Chapter 2: Preliminary Operations

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Notes

Introduction

This section first verifies proper frame equipage. This includes verifying module placement, jumper, and dual in–line package (DIP) switch settings against the site-specific documentation supplied for each BTS application. Next, pre-power up and initial power-up procedures are presented.

Cell Site Types

Sites are configured as Omni with a maximum of 4 carriers, 3–sectored with a maximum of 4 carriers, and 6–sectored with a maximum of 2 carriers. Each type has unique characteristics and must be optimized accordingly. For more information on the differences in site types, please refer to the *BTS/Modem Frame Hardware Installation* manual.

CDF

The Cell-site Data File (CDF) contains site type and equipage data information and passes it directly to the LMF during optimization. The number of modem frames, C–CCP shelves, BBX boards, MCC boards (per cage), and linear power amplifier assignments are some of the equipage data included in the CDF.

IMPORTANT

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

Site Equipage Verification

Review the site documentation. Match the site engineering equipage data to the actual boards and modules shipped to the site. Physically inspect and verify the equipment provided for the BTS or Modem frame and ancillary equipment frame.

CAUTION

Always wear a conductive, high impedance wrist strap while handling any circuit card/module to prevent damage by ESD. After removal, the card/module should be placed on a conductive surface or back into the anti–static shipping bag.

Initial Installation of Boards/Modules

Follow the procedure in Table 2-1 to verify the initial installation of boards/modules.

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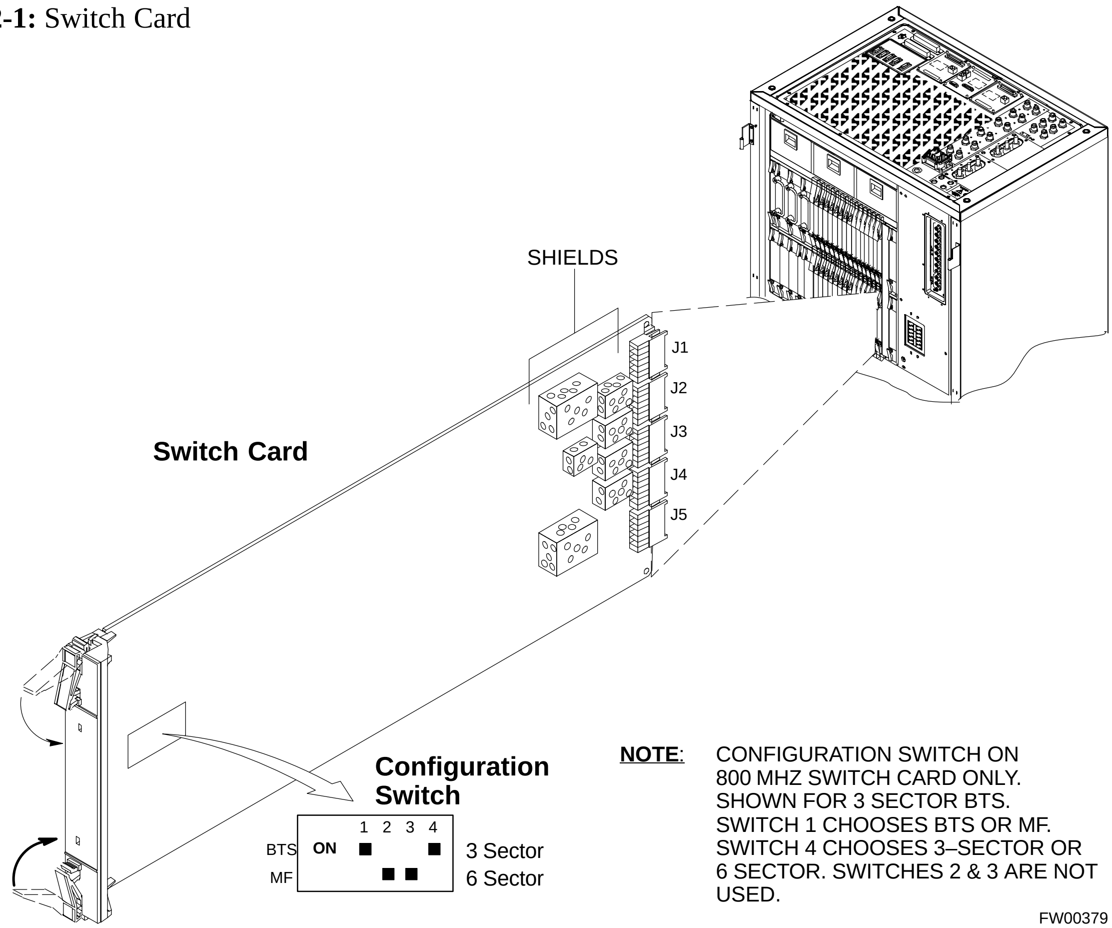
Table 2-1: Initial Installation of Boards/Modules	
Step	**Action**
1	Refer to the site documentation and install all boards and modules into the appropriate shelves as required. **Verify they are NOT SEATED at this time.** **NOTE** On 800 MHz systems, the Switch Card has a configuration switch that must match the site configuration (see Figure 2-1).
2	As the actual site hardware is installed, record the serial number of each module on a “Serial Number Checklist” in the site logbook.

