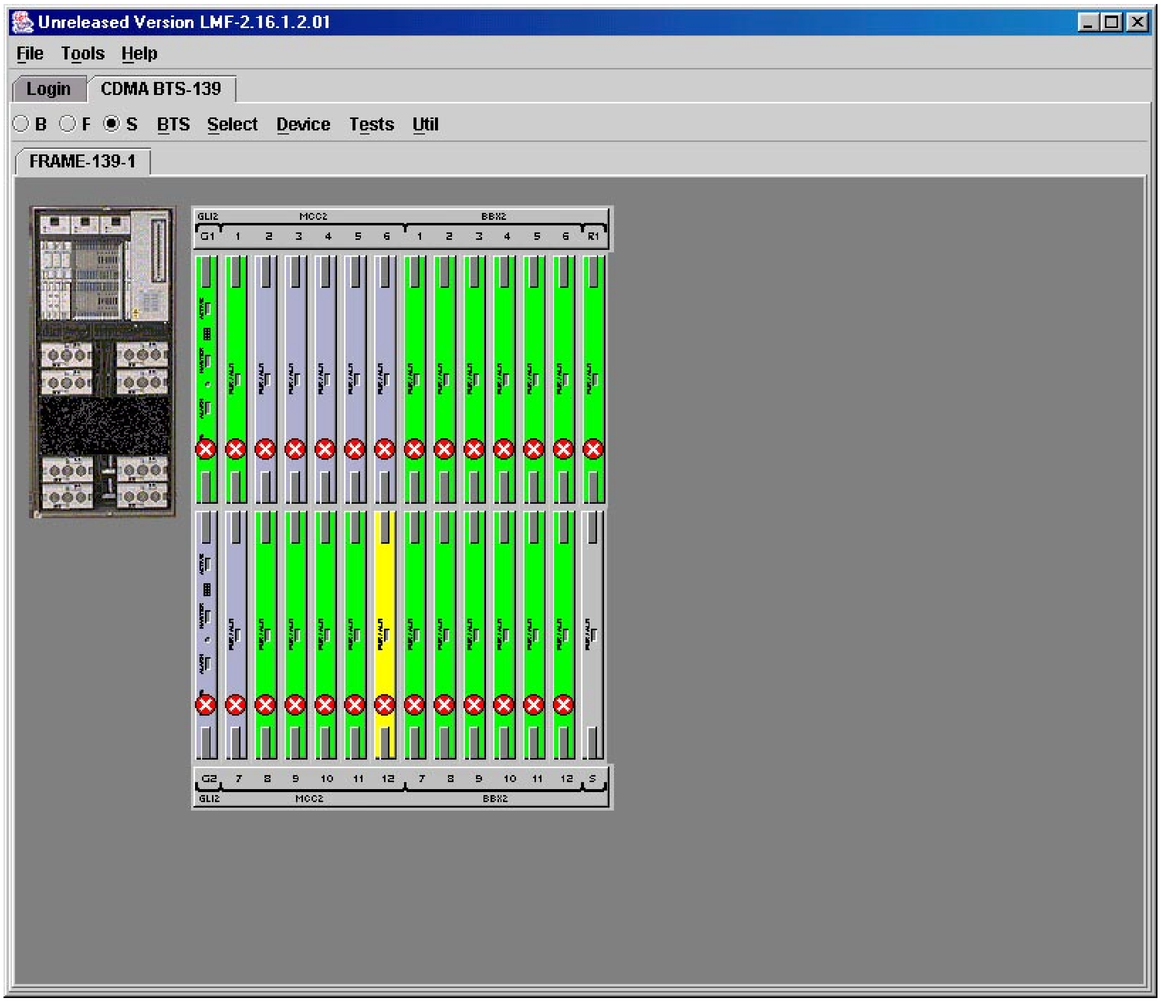
Figure 3-5: BTS Login Screen – Identifying Circuit and Packet BTS Files



Self-Managed Network Elements Screen

Figure 3-6 depicts the Self-Managed Network Elements (NEs) State of a Packet Mode SC4812T. Note that an “X” is on the front of each card that is under Self–Managed Network Elements (NEs) Control by the GLI3 Card.

Figure 3-6: Self–Managed Network Elements (NEs) State of a Packet Mode SC4812T



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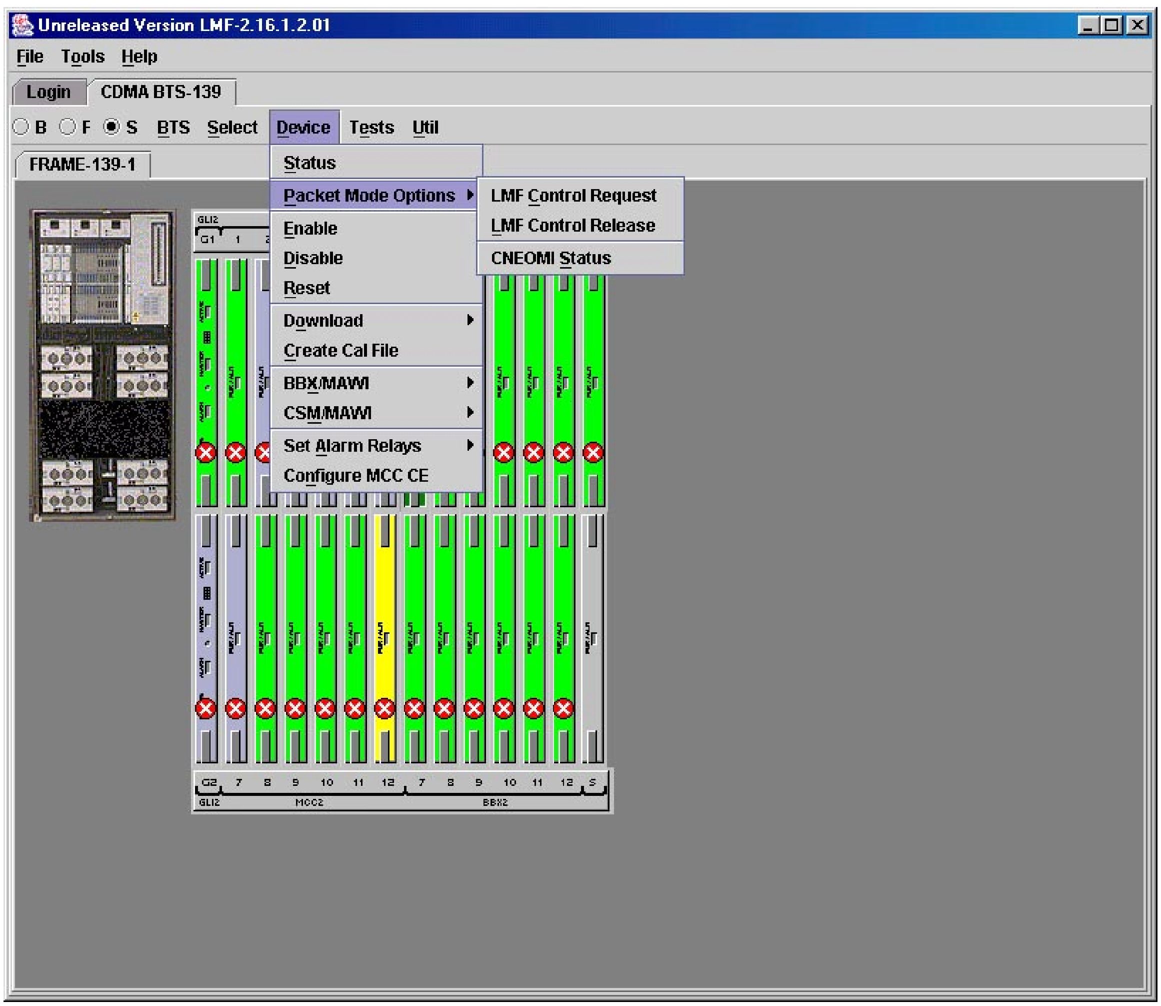
Packet Mode Commands Screen

Figure 3-7 depicts three of the available Packet Mode Commands. Normally the GLI3 has Self-Managed Network Elements (NEs) Control of all cards as shown in Figure 3-6 by an "(X)". In that state, the LMF may only status a single card.

In order to download code or test a card, the LMF must request Self-Managed Network Elements (NEs) Control of the card by using the shown Pull–down Menu. It also uses this menu to release control of the card back to the GLI3.

The GLI3 also assumes control of the cards after the LMF logs out of the BTS. The Packet Mode GLI3 normally is loaded with a Tape Release and NECB and NECJ Files that point to a Tape Release stored on the GLI3. When the GLI3 has control of a card it will maintain that card with the code on that Tape Release.

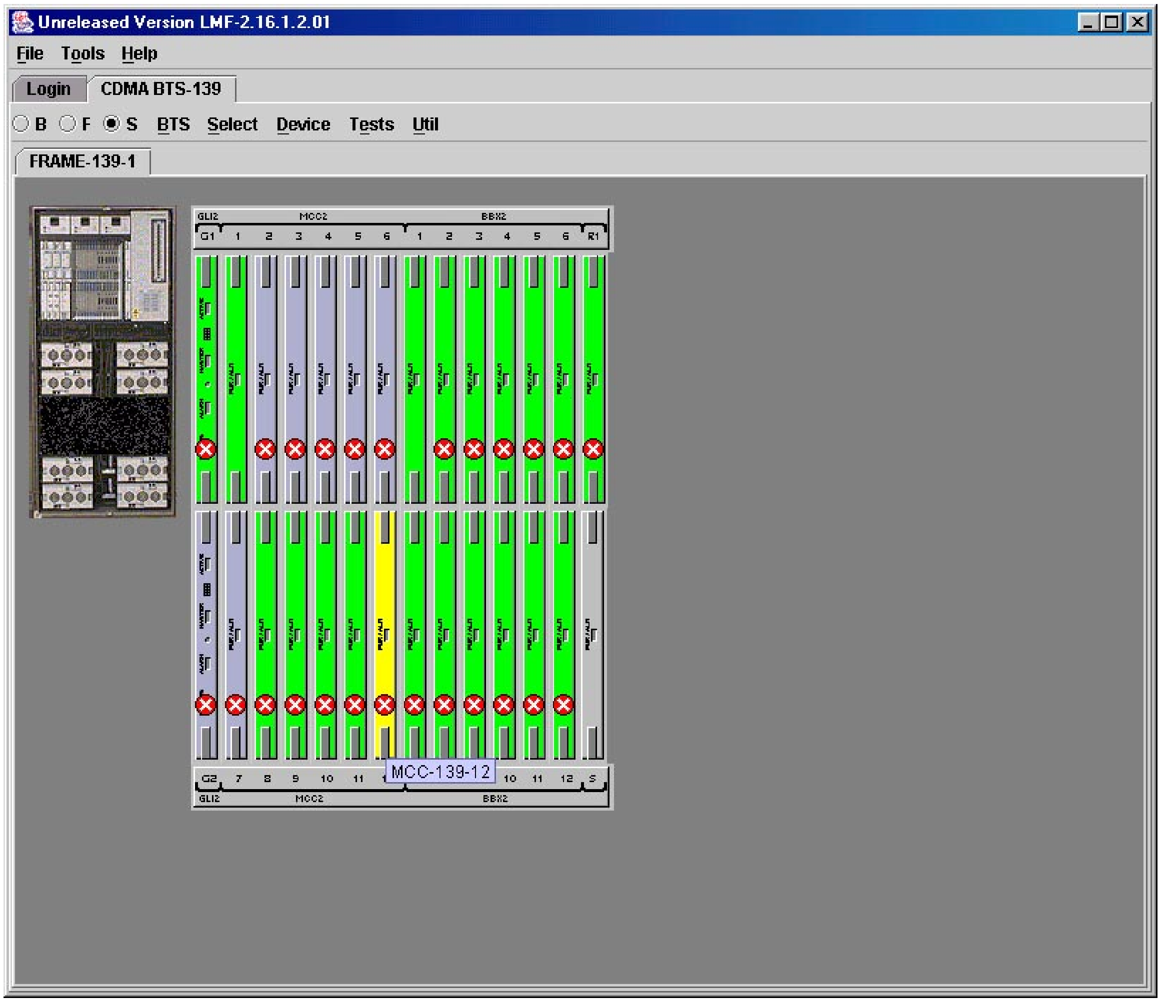
Figure 3-7: Available Packet Mode Commands



Packet Mode Site under LMF Control

Figure 3-8 depicts a Packet Mode Site that has the MCC–1 and the BBX–1 Cards under LMF Control. Notice that the “X” is missing from the front of these two cards.

Figure 3-8: Packet Mode Site with MCC–1 and BBX–1 under LMF Control



Command Line Interface Overview

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

Both the GUI and the CLI use a program known as the Handler. Only one Handler can be running at one time. The architectural design is such that 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 Sign (=) between the Keyword and the Parameter Value
  - 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 the *LMF CDMA CLI Reference* (68P09262A25) for a complete explanation of the CLI Commands and their usage.

Logging Into a BTS

Logging into a BTS establishes a Communication Link between the BTS and the LMF. An LMF Session can be logged into only one BTS at a time.

Prerequisites

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

- The LMF Program is correctly installed on the LMF Computer.
- A ***bts-nnn*** Folder with the correct CDF/NECF and CBSC Files is present.
- The LMF Computer was connected to the BTS before starting the *Windows* Operating System and the LMF Software. If necessary, restart the computer after connecting it to the BTS in accordance with Table 3-6 and Figure 3-3.

CAUTION

Ensure that the correct **bts–#.cdf/necf** and **cbsc–#.CDF** Files are used for the BTS. These should be the CDF/NECF Files that are provided for the BTS by the CBSC.

Failure to use the correct CDF/NECF Files can result in invalid Optimization.

Failure to use the correct CDF/NECF Files to log into a live (traffic–carrying) site can shut down the site.

BTS Login from the GUI Environment

Perform the procedure in Table 3-10 to log into a BTS when using the GUI Environment.

Table 3-10: BTS GUI Login Procedure

✓	Step	Action
	1	Start the LMF GUI Environment by double–clicking on the WinLMF Desktop Icon (if the LMF is not running). – An LMF Window will open and display the LMF Build Number in the Title Bar.

	2	If a warning similar to the following is displayed, *proceed to Step 3*.
		`The CLI Handler is already running.`
		`This may cause conflicts with the LMF.`
		`Are you sure you want to start the application?`
		`Yes No`

table continued on next page

3

Table 3-10: BTS GUI Login Procedure		
✓	Step	Action
		* IMPORTANT The following statements are provided to assist the operator in using the LMF GUI. • If an attempt is made to log into a BTS that is already logged on, all devices will appear gray in the display. • 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 in the display), it must be downloaded with RAM Code before other devices can be seen. • If the MGLI is OOS–RAM (yellow in the display), it must be enabled before other installed devices can be seen.
	3	Perform the following actions:
	3a	Select **NO**.
	3b	Shut down any other LMF Sessions that may be running.
	3c	Start the LMF GUI Environment again.
	4	Click on the **Login** Tab (if not displayed).
	5	Double click on **CDMA** (in the **Available Base Stations** Pick List).
	6	Click on the desired BTS Number.
	7	Click on the **Network Login** Tab (if not already in the forefront).
	8	Enter the correct IP Address (normally **128.0.0.2**) for a Customer BTS, if not correctly displayed in the **IP Address** Box.
	9	Enter the correct IP Port Number (normally **9216**), if not correctly displayed in the **IP Port** Box.

	10	Click on **Ping**.
		• If the connection is successful, the **Ping Display W**indow shows text similar to the following:
		`Reply from 128.0.0.2: bytes=32 time=3ms TTL=255`
		• If there is no response, the following is displayed:
		`128.0.0.2:9216:Timed out`
		• If the MGLI fails to respond, reset and perform the Ping Process again.
		• If the MGLI still fails to respond, check for the following problems:
		– Shorted BNC to Inter–frame Cabling
		– Open Cables
		– Crossed A and B Link Cables
		– Missing 50–Ohm Terminators
		– MGLI problem

table continued on next page

Table 3-10: BTS GUI Login Procedure		
✓	**Step**	**Action**
	11	In the **Equipage Information** Field, select the **Multi-channel Preselector** Type from the **Multi-channel Preselector** Pull–down Menu (default is **MPC**) to a device corresponding to your BTS Configuration, if required.
		NOTE The “**Use a Tower Top Amplifier**” Option is not applicable to the SC4812T Lite.
	12	In the **SC4812ET Lite/T Lite** Field, click in the **SC4812T Lite** Check Box to select it. **NOTE** This Check Box is used to differentiate the SC4812ET Lite BTS Frame from the SC4812T Lite BTS Frame.
	13	Click on **Login**. – A BTS Tab with the BTS and Frame Numbers is displayed.

BTS Login from the CLI Environment

Perform the procedures in Table 3-11 to log into a BTS when using the CLI Environment.

> **NOTE**
>
> If the CLI and GUI Environments are to be used at the same time, the *GUI must be started first and the BTS Login must be performed from the GUI.*
>
> – Refer to Table 3-10 to start the GUI Environment and log into a BTS.

Table 3-11: BTS CLI Login Procedure

✓	Step	Action
	1	Double–click the WinLMF CLI Desktop Icon (if the LMF CLI Environment is not already running).
		NOTE If a BTS was logged into under a GUI Session before the CLI Environment was started, the CLI Session will be logged into the same BTS, and Step 2 is not required.

	2	At the `/wlmf` Prompt, enter the following command:
		Login bts–*<bts#>* **host=***<host>* **port=***<port>* **tlite**
		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 the port last logged into for this BTS, or 9216 if this is first Login to this BTS).
		– *tlite* = option used to differentiate between SCCP Cage BTS Models (i.e. SC4812ET Lite AND SC4812T Lite).
		– A response similar to the following will be displayed:
		`LMF>`
		`13:08:18.882 Command Received and Accepted`
		`             COMMAND=Login bts-33`
		`13:08:18.882 Command In Progress`
		`13:08:21.275 Command Successfully Completed`
		`             REASON_CODE=”No Reason”`

Logging Out

Logging out of a BTS is accomplished differently for the GUI and CLI Operating Environments.

NOTE

The GUI and CLI Environments use the same connection to a BTS.

– If a GUI and the CLI Session are running for the same BTS at the same time, logging out of the BTS in either environment will log out of it for both.

When either a Login or logout is performed in the CLI Window, there is no GUI indication that the Login or Logout has occurred.

Logging Out of a BTS from the GUI Environment

Perform the procedure in Table 3-12 to logout of a BTS when using the GUI Environment.

Table 3-12: BTS GUI Logout Procedure

✓	Step	Action
	1	Click on **BTS** in the BTS Menu Bar.
	2	Click the **Logout** item in the Pull–down Menu (a **Confirm Logout** Pop-up Message will appear).
	3	Click on **Yes** (or press the **Enter** Key) to confirm logout. – The **Login** Tab will appear. • 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 will appear stating that the system could not log out of the BTS. When this occurs, the GUI must be exited and restarted before it can be used for further operations. • If a **Logout Error** Pop–up Message appears stating that the system could not log out of the Base Station because the given BTS is not logged in, click **OK** and *proceed to Step 4.*
	4	Select **File > Exit** in the Window Menu Bar, click **Yes** in the **Confirm Logout** Pop–up Window.
	5	Click **OK** in the **Logout Error** Pop–up Window that appears again.
	6	If further work is to be done in the GUI, restart it.
		NOTE • The **Logout** item on the BTS Menu Bar will only log you out of the displayed BTS. • You can also log out of all BTS Sessions and exit LMF by clicking on the **File** Selection in the Menu Bar and selecting **Exit** from the **File** Menu List. – A **Confirm Logout** Pop–up Message will appear.

Logging Out of a BTS from the CLI Environment

Perform the procedure in Table 3-13 to logout of a BTS when using the CLI Environment.

Table 3-13: BTS CLI Logout Procedure

✓	Step	Action
		NOTE If the BTS is also logged into from a GUI running at the same time and further work must be done with it in the GUI, *proceed to Step 1*.

	1	Log out of a BTS by entering the following command:
		logout bts–<*bts#*>
		– A system response similar to the following will be displayed:
		`LMF>`
		`13:24:51.028  Command Received and Accepted`
		`              COMMAND=logout bts-33`
		`13:24:51.028  Command In Progress`
		`13:24:52.04   Command Successfully Completed`
		`              REASON_CODE="No Reason"`

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

Establishing an MMI Communication Session

Equipment Connection

Figure 3-9 illustrates common equipment connections for the LMF Computer. For specific connection locations on FRUs, refer to the illustration accompanying the procedures that require the MMI Communication Session..

Initiate MMI Communication

For those procedures that require MMI Communication between the LMF and BTS FRUs, perform the procedures in Table 3-14 to initiate the Communication Session..

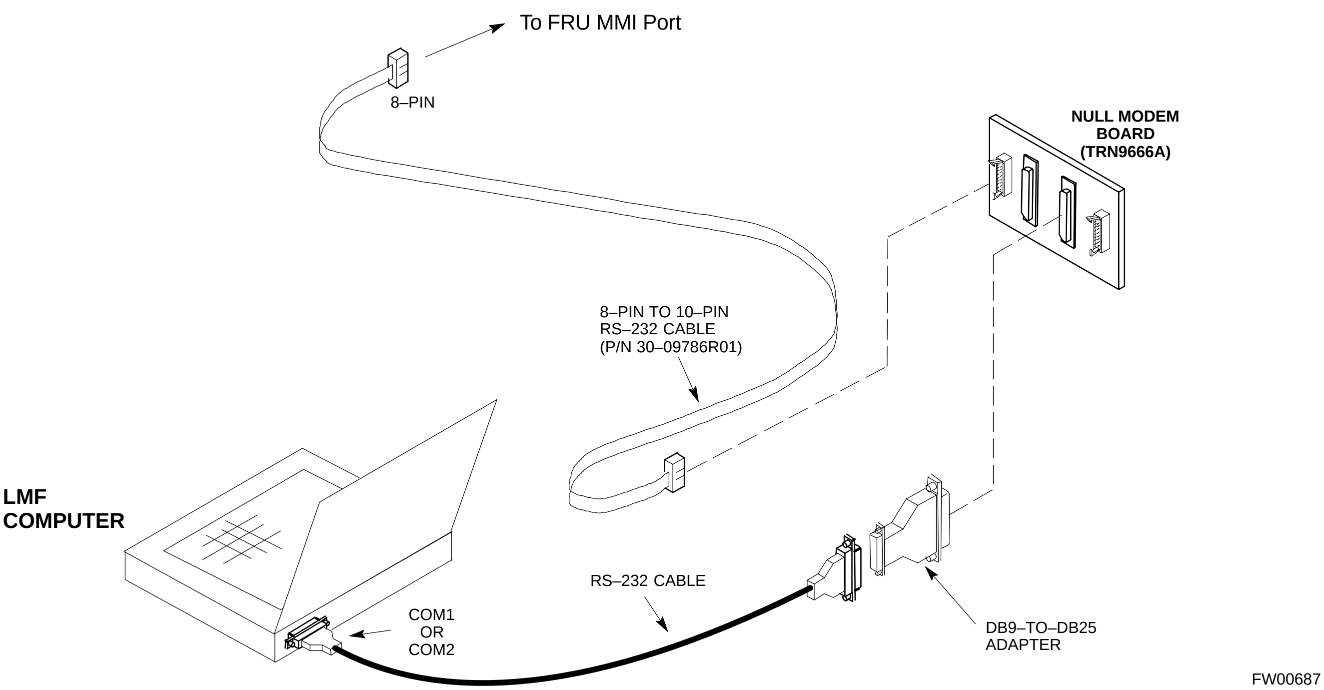
Table 3-14: Establishing MMI Communication Procedure

✓	Step	Action
	1	Connect the LMF Computer to the equipment as detailed in the applicable procedure that requires the MMI Communication Session.

table continued on next page

Table 3-14: Establishing MMI Communication Procedure		
✓	Step	Action
	2	If the LMF Computer has only one Serial Port (COM1) and the LMF is running, disconnect the LMF from COM1 by performing the following actions.
	2a	Click on **Tools** in the LMF Window Menu Bar, and select **Options** from the Pull–down Menu. – An **LMF Options** Dialog Box will appear.
	2b	In the **LMF Options** Dialog Box, click the **Disconnect Port** Button on the **Serial Connection** Tab.
	3	Start the named HyperTerminal Connection for MMI Sessions by double clicking on its *Windows* Desktop Shortcut.
		NOTE If a *Windows* Desktop Shortcut was not created for the MMI Connection, access the connection from the *Windows* Start Menu by selecting: **Programs > Accessories > Hyperterminal > HyperTerminal > <*Named HyperTerminal Connection (e.g., MMI Session)*>**
	4	Once the MMI 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 3-9: LMF Computer Common MMI Connections



Online Help

Task oriented Online Help is available in the LMF by clicking **Help** in the Window Menu Bar, and selecting **LMF Help** from the Pull–down Menu.

Pinging the BTS

For proper operation, the integrity of the 10Base–2 Ethernet LAN A and B Links must be verified. Figure 3-10 represents a typical BTS Ethernet Configuration for an *SC*4812T Lite Stand–alone Frame. The drawing depicts cabling and terminators for both the A and B LANs.

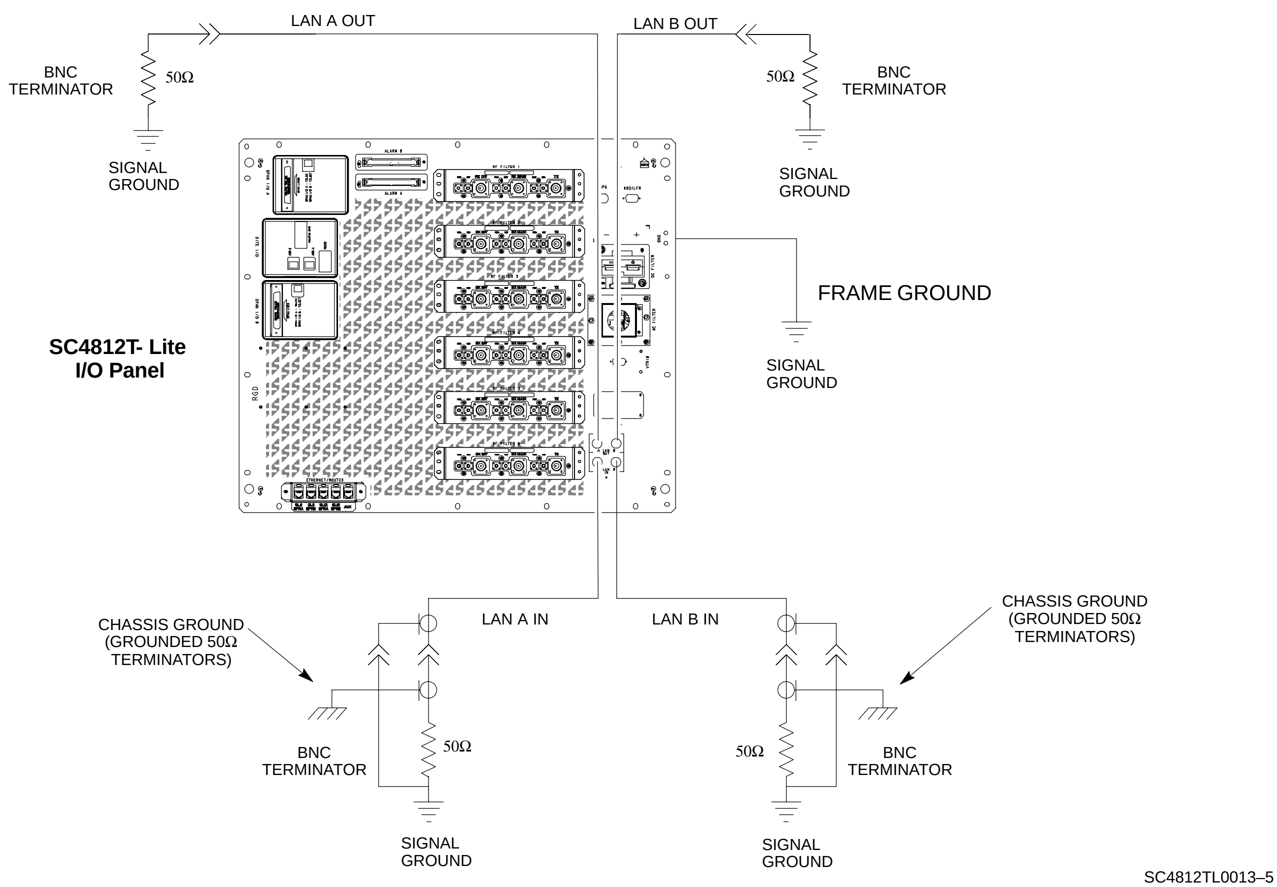
”Ping” is a program that sends Request Data Packets to hosts on a network, in this case GLI Cards on the BTS LAN, to obtain a response from the “Target” Host specified by an IP Address.

Perform the steps in Table 3-15 to ping each processor (on both LAN A and LAN B) and verify that LAN Redundancy is working properly.

CAUTION

Always wear an approved Anti–static Wrist Strap while handling any circuit card/module to prevent damage by Electrostatic Discharge (ESD).

Figure 3-10: BTS 10base–2 Ethernet LAN Terminator



NOTE

The Ethernet LAN A and B Cables and/or Terminators must be installed on each BTS Frame/Enclosure External LAN Connector before performing this test. All other Processor Card LAN Connections are made through the backplanes.

Table 3-15: Pinging the Processors Procedure

✓	Step	Action
	1	If this is a *first–time communication* with a newly–installed frame *or* a GLI Card that has been replaced: – Perform the procedure in Table 6-4. – Then, return to Step 2.
	2	Ensure that any uncabled LAN A and B IN and OUT Connectors are terminated with 50 Ω Loads.
	3	*If it has not already been done*, connect the LMF Computer to BNTS LAN A. – Refer to Table 3-6 and Figure 3-3, or Table 3-7 and Figure 3-4.
	4	*If it has not already been done*, start a *GUI* LMF Session and log into the BTS . – Refer to Table 3-10.
	5	At the I/O Panel, remove the 50Ω Terminator on the Frame LAN B IN Connector. – The LMF session should remain active.
	6	Replace the 50Ω Terminator on the BTS Frame LAN B IN Connector.
	7	From the *Windows* Desktop, click the **Start** Button and select **Run**.
	8	In the **Open** Box, type **`ping`** and the INS_ACTIVE **GLI IP Address** (for example, **`ping 128.0.0.2`**). **NOTE** 128.0.0.2 is the Default IP Address for the GLI Card in Slot GLI–1 in operational BTS Units.

	9	Click on **OK**.
		• If the targeted GLI Card responds, a DOS Window will appear with a display similar to the following:
		`Reply from 128.0.0.2: bytes=32 time=3ms TTL=255`
		• If the GLI responds, *proceed to Step 19*.
		• If there is no response, the following is displayed:
		`Request timed out`
		• If the GLI fails to respond, *proceed to Step 10*.

table continued on next page

Table 3-15: Pinging the Processors Procedure		
✓	Step	Action
	10	Reset and re–Ping the target MGLI. • If the GLI ***does respond***, *proceed to Step 19*. • If the GLI ***does not respond***, typical problems to check are as follows: – Failure of the LMF to Login. – Shorted BNC–to–Inter-Frame Cabling – Open cables – Crossed A and B Link Cables – GLI problem
	11	Logout of the BTS as described in Table 3-12, exit from the LMF Program, and restart the *Windows* Operating System on the LMF Computer.
	12	Restart the LMF *GUI* Program as described in *WinLMF On-Line Help SR2.16.x* , and log into the BTS as described in Table 3-10.
	13	Perform Step 7 through Step 9 again. • If the GLI ***does respond***, *proceed to Step 19*. • If the GLI ***does not respond***, *proceed to Step 14*.
	14	If the Ping Attempt was unsuccessful after restarting the LMF Computer: – Press the MGLI Front Panel Reset Button. – *Perform Step 7 through Step 9 again.* **NOTE** Refer to Table 6-1 if the Ping Attempt was unsuccessful after resetting the MGLI.
	15	After the BTS has been successfully pinged, ensure that the 50Ω Terminator is replaced on the BTS Frame LAN B IN Connector in the Power Entry Compartment (Figure 3-10).
	16	Disconnect the LMF Cable from the LAN Shelf LAN A Connector, and connect it to LAN B (right–hand Connector). – Refer to Figure 3-3.
	17	In the Power Entry Compartment, remove the 50Ω Terminator on the BTS Frame LAN A IN Connector.
	18	Repeat Step 5 through Step 9 using LAN B.
	19	After the BTS has been successfully pinged on the Secondary LAN, replace the 50Ω Terminator on the Frame LAN A IN Connector in the Power Entry Compartment.
	20	Disconnect the LMF Cable from the LAN Shelf LAN B and connect it to LAN A.
	21	Remove and replace the 50Ω Terminator on the LAN B IN Connector to force the MGLI to switch to Primary LAN A.
	22	Repeat Step 5 through Step 9 to ensure proper Primary LAN Operation.

Overview

Before a BTS can operate, each equipped device must contain Device Initialization (ROM) Code. ROM Code is loaded in all devices during manufacture, factory repair, or, for software upgrades, from the CBSC using the DownLoad Manager (DLM). Device Application (RAM) Code and Data must be downloaded to each equipped device by the user before the BTS can be made fully functional for the site where it is installed.

ROM Code

Downloading ROM Code to BTS Devices from the LMF is *NOT Routine Maintenance or a normal part of the Optimization Process.* It is only done in unusual situations where the resident ROM Code Release Level in the device is not compatible with the required Release Level of the Site Operating Software *and* the CBSC can not communicate with the BTS to perform the download.

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

Before ROM Code can be downloaded from the LMF, the correct ROM Code File for each device to be loaded must be present on the LMF Computer. ROM Code *must be manually selected* for download.

NOTE

The ROM Code File is not available for GLI3s. GLI3s are ROM Code loaded at the factory.

ROM Code can be downloaded to a device that is in any state. After the download is started, the device being downloaded changes to OOS_ROM (blue). The device will remain OOS_ROM (blue) when the download is completed.

A *compatible Revision Level* RAM Code must then be downloaded to the device. Compatible Code Loads for ROM and RAM must be used for the device type to ensure proper performance. The compatible Device Code Release Levels for the BSS Software Release being used are listed in the Version Matrix section of the SC™ CDMA Release Notes (supplied on the tape or CD–ROM containing the BSS Software).

RAM Code

Before RAM Code can be downloaded from the LMF, the correct RAM Code File for each device must be present on the LMF Computer. RAM Code can be automatically or manually selected depending on the **Device** Menu Item chosen and where the RAM Code File for the device is stored in the LMF File Structure.

The RAM Code File will be selected automatically if the file is in the ***<x>:\<lmf Home Directory>****\cdma\loads\n.n.n.n\code* Folder (where *n.n.n.n* is the download Code Version Number that matches the “NextLoad” Parameter of the CDF File). The RAM Code File in the Code Folder must have the correct Hardware BIN Number for the device to be loaded.

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

For non–GLI Devices, data must be downloaded after RAM Code is downloaded. To download data, the Device State must be OOS_RAM (yellow).

The devices to be loaded with RAM Code and Data are:

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

NOTE

The MGLI *must* be successfully downloaded with RAM Code and Data, and in INS_ACTIVE (bright green) Status *before* downloading any other device.