Figure 2-1: Switch Card

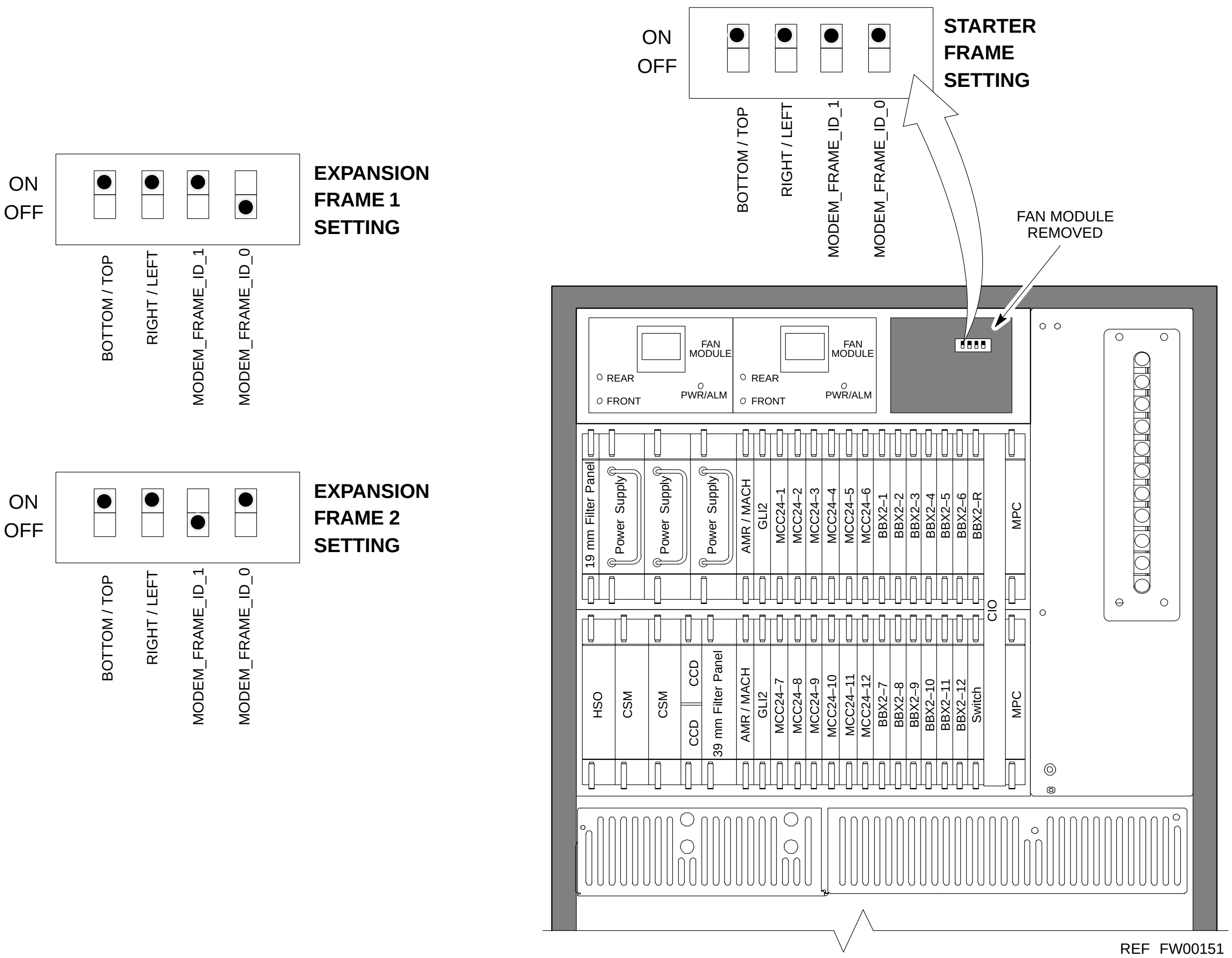


Setting Frame C–CCP Shelf Configuration Switch

The backplane switch settings behind the fan module nearest the breaker panel should be set as shown in Figure 2-2.