The RAM Code Download Process for an MGLI automatically downloads data and then enables the MGLI.

Verify GLI ROM Code Loads

Devices should not be loaded with a RAM Code Version that is not compatible with the ROM Code with which they are loaded. Before downloading RAM Code and Data to the Processor Cards, perform the procedure in Table 3-16 to verify that the GLI Devices are loaded with the correct ROM Code for the Software Release used by the BSS.

Prerequisite

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

Table 3-16: Verify GLI ROM Code Loads Procedure

✓	Step	Action
	1	***If it has not already been done***, start a *GUI* LMF Session and log into the BTS. – Refer to Table 3-10.
	2	Select all GLI Devices by clicking on them, and select **Device** > **Status** from the BTS Menu Bar.
	3	In the Status Report Window that opens, note the number in the **ROM Ver** Column for each GLI2.
	4	If the ROM Code loaded in the GLI Cards is *not* the correct one for the Software Release being used on the BSS, perform the following actions.
	4a	Log out of the BTS as described in Table 3-12 or Table 3-13, as applicable.
	4b	Disconnect the LMF Computer.
	4c	Reconnect the Span Lines as described in Table 5-4.
	4d	Have the CBSC download the correct ROM Code Version to the BTS Devices.
	5	When the GLI Cards have the correct ROM Load for the Software Release being used, perform the following actions.
	5a	Ensure that the Span Lines are disabled as outlined in Table 3-5.
	5b	Proceed to downloading RAM Code and Data.

3

Download RAM Code and Data to MGLI and GLI

Perform the procedure in Table 3-17 to download the RAM Code and Data to the MGLI and other installed GLI Devices.

Prerequisites

- Prior to performing these procedures, ensure that a Code File exists for each of the devices to be loaded.
- The LMF Computer is connected to the BTS.
  – Refer to Table 3-6.
- The LMF Computer is logged in using the GUI Environment.
  – Refer to Table 3-10.

Table 3-17: Download and Enable MGLI and GLI Devices Procedure

✓	Step	Action
	1	Ensure that the LMF will use the correct Software Release for Code and Data Downloads by performing the following actions:
	1a	Click on **Tools** in the LMF Menu Bar, and select **Update NextLoad > CDMA** from the Pull–down Menu.
	1b	Click on the BTS to be loaded. – The BTS will be highlighted.
	1c	Click the button next to the correct Code Version for the Software Release being used. – A black dot will appear in the Button Circle.
	1d	Click **Save.**
	1e	Click **OK** to close each of the advisory Boxes that appear.
	2	Prepare to download code to the MGLI by clicking on the device.
	3	Click **Device** in the BTS Menu Bar, and select **Download > Code/Data** in the Pull–down Menu. – A Status Report is displayed confirming change in the device(s) status.
	4	Click **OK** to close the Status Window. – The MGLI will automatically be downloaded with data, and then enabled.
	5	Once the MGLI is enabled, load and enable the additional installed GLI Cards by clicking on the devices and repeating Step 3 and Step 4.
	6	Click **OK** to close the Status Window for the additional GLI Devices.

Download RAM Code and Data to Non–GLI Devices

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

NOTE

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

Perform the procedure in Table 3-18 to download RAM Code and Data to non–GLI Devices.

Table 3-18: Download RAM Code and Data to Non–GLI Devices Procedure

✓	Step	Action
	1	Select the target CSM, MCC, and/or BBX Card(s) by clicking on them.
	2	Click **Device** in the BTS Menu Bar, and select **Download > Code/Data** in the Pull–down Menu. – A Status Report is displayed that shows the results of the download for each selected device.
	3	Click **OK** to close the Status Report Window when downloading is completed.
		NOTE After a BBX, CSM, or MCC Card is successfully loaded with RAM Code and Data has changed to the OOS_RAM State (yellow), the Status LED should be rapidly flashing GREEN.
		NOTE The command in Step 2 loads both code and data. Data can be downloaded without doing a Code Download anytime a device is OOS–RAM by using the command in Step 4.
	4	To download just the Firmware Application Data to each device, select the target device and select: **Device>Download>Data**

When BBX Cards Remain OOS_ROM

When BBX Cards remain OOS_ROM (blue) after Power–up or following Code Load, refer to Table 6-8, Step 9 and Step 10.

Selecting CSM Clock Source and Enabling CSM Cards

CSM Cards must be enabled prior to enabling the MCC Cards. Procedures in the following two sub-sections cover the actions to accomplish this. For additional information on the CSM Subsystem, see “Clock Synchronization Manager (CSM) Subsystem Description” in the CSM System Time – GPS and HSO Verification section of this chapter.

GPS Satellite System

The GPS Satellite System Satellites are maintained and operated by the United States Department of Defense (DOD). The DOD periodically alters satellite orbits; they are not in geo–synchronous orbits. Therefore, satellite trajectories are subject to change.

A GPS Receiver that is in service (INS) contains an “Almanac” that is updated periodically to take these changes into account.

- If a GPS Receiver has not been updated for a number of weeks, it may take up to an hour for the GPS Receiver “Almanac” to be updated.
- Once updated, the GPS Receiver must track at least four satellites and obtain (hold) a 3–D position fix for a minimum of 45 seconds before the CSM will come in service. In some cases, the GPS Receiver needs to track only one satellite, depending on Accuracy Mode set during the Data Load.

Select CSM Clock Source

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

- Local GPS
- Mate GPS
- Remote GPS
- HSO (only for Sources 2 and 3)
- HSO Extender
- 10 MHz (only for Sources 2 and 3)
- NONE (only for Sources 2 and 3)

Prerequisites

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

Perform the procedure in Table 3-19 to select a CSM Clock Source.

Table 3-19: Select CSM Clock Source Procedure		
✓	**Step**	**Action**
	1	Select the applicable CSM(s) for which the Clock Source is to be selected.
	2	Click on **Device** in the BTS Menu Bar, and select **CSM/MAWI > Select Clock Source...** in the Pull–down Menu. – A CSM Clock Reference Source Selection Window will appear.
	3	Select the applicable Clock Source in the **Clock Reference Source** Pick List.
	4	Uncheck the related Check Boxes for Clock Reference Sources 2 and 3 if you do not want the displayed Pick List Items to be used.
	5	Click on the **OK** Button. – A Status Report is displayed showing the results of the operation.
	6	Click on the **OK** Button to close the Status Report Window.

NOTE

For RF–GPS, verify that the CSM configured with the GPS Receiver "Daughter Board" is installed in the frame's CSM 1 Slot before continuing.

Enable CSM Cards

Perform the procedure in Table 3-20 to enable the CSM Cards installed in the SCCP Cage.

Table 3-20: Enable CSM Cards Procedure		
✓	**Step**	**Action**
		NOTE If equipped with two CSM Cards, enable the CSM Card in Slot CSM 2 first.
	1	Click on the target CSM.
	2	Click on **Device** in the BTS Menu Bar, and select **Enable** in the Pull–down Menu. – A Status Report is displayed showing the results of the Enable Operation.
	3	Click on **OK** to close the Status Report Window.
		NOTE The CSM Card in the CSM 1 Slot interfaces with the GPS Receiver. The Enable Sequence for this card can take up to ***one hour***. FAIL may be shown in the Status Report Table for a Slot CSM 1 Enable Action. – If "**Waiting For Phase Lock**" is shown in the Description Field, do not cancel the Enable Process; the CSM changes to the Enabled State after Phase Lock is achieved.

. . . continued on next page

table continued on next page

Table 3-20: Enable CSM Cards Procedure		
✓	Step	Action
		NOTE If two CSM Cards are installed and the CSM Card in the CSM 1 Slot has enabled, the LMF CSM Cage View should show Slot CSM 1 as bright green (INS–ACT) and Slot CSM 2 as dark green (INS_STANDBY). – After the CSM Cards have been successfully enabled, ensure that the PWR/ALM LEDs are steady green (alternating green/red indicates that the card is in the Alarm State).
	3	If more than an hour has passed without the CSM Card in the CSM 1 Slot enabling, refer to the CSM System Time – GPS and HSO Verification section of this chapter. – Refer to Table 3-23, Figure 3-11, and Table 3-24 to determine the cause.

Enable MCC Cards

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).

Perform the procedure in Table 3-21 to enable the MCC Cards installed in the SCCP Cage.

NOTE

The MGLI and Primary CSM must be downloaded and enabled (IN–SERVICE ACTIVE), prior to downloading and enabling an MCC.

Table 3-21: Enable MCC Cards Procedure		
✓	Step	Action
	1	If the GLI/MCC/BBX View is not displayed in the LMF Window, click on the GLI/MCC/BBX Area of the SCCP Cage.
	2	Click on the target MCC(s). OR Click on **Select** in the BTS Menu Bar, and select **MCC Cards** in the Pull–down Menu.
	3	Click on **Device** in the BTS Menu Bar, and select **Enable** in the Pull–down Menu. – A Status Report is displayed showing the results of the Enable Operation.
	4	Click **OK** to close the Status Report Window.

Clock Synchronization Manager (CSM) Subsystem Description

Overview

Each BTS CSM Subsystem features two CSM Cards per RF Modem Frame. The primary function of the CSM Cards is to maintain CDMA System Time. GPS is used as the Primary Timing Reference and Synchronizes the entire Cellular System.

In typical operation, the Primary CSM locks its Digital Phase Locked Loop (DPLL) Circuits to GPS Signals. These signals are provided by either an on–board GPS Receiver Module (RF–GPS) or a Remote GPS Receiver (RGPS).

RGPS uses a GPS Receiver in the Antenna Head that has a Digital Output. The second generation CSM Card (CSM–II) is required when using the RGPS. A CSM–II Card can also be equipped with a Local GPS Receiver Daughter Card to support an RF–GPS Signal..

SCCP Cage CSM Card Slot Assignments

The GPS Receiver is interfaced to the CSM Card in SCCP Cage Slot CSM 1. This card is the Primary Timing Source, while the CSM Card in Slot CSM 2 provides Redundancy. The redundant card, does not have a GPS Receiver..

CSM–II Card Type Description

Each CSM–II Card features a temperature–stabilized Crystal Oscillator that provides 19.6608 MHz Clock, Even–Second Pulse, and 3 MHz Reference Signals to the Synchronization Source selected from the following list.

– Refer to Table 3-24 for Source Selection/Verification Procedures..

- GPS: Local/RF–GPS or Remote/RGPS
- High Stability Oscillator (HSO)
- External Reference Oscillator Sources

CDMA Clock Distribution Card (CCD) Description

CCD Cards buffer and distribute Even–Second Reference and 19.6608 MHz Clock Signals from the CSM Cards. CCD 1 is married to the CSM 1 Card in the CSM 1 Slot, and CCD 2 is married to the CSM 2 Card in Slot CSM 2..

CSM Card Redundancy

The BTS switches between the Primary and Redundant units (Card Slots CSM 1 and CSM 2, respectively) upon failure or command. A failure in CSM 1 or CCD 1 will cause the system to switch to the CSM 2/CCD 2 Redundant Card Pair. GPS Timing Synchronization is continually maintained between the Primary and Redundant CSM/CCD Pairs..

3

Secondary Timing References

The BTS may be equipped with a High Stability Oscillator (HSO), or External 10 MHz Rubidium Source that the CSM can use as a Secondary Timing Reference. Continuous GPS Synchronization is maintained for the HSO Secondary Timing References. The CSM monitors and determines what reference to use at a given time..

Timing Source Fault Management

Fault Management has the capability of switching between the GPS Synchronization Source and the HSO Back–up Source in the event of a GPS Receiver failure. During normal operation, the CSM Card in the CSM 1 Slot selects GPS as the Primary Timing Source (Table 3-24). The Source Selection can also be overridden via the LMF or by the System Software..

Front Panel LEDs

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

Table 3-22: CSM Card PWR/ALM LED States

LED State	Device Status
Solid GREEN	Master CSM is locked on to the GPS or LFR while operating in INS_ACTIVE or INS_STANDBY Mode. – No alarm present.
Solid RED	1. Color during System Initialization. 2. Alarm (Fault) Mode – An alarm is being reported.
Fast Flashing GREEN	Standby CSM is locked on to the GPS or LFR while in INS_STANDBY Mode. – No alarm present.
Alternating Slow Flashing RED/ Fast Flashing GREEN	OOS_ROM Mode – An alarm is being reported.
Fast Flashing GREEN	1. OOS_RAM Mode 2. INS_ACTIVE Mode in DUMB Configuration. – No alarm present.
Alternating Fast Flashing RED/ Fast Flashing GREEN	OOS_RAM Mode – An alarm is being reported.

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Table 3-22: CSM Card PWR/ALM LED States	
LED State	**Device Status**
Alternating Fast Flashing RED/ Slow Flashing GREEN	OOS_RAM Mode and attempting to lock on to the GPS Signal. – An alarm is being reported.
Solid YELLOW	After a reset, the CSMs begin to boot. Color during the SRAM Test and the Flash EPROM Code Check Test. – If SRAM or Flash EPROM Tests fail, the LED changes to Steady RED and the CSM attempts to reboot.
OFF	1. No DC Power to the card. 2. The on-board fuse is open.

3

High Stability Oscillator (HSO)

The CSM and the HSO

The CSM performs the overall Configuration and Status Monitoring Functions for the HSO. In the event of GPS failure, the HSO is capable of maintaining Synchronization initially established by the GPS Reference Signal..

HSO

The HSO is a High Stability 10 MHz oscillator with the necessary interface to the CSM Cards. Since the HSO is a free–standing oscillator, System Time can only be maintained for 24 hours..

Upgrades and Expansions: HSO2/HSOX

The HSO2 (second generation card) exports a Timing Signal to other BTS Frames located at a site. These Expansion Frames require an HSO Expansion (HSOX) Card.

The HSOX accepts input from the Starter Frame and interfaces with the CSM Cards in the Expansion Frames. HSO, HSO2, and HSOX use the same Source Code in Source Selection (Table 3-24).

NOTE

Allow the **BTS and Test Equipment to warm–up for 60 minutes** after any interruption in Oscillator Power.

– CSM Warm-up allows the Oscillator Oven Temperature and Oscillator Frequency to stabilize prior to test.

– Test Equipment Warm-up allows the Rubidium Standard Time Base to stabilize in frequency before any measurements are made.

CSM Frequency Verification

The objective of this procedure is the initial verification of the Clock Synchronization Module (CSM) Cards before performing the RF Path Verification Tests.

Test Equipment Set–up (GPS and HSO Verification)

Perform the procedure in Table 3-23 to set–up Test Equipment.

Table 3-23: Test Equipment Set–up (GPS and HSO Verification) Procedure

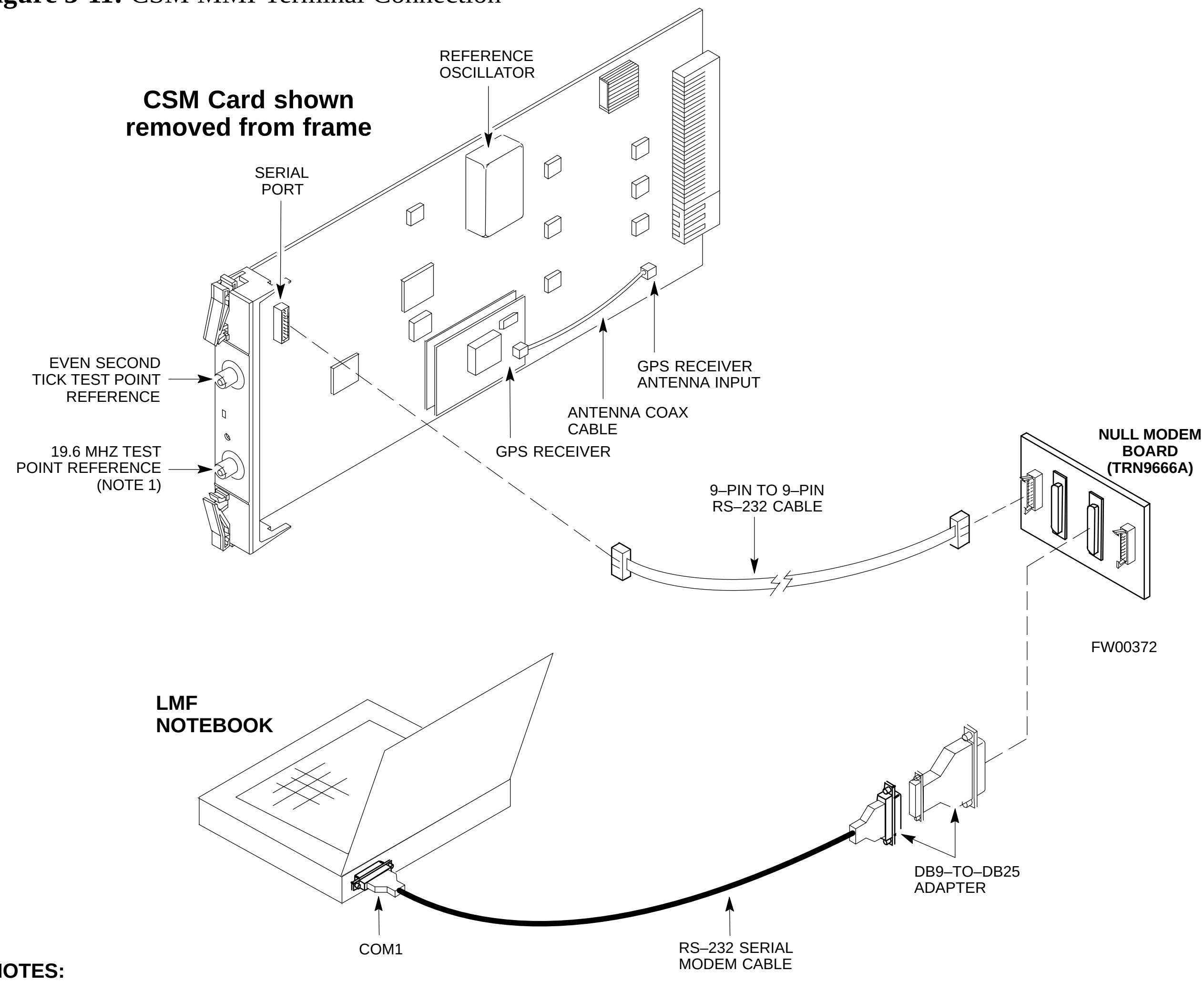
Step	Action
1	Perform one of the following as required by installed equipment:
1a	For **Local GPS** (RF–GPS): Verify that a CSM Card with a GPS Receiver is installed in the Primary CSM Slot, CSM 1, and that the card is INS_ACTIVE (bright green). – Verify by checking the Card Ejector Tabs for Kit Number **SGLN1145** on the card in the CSM 1 Slot.
1b	For **Remote GPS** (RGPS): Verify that a CSM–II Card is installed in Primary Slot CSM 1 and that the card is INS_ACTIVE (bright green). – Verify by checking the Card Ejector Tabs for Kit Number **SGLN4132ED** or subsequent.
2	Remove CSM 2 (if installed) and connect a Serial Cable from the LMF COM 1 Port (via Null Modem Card) to the MMI Port on CSM 1. – Refer to Figure 3-11.
3	Reinstall CSM 2.
4	Start an MMI Communication Session with CSM 1 by using the *Windows* Desktop Shortcut Icon. – Refer to Table 3-14 .
5	When the Terminal Screen appears press the **Enter** Key until the `CSM>` Prompt appears.

CAUTION

In the Power Entry Compartment, connect the GPS Antenna to the RF GPS Connector **ONLY**.

Damage to the GPS Antenna and/or *receiver* can result if the GPS Antenna is inadvertently connected to any other RF Connector.

Figure 3-11: 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

Prerequisites

Ensure the following prerequisites have been met before proceeding:

- The Primary CSM and HSO (if equipped) has been warmed–up for at least 15 minutes.
- The LMF Computer is connected to the MMI Port of the Primary CSM as shown in Figure 3-11.
- An MMI Communication Session has been started (Table 3-14), and the CSM> Prompt is present in the HyperTerminal Window (Table 3-23).

Perform the procedure in Table 3-24 to initialize and verify proper GPS Receiver Functionality.

Table 3-24: GPS Initialization/Verification Procedure

✓	Step	Action

	1	To verify that the following messages are displayed within the report, issue the following MMI Command.
		`Clock alarms (0000), Dpll is locked and has a Reference Source`
		`GPS self test passed`
		bstatus
		– The system will display a response similar to the following:
		`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	Enter the following command at the CSM> Prompt to display the current status of the Timing Sources.
		sources
		– When equipped with HSO, the system will generate a response similar to the following:
		`Num Source Name Type TO Good Status Last Phase Target Phase Valid`
		`---------------------------------------------------------------------`
		`0 Local GPS Primary 4 Yes Good 3 0 Yes`
		`1 HSO Backup 4 No N/A timed-out* Timed-out* No`
		NOTE
		Verify that the HSO is FULLY SEATED and LOCKED to prevent any possible card warpage.
		“Timed–out” should only be displayed while the HSO is warming up.
		“Not–Present” or “Faulty” should not be displayed.

table continued on next page

✓	Step	Action
Table 3-24: GPS Initialization/Verification Procedure		
	3	If the HSO does not appear as one of the sources, then configure the HSO as a Back–up Source by entering the following command at the CSM> Prompt. `csm>`**`ss 1 12`** – After a maximum of 15 minutes, the Rubidium Oscillator should reach operational temperature and the PWR/ALM LED on the HSO should now have changed from red to green. • If the LED is green, *proceed to Step 5.* • If the LED is RED, *proceed to Step 4.*
	4	verify that the HSO had been powered–up for at least 5 minutes. – After the oscillator temperature is stable, the LED should go GREEN. – ***Wait for this to occur before continuing!***
	5	After the HSO LED has changed to green, enter the following command at the CSM> Prompt. `csm>`**sources <cr>** – The HSO should be valid within one (1) minute, assuming the DPLL is locked and the HSO Rubidium Oscillator is fully warmed.

	6	Verify that the HSO is now a valid source by confirming that the bold text below matches the response of the “sources” command.
		`Num  Source Name  Type     TO  Good   Status  Last Phase  Target Phase Valid`
		`---------------------------------------------------------------------------`
		`0    Local GPS    Primary  4   Yes    Good         3            0       Yes`
		`1    HSO          Backup   4   Yes``    N/A     xxxxxxxxxx   xxxxxxxxxx  `**`Yes`**
		• If “timed out” ***is displayed*** in the Last Phase column, suspect the HSO Output Buffer or Oscillator to be defective.
		– Replace the HSO before proceeding.
		• If “timed out” ***is not displayed*** in the “Last Phase” Column, *proceed to Step 7.*

	7	HSO Information (underlined text above in Step 6, verified from left to right) is usually the #1 Reference Source. – If this is not the case, *proceed to Step 8.*
	8	At the OMC–R, determine if the correct BTS Timing Source has been identified in the database by entering the following command. `omc–000000 >`**display bts csmgen**
	9	From the system response to the command in Step 8, if the correct BTS Timing Source is not listed, enter the following command to make corrections to the database. `omc–000000 >`**edit csm csmgen refsrc**

table continued on next page

Table 3-24: GPS Initialization/Verification Procedure

✓	Step	Action
	10	Verify that the following GPS information (underlined text in Step 6) is true. – The GPS is usually the “0” Reference Source. – At least one Primary Reference Source must indicate “Status = good” and “Valid = yes” to bring the site up.

	11	Enter the following command at the `CSM>` Prompt to verify that the GPS Receiver is in Tracking Mode.
		`csm>`**gstatus**
		Observe the following typical system 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.`

	12	Verify the following GPS information (shown in Step 11 above in underlined text): – At least four satellites are being tracked, and four 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.

table continued on next page

Table 3-24: GPS Initialization/Verification Procedure		
✓	**Step**	**Action**
	13	**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.
	14	**If Steps 1 through 12 pass, the GPS is good.** **NOTE** If any of the above mentioned areas fail, verify that: • If *Initial Position Accuracy* is "estimated" (typical), at least four satellites must be tracked and visible (one satellite must be tracked and visible if actual Latitude, Longitude, 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. – The GPS will not automatically survey and update its position. • The GPS Antenna is not obstructed or misaligned. • The GPS Antenna Connector Center Conductor measures approximately +5V DC with respect to the Shield. • There is no more than 4.5 dB of Signal Loss between the GPS Antenna OSX Connector and the BTS Frame GPS Input. • Any Lightning Protection installed between the GPS Antenna and the BTS Frame is installed correctly.
	15	Enter the following command at the `CSM>` Prompt to verify that the CSM is warmed–up and that GPS Acquisition has taken place. `csm>`**debug dpllp** • If the CSM ***is warmed–up***, *proceed to Step 17.* • If the CSM ***is not warmed–up*** (15 minutes from application of power), *proceed to Step 16.*

	16	Observe the following typical response if the CSM is not warmed–up.
		`CSM>DPLL Task Wait. 884 seconds left.`
		`DPLL Task Wait. 882 seconds left.`
		`DPLL Task Wait. 880 seconds left.   ...........etc.`
		NOTE
		The **warm** command can be issued at the MMI Port used to force the CSM into Warm–up Mode, but the Reference Oscillator will be unstable.

	17	Observe the following typical response if the CSM is warmed–up.
		`c:17486 off: -11, 3, 6 TK SRC:0 S0: 3 S1:-2013175,-2013175`
		`c:17486 off: -11, 3, 6 TK SRC:0 S0: 3 S1:-2013175,-2013175`
		`c:17470 off: -11, 1, 6 TK SRC:0 S0: 1 S1:-2013175,-2013175`
		`c:17486 off: -11, 3, 6 TK SRC:0 S0: 3 S1:-2013175,-2013175`
		`c:17470 off: -11, 1, 6 TK SRC:0 S0: 1 S1:-2013175,-2013175`
		`c:17470 off: -11, 1, 6 TK SRC:0 S0: 1 S1:-2013175,-2013175`

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Table 3-24: GPS Initialization/Verification Procedure		
✓	Step	Action
	18	Verify the following GPS information (underlined text in Step 17, 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.
	19	Enter the following commands at the `CSM>` Prompt to exit the Debug Mode Display. `csm>`**debug dpllp**

Connecting Test Equipment to the BTS

The following types of Test Equipment are required to perform Calibration and ATP Tests:

- LMF
- Communications System Analyzer Model supported by the LMF
- Power Meter Model supported by the LMF (required when using the HP 8921A/600 and Advantest R3465 Analyzers)
- Non–radiating Transmit Line Termination Load
- Directional Coupler and In–line Attenuator
- RF Cables and Adapters

Refer to Table 3-25 for an overview of Test Equipment Connections for currently supported by the LMF. In addition, see the following figures:

- Figure 3-16, Figure 3-17, and Figure 3-18 show the Test Set Connections for TX Calibration
- Figure 3-20 through Figure 3-25 show the Test Set Connections for Optimization/ATP Tests

Test Equipment GPIB Address Settings

All Test Equipment is controlled by the LMF through an IEEE–488/GPIB Bus. To communicate on the Bus, each piece of Test Equipment must have a GPIB Address Set that the LMF will recognize. The Standard Address Settings used by the LMF for the various types of Test Equipment Items are as follows:

- Signal Generator Address: **1**
- Power Meter Address: **13**
- Communications System Analyzer Address: **18**

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

Supported Test Equipment

CAUTION

To prevent damage to the Test Equipment, all Transmit (TX) Test Connections must be through a 30 dB Directional Coupler *plus* a 20dB In-line Attenuator for both the 800 MHz and 1.9 GHz BTSs.

IS–95A/B Operation

Optimization and ATP Testing for IS–95A/B Sites and Carriers may be performed using the following Test Equipment:

- CyberTest
- Advantest R3267 Spectrum Analyzer with R3562 Signal Generator
- Advantest R3465 Spectrum Analyzer with R3561L Signal Generator and HP–437B or Gigatronics Power Meter
- Agilent E4406A Transmitter Test Set with E4432B Signal Generator
- Agilent 8935 Series E6380A Communications Test Set (formerly HP 8935)
- Hewlett–Packard HP 8921 (with CDMA Interface and, for 1.9 GHz, PCS Interface) and HP–437B or Gigatronics Power Meter
- Spectrum Analyzer (HP8594E) – *optional*
- Rubidium Standard Timebase – *optional*

CDMA2000 1X Operation

Optimization and ATP Testing for CDMA2000 1X Sites and Carriers may be performed using the following Test Equipment:

- Advantest R3267 Spectrum Analyzer with R3562 Signal Generator
- Agilent E4406A Transmitter Test Set with E4432B Signal Generator
- Agilent 8935 Series E6380A Communications Test Set (formerly HP 8935) with Option 200 or R2K and with E4432B Signal Generator for 1X FER
- Agilent E7495A Communications Test Set

Test Equipment Preparation

See Appendix F for specific steps to prepare each type of Test Set and Power Meter to perform Calibration and ATP.

Agilent E7495A Communications Test Set requires additional set–up and preparation. This is described in detail in Appendix F.

Test Equipment Connection Charts

To use the following charts to identify necessary Test Equipment Connections, locate the Communications System Analyzer being used in the **COMMUNICATIONS SYSTEM ANALYZER** Columns, and read down the column. Where a dot appears in the column, connect one end of the Test Cable to that Connector. Follow the horizontal line to locate the end connection(s), reading up the column to identify the appropriate Test Equipment and/or BTS Connector.

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IS–95A/B–only Test Equipment Connections

Table 3-25 depicts the Interconnection Requirements for currently available Test Equipment *supporting IS–95A/B only* that meets Motorola Standards and is supported by the LMF.

Table 3-25: IS–95A/B–only Test Equipment Interconnection

SIGNAL	COMMUNICATIONS SYSTEM ANALYZER				ADDITIONAL TEST EQUIPMENT				BTS
	Cyber–Test	Advantest R3465	HP 8921A	HP 8921 W/PCS	Power Meter	GPIB Interface	LMF	Attenuator and Directional Coupler	
EVEN SECOND SYNCHRONIZATION	EVEN SEC REF	EVEN SEC SYNC IN	EVEN SECOND SYNC IN	EVEN SECOND SYNC IN					SYNC MON-ITOR
	●								●
		●							●
			●						●
				●					●
19.6608 MHZ CLOCK	TIME BASE IN	CDMA TIME BASE IN	CDMA TIME BASE IN	CDMA TIME BASE IN					FREQ MON-ITOR
	●								●
		●							●
			●						●
				●					●
CONTROL IEEE 488 BUS	IEEE 488	GPIB	HP–I B	HP–IB	HP–IB	GPIB	SERIAL PORT		
	●					●	●		
		●			●	●	●		
			●		●	●	●		
				●	●	●	●		
TX TEST CABLES	RF IN/OUT	INPUT 50Ω	RF IN/OUT	RF IN/OUT				20 DB ATTEN. / BTS PORT	TX1–6
	●								●
		●						● - - ●	●
			●					● - - ●	●
				●				● - - ●	●
RX TEST CABLES	RF GEN OUT	RF OUT 50Ω	DUPLEX OUT	RF OUT ONLY					RX1–6
	●								●
		●							●
			●						●
				●					●

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

Table 3-26 depicts the Interconnection Requirements for currently available Test Equipment supporting *both* CDMA 2000 1X *and* IS–95A/B that meets Motorola Standards and is supported by the LMF.

Table 3-26: CDMA2000 1X/IS–95A/B Test Equipment Interconnection

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

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

Equipment Warm-up

NOTE

To assure BTS stability and contribute to Optimization accuracy of the BTS, warm-up the BTS Test Equipment prior to performing the BTS Optimization Procedure as follows:

- Agilent E7495A for a minimum of 30 minutes
- All other Test Sets for a minimum of 60 minutes

Time spent running initial or normal Power-up, Hardware/ Firmware Audit, and BTS Download counts as Warm-up Time.

WARNING

Before installing any Test Equipment directly to any BTS **TX OUT Connector**, verify that there are *no* CDMA Channels keyed.

- At active sites, have the OMC-R/CBSC place the antenna (sector) assigned to the BBX under test to out of service (OOS). Failure to do so can result in serious personal injury and/or equipment damage.

Automatic Cable Calibration Set–up

Figure 3-12 and Figure 3-13 show the Cable Calibration Set–up for the Test Sets supported by the LMF. The left side of the diagram depicts the location of the Input and Output Connectors of each Test Equipment Item, and the right side details the connections for each test. Table 3-32 provides a procedure for performing Automatic Cable Calibration.

Manual Cable Calibration

If Manual Cable Calibration is required, refer to the procedures in Appendix F.