The switch setting must be verified and set before power is applied to the BTS equipment.

Figure 2-2: Backplane DIP Switch Settings – SC 4812T



SC 4812T C–CCP SHELF

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Objective

This procedure checks for any electrical short circuits and verifies the operation and tolerances of the cellsite and BTS power supply units prior to applying power for the first time.

Test Equipment

The following test equipment is required to complete the pre–power–up tests:

- Digital Multimeter (DMM)

CAUTION

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

Cabling Inspection

Using the site-specific documentation generated by Motorola Systems Engineering, verify that the following cable systems are properly connected:

- Receive RF cabling – up to 12 RX cables
- Transmit RF cabling – up to six TX cables
- GPS
- LFR

IMPORTANT

For positive power applications (+27 V):

- The positive power cable is red.
- The negative power cable (ground) is black.

For negative power applications (–48 V):

- The negative power cable is red or blue.
- The positive power cable (ground) is black.

In all cases, the black power cable is at ground potential.

DC Power Pre-test (BTS Frame)

Before applying any power to the BTS frame, follow the procedure in Table 2-2 while referring to Figure 2-3 and Figure 2-4 for +27 V systems or to Figure 2-5 and Figure 2-6 for –48 V systems to verify there are no shorts in the BTS frame DC distribution system.

Table 2-2: DC Power Pre–test (BTS Frame)

Step	Action
1	*Physically verify* that all DC power sources supplying power to the frame are **OFF** or disabled.
2	*On each frame:* • *Unseat* all circuit boards (except CCD and CIO cards) in the C–CCP shelf and LPA shelves, but leave them in their associated slots. • Set C–CCP shelf breakers to the **OFF** position by *pulling out* power distribution breakers (labeled **C–CCP 1, 2, 3** on the +27 V BTS C–CCP power distribution panel and labeled **POWER 1,4,5,2,6,7,3,8,9** on the –48 V C–CCP power distribution panel). • Set LPA breakers to the **OFF** position by *pulling out* the LPA breakers (8 breakers, labeled **1A–1B** through **4C–4D** – located on the C–CCP power distribution panel in the +27 V BTS or on the power conversion shelf power distribution panel in the –48 V BTS).
3	Verify that the resistance from the power (+ or –) feed terminals with respect to the ground terminal on the top of the frame measures ≥ **500 Ω** (see Figure 2-3). • If reading is **< 500** Ω, a short may exist somewhere in the DC distribution path supplied by the breaker. Isolate the problem before proceeding. A reading **> 3 M**Ω could indicate an open (or missing) bleeder resistor (installed across the filter capacitors behind the breaker panel).
4	Set the C–CCP (POWER) breakers to the **ON** position by pushing them IN *one at a time*. Repeat Step 3 after turning on each breaker. *** IMPORTANT** If the ohmmeter stays at **0** Ω after inserting any board/module, a short probably exists in that board/module. Replace the suspect board/module and repeat the test. If test still fails, isolate the problem before proceeding.
5	Insert and lock the DC/DC converter modules for the C–CCP shelf and into their associated slots *one at a time*. Repeat Step 3 after inserting each module. • A typical response is that the ohmmeter steadily climbs in resistance as capacitors charge, finally indicating approximately **500** Ω. **! CAUTION** Verify the correct power/converter modules by observing the locking/retracting tabs appear as follows: – STPN4009 PWR CONV CDMA RCVR (in +27 V BTS C–CCP shelf) – STPN4045A PWR CONV CDMA RCVR (in –48 V BTS C–CCP shelf)
6	Insert and lock all remaining circuit boards and modules into their associated slots in the C–CCP shelf. Repeat Step 3 after inserting and locking each board or module. • A typical response is that the ohmmeter steadily climbs in resistance as capacitors charge, stopping at approximately **500** Ω.