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

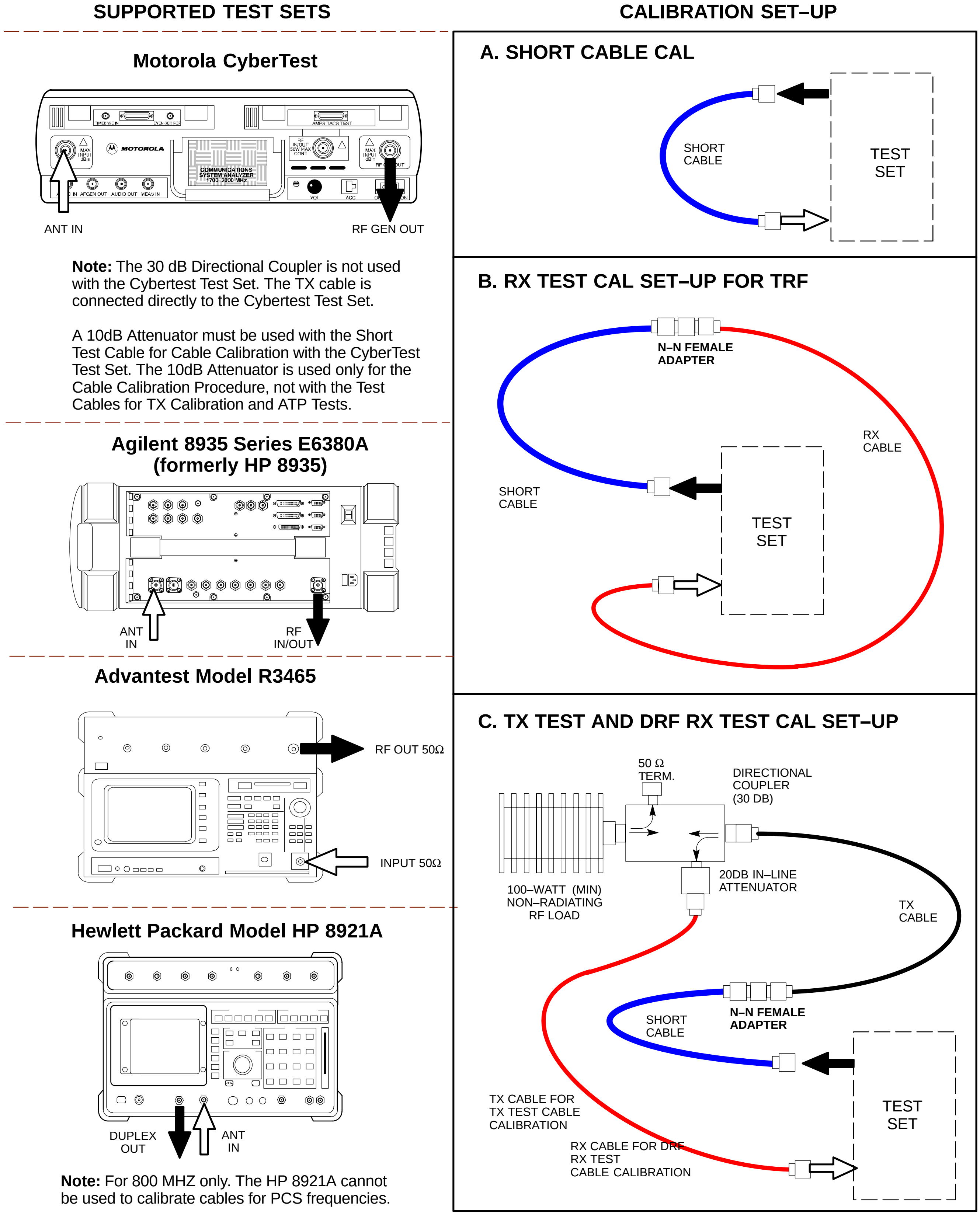
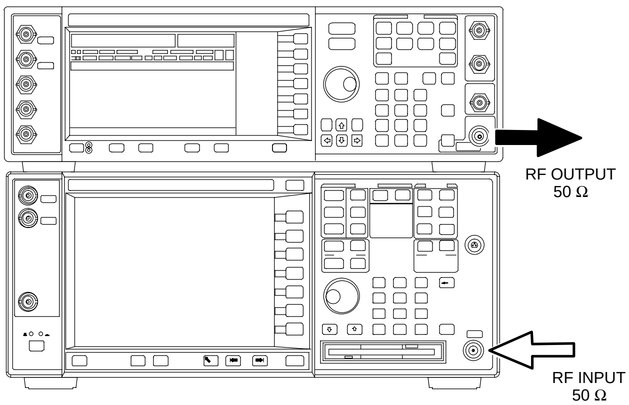


Figure 3-13: IS–95A/B and CDMA 2000 1X Cable Calibration Test Set–up – Agilent E4406A/E4432B and Advantest R3267/R3562

SUPPORTED TEST SETS

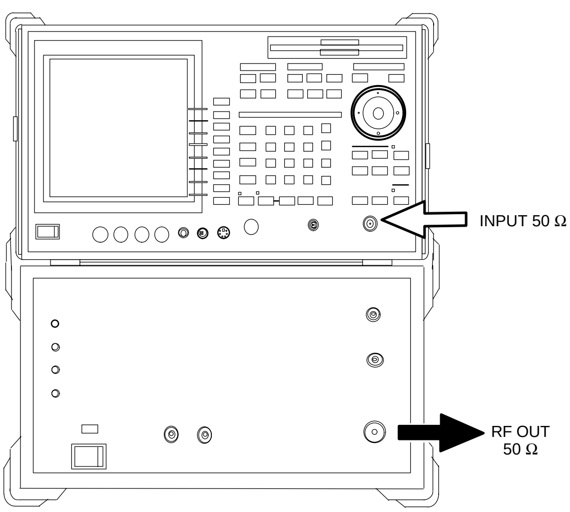
Agilent E4432B (Top) and E4406A (Bottom)



NOTE:

10 MHZ IN ON REAR OF SIGNAL GENERATOR IS CONNECTED TO **10 MHZ OUT (SWITCHED)** ON REAR OF TRANSMITTER TESTER (FIGURE F-18).

Advantest R3267 (Top) and R3562 (Bottom)



NOTE:

SYNTHE REF IN ON REAR OF SIGNAL GENERATOR IS CONNECTED TO **10 MHZ OUT** ON REAR OF SPECTRUM ANALYZER

CALIBRATION SET–UP

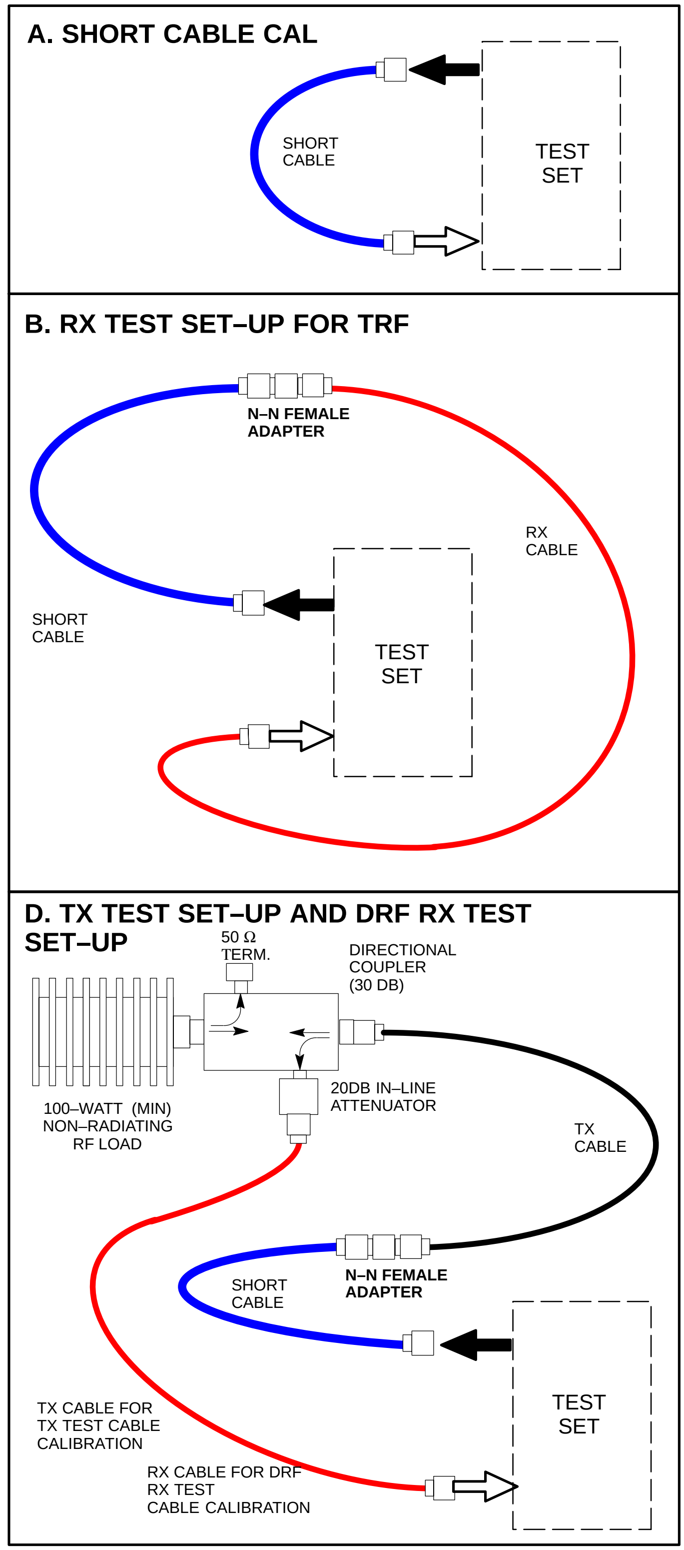


Figure 3-14: CDMA2000 1X Cable Calibration Test Set–up – Agilent 8935/E4432B

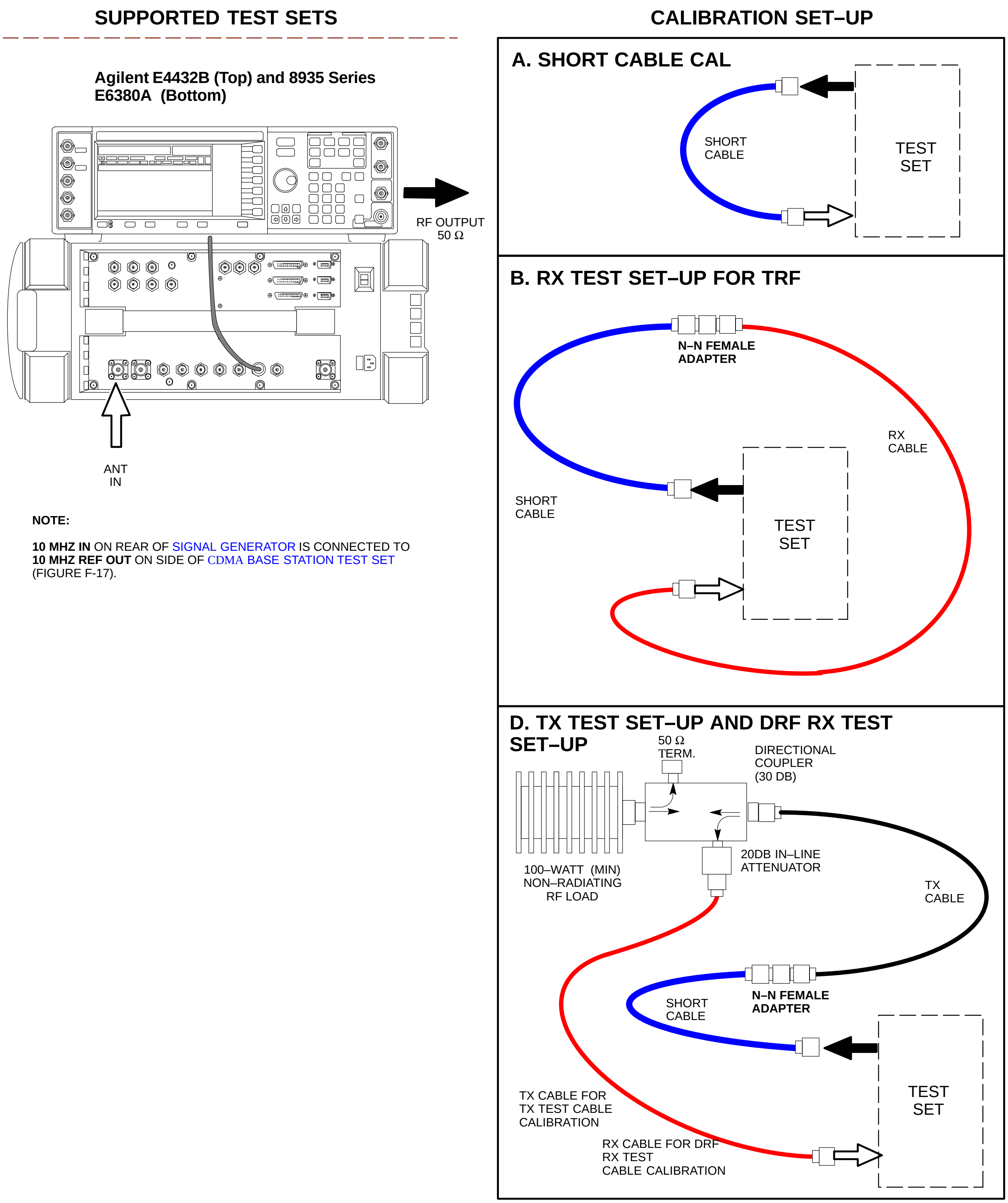
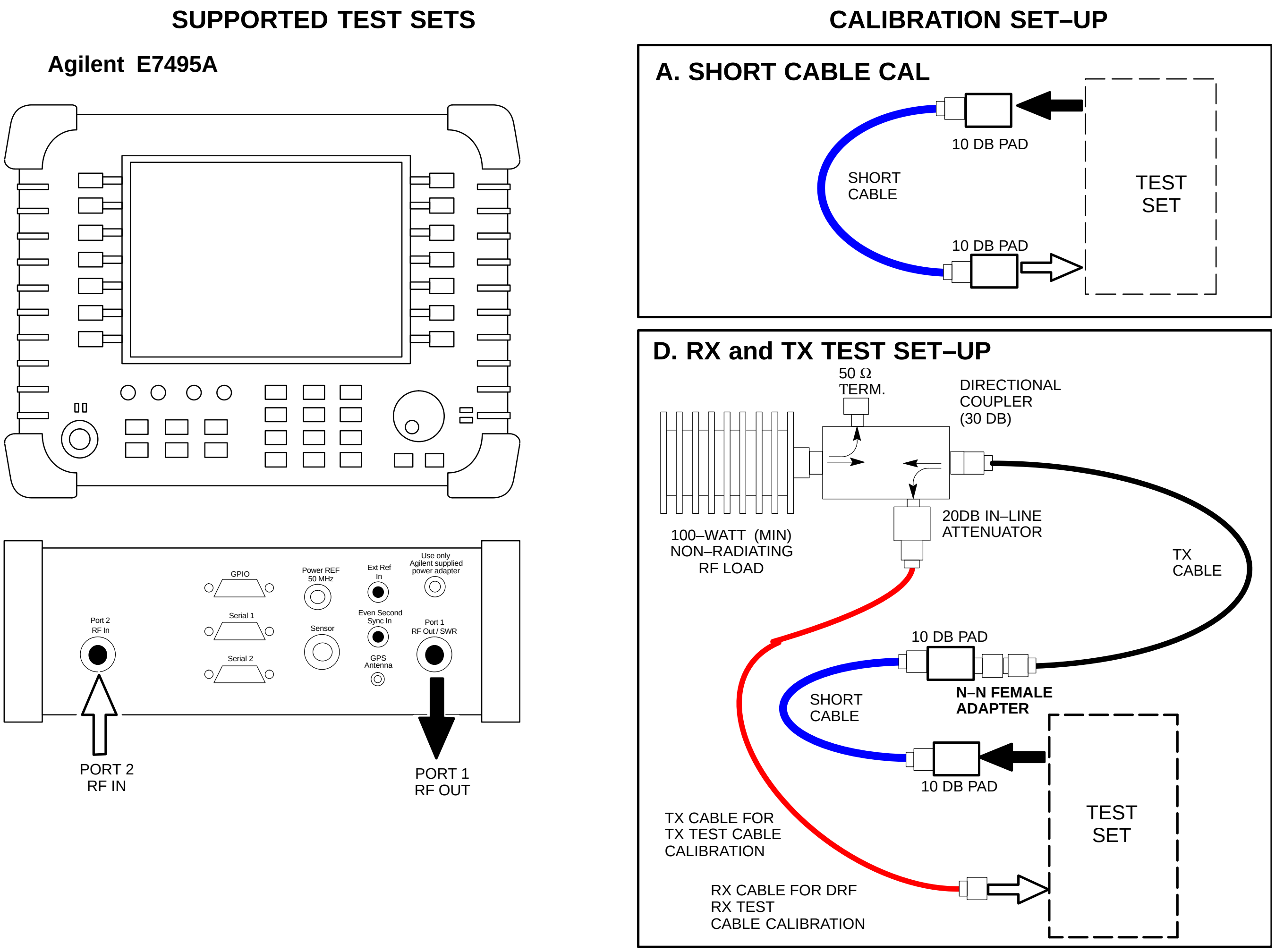


Figure 3-15: CDMA2000 1X Cable Calibration Test Set–up – Agilent E7495A



Set-up for TX Calibration

Figure 3-16 and Figure 3-17 show the Test Set Connections for TX Calibration.

Figure 3-16: TX Calibration Test Set–up – CyberTest (IS–95A/B) and Agilent 8935 (IS–95A/B and CDMA2000 1X)

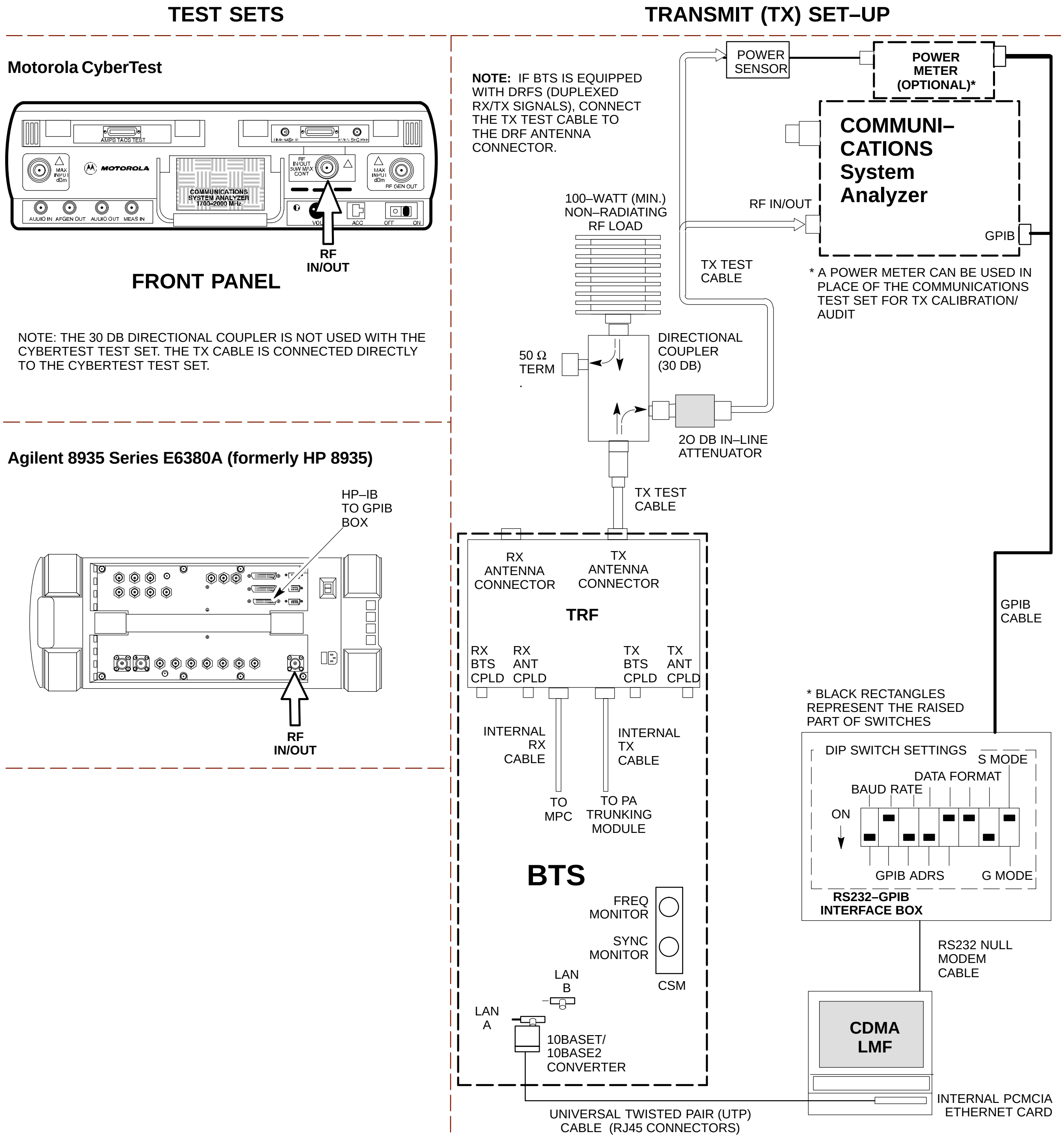


Figure 3-17: TX Calibration Test Set–up – Using Power Meter

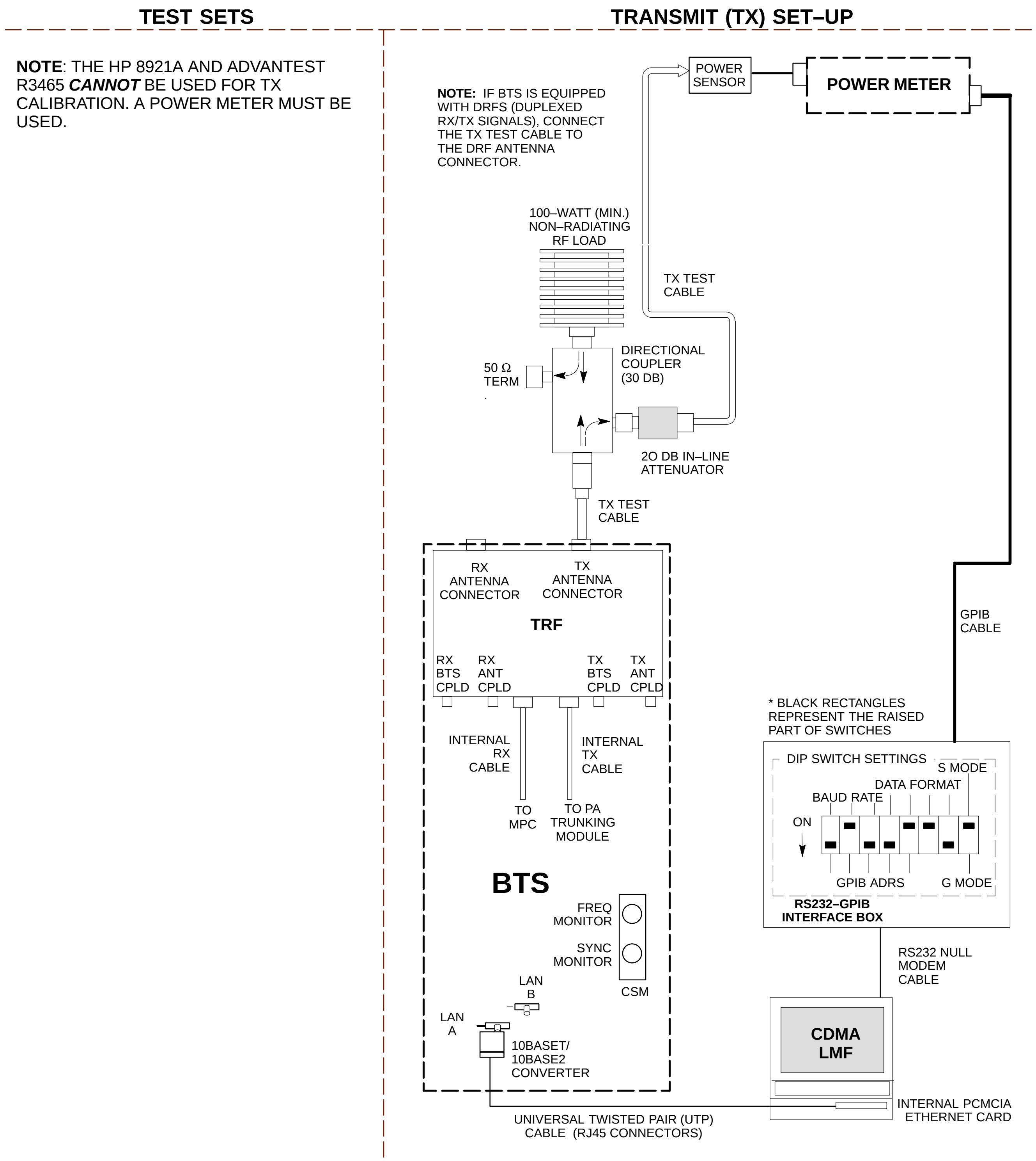


Figure 3-18: TX Calibration Test Set–up –
Agilent E4406A and Advantest R3567 (IS–95A/B and CDMA2000 1X)

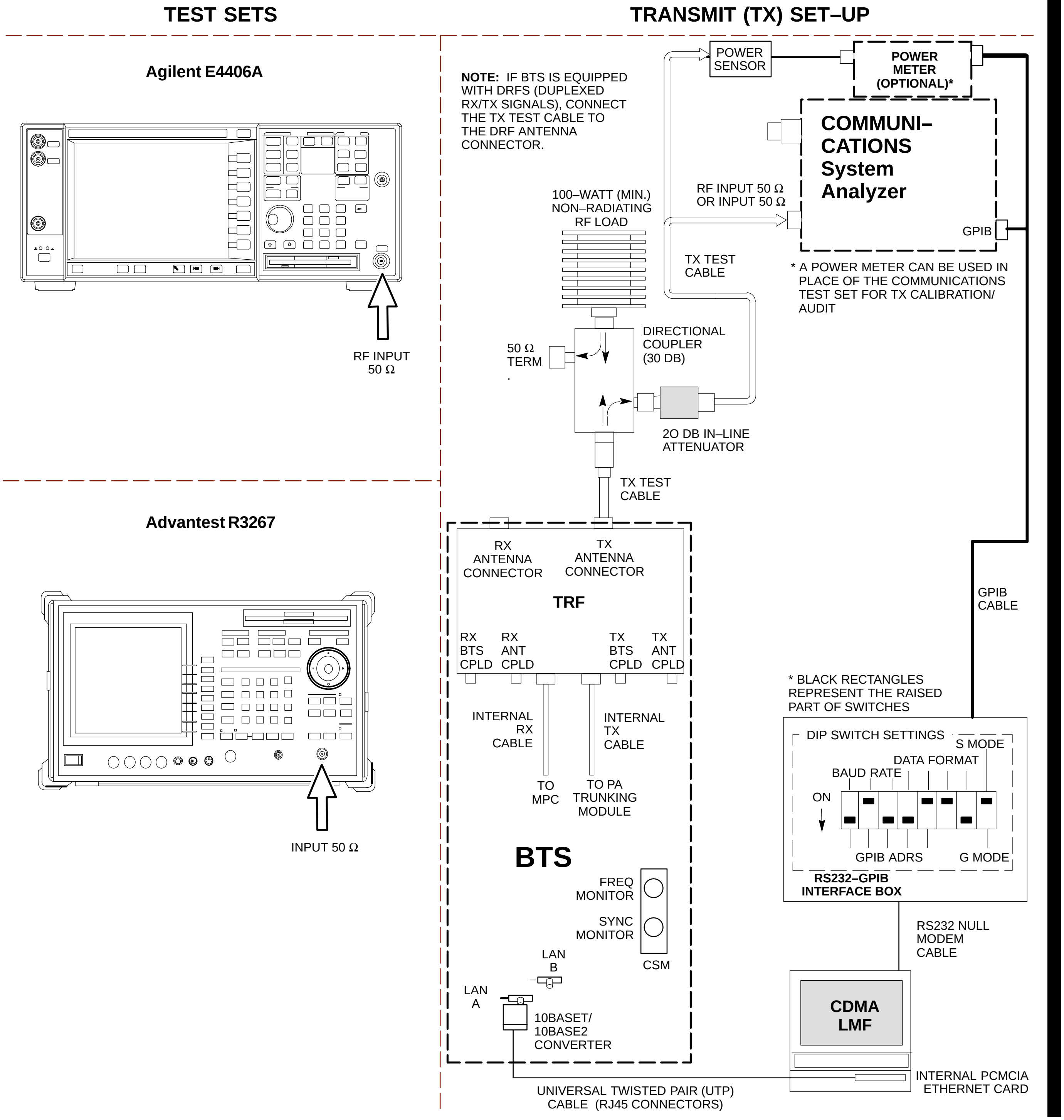
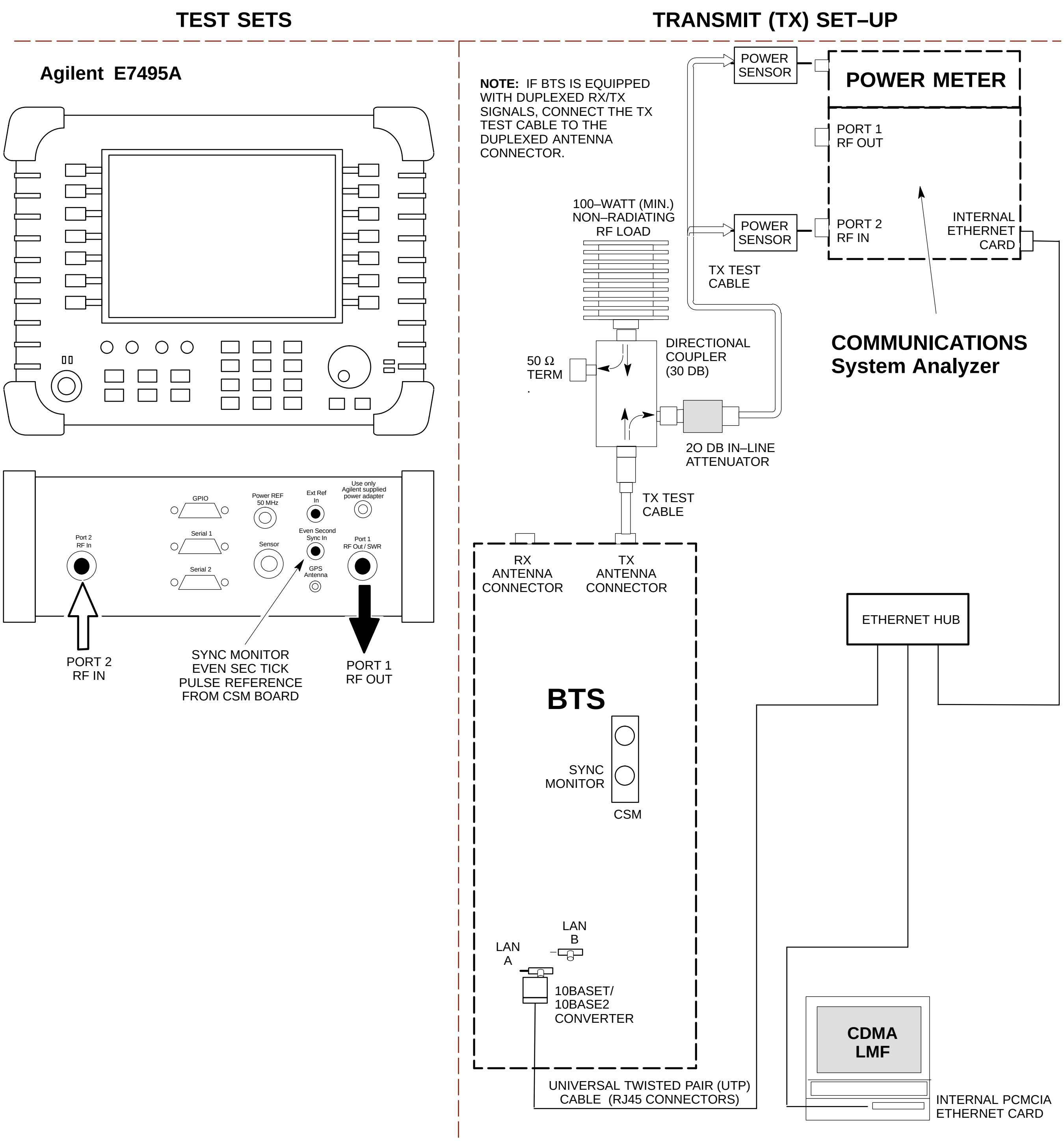


Figure 3-19: TX Calibration Test Set–up – Agilent E7495A (IS–95A/B and CDMA2000 1X)



Set–up for ATP

Figure 3-20 and Figure 3-21 show the Test Set Connections for ATP Tests.

Figure 3-20: IS–95A/B ATP Test Set–up, TRF Shown – CyberTest, Advantest R3465, and Agilent 8935

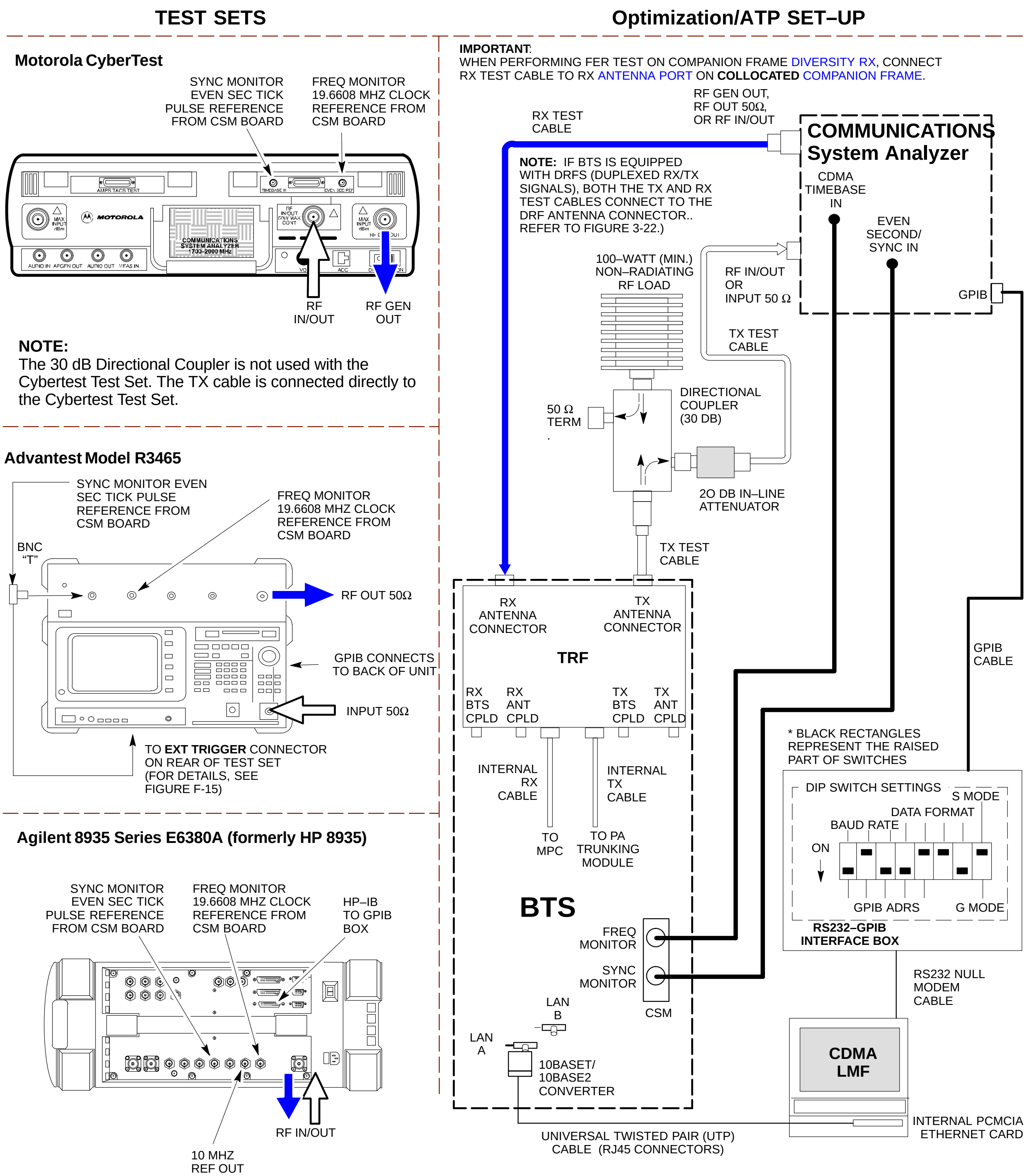


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Figure 3-21: IS–95A/B ATP Test Set–up – HP 8921A

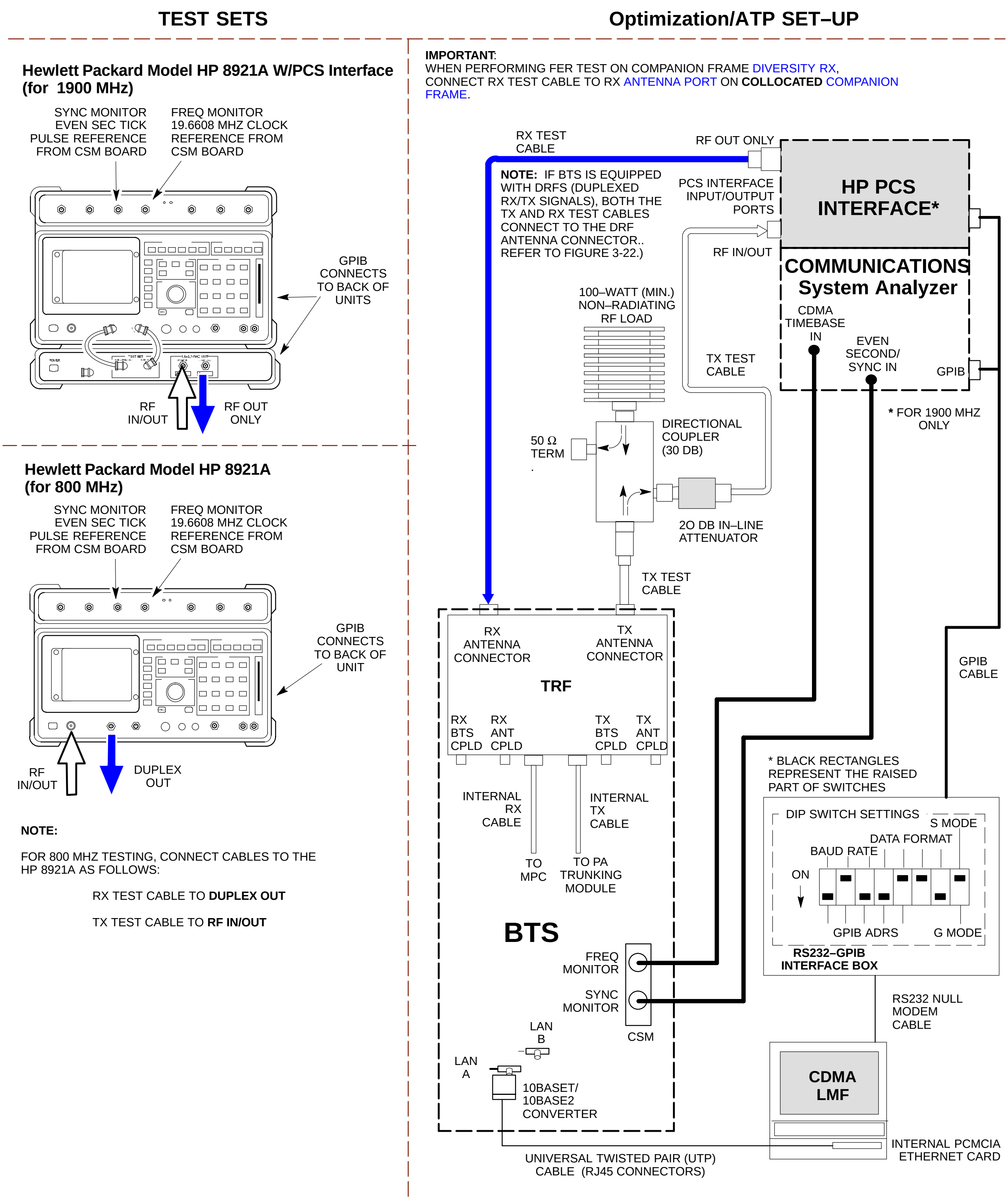

Figure 3-22: IS–95A/B and CDMA2000 1X ATP Test Set–up With DRFs – Agilent Test Equipment

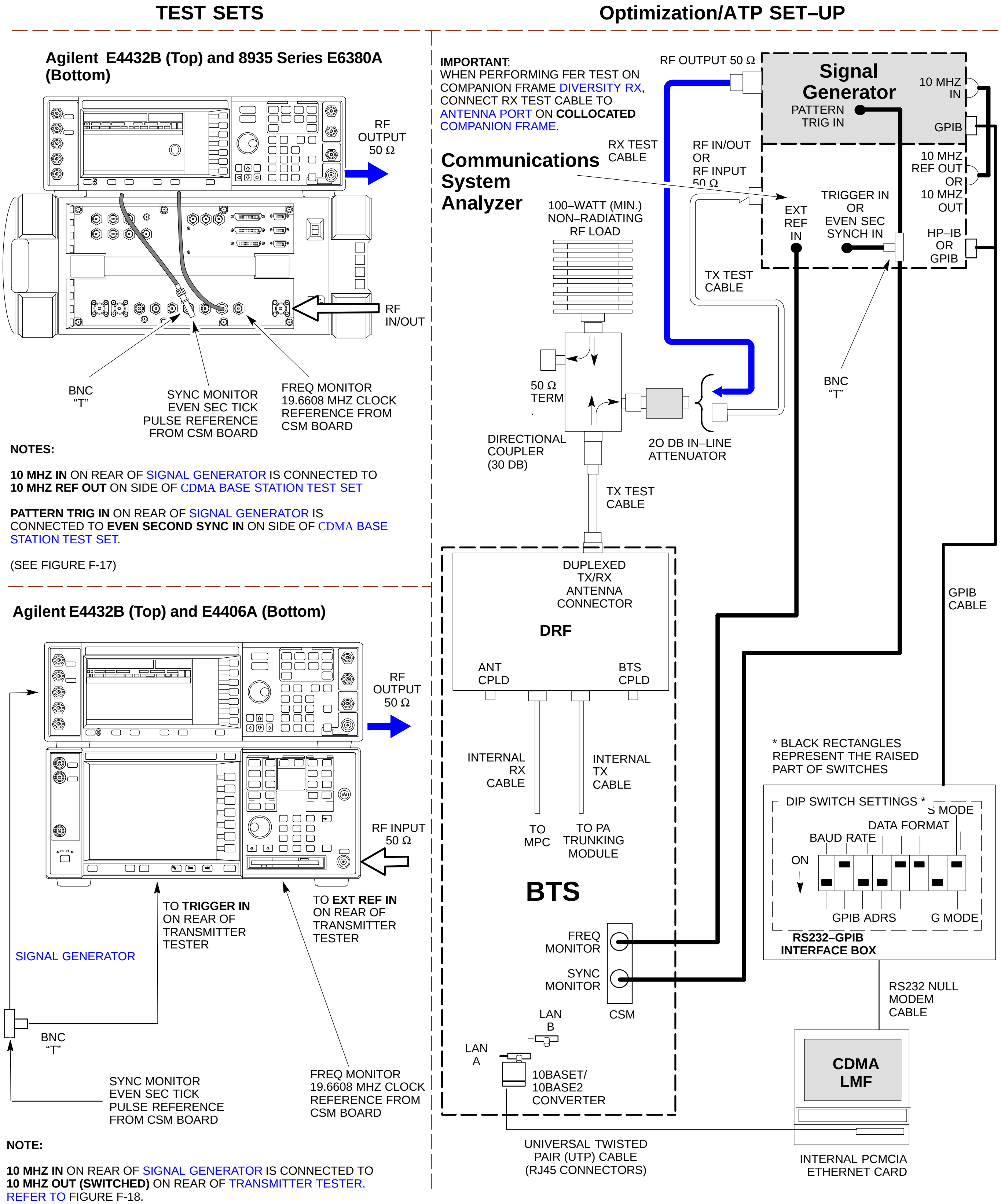

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Figure 3-23: IS–95A/B and CDMA2000 1X ATP Test Set–up With DRFs – Advantest R3267/3562 Test Equipment

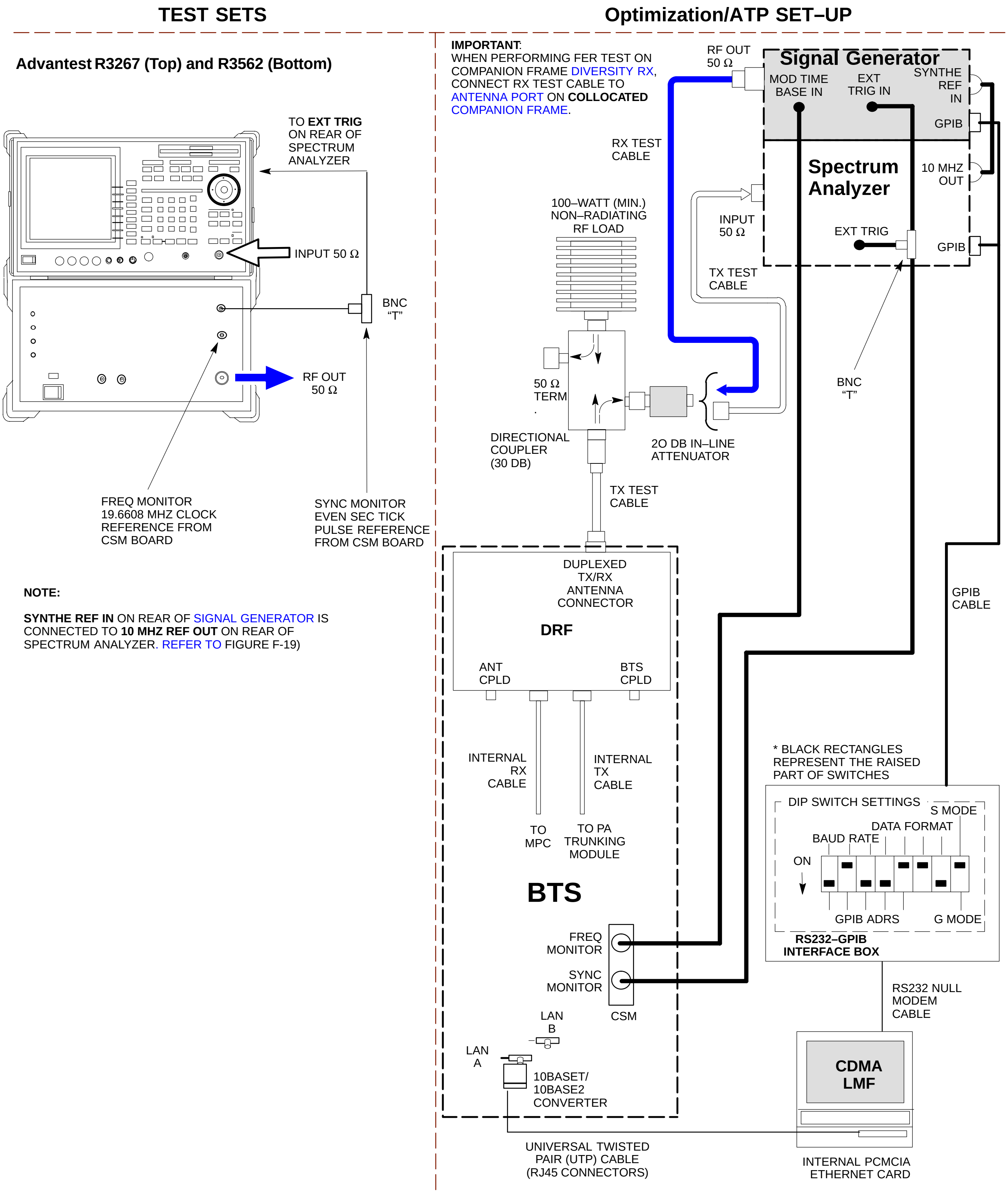

Figure 3-24: IS–95A/B and CDMA2000 1X ATP Test Set–up With TRFs – Agilent Test Equipment

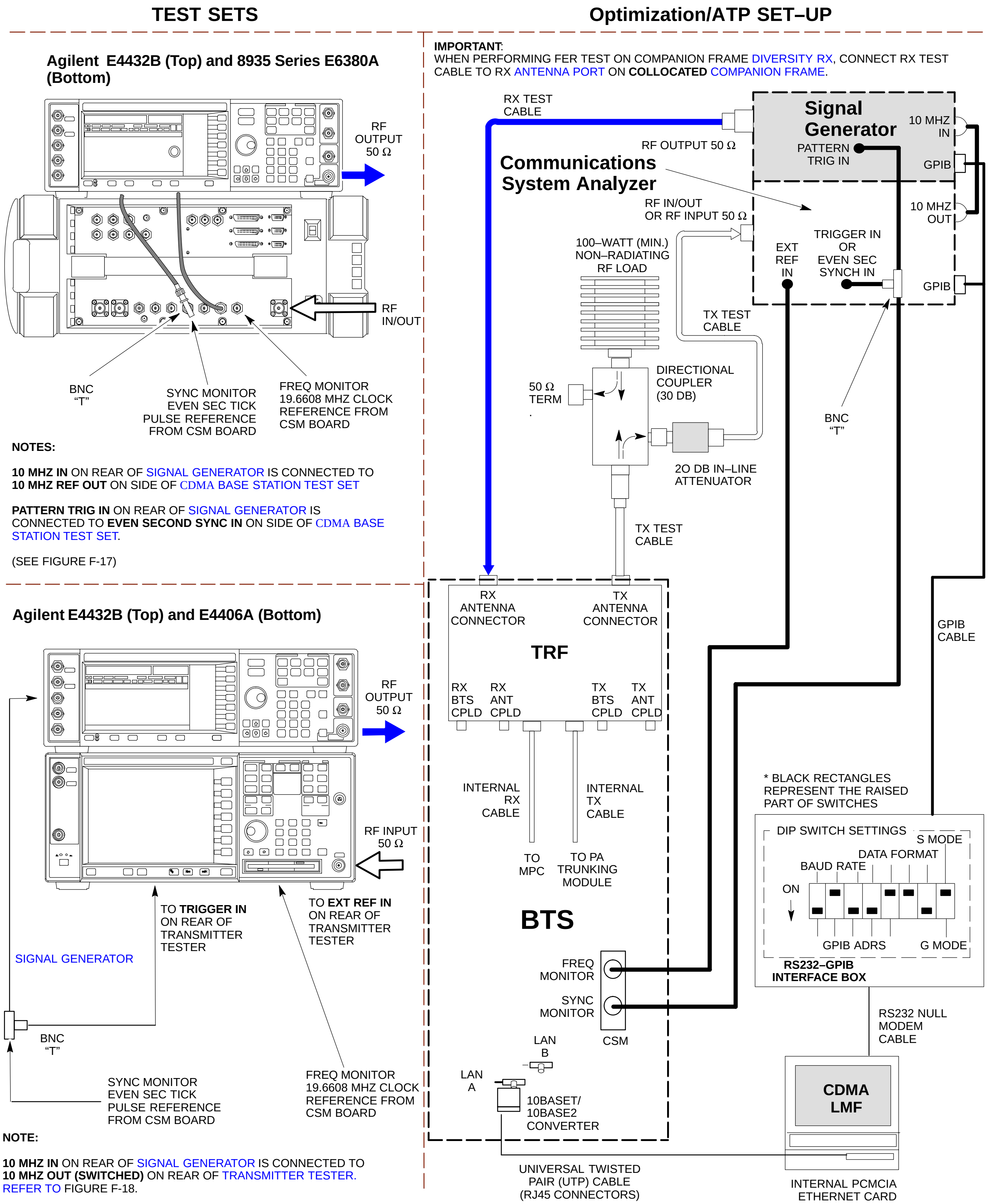

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Figure 3-25: IS–95A/B and CDMA2000 1X ATP Test Set–up With TRFs – Advantest R3267/3562 Test Equipment

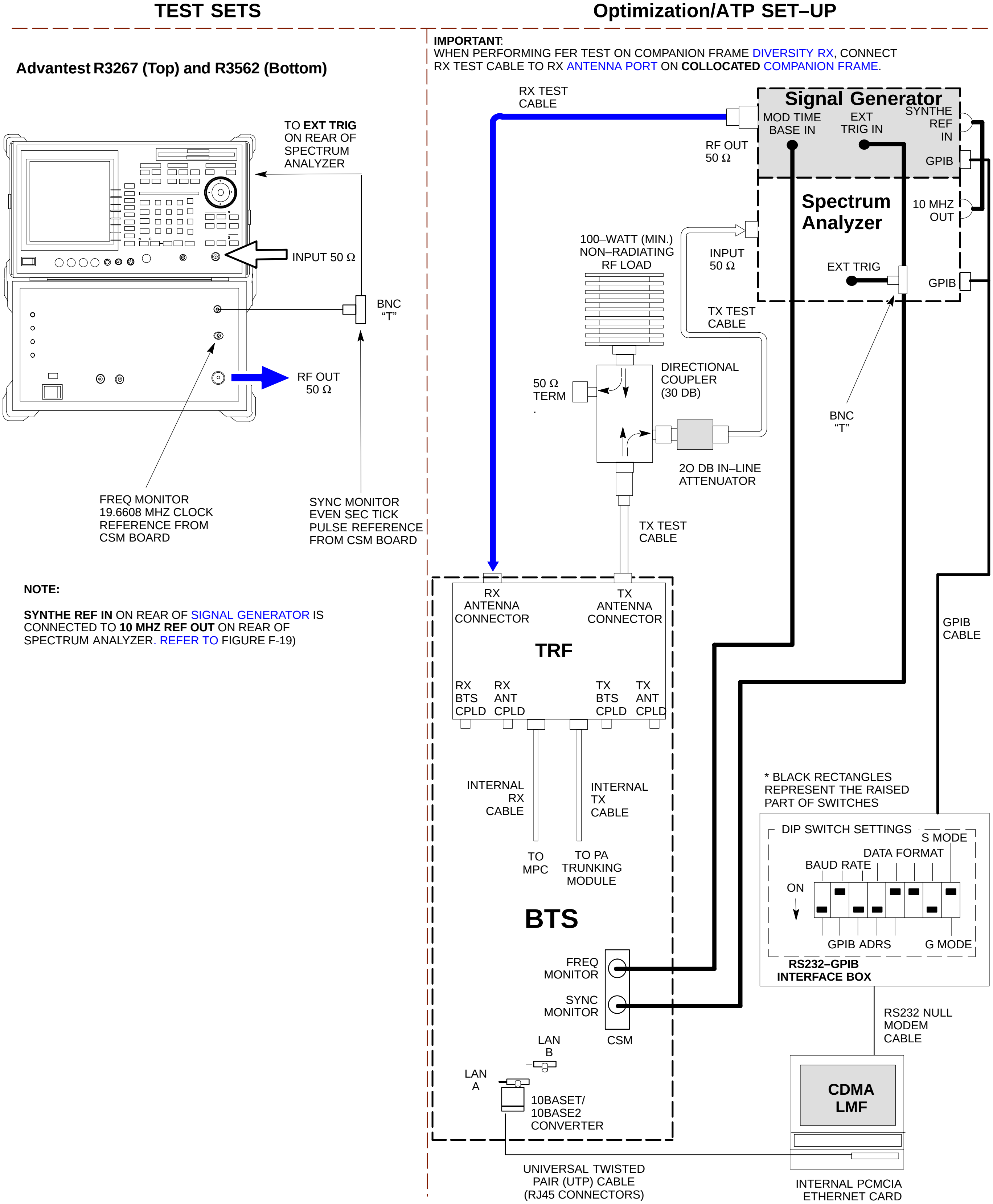
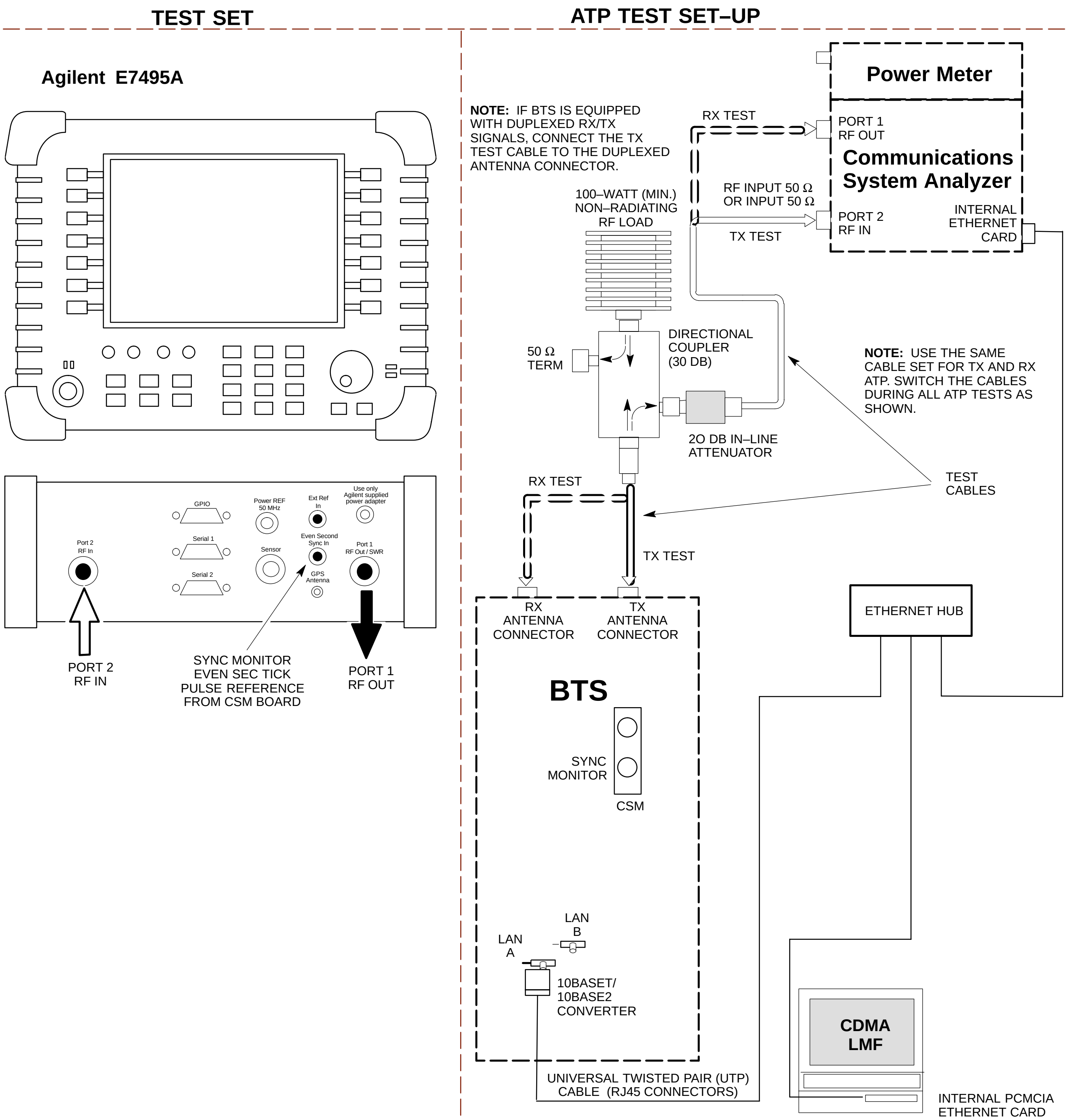


Figure 3-26: IS–95A/B and CDMA2000 1X Optimization/ATP Test Set–up – Agilent E7495A



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Connecting Test Equipment to the BTS

The following types of Test Equipment are required to perform Calibration and ATP Tests:

- LMF
- Communications System Analyzer Model supported by the LMF
- Power Meter Model supported by the LMF (required when using the HP 8921A/600 and Advantest R3465 Analyzers)
- Non–radiating Transmit Line Termination Load
- Directional Coupler and In–line Attenuator
- RF Cables and Adapters

Refer to Table 3-27 for an overview of Test Equipment Connections for currently supported by the LMF. In addition, see the following figures:

- Figure 3-31, Figure 3-32, and Figure 3-33 show the Test Set Connections for TX Calibration
- Figure 3-35 through Figure 3-40 show the Test Set Connections for Optimization/ATP Tests

Test Equipment GPIB Address Settings

All Test Equipment is controlled by the LMF through an IEEE–488/GPIB Bus. To communicate on the Bus, each piece of Test Equipment must have a GPIB Address Set that the LMF will recognize. The Standard Address Settings used by the LMF for the various types of Test Equipment Items are as follows:

- Signal Generator Address: **1**
- Power Meter Address: **13**
- Communications System Analyzer Address: **18**

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

Supported Test Equipment

CAUTION

To prevent damage to the Test Equipment, all Transmit (TX) Test Connections must be through a 30 dB Directional Coupler *plus* a 20dB In-line Attenuator for both the 800 MHz and 1.9 GHz BTSs.

IS–95A/B Operation

Optimization and ATP Testing for IS–95A/B Sites and Carriers may be performed using the following Test Equipment:

- CyberTest
- Advantest R3267 Spectrum Analyzer with R3562 Signal Generator
- Advantest R3465 Spectrum Analyzer with R3561L Signal Generator and HP–437B or Gigatronics Power Meter
- Agilent E4406A Transmitter Test Set with E4432B Signal Generator
- Agilent 8935 Series E6380A Communications Test Set (formerly HP 8935)
- Hewlett–Packard HP 8921 (with CDMA Interface and, for 1.9 GHz, PCS Interface) and HP–437B or Gigatronics Power Meter
- Spectrum Analyzer (HP8594E) – *optional*
- Rubidium Standard Timebase – *optional*

CDMA2000 1X Operation

Optimization and ATP Testing for CDMA2000 1X Sites and Carriers may be performed using the following Test Equipment:

- Advantest R3267 Spectrum Analyzer with R3562 Signal Generator
- Agilent E4406A Transmitter Test Set with E4432B Signal Generator
- Agilent 8935 Series E6380A Communications Test Set (formerly HP 8935) with Option 200 or R2K and with E4432B Signal Generator for 1X FER
- Agilent E7495A Communications Test Set

Test Equipment Preparation

See Appendix F for specific steps to prepare each type of Test Set and Power Meter to perform Calibration and ATP.

Agilent E7495A Communications Test Set requires additional set–up and preparation. This is described in detail in Appendix F.

Test Equipment Connection Charts

To use the following charts to identify necessary Test Equipment Connections, locate the Communications System Analyzer being used in the **COMMUNICATIONS SYSTEM ANALYZER** Columns, and read down the column. Where a dot appears in the column, connect one end of the Test Cable to that Connector. Follow the horizontal line to locate the end connection(s), reading up the column to identify the appropriate Test Equipment and/or BTS Connector.

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IS–95A/B–only Test Equipment Connections

Table 3-27 depicts the Interconnection Requirements for currently available Test Equipment *supporting IS–95A/B only* that meets Motorola Standards and is supported by the LMF.

Table 3-27: IS–95A/B–only Test Equipment Interconnection

SIGNAL	COMMUNICATIONS SYSTEM ANALYZER				ADDITIONAL TEST EQUIPMENT				BTS
	Cyber–Test	Advantest R3465	HP 8921A	HP 8921 W/PCS	Power Meter	GPIB Interface	LMF	Attenuator and Directional Coupler	
EVEN SECOND SYNCHRONIZATION	EVEN SEC REF	EVEN SEC SYNC IN	EVEN SECOND SYNC IN	EVEN SECOND SYNC IN					SYNC MON-ITOR
19.6608 MHZ CLOCK	TIME BASE IN	CDMA TIME BASE IN	CDMA TIME BASE IN	CDMA TIME BASE IN					FREQ MON-ITOR
CONTROL IEEE 488 BUS	IEEE 488	GPIB	HP–IB	HP–IB	HP–IB	GPIB	SERIAL PORT		
TX TEST CABLES	RF IN/OUT	INPUT 50Ω	RF IN/OUT	RF IN/OUT				20 DB ATTEN. / BTS PORT	TX1–6
RX TEST CABLES	RF GEN OUT	RF OUT 50Ω	DUPLEX OUT	RF OUT ONLY					RX1–6

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

Table 3-28 depicts the Interconnection Requirements for currently available Test Equipment supporting *both* CDMA 2000 1X *and* IS–95A/B that meets Motorola Standards and is supported by the LMF.

Table 3-28: CDMA2000 1X/IS–95A/B Test Equipment Interconnection

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

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

Equipment Warm-up

NOTE

To assure BTS stability and contribute to Optimization accuracy of the BTS, warm-up the BTS Test Equipment prior to performing the BTS Optimization Procedure as follows:

- Agilent E7495A for a minimum of 30 minutes
- All other Test Sets for a minimum of 60 minutes

Time spent running initial or normal Power-up, Hardware/ Firmware Audit, and BTS Download counts as Warm-up Time.

WARNING

Before installing any Test Equipment directly to any BTS **TX OUT Connector**, verify that there are *no* CDMA Channels keyed.

- At active sites, have the OMC-R/CBSC place the antenna (sector) assigned to the BBX under test to out of service (OOS). Failure to do so can result in serious personal injury and/or equipment damage.

Automatic Cable Calibration Set–up

Figure 3-27 and Figure 3-28 show the Cable Calibration Set–up for the Test Sets supported by the LMF. The left side of the diagram depicts the location of the Input and Output Connectors of each Test Equipment Item, and the right side details the connections for each test. Table 3-32 provides a procedure for performing Automatic Cable Calibration.

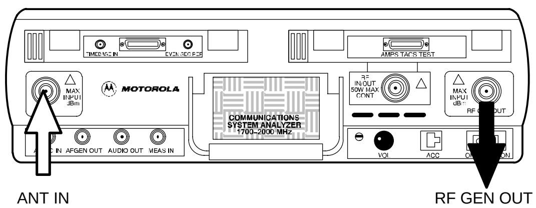
Manual Cable Calibration

If Manual Cable Calibration is required, refer to the procedures in Appendix F.

Figure 3-27: IS–95A/B Cable Calibration Test Set–up – CyberTest, Agilent 8935, Advantest R3465, and HP 8921A

SUPPORTED TEST SETS

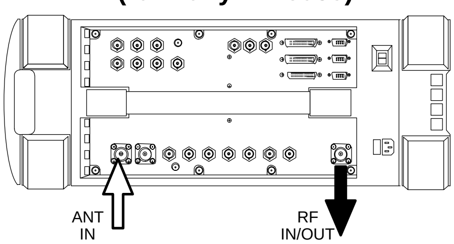
Motorola CyberTest



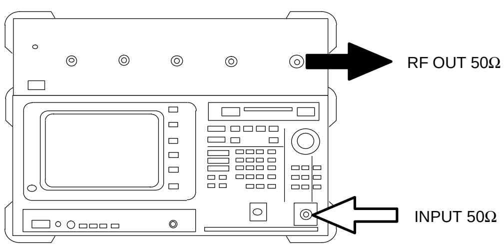
Note: The 30 dB Directional Coupler is not used with the Cybertest Test Set. The TX cable is connected directly to the Cybertest Test Set.

A 10dB Attenuator must be used with the Short Test Cable for Cable Calibration with the CyberTest Test Set. The 10dB Attenuator is used only for the Cable Calibration Procedure, not with the Test Cables for TX Calibration and ATP Tests.

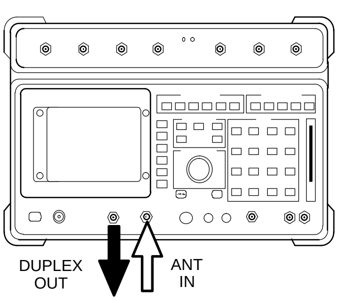
Agilent 8935 Series E6380A (formerly HP 8935)



Advantest Model R3465

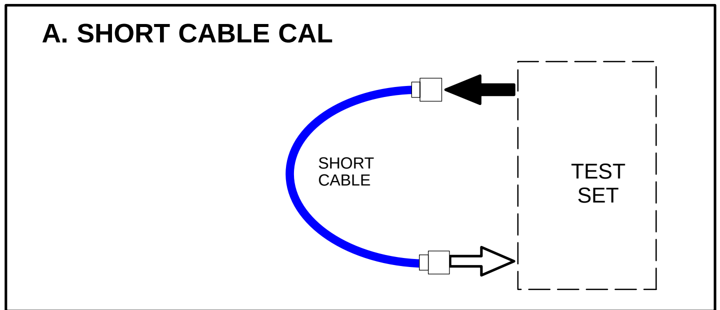


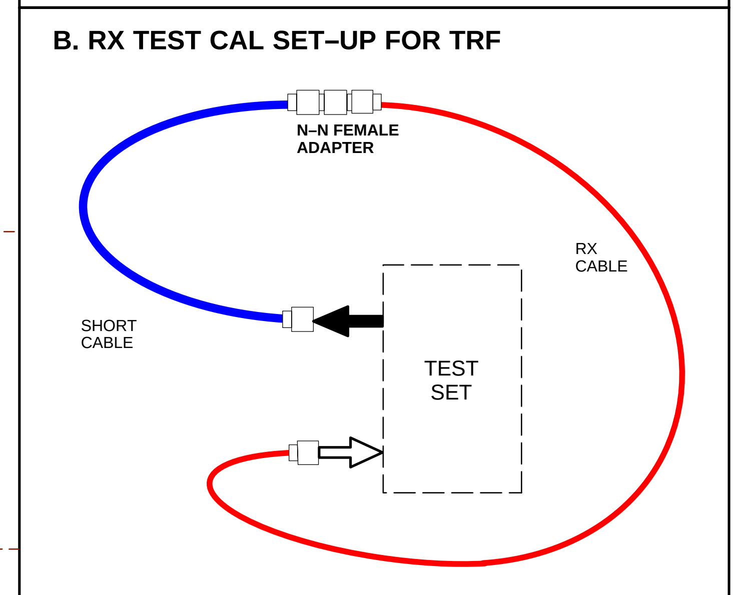
Hewlett Packard Model HP 8921A



Note: For 800 MHZ only. The HP 8921A cannot be used to calibrate cables for PCS frequencies.

CALIBRATION SET–UP





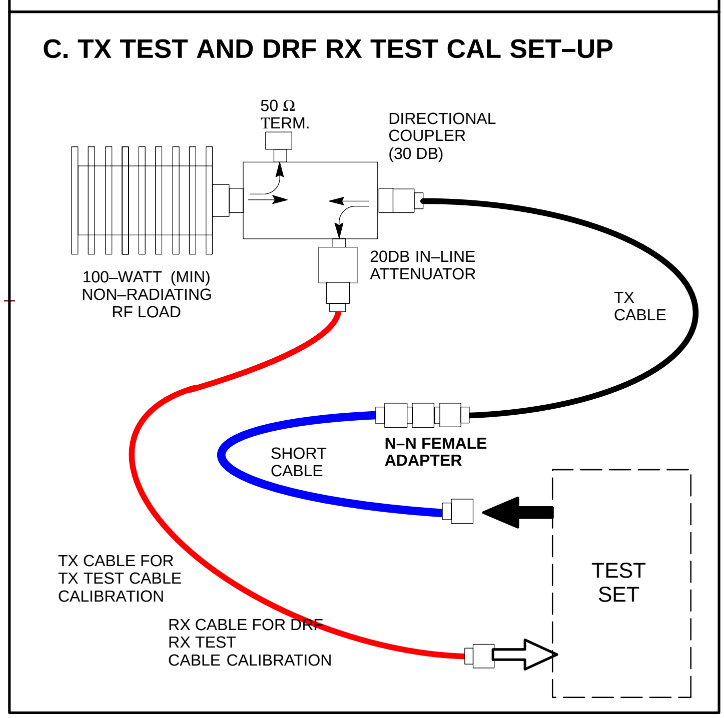
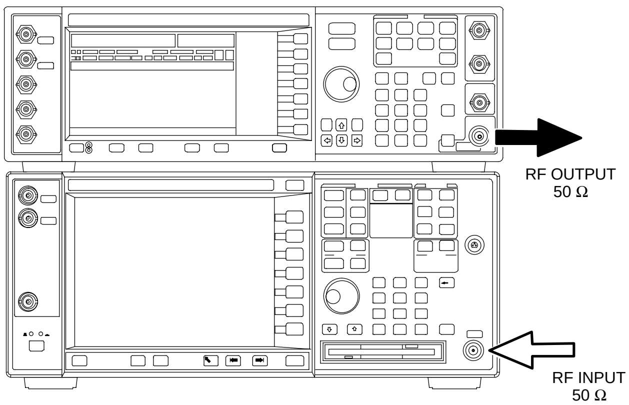


Figure 3-28: IS–95A/B and CDMA 2000 1X Cable Calibration Test Set–up – Agilent E4406A/E4432B and Advantest R3267/R3562

SUPPORTED TEST SETS

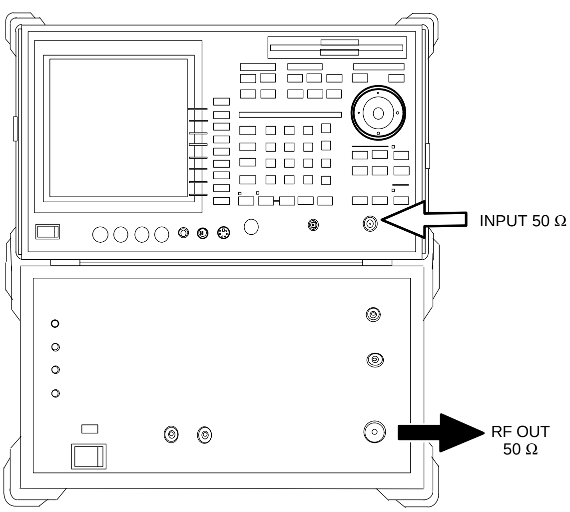
Agilent E4432B (Top) and E4406A (Bottom)



NOTE:

10 MHZ IN ON REAR OF SIGNAL GENERATOR IS CONNECTED TO **10 MHZ OUT (SWITCHED)** ON REAR OF TRANSMITTER TESTER (FIGURE F-18).