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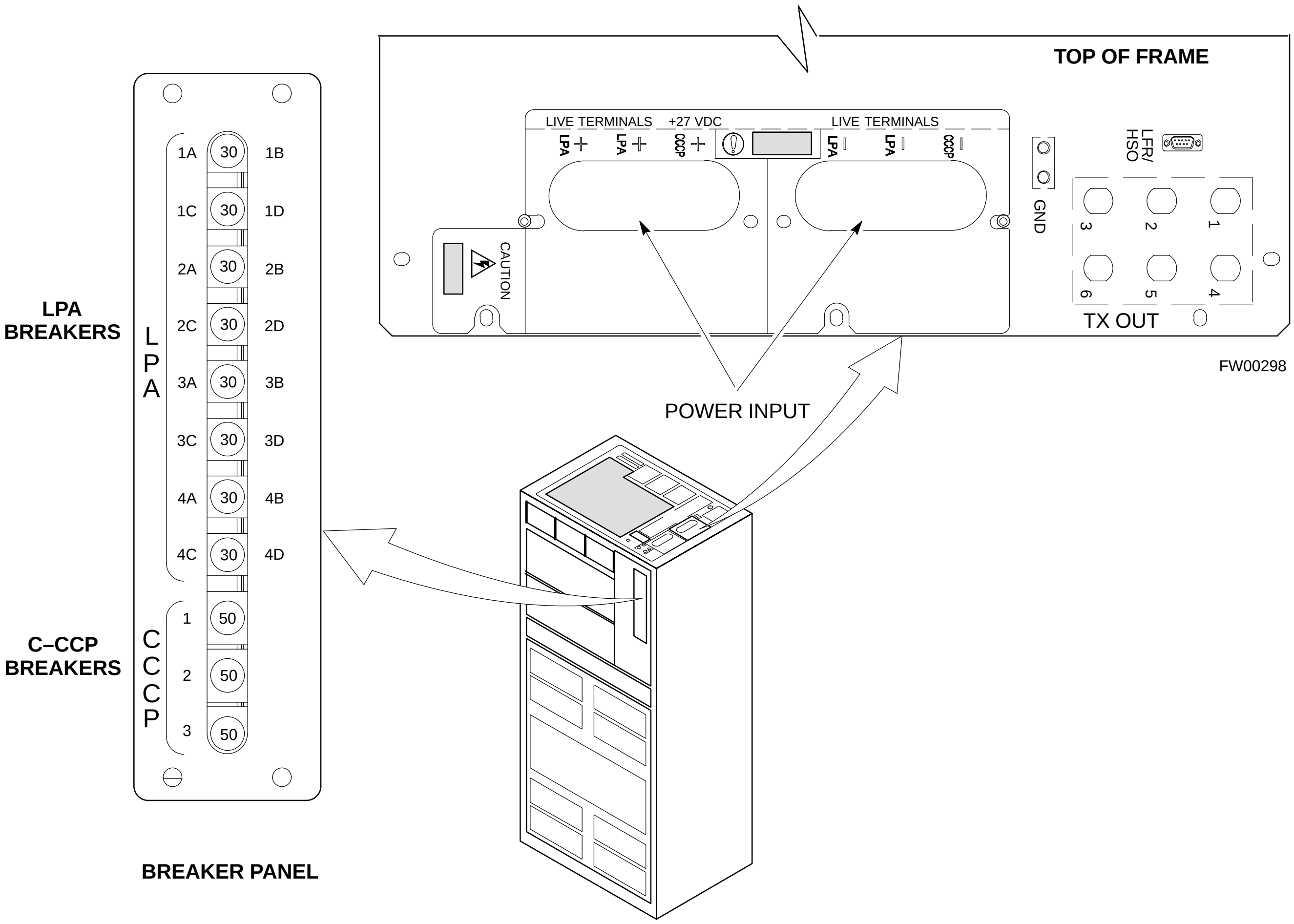
Table 2-2: DC Power Pre–test (BTS Frame)

Step	Action
7	Set the **LPA** breakers **ON** by pushing them IN *one at a time*. Repeat Step 3 after turning on each breaker. • A typical response is that the ohmmeter will steadily climb in resistance as capacitors charge, stopping at approximately **500** Ω.
8	In the –48 V BTS, insert and lock the DC/DC LPA converter modules into their associated slots *one at a time*. Repeat Step 3 after inserting each module. • A typical response is that the ohmmeter steadily climbs in resistance as capacitors charge, finally indicating approximately **500** Ω. **! CAUTION** Verify the correct power/converter modules by observing the locking/retracting tabs appear as follows: – STPN4044A PWR CONV LPA (in –48 V BTS power conversion shelf)
9	Seat all LPA and associated LPA fan modules into their associated slots in the shelves *one at a time*. Repeat Step 3 after seating each LPA and associated LPA fan module. • A typical response is that the ohmmeter will steadily climb in resistance as capacitors charge, stopping at approximately **500** Ω.

Figure 2-3: +27 V BTS DC Distribution Pre-test



Breakering:

- Two LPAs on each trunking backplane breakered together
- Designed for peak LPA current of 15 amps (30 amp breakers)
- Unused TX paths do not need to be terminated
- Single feed for C–CCP
- Dual feed for LPA

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Figure 2-4: +27 V SC 4812T BTS Starter Frame

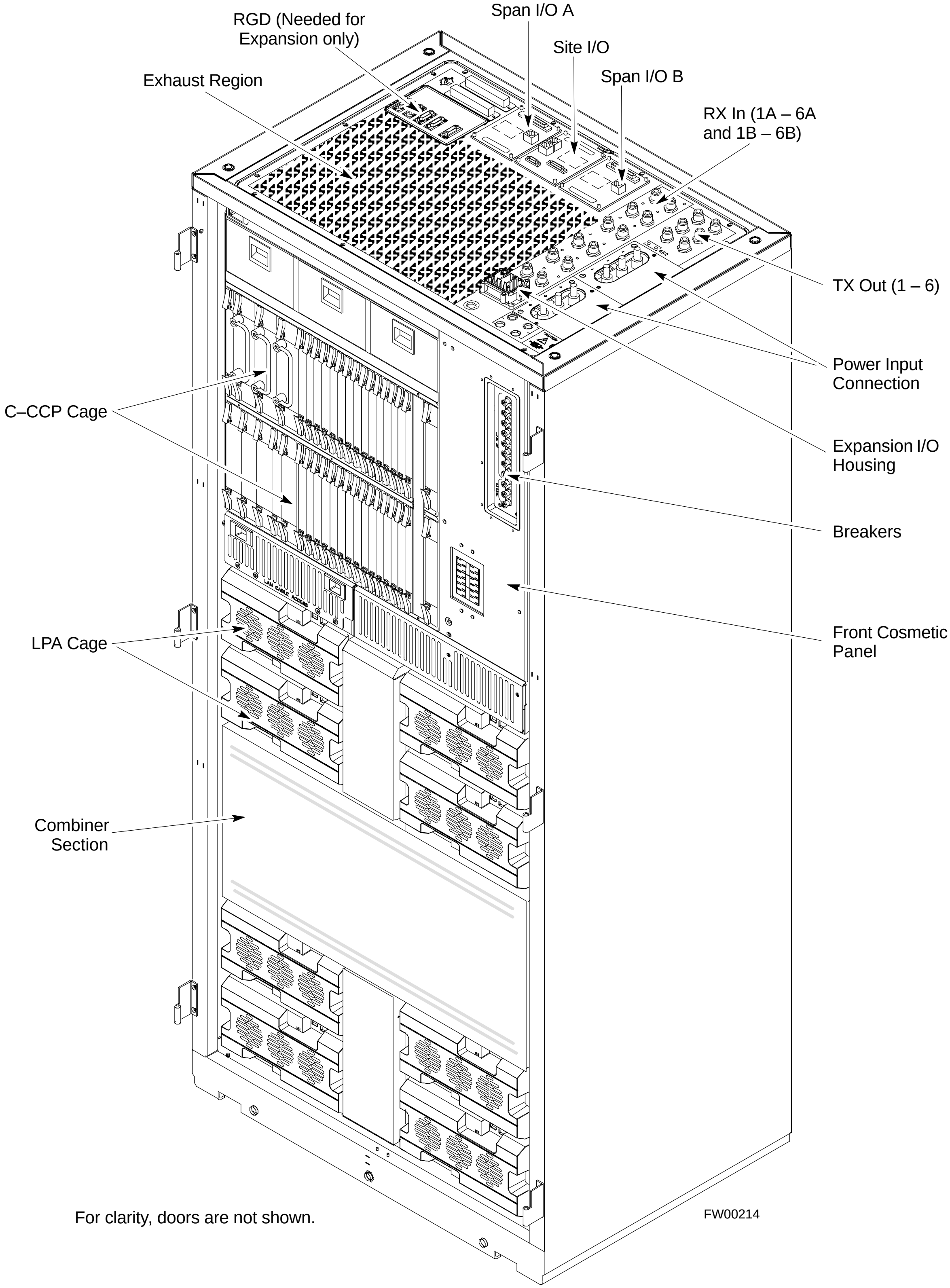