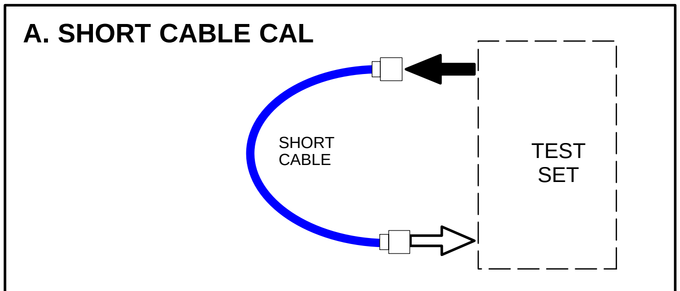
Advantest R3267 (Top) and R3562 (Bottom)

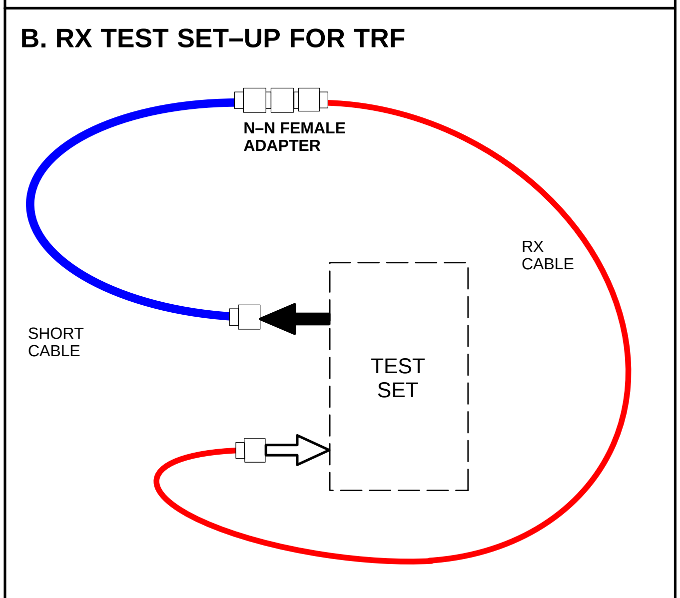


NOTE:

SYNTHE REF IN ON REAR OF SIGNAL GENERATOR IS CONNECTED TO **10 MHZ OUT** ON REAR OF SPECTRUM ANALYZER

CALIBRATION SET–UP





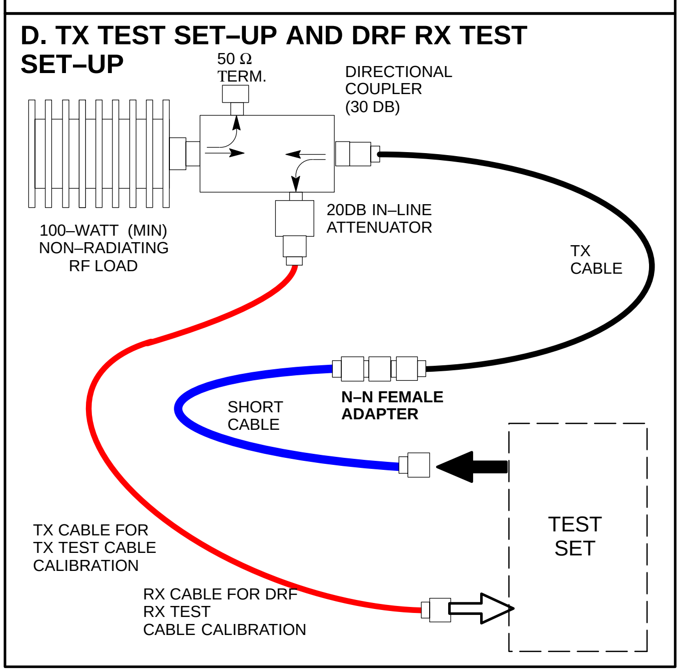
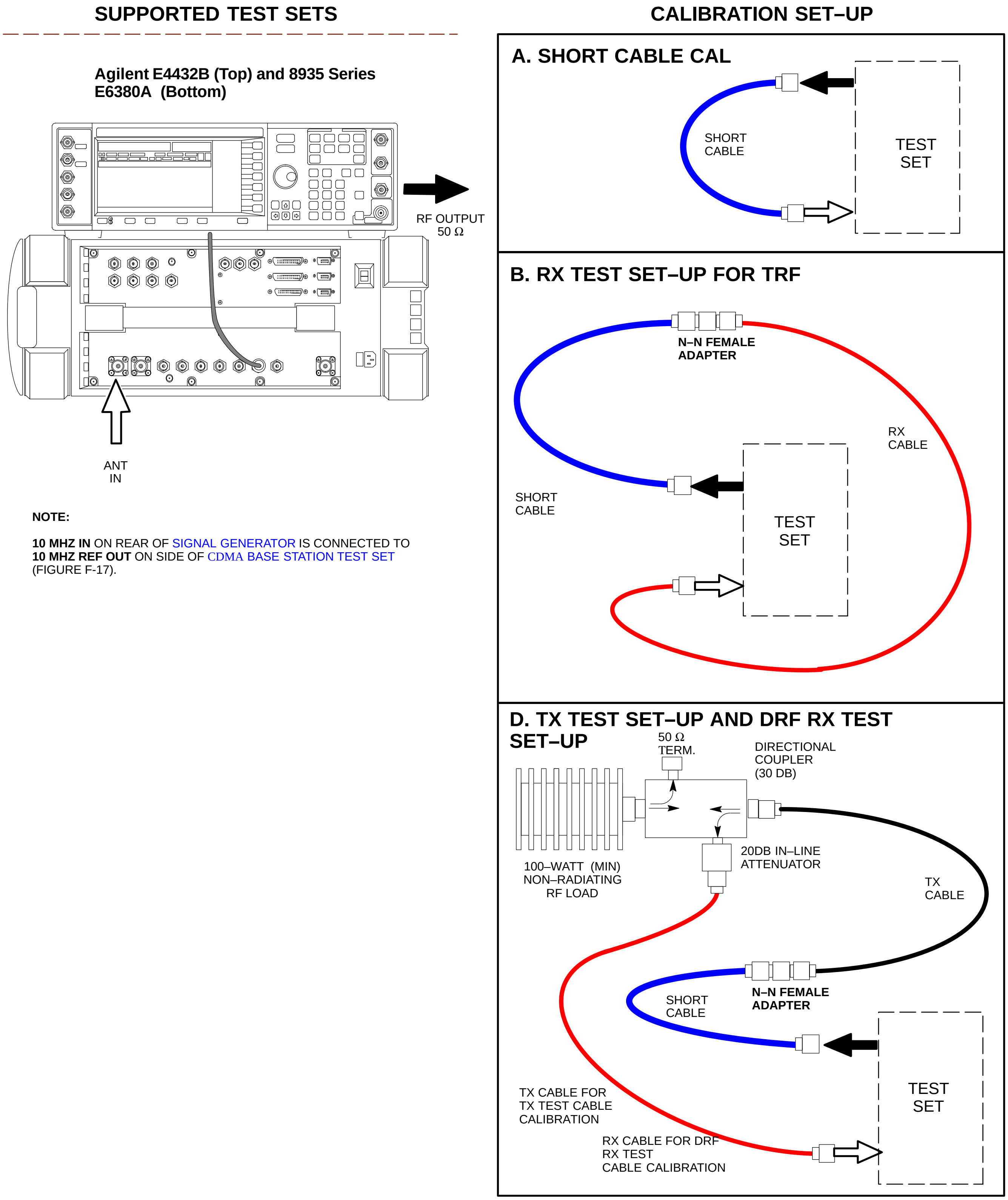


Figure 3-29: CDMA2000 1X Cable Calibration Test Set–up – Agilent 8935/E4432B

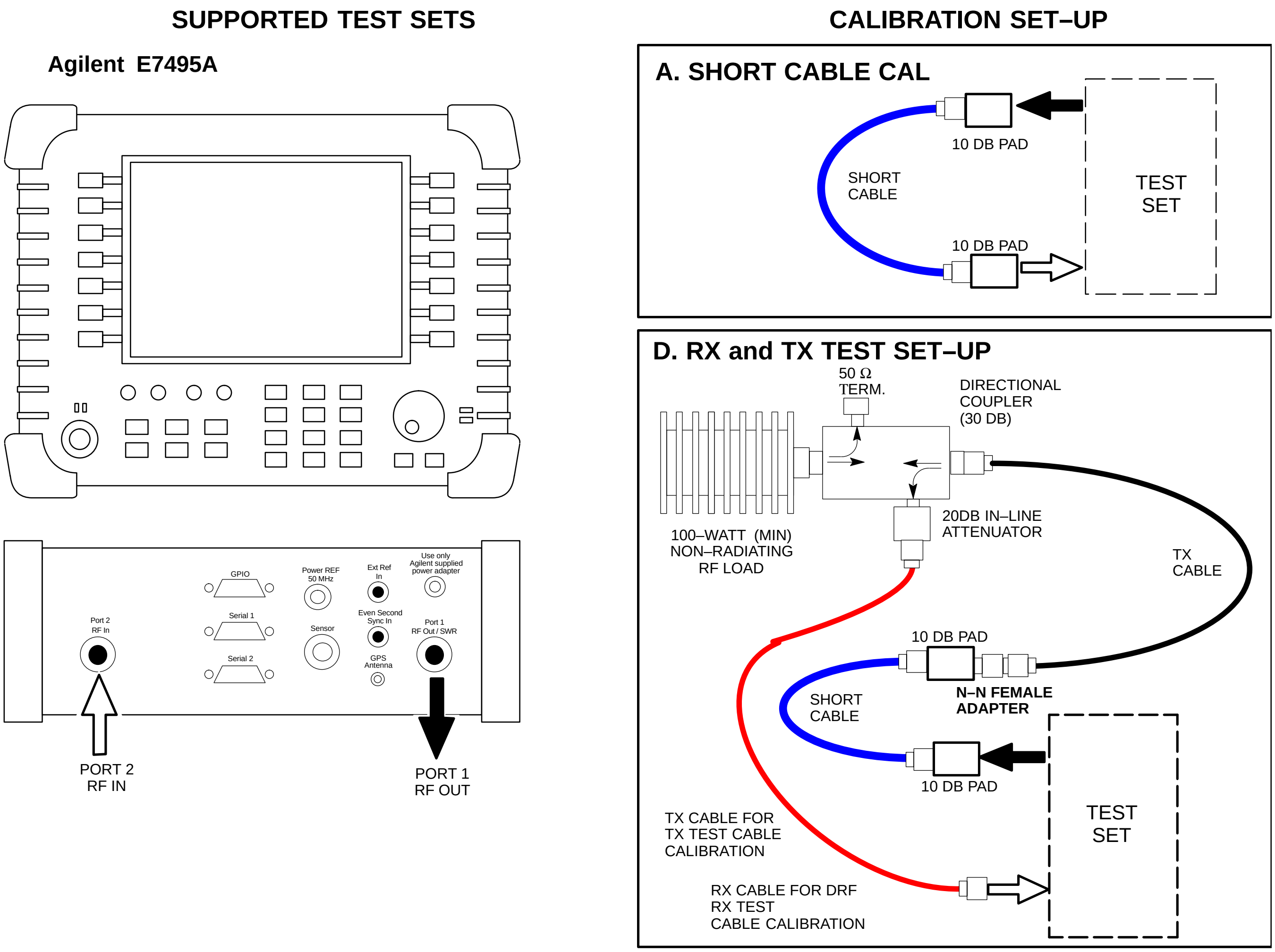


NOTE:

10 MHZ IN ON REAR OF SIGNAL GENERATOR IS CONNECTED TO **10 MHZ REF OUT** ON SIDE OF CDMA BASE STATION TEST SET (FIGURE F-17).

PRELIMINARY

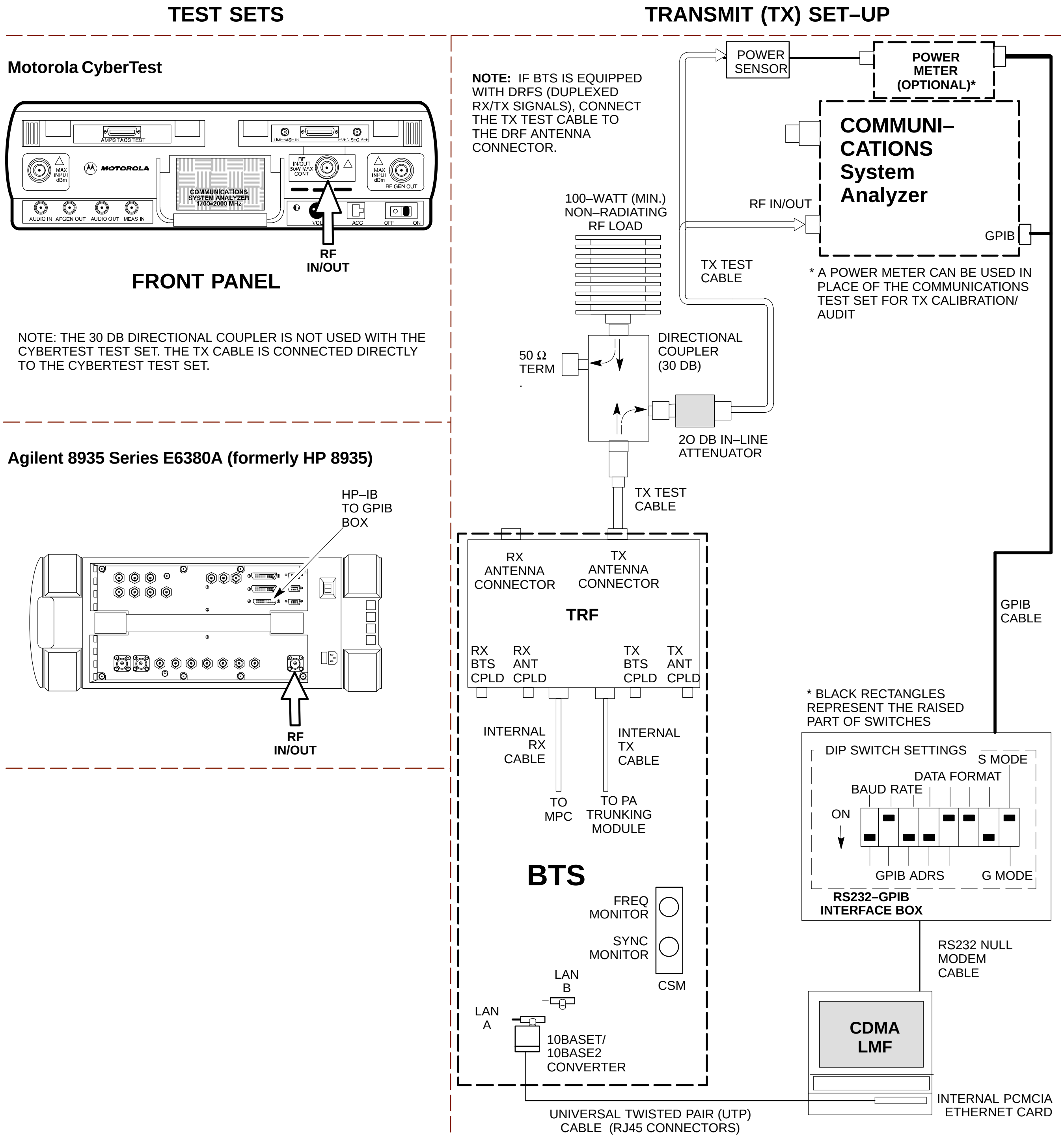
Figure 3-30: CDMA2000 1X Cable Calibration Test Set–up – Agilent E7495A



Set-up for TX Calibration

Figure 3-31 and Figure 3-32 show the Test Set Connections for TX Calibration.

Figure 3-31: TX Calibration Test Set–up – CyberTest (IS–95A/B) and Agilent 8935 (IS–95A/B and CDMA2000 1X)



3

Figure 3-32: TX Calibration Test Set–up – Using Power Meter

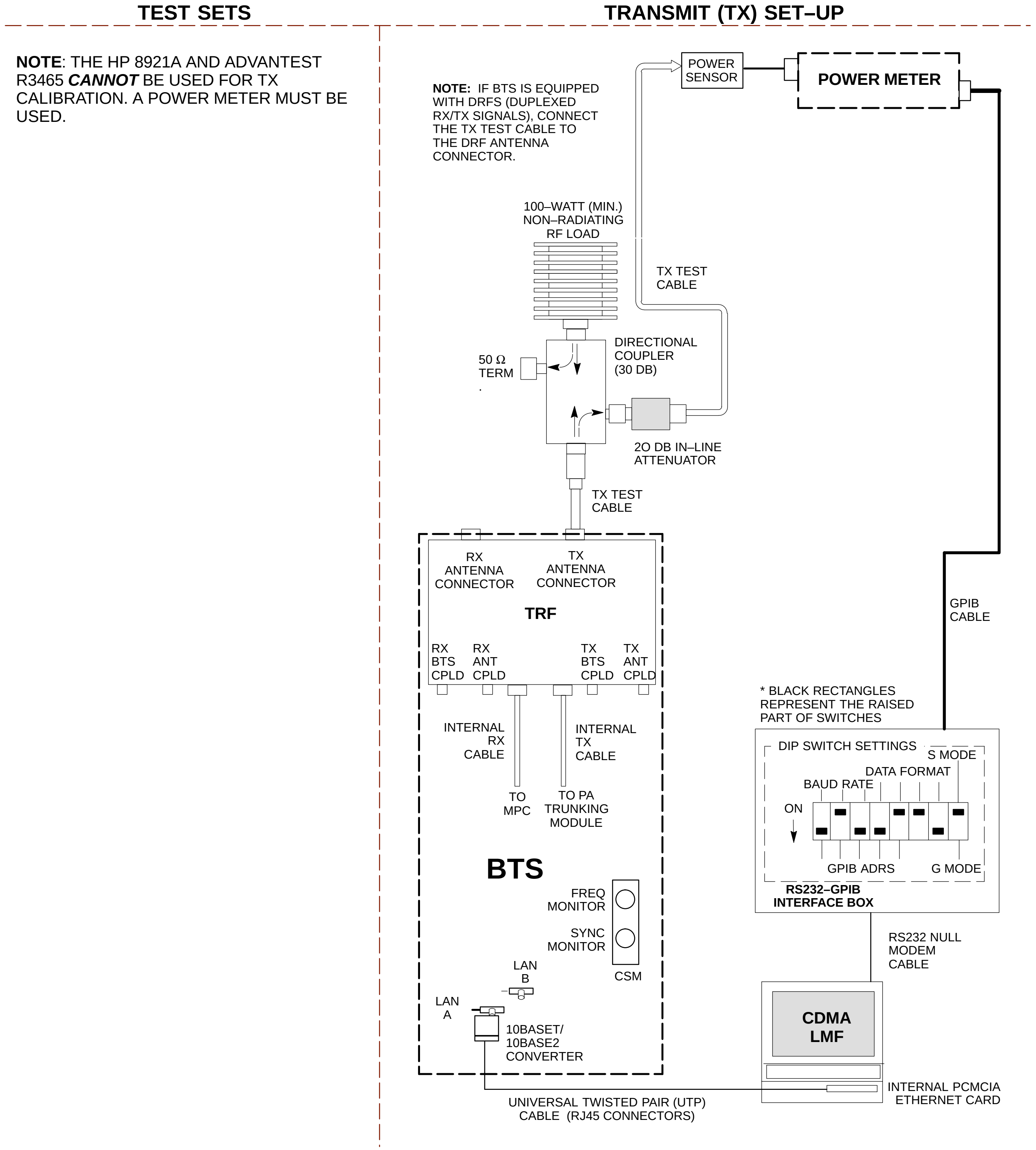
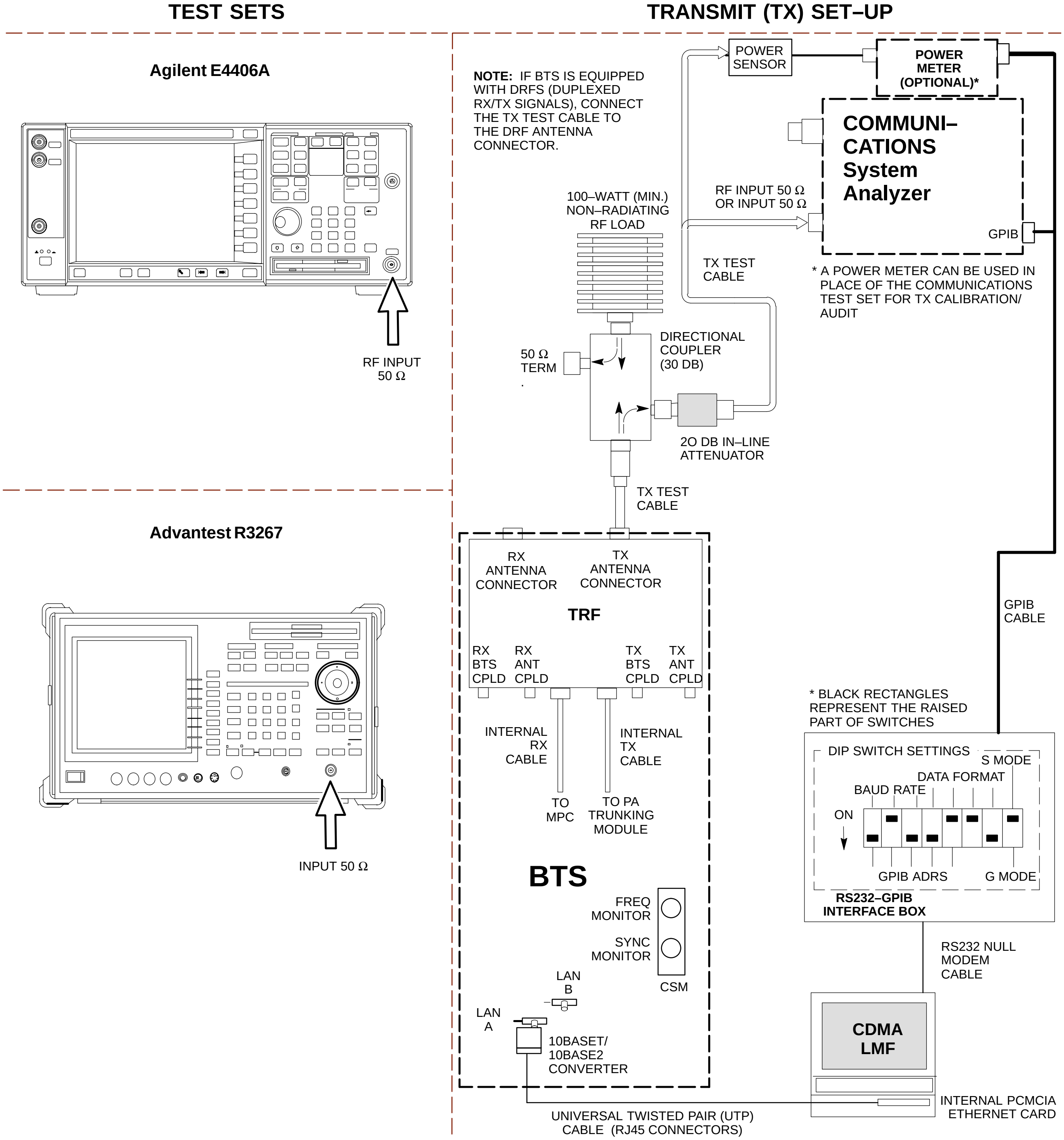


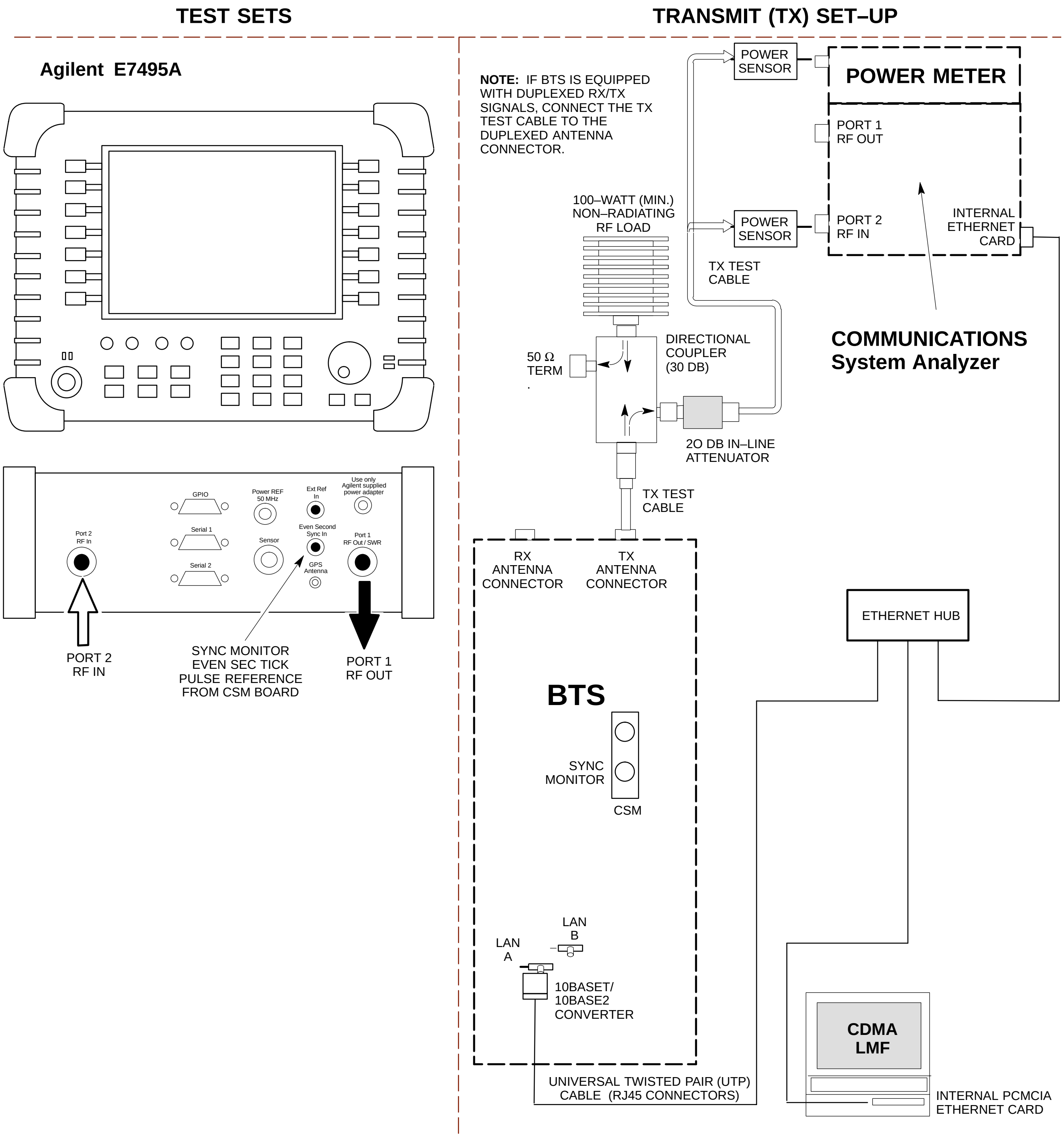
Figure 3-33: TX Calibration Test Set–up –
Agilent E4406A and Advantest R3567 (IS–95A/B and CDMA2000 1X)



3

3

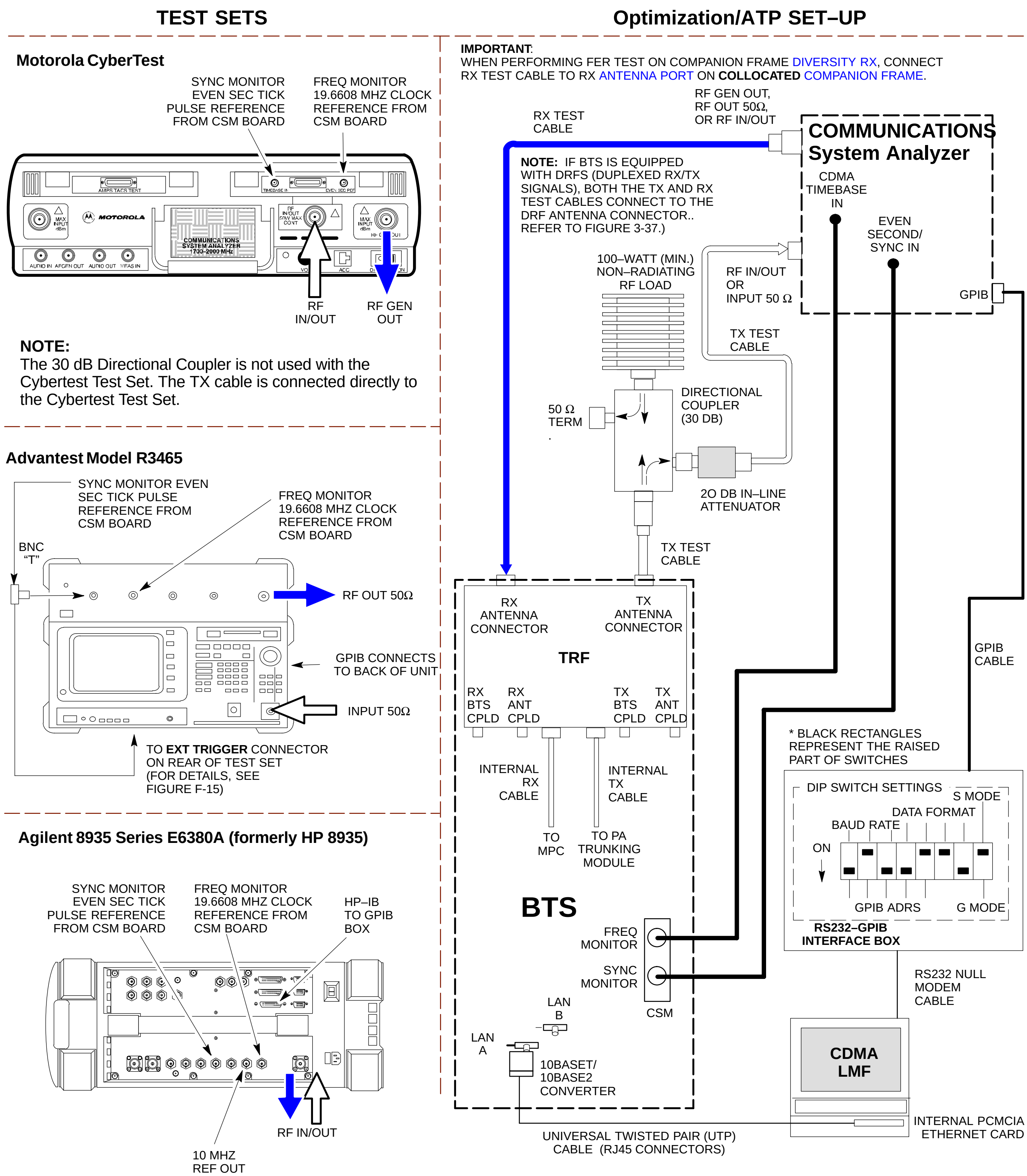
Figure 3-34: TX Calibration Test Set–up – Agilent E7495A (IS–95A/B and CDMA2000 1X)



Set–up for ATP

Figure 3-35 and Figure 3-36 show the Test Set Connections for ATP Tests.

Figure 3-35: IS–95A/B ATP Test Set–up, TRF Shown – CyberTest, Advantest R3465, and Agilent 8935



PRELIMINARY

Figure 3-36: IS–95A/B ATP Test Set–up – HP 8921A

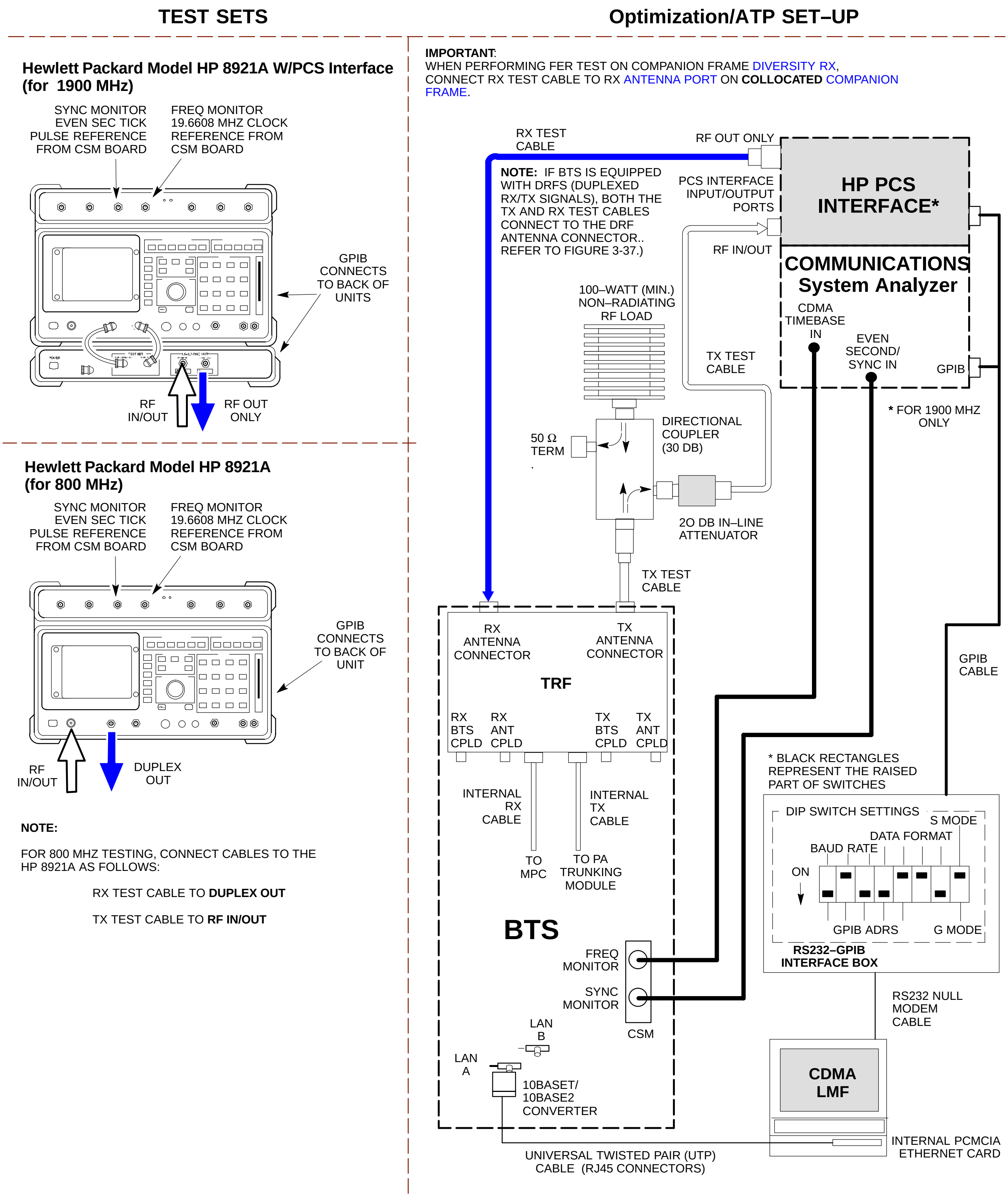
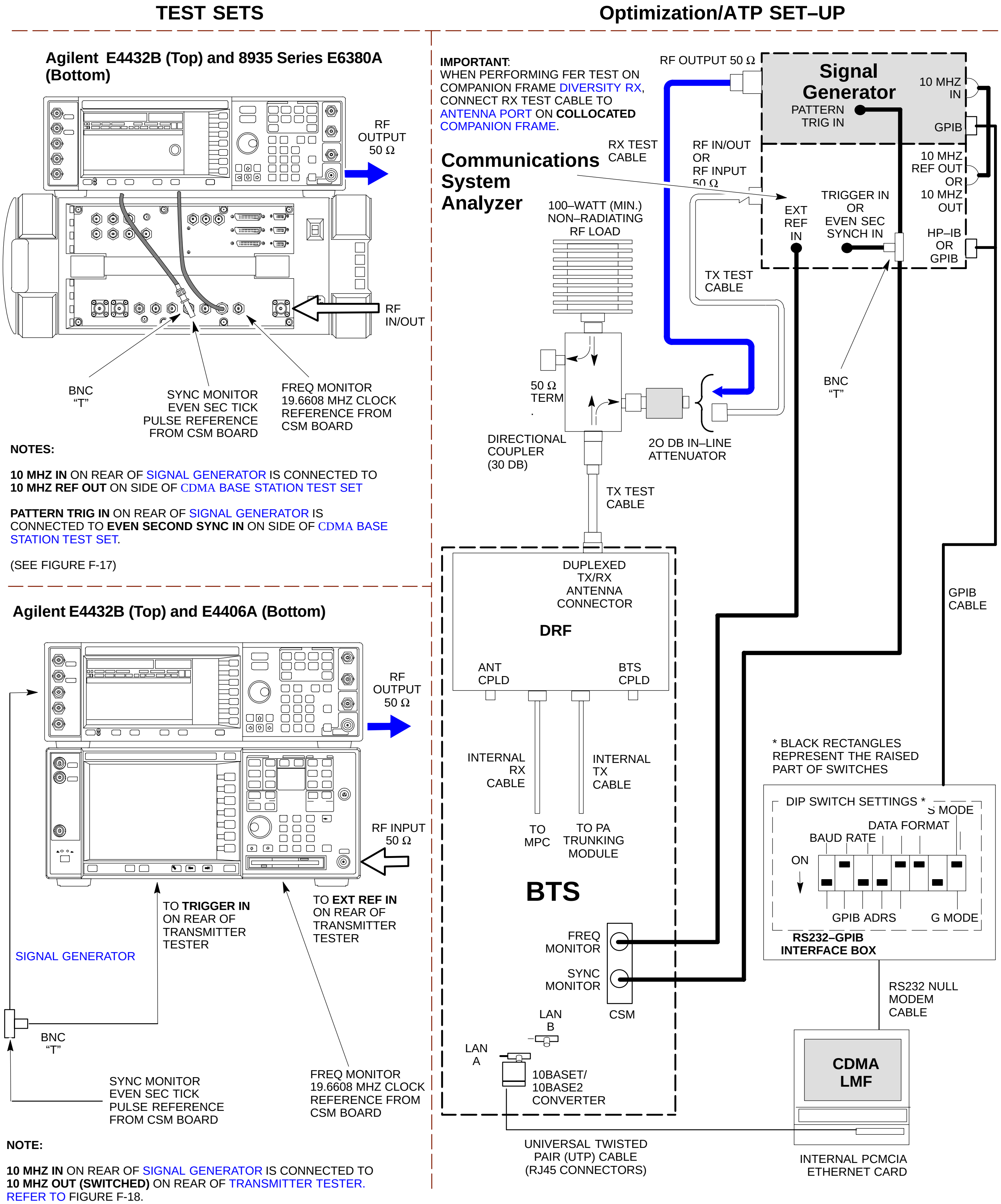


Figure 3-37: IS–95A/B and CDMA2000 1X ATP Test Set–up With DRFs – Agilent Test Equipment



3

Figure 3-38: IS–95A/B and CDMA2000 1X ATP Test Set–up With DRFs – Advantest R3267/3562 Test Equipment

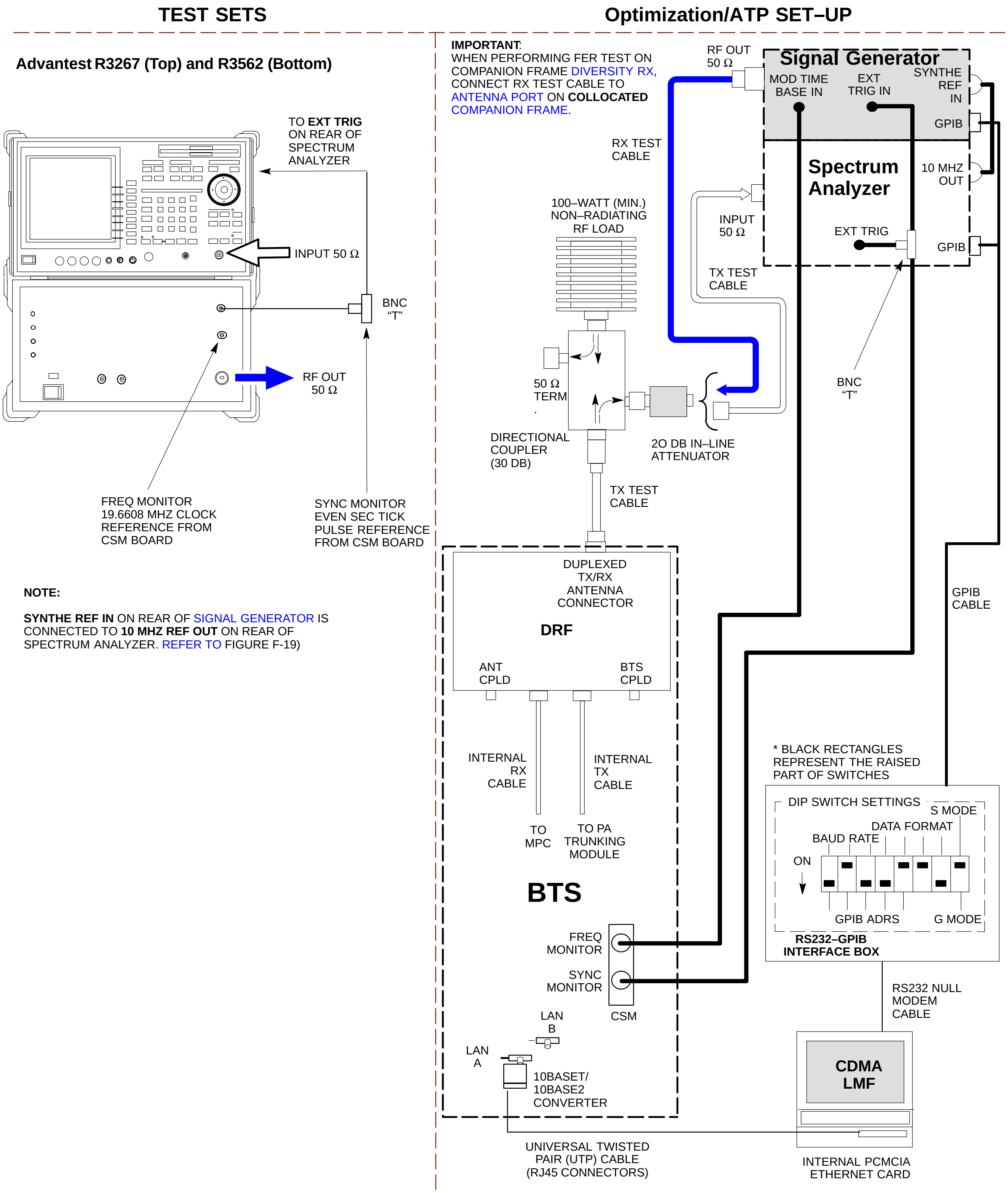
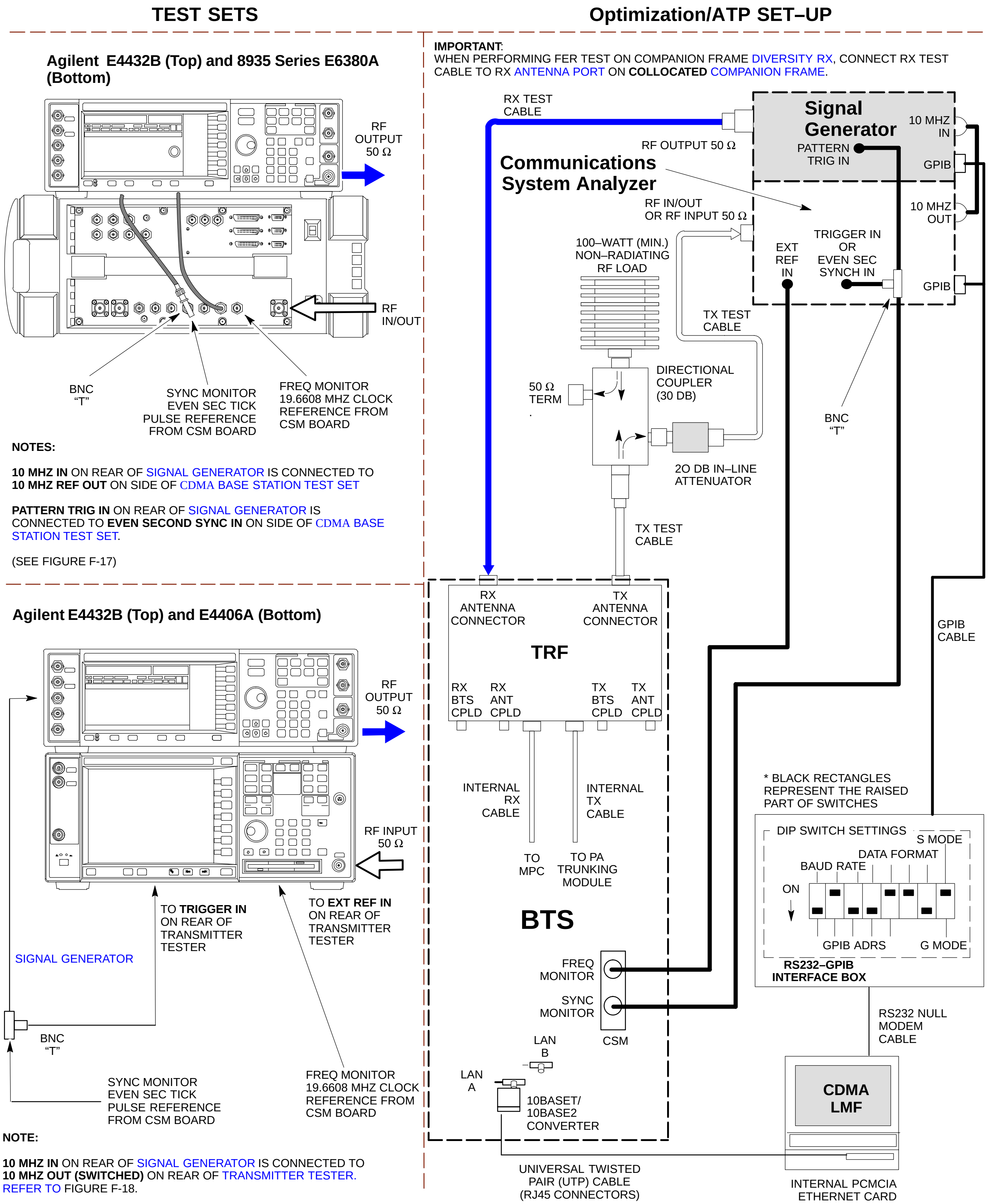


Figure 3-39: IS–95A/B and CDMA2000 1X ATP Test Set–up With TRFs – Agilent Test Equipment



3

Figure 3-40: IS–95A/B and CDMA2000 1X ATP Test Set–up With TRFs – Advantest R3267/3562 Test Equipment

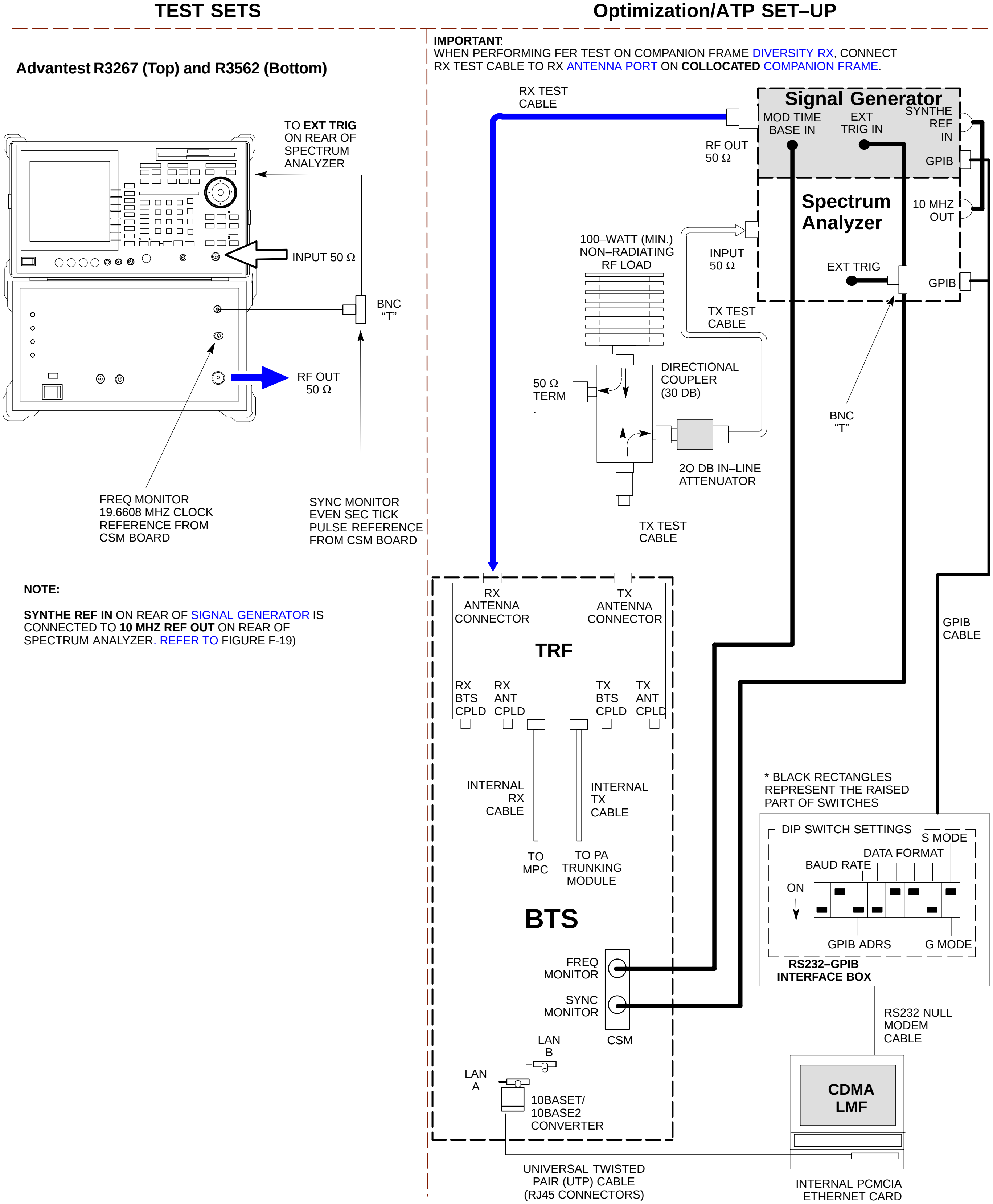
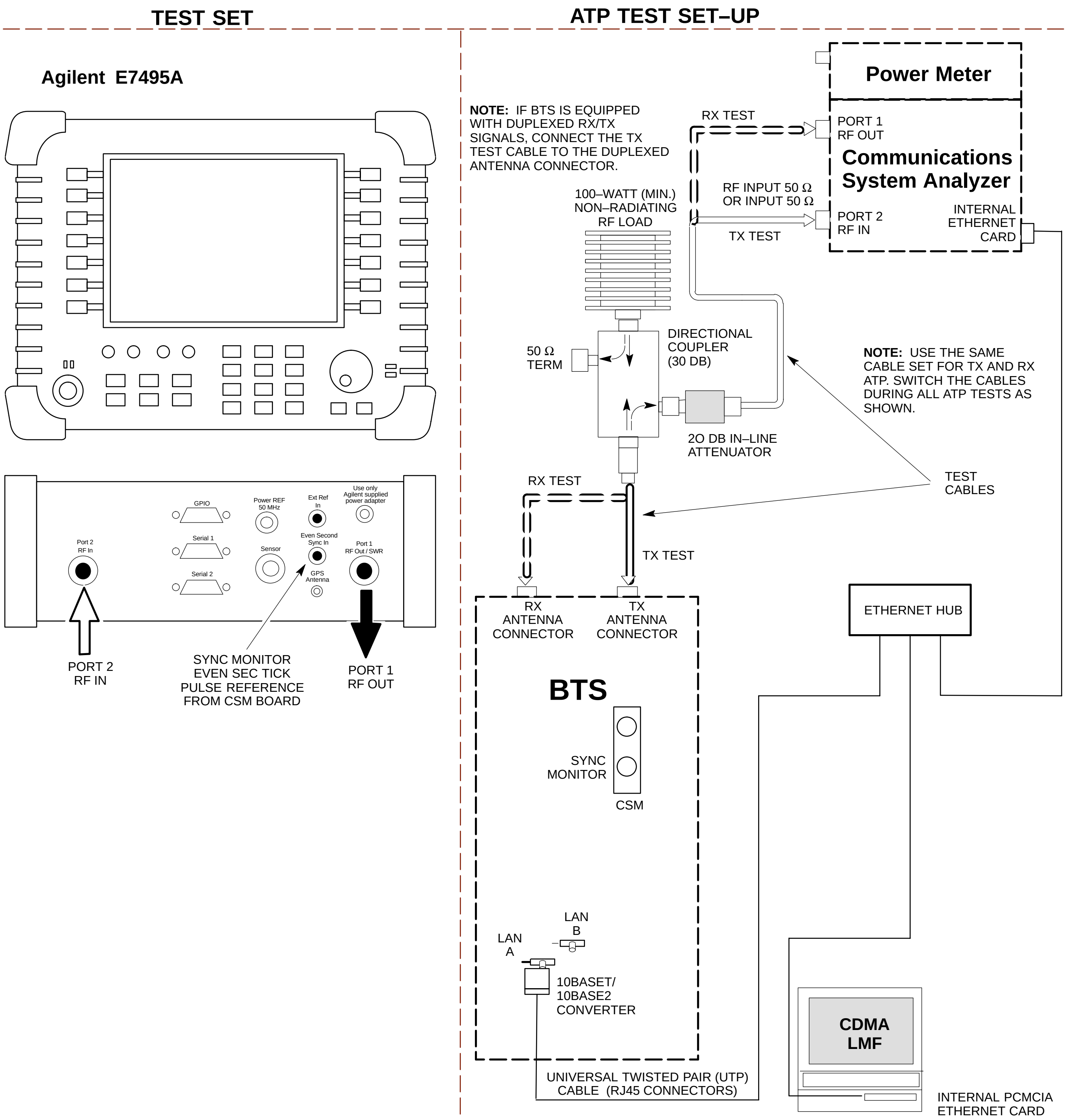


Figure 3-41: IS–95A/B and CDMA2000 1X Optimization/ATP Test Set–up – Agilent E7495A



PRELIMINARY

Test Equipment Calibration Background

Proper Test Equipment Calibration helps to ensure accurate BTS Optimization and Acceptance Testing by assuring that the Test Equipment and associated cables do not introduce Measurement Errors.

NOTE

If the Test Equipment Set being used to optimize or test the BTS has been calibrated and maintained as a set, this procedure does not need to be performed.

This procedure must be performed *prior to* beginning the Optimization. Verify that all Test Equipment (including all associated cables and adapters actually used to interconnect Test Equipment Items and the BTS) has been calibrated and maintained as a set.

CAUTION

If any piece of Test Equipment, Test Cable, or RF Adapter that makes up the calibrated *Test Equipment Set* has been replaced, the *set* must be re-calibrated.

- Failure to do so can introduce Measurement Errors, resulting in incorrect measurements and degradation to system performance.
- Motorola recommends repeating Cable Calibration before testing at each BTS Site.

NOTE

Calibration of the Communications System Analyzer (or equivalent Test Equipment) must be performed at the site before calibrating the overall *Test Equipment Set*.

- Calibrate the Test Equipment *after* it has been allowed to warm–up and stabilize for a *a minimum of 60 minutes*.

Automatic Calibration Procedure

Procedures included in this section use the LMF Automated Calibration Procedure to determine Path Losses of the supported Communications Analyzer, Power Meter, associated Test Cables, Adapters, and (if used) Antenna Switch that make up the overall calibrated *Test Equipment Set*. After Calibration, the Gain/Loss Offset Values are stored in a Test Measurement Offset File on the LMF Computer.

Manual Calibration Procedures

Agilent E4406A Transmitter Tester

The E4406A does not support the Power Level Zeroing Calibration performed by the LMF. If this instrument is to be used for Bay Level Offset Calibration and Calibration is attempted with the LMF **Calibrate Test Equipment** Function, the LMF will return a Failure Message Status Window stating that Zeroing Power is not supported by the E4406A.

- Refer to the Equipment Calibration section of Appendix F for instructions on using the instrument's Self–alignment (Calibration) Function prior to performing Bay Level Offset Calibration..

Power Meters

Manual Power Meter Calibration Procedures to be performed prior to automated Calibration are included in the Equipment Calibration section of Appendix F..

Cable Calibration

Manual Cables using the HP 8921A and Advantest R3465 Communications System Analyzers are provided in the Manual Cable Calibration section of Appendix F, if needed..

GPIB Addresses

GPIB Addresses can range from 1 through 30. The LMF will accept any address in that range, but the numbers entered in the LMF Options Window GPIB Address Boxes (Table 3-29 and Table 3-30) must match the addresses set in the Test Equipment. Motorola recommends using **1** for a CDMA Signal Generator, **13** for a Power Meter, and **18** for a Communications System Analyzer. To verify and, if necessary, change the GPIB Addresses of the Test Equipment, refer to the Setting GPIB Addresses section of Appendix F.

IP Addresses

For the Agilent E7495A Communications Test Set, set the IP Address and complete Initial Set–up as described in Appendix F. Specifically, see Table F-1 on Page F-1.

Selecting Test Equipment

Serial Connection and **Network Connection** Tabs are provided in the **LMF Options Window** to specify the Test Equipment Connection Method.

- The **Serial Connection** Tab is used when the Test Equipment Items are connected directly to the LMF Computer through a GPIB Box (normal set–up).
- The **Network Connection** Tab is used when the Test Equipment is to be connected remotely via a Network Connection or the Agilent E7495A Communications Test Set is used. Refer to Appendix F. Specifically, see Table F-1 on Page F-1.

Prerequisites

Ensure that the following have been completed before selecting Test Equipment:

- Test Equipment is turned on.
- GPIB Addresses set in the Test Equipment have been verified as correct using the applicable procedures in Appendix F. (Not required with Agilent E7495A.)
- LMF Computer Serial Port and Test Equipment are connected to the GPIB Box. (GPIB not applicable with Agilent E7495A)

Selecting Test Equipment

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

Manually Selecting Test Equipment in a Serial Connection Tab

Test Equipment can be manually specified before or after the Test Equipment is connected. The LMF does not attempt to verify that the Test Equipment is actually detected when Manual Selection is specified. Perform the procedure in Table 3-29 to manually select Test Equipment.

Table 3-29: Selecting Test Equipment Manually in the Serial Connection Tab Procedure

✓	Step	Action
	1	In the LMF Window Menu Bar, click **Tools** and select **Options...** from the Pull–down Menu. – The **LMF Options Window** appears. – If it is not in the forefront, click on the **Serial Connection** Tab.
	2	Select the correct Serial Port in the **COMM Port:** Pick List (normally **COM1**). – *If it is not selected (no black dot showing)*, click on the **Manual Specification** Button.
	3	Click on the Check Box(es) corresponding to the Test Equipment Item(s) to be used.

table continued on next page

Table 3-29: Selecting Test Equipment Manually in the Serial Connection Tab Procedure		
✓	**Step**	**Action**
	4	Type the GPIB Address in the corresponding **GPIB Address Box**. – Refer to the Setting GPIB Addresses section of Appendix F for directions on verifying and/or changing Test Equipment GPIB Addresses. ***Motorola–recommended addresses are:*** – **1** = Signal Generator – **13** = Power Meter – **18** = Communications System Analyzer **NOTE** When Test Equipment Items are manually selected by the operator, the LMF defaults to using a Power Meter for RF Power Measurements. The LMF will use a Communications System Analyzer for RF Power Measurements only if a Power Meter is not selected (Power Meter Check Box *not* checked).
	5	Click on **Apply**. – The button will darken until the selection has been recorded. **NOTE** With Manual Selection, the LMF does not attempt to detect the Test Equipment to verify it is connected and communicating with the LMF.
	6	Click on **Dismiss** to close the **LMF Options Window**.

Automatically Selecting Test Equipment in the Serial Connection Tab

When using the Auto–detection Feature to select Test Equipment, the LMF determines which Test Equipment Items are actually communicating with LMF. Perform the procedure in Table 3-30 to use the Auto–detection Feature.

Table 3-30: Selecting Test Equipment Using Auto-Detect Procedure

✓	Step	Action
		NOTE An alternate procedure is required if using the Agilent E7495A Test Set. – See "**Detecting Test Equipment when using Agilent E7495A**" topic following this table.
	1	In the LMF Window Menu Bar, click **Tools** and select **Options...** from the Pull–down Menu. – The **LMF Options Window** appears. – If it is not in the forefront, click on the **Serial Connection** Tab.
	2	Select the correct Serial Port in the **COMM Port:** Pick List (normally **COM1**). • *If it is not selected (no black dot showing),* click on the **Auto–Detection** Button. • *If they are not already displayed* in the box labeled **GPIB Address to search**, click in the box and type in the GPIB Addresses for the Test Equipment to be used, separating each address *with commas and no spaces*. – Refer to the Setting GPIB Addresses section of Appendix F for instructions on verifying and/or changing Test Equipment GPIB Addresses. *** IMPORTANT** During the GPIB Address search for a Test Equipment Item to perform RF Power Measurements (that is, for TX Calibration), the LMF will select the first item it finds with the capability to perform the measurement. • If, for example, the address sequence **13,18,1** is included in the **GPIB Addresses to search** Box, the Power Meter (GPIB Address 13) will be used for RF Power Measurements. • If the address sequence **18,13,1** is included, the LMF will use the Communications System Analyzer (GPIB Address 18) for Power Measurements.
	3	Click **Apply.** – The button will darken until the selection has been recorded. – A Check Mark will appear in the applicable **Manual Configuration** section.
	4	Check the boxes for detected Test Equipment Items.
	5	Click **Dismiss** to close the **LMF Options Window**.

Detecting Test Equipment when using Agilent E7495A

IMPORTANT

Verify that no other equipment is connected to the LMF.

Agilent E7495A equipment must be connected to the LAN to detect it. Then perform the procedures described in Appendix F. Specifically, refer to Table F-1 on Page F-1, Table F-2, and Table F-3 on Page F-3.

Calibrating Test Equipment

The LMF **Calibrate Test Equipment Procedure** zeros the Power Measurement Level of the Test Equipment Item that is to be used for TX Calibration and Audit. If both a Power Meter and an Analyzer are connected (for example, an HP 437 and an HP 8921A/600), only the Power Meter is Zeroed.

NOTE

The Agilent E4406A Transmitter Tester does not support Power Measurement Level zeroing.

– Refer to the Equipment Calibration section of Appendix F for Agilent E4406A Calibration.

Prerequisites

- LMF Computer Serial Port and Test Equipment are connected to the GPIB Box.
- Test Equipment is turned on and has warmed–up for at least 60 minutes.
- Test Equipment has been selected in the LMF (Table 3-29 or Table 3-30)

Perform the procedure in Table 3-31 to calibrate the Test Equipment.

Table 3-31: LMF Test Equipment Calibration Procedure

✓	Step	Action
	1	From the **Util** Menu, select **Calibrate Test Equipment** from the Pull–down Menu. – A **Directions** Window is displayed.
	2	Follow the directions provided.
	3	Click on **Continue** to close the **Directions** Window and start the Calibration Process. – A Status Report Window is displayed.
	4	Click on **OK** to close the Status Report Window.

LMF Cables Calibration Overview

3

The **LMF Cable Calibration** Function is used to measure the Path Loss (in dB) for the TX and RX Cables, Adapters, Directional Couplers, and Attenuators that make up the Cable Configurations used for testing. A Communications System Analyzer is used to measure the Signal Loss of both the TX Test Cable and the RX Test Cable Configurations. The LMF Cable Calibration consists of the following processes:

Measure the Signal Loss in a Short Cable

This measurement is done to compensate for any Measurement Error in the Communications System Analyzer. The Short Test Cable, which is used only for the Calibration Process, is connected in series with both the TX and RX Test Cable Configurations when they are measured.

The measured Signal Loss in the Short Test Cable is deducted from the measured Signal Loss of the TX and RX Test Cable Configurations to determine the actual loss of the configurations. This deduction is done so that any error in the analyzer measurement can be adjusted out of both the TX and RX Measurements.

Measure the Signal Loss in the Short Cable plus the RX Test Cable Configuration

The RX Test Cable Configuration normally consists only of a COAX Cable with Type–N Connectors that is long enough to reach from the BTS RX Connector to the Test Equipment.

When the BTS Antenna Connectors carry *Duplexed TX and RX* Signals, a Directional Coupler is required. If required by BTS Type, an additional Attenuator is also required for the RX Test Cable Configuration. These additional items must be included in the Path Loss Measurement.

Measure the Signal Loss in the Short Cable plus the TX Test Cable Configuration

The TX Test Cable Configuration normally consists of two COAX Cables with Type–N Connectors, a Directional Coupler, a Termination Load with sufficient rating to dissipate the BTS Output Power, and an additional Attenuator, if required by the BTS Type.

The total Path Loss of the TX Test Configuration must be as required for the BTS (normally 30 or 50 dB). The Motorola CyberTest Analyzer is different from other Communications System Analyzers because the required Attenuation/Load is built into the Test Set. Because of this, the Cybertest TX Test Configuration consists only of the required length COAX Cable.

Calibrating Test Cabling using a Communications System Analyzer

Prerequisites

- Test Equipment is turned on and has warmed–up for at least 60 minutes.
- Test Equipment has been selected in the LMF (Table 3-29 or Table 3-30).
- Test Equipment has been calibrated and correctly connected for the type of Test Cable Configuration to be calibrated.

NOTE

LMF Cable Calibration cannot be accomplished with an HP 8921A Analyzer for 1.9 GHz. A different analyzer type or the Signal Generator and Spectrum Analyzer Method (Table 3-33 and Table 3-34) must be used.

Cable Calibration Values must be manually entered into the LMF Test Cable Insertion Loss File if the Signal Generator and Spectrum Analyzer Method is used.

To use the HP 8921A for *Manual* Test Cable Configuration Calibration for 800 MHz BTSs, refer to the Manual Cable Calibration section of Appendix F.

Procedure

Refer to Figure 3-12, Figure 3-13, or Figure 3-14 and perform the procedure in Table 3-32 to calibrate the Test Cable Configurations.

Table 3-32: Test Cabling Calibration using Communications System Analyzer Procedure

✓	Step	Action
	1	Click **Util** in the BTS Menu Bar, and select **Cable Calibration...** in the Pull–down Menu. – A **Cable Calibration** Window is displayed.
	2	Enter one or more Channel Numbers in the **Channels** Box. **NOTE** Multiple Channel Numbers must be separated by a comma with no spaces (for example, `200,800`). – When two or more Channel Numbers are entered, the cables are calibrated for each channel. – Interpolation is accomplished for other channels, as required, for TX Calibration.

table continued on next page

Table 3-32: Test Cabling Calibration using Communications System Analyzer Procedure		
✓	Step	Action
	3	Select: – **TX and RX CABLE CAL**, **TX CABLE CAL** or – **RX CABLE CAL** in the **Cable Calibration** Pick List.
	4	Click **OK**, and follow the directions displayed for each step. – A Status Report Window will be displayed with the results of the Cable Calibration.

Calibrate Test Cabling using a Signal Generator and Spectrum Analyzer

Refer to Figure 3-42 and perform the procedure in Table 3-33 to calibrate the TX Test Cable Configuration for all BTSs or the RX ATP Test Cable Configuration for BTSs with *Duplexed TX/RX* using the Signal Generator and Spectrum Analyzer.