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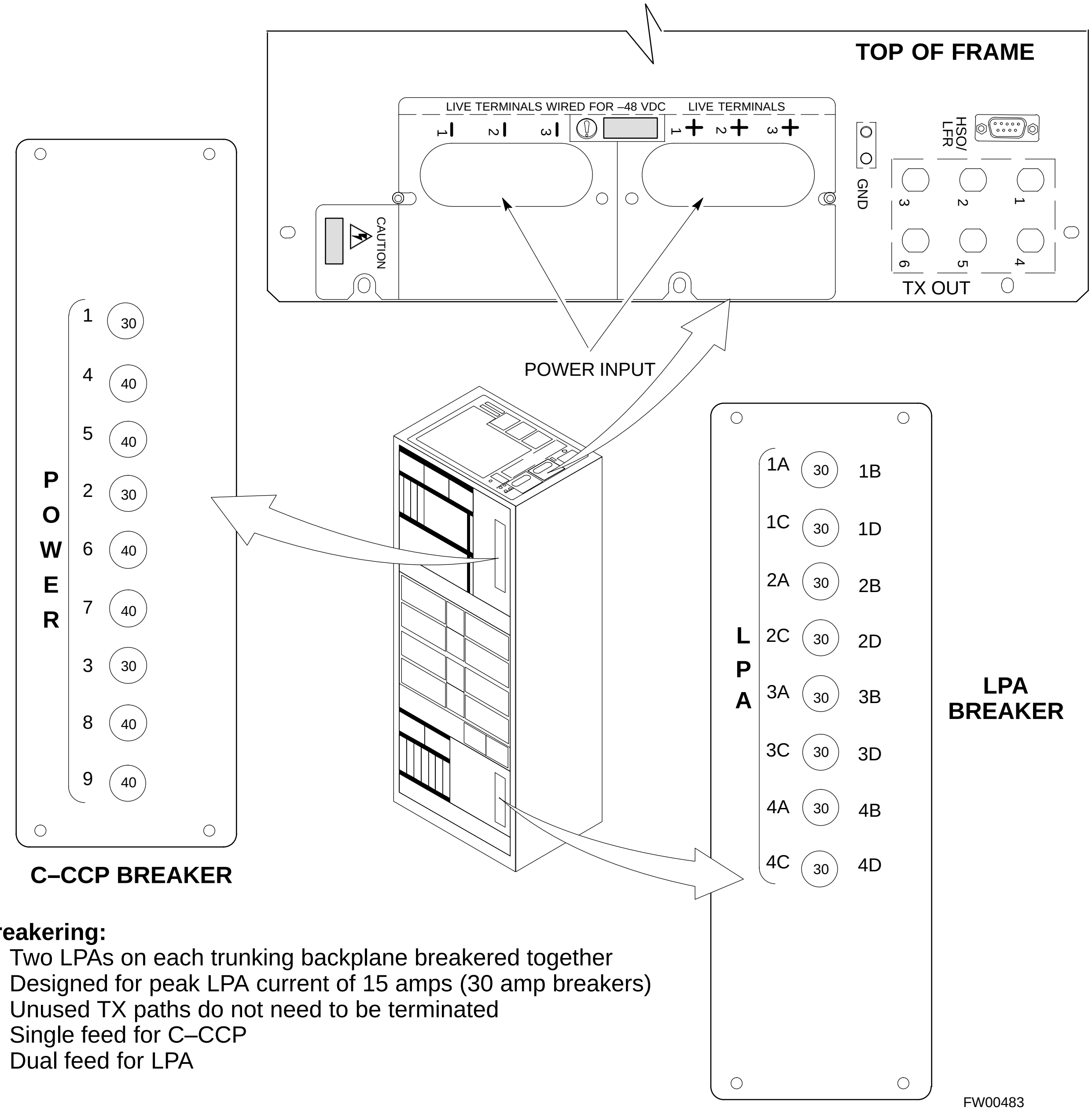
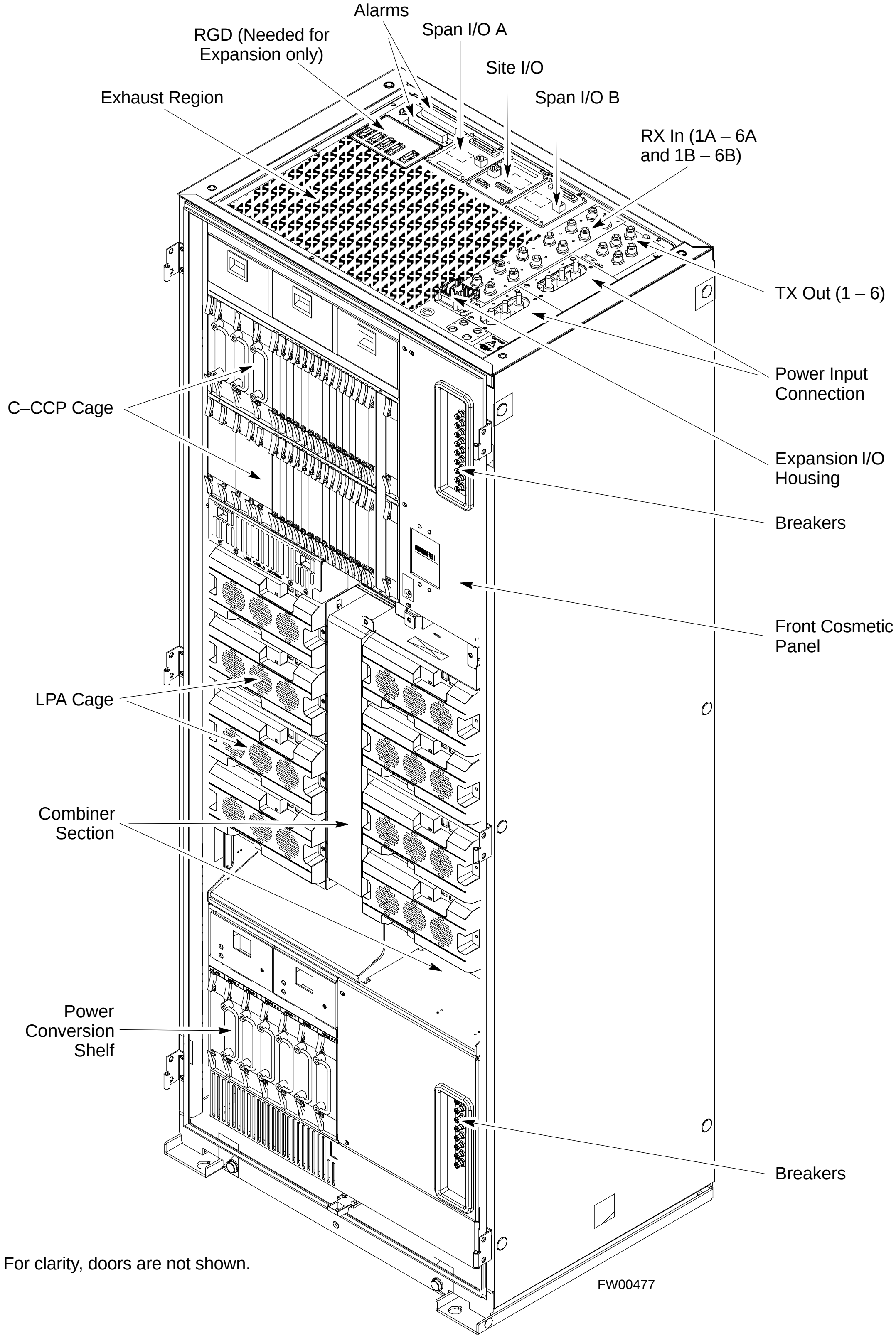
Figure 2-5: –48 V BTS DC Distribution Pre-test