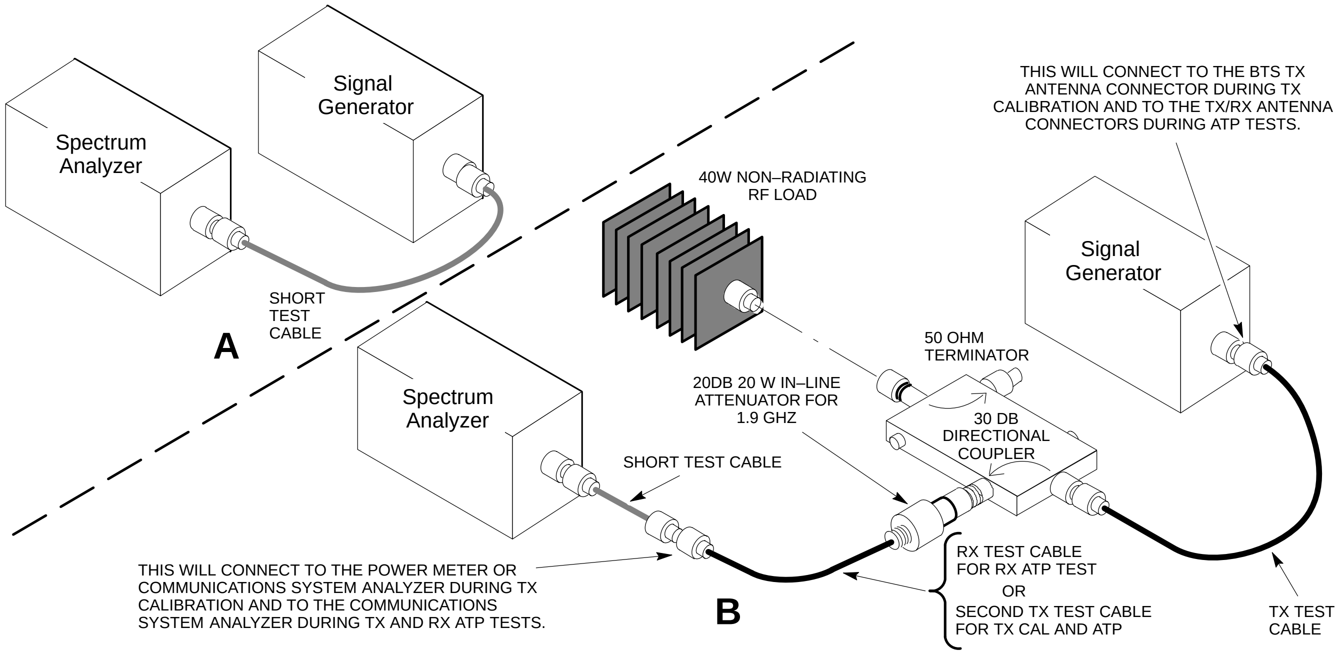
Refer to Figure 3-43 and perform the procedure in Table 3-34 to calibrate the Test Cable Configuration for *non*–Duplexed RX using the Signal Generator and Spectrum Analyzer.

TX and Duplexed RX Cable Calibration

Table 3-33: TX/Duplexed RX Test Cabling using Signal Generator and Spectrum Analyzer Calibration Procedure

✓	Step	Action
	1	Connect a Short Test Cable between the Spectrum Analyzer and the Signal Generator as shown in Figure 3-42, Detail "A" (top portion of figure).
	2	Set the Signal Generator to 0 dBm at the Customer Frequency. – 869.7–893.31 MHz for North American Cellular or – 1930–1990 MHz for North American PCS
	3	Use Spectrum Analyzer to measure the Signal Generator Output.
	4	Record the value for the Detail "A" Set–up.
	5	Change the Test Set–up to the one shown in Detail "B" (lower portion of Figure 3-42), to measure Cable Output at the Customer Frequency. – 869.7–893.31 MHz for North American Cellular or – 1930–1990 MHz for North American PCS
	6	Record the value measured using the Detail "B" Test Set–up.
	7	Calibration Factor = (Value measured with Detail "A" Set–up) – (Value measured with Detail "B" Set–up) Example: Calibration Factor = –1 dBm – (–53.5 dBm) = 52.5 dBm *** IMPORTANT** The Short Test Cable is used for *Calibration Only.* – It is *not* part of the Final Test Set–up. After Calibration is completed, *do not* re-arrange any cables. – Use the Test Cable Configuration as–is to ensure that the Test Procedures use the correct Calibration Factor.

Figure 3-42: Calibration Set–up for TX/Duplexed RX Test Cabling using a Signal Generator and a Spectrum Analyzer



Non-Duplexed RX Cable Calibration

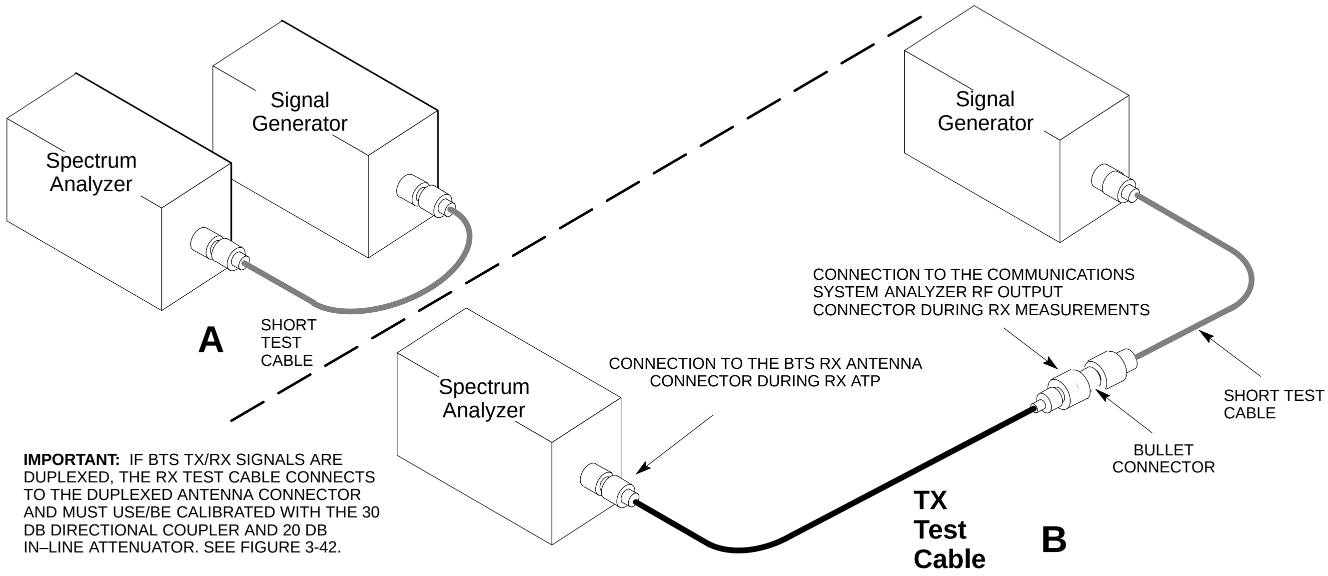
Table 3-34: *Non*–Duplexed RX Test Cabling Using Signal Generator and Spectrum Analyzer Calibration Procedure

✓	Step	Action
		*** IMPORTANT** When preparing to calibrate a BTS with *Duplexed TX and RX*, the RX Cable Calibration must be done using the Calibration Set–up in Figure 3-42 and the procedure in Table 3-33.
	1	Connect a Short Test Cable between the Spectrum Analyzer and the Signal Generator as shown in Figure 3-43, Detail “A” (top portion of figure).
	2	Set the Signal Generator to –10 dBm at the Customer’s RX Frequency. – 824.7–848.31 MHz for North American Cellular or – 1850–1910 MHz for North American PCS
	3	Use the Spectrum Analyzer to measure Signal Generator Output. – Record the value for the Detail “A” Set–up.

table continued on next page

Table 3-34: *Non*–Duplexed RX Test Cabling Using Signal Generator and Spectrum Analyzer Calibration Procedure		
✓	Step	Action
	4	Change the Test Set–up to the one shown in Detail “B” (lower portion of Figure 3-43) to measure the output at the Customer’s RX Frequency. – 824.7–848.31 MHz for North American Cellular or – 1850–1910 MHz for North American PCS
	5	Record the value measured with the Detail “B” Test Set–up.
	6	Calibration Factor = (Value measured with Detail “A” Set–up) – (Value measured with Detail “B” Set–up) Example: Calibration Factor = –12 dBm – (–14 dBm) = 2 dB *** IMPORTANT** The Short Test Cable is used for Test Equipment Set–up Calibration *Only.* – It is not part of the Final Test Set–up. After Calibration is completed, *do not* re-arrange any cables. – Use the Test Cable Configuration as–is to ensure Test Procedures use the correct Calibration Factor.

Figure 3-43: Calibration Set–up for Non–Duplexed RX Test Cabling using a Signal Generator and a Spectrum Analyzer



Setting Cable Loss Values

Cable Loss Values for TX and RX Test Cable Configurations are normally set by accomplishing Automatic Cable Calibration using the LMF and the applicable Test Equipment. The LMF stores the measured Signal Loss Values in the Test Cable Insertion Loss Files. The Test Cable Insertion Loss Values can also be set or changed manually.

CAUTION

If Cable Calibration was performed without using the LMF, Test Cable Insertion Loss Values *must* be manually entered in the LMF Database. Failure to do this will result in inaccurate BTS Calibration and reduced site performance.

Prerequisites

- LMF is logged into the BTS.

Table 3-35: Setting Cable Loss Values Procedure

✓	Step	Action
	1	Click **Util** in the BTS Menu Bar, and select **Edit > Cable Loss** in the Pull–down Menus. – A Tab*bed* Data Entry Pop–up Window will appear.
	2	Click on the **TX Cable Loss** Tab or the **RX Cable Loss** Tab, as required.
	3	To add a new Channel Number, perform the following actions.
	3a	Click on the **Add Row** Button.
	3b	Click in the **Channel #** or **Loss (dBm)** Column, as required.
	3c	Enter the desired value.
	4	To edit existing values, click in the Data Box to be changed and change the value.
	5	To delete a row, click on the row and then click on the **Delete Row** Button.
	6	*For each tab that needs to be changed*, click on the **Save** Button to save the displayed values.
	7	Click on the **Dismiss** Button to close the window. *** IMPORTANT** • Values entered or changed after the **Save** Button was used will be lost when the window is dismissed. • If Test Cable Insertion Loss Values exist for two different channels, the LMF will interpolate for all other channels. • Entered values will be used by the LMF as soon as they are saved. • It is not necessary to log out and log back into the LMF for changes to take effect.

Setting TX Coupler Loss Value

If an in–service TX Coupler is installed, the Coupler Loss must be manually entered so it will be included in the LMF TX Calibration and Audit Calculations.

Prerequisites

- LMF is logged into the BTS.
- Path Loss, in dB, of the TX Coupler must be known.

Table 3-36: Setting TX Coupler Loss Values Procedure

✓	Step	Action
	1	Click **Util** in the BTS Menu Bar, and select **Edit > Coupler Loss...** in the Pull–down Menus. – A Tab*bed* Data Entry Pop–up Window will appear.
	2	Click on the **TX Coupler Loss** Tab or the **RX Coupler Loss** Tab, as required.
	3	Click in the **Loss (dBm)** Column for each carrier that has a coupler and enter the appropriate value.
	4	Perform the following actions to edit existing values.
	4a	Click in the Data Box to be changed.
	4b	Change the value.
	5	*For each tab that needs to be changed*, click on the **Save** Button to save displayed values.
	6	Click on the **Dismiss** Button to close the window. *** IMPORTANT** • Values entered or changed after the **Save** Button is used will be lost when the window is dismissed. • The **In–Service Calibration** Check Box in the **Tools** > **Options** > **BTS Options** Tab must be checked before entered TX Coupler Loss Values will be used by the TX Calibration and Audit Functions. • New or changed values will be used by the LMF as soon as they are saved. • Logging out and logging in again *are not required* to cause saved changes to take effect.

Introduction

Bay Level Offset (BLO) Calibration is the central activity of the Optimization Process. BLO Calibration compensates for normal equipment variations within the BTS RF Paths and assures that the correct Transmit Power is available at the BTS Antenna Connectors to meet site performance requirements.

What is BLO Calibration?

Description

BLO Calibration is the complete title of what is normally referred to as "Calibration." Calibration identifies the accumulated Gain in every *Transmit* Path at the BTS Site.

The Transmit Path BLO Values determined during Calibration are stored in the LMF Calibration Data File, and are subsequently downloaded to each BBX. When Transmit Path Calibration is performed, Receive Path BLO Values are automatically set to the Default Value in the LMF Calibration File and downloaded.

BTS RF Path Descriptions

Transmit (TX) Path

A TX Path starts at an SCCP Cage BBX Backplane Slot, travels through the CIO Card, is routed to the Power Amplifier (PA) Trunking Module for Sector Phase Shifting, through the PAs, back through the PA Trunking Module for Sector Phase Selection, through the TX Bandpass Filter (Starter Frames) or 2:1 TX Combiner (Expansion Frames), through the Transmit and Receive Filter (TRF) or Duplexer TX/RF Filter (DRF), and ends at the TRF or DRF Antenna Connector..

Receive (RX) Main Path

A Main RX Path starts at ANTENNAS Connectors 1A, 2A, or 3A and travels through the associated TRF or DRF, the MPC in the SCCP Cage MPC–1 Slot, the CIO Card, and terminates at a Backplane BBX Slot in the SCCP Cage..

Diversity RX Path

Diversity RX Paths differ for SC4812T Lite Starter and Expansion Frames. The following describe each type of path.:

- **Starter Frame Diversity RX Path** – A Starter Frame Diversity RX Path is the same as a Main RX Path except that it starts at ANTENNAS Connectors 1B, 2B, or 3B, travels through the associated TRF or DRF, and the MPC Card in SCCP Cage MPC–2 Slot.

- **Expansion Frame Diversity RX Path** – The Starter Frame Main RX Signal is used for the Expansion Frame Diversity RX Signal. An Expansion Frame's Diversity RX Path starts at ANTENNAS Connectors 1A, 2A, or 3A *in the Starter Frame*. It travels through the associated TRF or DRF, the MPC in SCCP Cage MPC–1 Slot, and the CIO Card where it is then routed out of the frame through the RX Expansion *Out* Connectors (RX EXPANSION 1A, 2A, or 3A).

  The signal travels through the Inter–frame Diversity RX Cables, into the RX Expansion *In* Ports (RX EXPANSION 1B, 2B, or 3B) of the Expansion Frame, through the Expansion MPC (EMPC) in SCCP Cage MPC–2 Slot, the CIO, and terminates at a Backplane BBX Slot in the SCCP Cage.
- **RFDS sampling paths** – Directional Couplers for RFDS signal sampling are integral to the SC4812T Lite Transmit and Receive Paths in the DRFs and TRFs. Cables connect from these Directional Couplers to the RFDS Input Connectors.

Component Verification During Calibration

TX Path Calibration

TX Path Calibration supports verification of correct BTS installation, RF Cabling installation and performance, functionality of all equipment installed in the Transmit RF Chain, and the proper functioning of each Transmit RF Path. External Test Equipment is used to calibrate and audit the TX Paths of the BTS.

RX Path Calibration

RX Path Calibration is not required or supported on CDMA BTS systems. Default RX Calibration Values are written to the RX Calibration Data Files during the TX Calibration process. RX Functionality is verified during Frame Erasure Rate (FER) Testing.

When to Calibrate BLOs

Calibration to determine BLO:

1. Is required after Initial BTS Installation.
2. Must be done once each year for an operational BTS Site.
3. Is recommended by Motorola for all associated RF Paths after replacing any of the following components.
   – BBX Card
   – SCCP Cage
   – CIO Card
   – CIO–to–PA Trunking Module RF Cable
   – PA Trunking Module
   – Power Amplifier
   – Trunking Module–to–TX Filter/Filter Combiner RF Cable

– TX Filter or TX Filter Combiner
– TX Filter/Filter Combiner–to–DRF/TRF Cable
– DRF or TRF

BLO Calibration Data File

During the Calibration Process, the LMF creates a Calibration (CAL) Data File where BLO Values are stored. After Calibration has been completed, these Offset Values must be downloaded to the BBX Cards using the LMF BLO Download Function. A detailed description of the file organization and content is provided in the following paragraphs.

NOTE

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

CAL File Organization

The CAL File is subdivided into three sections called “Slot Blocks”. These are:

1. **Slot[1] Block** that contains the Calibration Data for the six Primary BBX Slots.
2. **Slot[20] Block** that contains the Calibration Data for the Redundant BBX. Refer to Table 3-38.
3. **Slot[385] Block** that contains the Calibration Data for the RFDS.

BBX Slot Block Parts

BBX Slot Blocks are further subdivided into the parts described in the following paragraphs.

Slot Block Header – Each BBX Slot Block has a Header Section (Slot Header) that contains the following items.:

- A Creation Date and Time – broken down into separate parameters of “createMonth”, “createDay”, “createYear”, “createHour”, and “createMin”.
- The number of *Calibration Entries* in the file – the “numBayLevelPts” Parameter. The parameter is fixed at 720 entries for SC4812 Series Frames. These 720 entries are combined to define the 360 *Calibration Points* of the CAL File.
- The slot Block format parameter.

Slot Block Bay Level Calibration Data – Each BBX Slot Block has a Bay Level Calibration Data Section (BayLevelCal) that is organized as a large flat array. The array is organized by Branch, SCCP Cage BBX Slot, and Calibration *Entries*.

There are several ways to look at the array contents. Two different views are provided in the following to illustrate the significant features of “BayLevelCal” section content and organization:

- The first view of the array is shown in Table 3-37. This view shows the three *branches* of the array (Transmit, Main Receive, and Diversity Receive Offsets, and the *Calibration Entry* ranges that apply to each.

Table 3-37: BLO **bts–#.cal** File Array Branch Assignments

Range	Branch Assignment
C[1]–C[120]	Transmit
C[121]–C[240]	No SC4812T Lite BLO Cal Point Entries (Default only)
C[241]–C[360]	Receive
C[361]–C[480]	No SC4812T Lite BLO Cal Point Entries (Default only)
C[481]–C[600]	Diversity Receive
C[601]–C[720]	No SC4812T Lite BLO Cal Point Entries (Default only)

- The second view of the array is shown in Table 3-38. This view shows the assignment of *Calibration Entries* in each branch to each BBX Slot, Carrier, and Sectorization. Three sectors are allowed in an SC4812T Lite BTS Frame.

Table 3-38: SC4812T Lite **bts–#.cal** File Array (by BBX/Sector)

BBX	Sectorization	TX Branch	RX Branch	RX Diversity Branch
Slot[1] (Primary BBX Cards 1 through 6)				
1 (Omni)	3–Sector, 1st Carrier	C[1]–C[20]	C[241]–C[260]	C[481]–C[500]
2		C[21]–C[40]	C[261]–C[280]	C[501]–C[520]
3		C[41]–C[60]	C[281]–C[300]	C[521]–C[540]
4	3–Sector, 2nd Carrier	C[61]–C[80]	C[301]–C[320]	C[541]–C[560]
5		C[81]–C[100]	C[321]–C[340]	C[561]–C[580]
6		C[101]–C[120]	C[341]–C[360]	C[581]–C[600]
Not Used in SC4812T Lite (CAL File Entries are Channel 0 with Default Power Set Level)		C[121]–C[140]	C[361]–C[380]	C[601]–C[620]
		C[141]–C[160]	C[381]–C[400]	C[621]–C[640]
		C[161]–C[180]	C[401]–C[420]	C[641]–C[660]
		C[181]–C[200]	C[421]–C[440]	C[661]–C[680]
		C[201]–C[220]	C[441]–C[460]	C[681]–C[700]
		C[221]–C[240]	C[461]–C[480]	C[701]–C[720]

table continued next page

Table 3-38: SC4812T Lite **bts–#.cal** File Array (by BBX/Sector)				
BBX	**Sectorization**	**TX Branch**	**RX Branch**	**RX Diversity Branch**
Slot[20] (Redundant BBX–R1)				
1 (Omni)	3–Sector, 1st Carrier	C[1]–C[20]	C[241]–C[260]	C[481]–C[500]
2		C[21]–C[40]	C[261]–C[280]	C[501]–C[520]
3		C[41]–C[60]	C[281]–C[300]	C[521]–C[540]
4	3–Sector, 2nd Carrier	C[61]–C[80]	C[301]–C[320]	C[541]–C[560]
5		C[81]–C[100]	C[321]–C[340]	C[561]–C[580]
6		C[101]–C[120]	C[341]–C[360]	C[581]–C[600]
Not Used in SC4812T Lite (CAL File Entries are Channel 0 with Default Power Set Level)		C[121]–C[140]	C[361]–C[380]	C[601]–C[620]
		C[141]–C[160]	C[381]–C[400]	C[621]–C[640]
		C[161]–C[180]	C[401]–C[420]	C[641]–C[660]
		C[181]–C[200]	C[421]–C[440]	C[661]–C[680]
		C[201]–C[220]	C[441]–C[460]	C[681]–C[700]
		C[221]–C[240]	C[461]–C[480]	C[701]–C[720]

- When referring to the CAL File Printout and Table 3-38, it can be seen that there is one BBX Slot per sector with 20 “Calibration *Entries*” per BBX (sector) for each branch. *Two* Calibration *Entries* define a single “Calibration *Point*;” therefore there are *ten* Calibration *Points* in each branch for each BBX.
  - The first Calibration Entry for a Calibration Point (all odd entries) identifies the CDMA Channel (frequency) where the BLO is measured.
  - The second Calibration Entry (all even entries) is the Power Set Level (PwrLvlAdj) for that frequency. The valid range for “PwrLvlAdj” is from 2500 to 27500 (2500 corresponds to –125 dBm and 27500 corresponds to +125 dBm).
  - The ten Calibration Points for each Slot–Branch Combination must be stored in order of increasing frequency. If less than ten points (frequencies) are calibrated, the BLO Data for the highest frequency calibrated is written into the remainder of the ten points for that Slot–Branch.

Example:

C[1]=384	(Odd Cal Entry)	= *1 "Calibration Point"*
C[2]=19102	(Even Cal Entry)	
C[3]=777	(Odd Cal Entry)	= *1 "Calibration Point"*
C[4]=19086	(Even Cal Entry)	
.		
.		
.		
C[19]=777	(Odd Cal Entry)	= *1 "Calibration Point"*
C[20]=19086	(Even Cal Entry)	

In the example above, BLO was measured at only two frequencies (Channels 384 and 777) for SCCP BBX–1 Slot Transmit (Table 3-38). The BLO Data for the highest frequency measured (Channel 777) will be written to the remaining eight Transmit Calibration Points (defined by Entry C[5] through Entry C[20]) for BBX–1.

Slot Block Temperature Compensation – Each BBX Slot Block also has a Temperature Compensation Data Section (TempLevelCal) where Power Level Compensation Factors for Temperature Variations are stored..

CAL File and BLO Data Download

When BLO Data is downloaded to the BBX Cards after Calibration, the data is downloaded to the devices in the order it is stored in the CAL File. TX Calibration Data (Entries C[1] through C[60]) are sent first.

Data for the ten BBX Slot 1 Calibration Points (Entries C[1] through C[20]) are sent initially, followed by data for the ten BBX Slot 2 Calibration Points (Entries C[21] through C[40]), and so on. The RX Calibration Data is sent next in BBX Slot Sequence, followed by the RX Diversity Calibration Data.

Test Equipment Set–up for RF Path Calibration

Perform the procedure in Table 3-39 and refer as needed to Figure 3-16 or Figure 3-17 to Set–up Test Equipment.

Table 3-39: Set–up Test Equipment for RF Path Calibration Procedure

✓	Step	Action
	1	*If it has not already been done*, refer to the procedure in Table 3-6 (on Page 3-18) to interface the LMF Computer Terminal to the BTS Frame LAN A Connector.
	2	*If it has not already been done*, refer to Table 3-10 (on Page 3-29) to start a *GUI* LMF Session.
	3	If required, calibrate the Test Equipment per the procedure in Table 1-4.

table continued on next page

Table 3-39: Set–up Test Equipment for RF Path Calibration Procedure		
✓	Step	Action
		! CAUTION To prevent damage to the Test Equipment, all Transmit (TX) Test Connections must be via the 30 dB Directional Coupler for 800 MHz or via a 30 dB Coupler with a 20 dB In–line Attenuator for 1900 MHz.
	4	*For TX Path Calibration*, connect the Test Equipment as shown in Figure 3-16, Figure 3-17, or Figure 3-18, depending on the Communications Analyzer being used.

3

Transmit (TX) Path Calibration Description

The assigned Channel Frequency and desired Power Level at the Frame TX Ports for transmit Calibration are derived from the BTS CDF File. Each BBX at the site is assigned to a Sector and Carrier. These are specified respectively in the Sector and Carrier *Fields* of the "`ParentCARRIER`" Parameter in each BBX Cards CDF File Block.

The Channel Frequency and desired Power Output for the assigned *sector* are specified respectively in the "`ChannelList`" and "`SIFPilotPwr`" Parameters of the CDF Block for the CARRIER to which the BBX is assigned.

NOTE

Ensure that the **bts–#.cdf** (or **bts–#.necf**) and **cbsc–#.cdf** Files loaded on the LMF Computer are current. The LMF will obtain carrier and channel information from these files and insert it into the appropriate CDMA Test Parameter Screen.

Failure to have the most current files from the CBSC can result in incorrect channel information being used to calibrate the BTS and unfavorable affects on BTS performance.

Carrier and Channel Numbers should only be entered manually for special test cases or as a last resort.

The Calibration Process attempts to adjust the measured Power Output to within ±0.5 dB of the desired Power Output. The Calibration Settings will pass if the error is less than ±1.5 dB.

The TX BLO for the SC 4812T Lite is approximately 45.0 dB ±5.0 dB. BLO is the Gain in dB between the known Power Output of the BBX and the measured Power Input at the TX Port. BLO is derived by deducting the known BBX Power Output from the Power Input measured at the TX Port or (Measured TX Port Power Input) – (BBX TX Power Output).

Example:

Measured Power Input (at TX Port) = 39.0 dBm

Known BBX TX Power Output = –6.0 dBm

BLO = (39.0) – (–6.0) = 45.0 dB Gain

TX Calibration and the LMF

The LMF **Tests > TX > TX Calibration...** and **Tests > All Cal/Audit...** Selections perform TX BLO Calibration Testing for installed BBX(s).

– The **All Cal/Audit...** Selection initiates a series of actions to perform TX Calibration, and if Calibration is successful, download BLO and perform TX Audit.

– The **TX Calibration...** Selection performs only TX Calibration. When **TX Calibration...** is used, BLO Download and TX Audit *must be performed as separate activities*. The CDMA Test Parameters Window that opens when **TX Calibration...** or **All Cal/Audit...** is selected contains several “user–selectable” Features that are described in the following subsections.

Rate Set Drop–down Pick List

The Rate Set Drop–down Box is enabled if at least one MCC Card is selected for the test. The available options for TX Tests are 1 = 9600, and 3 = 9600 1X.

– Option 2 is only available if no 1X Cards are selected.

– Option 3 is only available if 1X Cards are selected for the test.

– The available Transfer Rate Options for RX Tests are 1 = 9600 and 2 = 14400.

Verify BLO Check Box

In both the TX Calibration and All Cal/Audit Dialog Boxes, a **Verify BLO** Check Box is provided and checked by default. After the actual TX Calibration is completed during either the TX Calibration or All Cal/Audit Process, the BLO derived from the Calibration is compared to a standard acceptable BLO Tolerance for the BTS.

In some installations, additional items may be installed in the Transmit Path. The additional change in Gain from these items could cause BLO Verification Failure and, therefore, failure of the entire Calibration.

– In these cases, either the **Verify BLO** Check Box should be unchecked or the additional Path Losses should be added into each applicable sector using the **Util>Edit>TX Coupler Loss...** Function.

Single–Sided BLO Check Box

An acceptable range of BLO Values for each type of BTS is established to allow for tolerance variations in all the components of the RF Chain. This acceptable range, 45.0 $\pm$5 dB for example, is very wide to accommodate the Redundant BBX in the BTS. This is a much wider tolerance than necessary for the Primary BBX Cards.

3

Primary BBX Cards normally will have BLOs in the lower half of the range. Using the example range, this would be from 40 to 45 dB. Checking the **Single–Sided BLO** Check Box should only be done when calibrating Primary BBX Cards because it will reduce the acceptable BLO Value variations to the lower half of the range. Because this is a much more stringent tolerance, Calibrations run with **Single–Sided BLO** are more likely to fail and should only be attempted by an experienced CFE.

IMPORTANT

Never select **Single–Sided BLO** when calibrating a *Redundant* BBX.

Test Pattern Drop–down Pick List

The **Tests > TX > TX Calibration...** Menu Window has a **Test Pattern** Pull–down Menu. This menu has the following choices:

- **Standard** – performs Calibration or Audit using Pilot, Paging, Synch, and six Traffic Channels with IS–97–specified Gain. This Pattern Setting should be used for all *non*–In–service Calibrations and Audits.

IMPORTANT

Using this Pattern Setting requires the selection of one BBX *and* at least one MCC.

- **Pilot (Default)** – performs Calibration using only the Pilot Channel.

IMPORTANT

This Pattern Setting should be used for In–service Calibrations, and requires selection of only one BBX.

- **CDFPilot** – This Pattern Setting is for advanced users. It performs Calibration or Audit using the CDF Value for Pilot Gain and IS–97 Gain Values for all the other channels included in the **Standard** Pattern Setting (Paging, Synch, and six Traffic).

IMPORTANT

Using this Pattern Setting requires the selection of one BBX *and* at least one MCC.

- **CDF** – This Pattern Setting is for advanced users who need to use CDF Gain Settings for *all* channels included in the **Standard** Pattern Setting (Pilot, Paging, Synch, and six Traffic).

IMPORTANT

Using this Pattern Setting requires the selection of one BBX *and* at least one MCC.

Test Pattern Channels and Gain Settings – The CDMA Channels and their respective Digital Gain Settings used for each Test Pattern are listed in Table 3-40.

Table 3-40: Test Patterns with Channels and Gain Settings Used

Test Pattern	Channel(s)	Gain Setting
Pilot	Pilot Channel only	541
Standard	Pilot	117
	Synch Channel (SCH)	57
	Paging (PCH)	114
	Traffic (TCH)	80 for each of 6 Walsh Codes used (6*80)
CDF Pilot	Pilot	Uses CDF–specified Pilot Gain
	SCH	57
	PCH	114
	TCH	6*80
CDF	Pilot	All channels use CDF–specified Gains
	SCH	
	PCH	
	TCH (6)	

TX Calibration

WARNING

Before installing any Test Equipment directly to any BTS **TX OUT Connector**, ***first verify that no CDMA Channels are keyed***.

– Failure to do so can result in serious personal injury and/or equipment damage.

CAUTION

Always wear an approved Anti–static Wrist Strap while handling any Circuit Card or Module.

– If this is not done, there is a high probability that the card or module could be damaged by ESD.

NOTE

At new site installations, to facilitate the complete test of each SCCP Cage (if the cage is not already fully populated with BBX Cards), move BBX Cards 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 (or NECF) File to verify that the correct BBX Slots are equipped. Edit the file as required to include BBX Slots not currently equipped (per Systems Engineering Documentation).

All Cal/Audit and TX Calibration Procedure

The LMF All Cal/Audit and TX Calibration Procedures are essentially identical, except for the step that selects the type of procedure desired.

– Refer to Step 4 in Table 3-41.

Prerequisites

Before running this procedure, make sure that the following actions/items have been performed/checked.

- The CSM Card in the CSM 1 Slot, GLI Cards, MCC Cards, and BBX Cards have correct Code and Data Loads.
- The LEDs on the Primary CSM and MGLI Cards are INS_ACTIVE (bright green).
- All BBX Cards are OOS_RAM (yellow).
- If running Calibration or Audit using a Test Pattern *other than* ***Pilot***, MCC Cards are INS_ACTIVE (bright green).
- Test Equipment and Test Cables are calibrated and connected for TX Calibration.
- The LMF is logged into the BTS in the GUI Environment.

NOTE

Verify that all BBX Cards removed and repositioned have been returned to their assigned shelves/slots.

Any BBX Cards that were moved since they were downloaded need to be downloaded again.

Perform the procedure in Table 3-41 to perform BLO Calibration on the TX Paths, download BLO Values to the BBX Cards, and perform TX Path Audit in one operation.

Table 3-41: All Cal/Audit and TX Calibration Procedure

✓	Step	Action
	1	*If it has not already been done*, configure the Test Equipment for TX Calibration by performing the procedure in Table 3-39.
	2	Click on the BBX(s) to be calibrated.
	3	If the **Test Pattern** to be used is **Standard**, **CDFPilot**, or **CDF**, select at least one MCC. – Refer to "Test Pattern Drop–down Pick List" under "TX Calibration and the LMF" in this section.
	4	***For All Cal Audit...*** Click **Tests** in the BTS Menu Bar, and select **TX > All Cal/Audit...** from the Pull–down Menus. – A CDMA Test Parameters Window will appear. ***For TX Calibration*** Click **Tests** in the BTS Menu Bar, and select **TX > TX Calibration** from the Pull–down Menus. – A CDMA Test Parameters Window will appear.
	5	Select the appropriate carrier(s) and sector(s) (carrier-bts#-sector#-carrier#) from those displayed in the **Channels/Carrier** Pick List. **NOTE** To select multiple items, hold down the **Shift** or **Ctrl K**ey while clicking on Pick List Items to select multiple carrier(s)–sector(s).
	6	Verify that the correct Channel Number for the selected carrier is shown in the **Carrier # Channels** Box. • If it is not, obtain the latest **bts–#.cdf** (or **bts–#.necf**) and **cbsc–#.CDF File**s from the CBSC. **NOTE** If necessary, the correct Channel Number may be manually entered into the **Carrier # Channels** Box.
	7	If at least one MCC was selected in Step 3, select the appropriate Transfer Rate (**1** = 9600, **3** = 9600 1X) from the Pull–down Menu in the **Rate Set** Box. **NOTE** The Rate Selection of **3** is only available if 1X Cards are selected for the test.
	8	If **Verify BLO** is to be used during the Calibration, leave the Check Box checked (default).
	9	If **Single–Sided BLO** is to be used during the Calibration, click on the Check Box. *** IMPORTANT** **Single–Sided BLO** should only be used for Primary BBX Cards. – Do not check the box when calibrating the *Redundant* BBX.

table continued on next page

Table 3-41: All Cal/Audit and TX Calibration Procedure

✓	Step	Action
	10	In the **Test Pattern** Box, select the Test Pattern to use for the Calibration from the Pull–down Menu. – Refer to "Test Pattern Drop–down Pick List" under "TX Calibration and the LMF" in this section.
	11	Click **OK** to display the Status Report Window. – A **Directions** Pop-up Window will then appear.
	12	Follow the Cable Connection Directions as they are displayed. – When the Calibration Process is completed, results will be displayed in the Status Report Window.
	13	Click **OK** to close the Status Report Window.

Exception Handling

In the event of a failure, the Calibration Procedure displays a **FAIL** message in the Status Report Window and provides information in the **Description Field**.

Re–check the Test Set–up and connection and re–run the Calibration. If the Calibration fails again, note specifics about the failure, and refer to Chapter 6, *Troubleshooting*.

Download BLO Procedure

After a successful TX Path Calibration, download the BLO Calibration File Data to the BBX Cards. BLO Data is extracted from the CAL File for the BTS and downloaded to the selected BBX Cards.

NOTE

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

Prerequisites

Ensure the following prerequisites have been met before proceeding.

- BBX Cards to receive the download are OOS_RAM (yellow).
- TX Calibration was successfully completed.

Perform the procedure in Table 3-42 to download the BLO Data to the BBX Cards.

Table 3-42: Download BLO Data Procedure

✓	Step	Action
	1	Select the BBX(s) to be downloaded.
	2	Click **Device** in the BTS Menu Bar, and select **Download > BLO** from the Pull–down Menus. – A Status Report Window displays the result of the download. **NOTE** Selected device(s) do not change color when BLO is downloaded.
	3	Click **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 values. 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 required for TX Calibration is used for TX Audit.

NOTE

RF Path Verification, BLO Calibration, and BLO Data Download to BBX Cards must be 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 steps in Table 3-43.

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**.

WARNING

Before installing any Test Equipment directly to any **TX OUT Connector**, ***first verify that there are no CDMA BBX channels keyed***.

Failure to do so can result in serious personal injury and/or equipment damage.

TX Audit Test

The **Tests** Menu Item, **TX Audit**, performs the TX BLO Audit Test for BBX Cards. All measurements are made through the appropriate TX Output Connector using the TX Calibration Set–up.

Prerequisites

Before running this test, the following should be done:

- The CSM 1 Card, GLI Cards, and BBX Cards all have the correct Code Load.
- The Primary CSM and MGLI Cards are INS_ACTIVE (bright green).
- All BBX Cards are OOS_RAM (yellow).
- The Test Equipment and Test Cables are calibrated and connected for TX BLO Calibration.
- The LMF is logged into the BTS.

TX Path Audit Procedure

After a TX Calibration has been performed, or if verification of BLO Data in the CAL File is required, perform the procedure in Table 3-43 to perform a BTS TX Path Audit.

Table 3-43: BTS TX Path Audit Procedure

✓	Step	Action
	1	***If it has not already been done***, configure Test Equipment for TX Path Audit by performing the procedure in Table 3-39. **NOTE** TX Audit uses the same configuration as TX Calibration.
	2	Select the BBX(s) to be audited.
	3	If the **Test Pattern** to be used is **Standard**, **CDFPilot**, or **CDF**, select at least one MCC. – Refer to “Test Pattern Drop–down Pick List” under “TX Calibraton and the LMF” in this section.
	4	Click **Tests** in the BTS Menu Bar, and select **TX > TX Audit...** from the Pull–down Menus. – A CDMA Test Parameters Window will appear.
	5	Select the appropriate carrier(s) (carrier-bts#-sector#-carrier#) from those displayed in the **Channels/Carrier** Pick List. **NOTE** To select multiple items, hold down the **Shift** or **Ctrl** Key while clicking on Pick List Items to select multiple carrier(s)–sector(s).

table continued on next page

Table 3-43: BTS TX Path Audit Procedure

✓	Step	Action
	6	Verify that the correct Channel Number for the selected carrier is shown in the **Carrier # Channels** Box. • If it is not, obtain the latest **bts–#.cdf** (or **bts–#.necf**) and **cbsc–#.CDF File**s from the CBSC. **NOTE** If necessary, the correct Channel Number may be manually entered into the **Carrier # Channels** Box.
	7	If at least one MCC was selected in Step 3, select the appropriate Transfer Rate (**1** = 9600, **3** = 9600 1X) from the Pull–down Menu in the **Rate Set** Box. **NOTE** The Rate Selection of **3** is only available if 1X Cards are selected for the test.
	8	From the **Test Pattern** Pick List, select a Test Pattern. – Selecting **Pilot** (default) performs tests using a Pilot Signal only. – Selecting **Standard** performs tests using Pilot, Synch, Paging, and six Traffic Channels. This requires an MCC to be selected. – Selecting **CDFPilot** performs tests using the CDF Value for Pilot Gain and IS–97 Gain Values for all the other channels included in the Standard Pattern Setting (Paging, Synch, and six Traffic). Using this Pattern Setting requires the selection of a BBX and at least one MCC. – Selecting **CDF** performs tests using Pilot, Synch, Paging and six Traffic Channels. However, the Gain for the Channel Elements is specified in the CDF File.
	9	Click **OK** to display the Status Report Window followed by a **Directions** Pop-up Window.
	10	Follow the Cable Connection Directions as they are displayed. – When the Calibration Process is completed, results will be displayed in the Status Report Window.
	11	Click on the **Save Results** or **Dismiss** Button, as desired, to close the Status Report Window.

Exception Handling

In the event of a failure, the Calibration Procedure displays a **FAIL** Message in the Status Report Window and provides information in the **Description Field**.

Re–check the Test Set–up and connections and re–run the test. If the tests fail again, note specifics about the failure, and refer to Chapter 6, *Troubleshooting*.

Create CAL File

The LMF Create Cal File Function gets the BLO Data from BBX Cards 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 be present so it can be transferred to the CBSC.

- If TX Calibration has been successfully performed for all BBX Cards and BLO Data has been downloaded, a CAL File will exist.

NOTE

The Create Cal File Function only applies to selected (highlighted) BBX Cards.

CAUTION

Editing the CAL File is not encouraged because 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 Function, the edited information will be lost.

Prerequisites

Before running this procedure, the following should be done:

- The LMF is logged into the BTS.
- The BBX Cards are OOS_RAM (yellow)
- The BLO has been downloaded to the BBX Cards.

Table 3-44: Create CAL File Procedure

✓	Step	Action
	1	Select the applicable BBX Cards. – The CAL File will be updated for the selected BBX Cards *only*.
	2	Click on **Device** in the BTS Menu Bar, and select **Create Cal File** from the Pull–down Menu. – A Status Report Window will appear and display the results of the action.
	3	Click the **OK** Button to close the Status Report Window.

RFDS Description

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

- Antenna Select Unit (ASU)
- Fixed Wireless Terminal Interface Card (FWTIC)
- Subscriber Unit Assembly (SUA)

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

RFDS Parameters

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 3-45 explains how to edit the Parameter Settings.

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

> **NOTE**
>
> Any Text Editor may be used to open the **bts–#.CDF File** to verify, view, or modify data.
>
> Because the **bts–#.CDF File** is generated on a UNIX system, a more sophisticated editor, such as *MicroSoft* WordPad, will display file content in a more easily–read format than many simple Text Editors.

Checking and Setting RFDS Parameters

Perform the procedure in Table 3-45 to review and/or edit RFDS Parameters.

Table 3-45: RFDS Parameter Settings Procedure

✓	Step	Action
		NOTE Log out of the BTS prior to perform this procedure.

	1	Using a Text Editor, verify that the following fields are set correctly in the **bts–#.cdf** File.
		EXAMPLE:
		`Asu1Equip = 1`
		`Asu2Equip = 0 (1 if system is non-duplexed)`
		`Mc1Equip = 0`
		`Mc2Equip = 0`
		`Mc3Equip = 0`
		`Mc4Equip = 0`
		`RfdsEquip = 2`
		`TestOrigDN = ’123456789’`
		`TsuEquip = 1`
		NOTE
		The above is an example of entries extracted from the **bts–#.cdf** File that should have been generated by the OMC–R and copied to the LMF.
		– These fields will have been set by the OMC–R if the RFDSPARM Database is modified for the RFDS.

	2	Save changes and/or quit the editor.
	3	Log into the BTS using an LMF *GUI* Session. – Refer to Table 3-10.
	4	Determine if changes were made to the **bts–#.cdf** File Fields listed in Step 1. • If changes ***were not made***, *proceed to Step 7.* • If changes ***were made***, *proceed to Step 5.* **NOTE** To make certain the complete data download is accepted, the MGLI should be OOS_RAM (yellow) when RFDS Parameter Settings are downloaded.
	5	When changes are made to RFDS Parameters in the **bts–#.CDF File**, data must be downloaded to the MGLI by performing the following actions
	5a	To be sure it does not take control when the MGLI is disabled, manually disable the Redundant GLI Card by unseating it from the Backplane Connectors and sliding it partially out of the SCCP Cage Slot.
	5b	Click on the MGLI.

table continued on next page

Table 3-45: RFDS Parameter Settings Procedure		
✓	Step	Action
	5c	Click on **Device** in the BTS Menu Bar, and select **Disable** from the Pull–down Menu. – A Status Report Window shows the status of the operation.
	5d	When the operation is complete, click **OK** to close the Status Report Window.
	5e	Click on the MGLI [now OOS_RAM (yellow)].
	5f	Click on **Device** in the BTS Menu Bar, and select **Download > Data** from the Pull–down Menus. – A Status Report Window shows the status of the download. **NOTE** Selected devices do not change color when data is downloaded.
	5g	Click **OK** to close the Status Report Window.
	5h	Click on the MGLI.
	5i	Click on **Device** in the BTS Menu Bar, and select **Enable** from the Pull–down Menu. – A Status Report Window shows the status of the operation.
	5j	When the operation is complete, click **OK** to close the Status Report Window. **! CAUTION** When the MGLI changes to INS_ACTIVE, data will automatically be downloaded to the RFDS. – During this process, the RFDS LED will slowly begin flashing red and green for approximately 2–3 minutes. – **DO NOT** attempt to perform any functions with the RFDS until the LED remains steady green.
	5k	Re–seat the Redundant GLI Card into its Backplane Connector and lock it in place with the Ejector Tabs.
	5l	Once the Redundant GLI initializes, download data to it by performing the following actions: – Select the card. – Click **Device** in the BTS Menu Bar. – Select **Download > Data** from the Pull–down Menu.
	6	Any MCC Cards that were INS_ACTIVE when the MGLI was disabled must be disabled, downloaded with data, and re–enabled as follows:
	6a	Select the devices to be reset. – Click on them. or – Choose **Select** from the BTS Menu Bar and click on **MCC Cards** in the Pull–down Menu.
	6b	In the BTS Menu Bar, click on **Device** and select **Disable** from the Pull–down Menu. – A Status Report Window shows the status of the operation.

table continued on next page

3

3

Table 3-45: RFDS Parameter Settings Procedure		
✓	**Step**	**Action**
	6c	Click **OK** to close the Status Report Window.
	6d	Repeat Step 6a to select the MCC Cards.
	6e	Click on **Device** in the BTS Menu Bar and select **Download > Data** from the Pull–down Menu. – A Status Report Window shows the status of the download. **NOTE** Selected devices do not change color when data is downloaded.
	6f	Click on **OK** to close the Status Report Window.
	6g	When data download is complete, enable the MCC Cards by performing the procedure in Table 3-21.
	7	Click on the RFDS Tab.
	8	Status the RFDS TSU by performing the following actions.
	8a	Click on the SUA to select it.
	8b	Click on **TSU** in the BTS Menu Bar, and select **Status TSU** from the Pull–down Menu. – A Status Report shows the software Version Number for the TSIC and SUA.
	8c	Click **OK** to close the Status Report Window. *** IMPORTANT** If the LMF Displays an Error Message, check the following: • Ensure that the AMR Cable from the BTS to the RFDS is connected correctly. • Verify that the RFDS has power. • Verify that the RFDS Status LED is green. • Verify that the entries in the RFDS Fields of the **bts–#.CDF File** are correct. – Refer to Step 1. • Status the MGLI and ensure it is communicating (by Ethernet) with the LMF, and is in the proper state [INS_ACTIVE (bright green)].

RFDS TSU NAM Programming

The Number Assignment Module (NAM) information needs to be programmed into the TSU before it can receive and process Test Calls, or be used for any type of RFDS Test. The RFDS TSU NAM must be programmed with the appropriate system parameters and a phone number during hardware installation. The TSU Phone Number and TSU MSI must be recorded for each BTS used for OMC–R RFDS Software Configuration.

NOTE

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

Explanation of Parameters Used When Programming the TSU NAM

Table 3-46 defines the parameters used when editing the **tsu.nam** file.

Table 3-46: Definitions of NAM 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 that are to be used in operation of the system.
Lock Code Security Code Service Level Station Class Mark	Do ***NOT*** change.
IMSI MCC IMSI 11 12	These fields are obtained at the OMC using the following command: `omc–000000 >`**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–R.
MIN Phone Number	This field is the phone number assigned to the mobile. – The ESN and MIN must be entered into the switch as well. **NOTE** This field is different from the TODN Field in the **bts–#.CDF File**. – The MIN is the phone number assigned to the RFDS Subscriber. – The TODN is the phone number that the subscriber calls.

Valid NAM Ranges

Table 3-47 provides the valid NAM Field Ranges. If any of the fields are missing or out-of–range, the RFDS will error out.

Table 3-47: 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	N/A	N/A
Station Class Mark	0	255
IMSI 11 12	0	99
IMSI MCC	0	999
MIN Phone Number	N/A	N/A

Set Antenna Map Data

The Antenna Map Data must be entered manually if an RFDS is installed. Antenna Map Data does not need to be entered if an RFDS is not installed. The Antenna Map Data is only used for RFDS Tests and is required if an RFDS is installed.

Prerequisite

- The LMF is logged into the BTS.

Perform the procedure in Table 3-48 to set Antenna Map Data for the RFDS.

Table 3-48: Set Antenna Map Data Procedure

✓	Step	Action
	1	Click on **Util** in the BTS Menu Bar, and select **Edit > Antenna Map...** from the Pull–down Menu. – A tabbed Data Entry Pop–up Window will appear.
	2	In the Data Entry Pop–up Window, click on the **TX Antenna Map** or **RX Antenna Map** Tab to select the Antenna Map to be edited.
	3	Locate the Carrier and Sector Number for which data is to be entered or edited, and click in the column where entry or editing is needed.
	4	Enter/edit **Antenna #** and **Antenna Label** column data as needed for each carrier. **NOTE** Refer to the **CDMA Help > Utility Menu > Edit–Antenna Map...** section of *LMF Help function on–line documentation* for Antenna Map examples.
	5	*For each Tab that needs to be changed*, click on the **Save** Button to save displayed values.
	6	Click on the **Dismiss** Button to close the window. **NOTE** • Values entered or changed after the **Save** Button was used will be lost when the window is dismissed. – Entered values will be used by the LMF as soon as they are saved. • It is not necessary to log out and log back into the LMF for changes to take effect.

Set RFDS Configuration Data

If an RFDS is installed, the RFDS Configuration Data must be manually entered.

Prerequisite

- LMF is logged into the BTS

> **NOTE**
>
> The entered **antenna#** index numbers must correspond to the **antenna#** index numbers used in the Antenna Maps.

Perform the procedure in Table 3-49 to set RFDS Configuration Data.

Table 3-49: Set RFDS Configuration Data Procedure

✓	Step	Action
	1	Click on **Util** in the BTS Menu Bar, and select **Edit > RFDS Configuration...** from the Pull–down Menus. – A Tab*bed* Data Entry Pop–up Window will appear.
	2	In the Data Entry Pop–up Window, click on the **TX RFDS Configuration** or **RX RFDS Configuration** Tab, as required.
	3	To add a new Antenna Number, perform the following actions.
	3a	Click on the **Add Row** Button.
	3b	Click in the **Antenna #**, **Cal Antenna**, **Scap Antenna**, or **Populate [Y/N**] Columns, as required.
	3c	Enter the desired data.
	4	To edit existing values click in the Data Box to be changed and change the value. **NOTE** Refer to the **CDMA Help > Utility Menu > Edit–RFDS Configuration...** section of *LMF Help function on–line documentation* for RFDS Configuration Data examples.
	5	To delete a row, click on the row and then click on the **Delete Row** Button.
	6	*For each tab that needs to be changed*, click on the **Save** Button to save the displayed values.
	7	Click on the **Dismiss** Button to close the window. **NOTE** • Values entered or changed after the **Save** Button was used will be lost when the window is dismissed. – Entered values will be used by the LMF as soon as they are saved. • It is not necessary to log out and log back into the LMF for changes to take effect.

RFDS Calibration

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

TX Path Calibration

For a TX Antenna Path Calibration, the BTS XCVR is keyed at a pre–determined Power Level and the BTS Power Output Level is measured by the RFDS. The Power Level is then measured at the TX Antenna Directional Coupler by the power measuring Test Equipment Item being used (Power Meter or Analyzer).

– The difference (Offset) between the Power Level at the RFDS and the Power Level at the TX Antenna Directional Coupler is used as the TX RFDS Calibration Offset Value.

RX Path Calibration

For an RX Antenna Path Calibration, the RFDS is keyed at a pre–determined Power Level and the Power Input Level is measured by the BTS BBX. A CDMA signal at the same Power Level measured by the BTS BBX is then injected at the RX antenna Directional Coupler by the Communications System Analyzer.

– The difference (Offset) between the RFDS–keyed Power Level and the Power Level measured at the BTS BBX is the RFDS RX Calibration Offset Value.

RFDS Calibration and the CAL File

The TX and RX RFDS Calibration Offset Values are written to the CAL File in the Slot[385] Block.

TSIC Channel Frequency

For each RFDS TSIC, the Channel Frequency is determined at the lower third and upper third of the appropriate band using the frequencies listed in Table 3-50..

Table 3-50: RFDS TSIC Calibration Channel Frequencies

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

WARNING

Before installing any Test Equipment directly to any **TX OUT Connector**, ***verify that there are no CDMA Channels keyed***.

– Failure to do so can result in serious personal injury and/or equipment damage.

Prerequisites

- Test Equipment has been selected.
- Test Equipment and Test Cables have been calibrated.
- TX Calibration has been performed and BLO Data has been downloaded to the BBX Cards.
- Test Equipment and Test Cables are connected for TX Calibration.
- Antenna Map Data has been entered for the site.
- BBX Cards are OOS–RAM.

RFDS Calibration Procedure

Perform the procedure in Table 3-51 to perform RFDS Calibration.

Table 3-51: RFDS Calibration Procedure

✓	Step	Action
	1	In the LMF, select the **CDMA BTS–xxx** Tab.
	2	*If the BTS Control Button is not selected (no black dot showing)*, click on the **B** Button in the BTS Menu Bar to select it.
	3	Select the BBX(s) assigned to the carrier(s) and sector(s) that will be used in RFDS Calibration. – Refer to Table 1-5 for BBX Carrier and Sector Assignments).
	4	Click on **RFDS** in the BTS Menu Bar, and select **RFDS Calibration...** from the Pull–down Menu. – An **RFDS Calibration Set–up** window will be displayed.
	5	In the **Tests to Perform** Box, select **TX Calibration** or **RX Calibration**, as required
	6	Enter the appropriate Channel Number(s) in the **Channel Field** Box. – Refer to Table 3-50. • To enter more than one Channel Number, use the following methods, as needed. – Separate *non*–sequential Channel Numbers with a comma and *no spaces*; for example: 247,585,742. – Enter a range of sequential Channel Numbers by typing the first and last Channel Numbers in the range separated by a dash and *no spaces*; for example: 385–395.
	7	If the frame is equipped with TX Combiners, click in the **Has Combiners** Check Box.
	8	Select the appropriate carrier(s) and sector(s) from the **Carriers** Pick List. **NOTE** Hold down the **Shift** or **Ctrl** Key while clicking on Pick List Items to select multiple carrier(s)–sector(s).
	9	If performing RX Calibration,.select the appropriate RX Branch (**Both**, **Main**, or **Div**ersity) in the Pull–down Menu.

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Table 3-51: RFDS Calibration Procedure		
✔	Step	Action
	10	Click on the **OK** Button. – A Status Report Window is displayed, followed by a **Directions** Pop–up Window.
	11	Follow the Cable Connection Directions as they are displayed.
	12	When the test is completed, the test results are displayed in the Status Report Window.
	13	Click on the **OK** Button to close the Status Report Window.
	14	Click on the BTS Frame Tab.
	15	Select the MGLI by clicking on it.
	16	Download updated RFDS offset data to the MGLI. – Refer to Step 5 in Table 3-45.

TSU Program TSU NAM

The NAM must be programmed before it can receive and process Test Calls, or be used for any type of RFDS Test.

Prerequisites

- MGLI is INS_ACTIVE (bright green).
- SUA is powered up and has a Code Load.

Perform the procedure in Table 3-52 to program the TSU NAM.

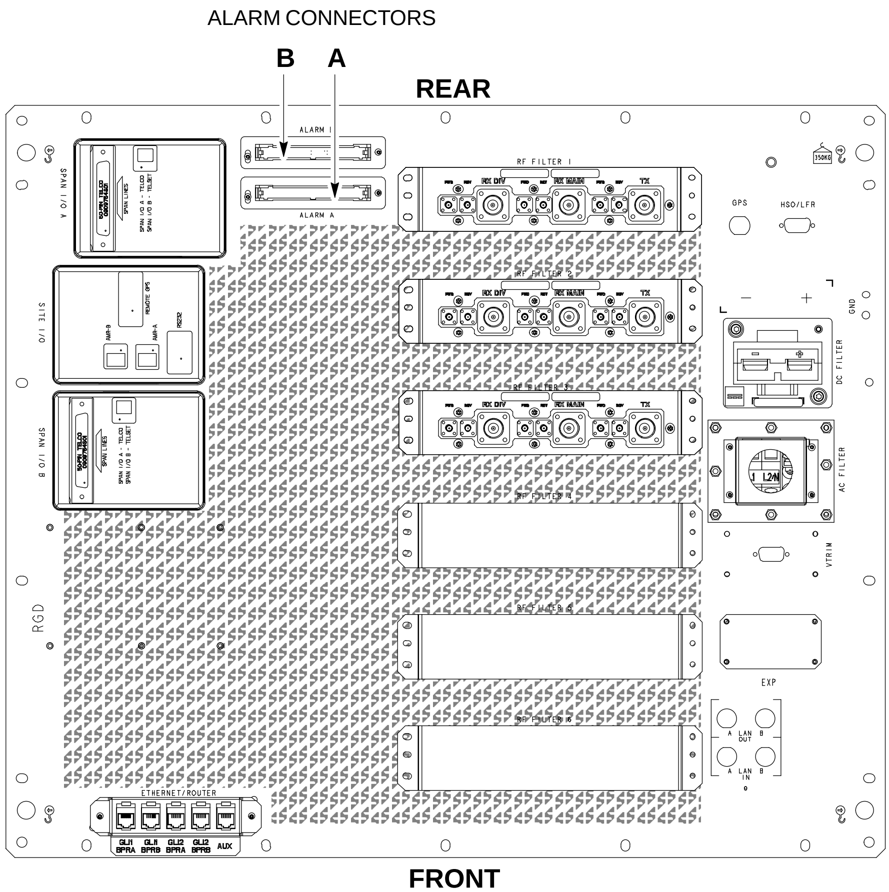
Table 3-52: Program TSU NAM Procedure		
✔	Step	Action
	1	In the LMF, select the RFDS Tab.
	2	Select the SUA by clicking on it.
	3	Click on **TSU** in the BTS Menu Bar, and select **Program TSU NAM** from the Pull–down Menu. – A NAM programming window will appear.
	4	Enter the appropriate information in the boxes. Refer to Table 3-46 and Table 3-47) .
	5	Click on the **OK** Button to display the Status Report.
	6	Click on the **OK** Button to close the Status Report Window.

Alarm Verification

ALARM Connectors provide Customer Defined Alarm Inputs and Outputs. The customer can connect BTS Site Alarm Input Sensors and Output Devices to the BTS, thus providing Alarm Reporting from active sensors as well as controlling Output Devices.

The SC 4812T Lite is capable of concurrently monitoring 35 Iinput Signals. These Input Signals are divided between two Alarm Connectors marked '**ALARM A**' and '**ALARM B**' located at the top of the frame. Refer to Figure 3-44.

Figure 3-44: Alarm Connector Location and Connector Pin Numbering



ti-CDMA-WP-00233-v01-ildoc-ftwREF

Alarm A and Alarm B Connector Comparison

The **ALARM A** Connector is always functional; the **ALARM B** Connector is functional when an AMR Card is equipped in the AMR 2 Slot in the SCCP Cage. Refer to Figure 3-45.

The **ALARM A** Port monitors Input Numbers 1 through 9 and 11 through 18, while **ALARM B** Port monitors Input Numbers 19 through 36. Refer to Figure 3-46.

- Alarm 10 is reserved for system use.
- State Transitions on these Input Lines are reported to the LMF and OMC–R 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.

Figure 3-45: SCCP Cage

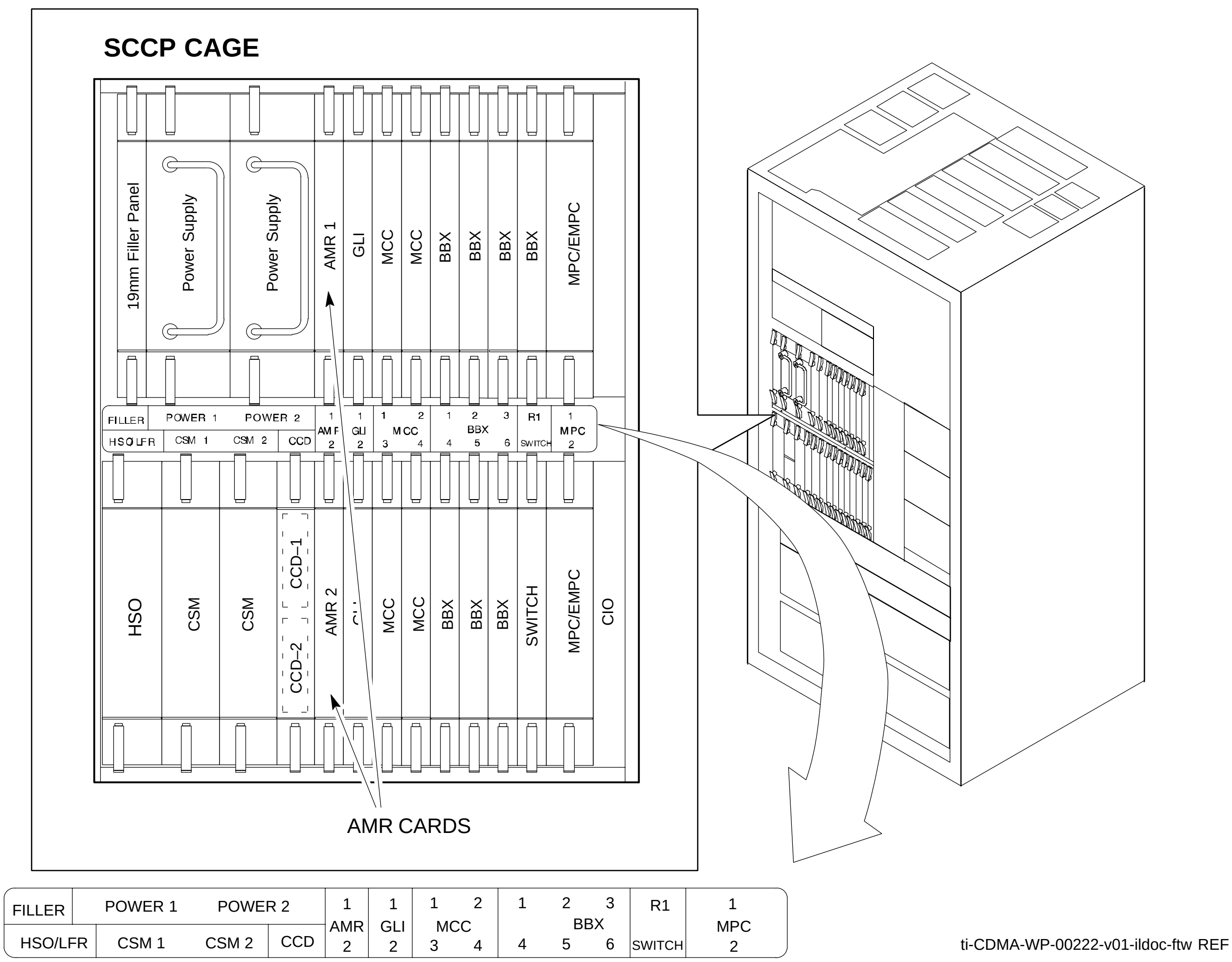
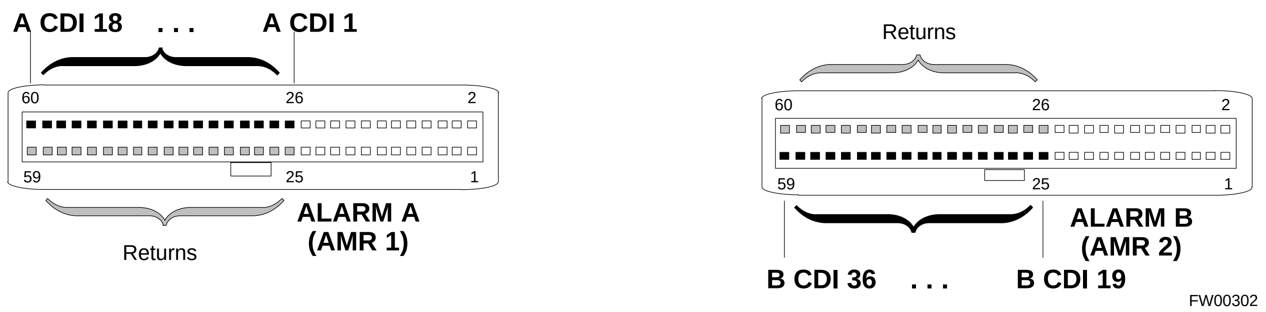


Figure 3-46: AMR Connector Pin Numbering



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.

Purpose

The following procedures verify that 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. Performing 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 stated in the *1X SC4812T Lite Hardware Installation* manual (68P09262A57) Manual.

NOTE

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

Test Equipment

The following Test Equipment is required to perform these tests:

- LMF
- Alarms Test Box (CGDSCMIS00014) –optional

NOTE

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

- NC = Normally Closed
- NO = Normally Open
- COM or C = Common
- CDO = Customer Defined (Relay) Output
- CDI = Customer Defined (Alarm) Input

NOTE

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

✓	Step	Action
	1	Connect the LMF to the BTS.
	2	Log into the BTS.
	3	Select the MGLI.
	4	Click on the **Device** Menu.
	5	Click on the **Set Alarm Relays** Menu Item.
	6	Click on **Normally Open**. – A Status Report Window displays the results of the action.
	7	Click on the **OK** Button to close the Status Report Window.
	8	Set all switches on the Alarms Test Box to the **Open** position. **NOTE** Input 10 (Pins 43 and 44) on the **Alarm A** Connector is reserved for the Power Supply Modules Alarm.
	9	Connect the Alarms Test Box to the **ALARM A** Connector. – Refer to Figure 3-44.
	10	Set all of the switches on the Alarms Test Box to the **Closed** position. – An alarm should be reported for each Backplane Configuration Switch Setting.
	11	Set all of the switches on the Alarms Test Box to the **Open** position. – An Alarm Clear Message should be reported for each Backplane Configuration Switch Setting.
	12	Disconnect the Alarms Test Box from the **ALARM A** Connector.
	13	Connect the Alarms Test Box to the **ALARM B** Connector.
	14	Set all switches on the Alarms Test Box to the **Closed** position. – An alarm should be reported for each Backplane Configuration Switch Setting.
	15	Set all switches on the Alarms Test Box to the **Open** position. – An Alarm Clear Message should be reported for each Backplane Configuration Switch Setting.
	16	Disconnect the Alarms Test Box from the **ALARM B** Connector.
	17	Select the MGLI.
	18	Click on the **Device** Menu.
	19	Click on the **Set Alarm Relays** Menu Item.
	20	Click on **Normally Closed**. – A Status Report Window displays the results of the action.

table continued on next page

Table 3-53: CDI Alarm Input Verification Procedure (using the Alarms Test Box)		
✓	**Step**	**Action**
	21	Click **OK** to close the Status Report Window. – Alarms should be reported for Alarm Inputs 1 through 36.
	22	Set all switches on the Alarms Test Box to the **Closed** position.
	23	Connect the Alarms Test Box to the **ALARM A** Connector. – Alarms should be reported for Alarm Inputs 1 through 18.
	24	Set all switches on the Alarms Test Box to the **Open** position. – An alarm should be reported for each Backplane Configuration Switch Setting.
	25	Set all switches on the Alarms Test Box to the **Closed** position. – An Alarm Clear Message should be reported for each Backplane Configuration Switch Setting.
	26	Disconnect the Alarms Test Box from the **ALARM A** Connector.
	27	Connect the Alarms Test Box to the **ALARM B** Connector. – An Alarm Clear Message should be reported for Alarm Inputs 19 through 36.
	28	Set all switches on the Alarms Test Box to the **Open** position. – An alarm should be reported for each Backplane Configuration Switch Setting.
	29	Set all switches on the Alarms Test Box to the **Closed** position. – An Alarm Clear Message should be reported for each Backplane Configuration Switch Setting.
	30	Disconnect the Alarms Test Box from the **ALARM B** Connector.
	31	Select the MGLI.
	32	Click on the **Device** Menu.
	33	Click on the **Set Alarm Relays** Menu Item.
	34	Click on **Unequipped**. – A Status Report Window displays the results of the action.
	35	Click on the **OK** Button to close the Status Report Window.
	36	Connect the Alarms Test Box to the **ALARM A** Connector.
	37	Set all switches on the Alarms Test Box to both the **Open** and the **Closed** position. – No alarm should be reported for any Backplane Configuration Switch Settings.
	38	Disconnect the Alarms Test Box from the **ALARM A** Connector.
	39	Connect the Alarms Test Box to the **ALARM B** Connector.
	40	Set all switches on the Alarms Test Box to both the **Open** and the **Closed** position. – No alarm should be reported for any Backplane Configuration Switch Settings.

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Table 3-53: CDI Alarm Input Verification Procedure (using the Alarms Test Box)		
✓	Step	Action
	41	Disconnect the Alarms Test Box from the **ALARM B** Connector.
	42	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 Procedure (without the Alarms Test Box)		
✓	Step	Action
	1	Connect the LMF to the BTS.
	2	Log into the BTS.
	3	Select the MGLI.
	4	Click on the **Device** Menu.
	5	Click on the **Set Alarm Relays** Menu Item.
	6	Click on **Normally Open**. – A Status Report Window displays the results of the action.
	7	Click on **OK** to close the Status Report Window. **NOTE** Input 10 (Pins 43 and 44) on the Alarm A Connector is reserved for the Power Supply Modules Alarm.
	8	Refer to Figure 3-46 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. – An Alarm Clear Message should be reported for each pair of pins when the short is removed.

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Table 3-54: CDI Alarm Input Verification Procedure (without the Alarms Test Box)		
✓	Step	Action
	9	Refer to Figure 3-46 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. – An Alarm Clear Message should be reported for each pair of pins when the short is removed.
	10	Select the MGLI.
	11	Click on the **Device** Menu.
	12	Click on the **Set Alarm Relays** Menu Item.
	13	Click on **Normally Closed**. – A Status Report Window displays the results of the action.
	14	Click on **OK** to close the Status Report Window. – Alarms should be reported for Alarm Inputs 1 through 36. **NOTE** Input 10 (Pins 43 and 44) on Alarm A Connector is reserved for the Power Supply Modules Alarm.
	15	Refer to Figure 3-46 and sequentially short the ALARM A Connector CDI 1 through CDI 18 Pins (25–26 through 59–60) together. – An Alarm Clear Message 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	Refer to Figure 3-46 and sequentially short the ALARM B Connector CDI 19 through CDI 36 pins (25–26 through 59–60) together. – An Alarm Clear Message 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.
	17	Select the MGLI.
	18	Click on the **Device** Menu.
	19	Click on the **Set Alarm Relays** Menu Item.
	20	Click on **Unequipped**. – A Status Report Window displays the results of the action.
	21	Click on **OK** to close the Status Report Window. **NOTE** Input 10 (Pins 43 and 44) on Alarm A Connector is reserved for the Power Supply Modules Alarm.
	22	Refer to Figure 3-46 and sequentially short the ALARM A Connector CDI 1 through CDI 18 Pins (25–26 through 59–60) together. – No alarms should be displayed.

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Table 3-54: CDI Alarm Input Verification Procedure (without the Alarms Test Box)		
✓	Step	Action
	23	Refer to Figure 3-46 and sequentially short the ALARM B Connector CDI 19 through CDI 36 pins (25–26 through 59–60) together. – No alarms should be displayed.
	24	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
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	Power Supply Modules Alarm Return	13	B CDO13 NC	43	B CDI 28
14	A CDO5 Com	44	Power Supply Modules Alarm	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

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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
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	Cust Retn 10	59	B CDI 36
30	A CDI 3	60	A CDI 18	30	A CDI 10	60	Cust Retn 36

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

Notes