Breakering:

- Two LPAs on each trunking backplane breakered together
- Designed for peak LPA current of 15 amps (30 amp breakers)
- Unused TX paths do not need to be terminated
- Single feed for C–CCP
- Dual feed for LPA

Figure 2-6: –48 V SC 4812T BTS Starter Frame



DC Power Pre-test (RFDS)

Before applying power to the RFDS, follow the steps in Table 2-3, while referring to Figure 2-7, to verify there are no shorts in the RFDS DC distribution system, backplanes, or modules/boards. As of the date of this publication, the RFDS is not used with the –48 V BTS.

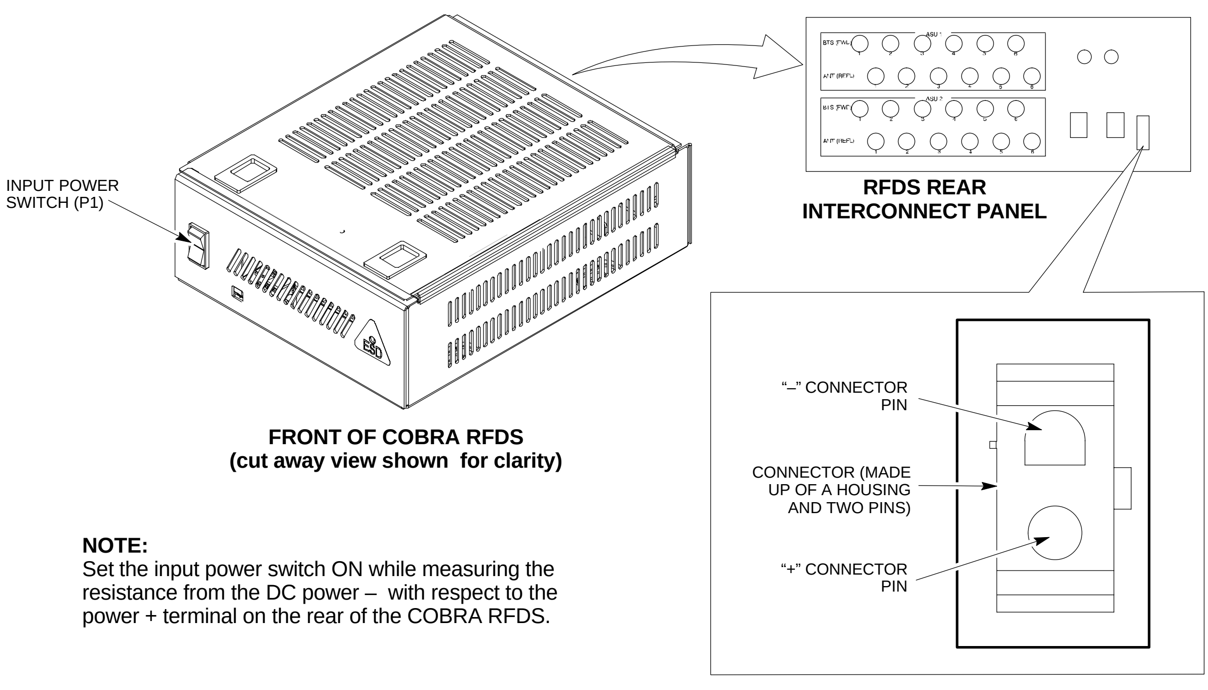
IMPORTANT

Visual inspection of card placement and equipage for each frame vs. site documentation must be completed, as covered in Table 2-1, on page 2-2, before proceeding with this test.

Table 2-3: DC Power Pre-test (RFDS)

Step	Action
1	*Physically verify* that all DC/DC converters supplying the RFDS are **OFF** or disabled.
2	Set the input power rocker switch **P1** to the **OFF** position (see Figure 2-7).
3	Verify the initial resistance from the power (+ or –) feed terminal with respect to ground terminal measures ≥ **5 kΩ** , then slowly begins to increase. • If the initial reading is ≤ **5 kΩ** and remains constant, a short exists somewhere in the DC distribution path supplied by the breaker. Isolate the problem before proceeding.
4	Set the input power rocker switch **P1** to the **ON** position. Repeat Step 3.

Figure 2-7: DC Distribution Pre-test (COBRA RFDS Detail)



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Power-up Procedures

WARNING

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

DC Input Power

In the tests to follow, power will first be verified at the input to each BTS frame. After power is verified, cards and modules within the frame itself will be powered up and verified one at a time.

Before applying any power, verify the correct power feed and return cables are connected between the power supply breakers and the power connectors at the top of each BTS frame. Verify correct cable position referring to Figure 2-3 on page 2-7 for +27 V systems and Figure 2-5 on page 2-9 for –48 V systems.

CAUTION

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

IMPORTANT

For positive power applications (+27 V):

- The positive power cable is red.
- The negative power cable (ground) is black.

For negative power applications (–48 V):

- The negative power cable is red or blue.
- The positive power cable (ground) is black.

In all cases, the black power cable is at ground potential.

Motorola recommends that the DC input power cable used to connect the frame to the main DC power source conforms to the guidelines outlined in Table 2-4.

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Table 2-4: DC Input Power Cable Guidelines	
Maximum Cable Length	**Wire Size**
30.38 m (100 ft)	107 mm^2 (AWG #4/0)
54.864 m (180 ft)	185 mm^2 (350 kcmil)
Greater that 54.864 m (180 ft)	Not recommended

IMPORTANT

If Anderson SB350 style power connectors are used, make sure the connector adapters are securely attached to each of the BTS power feeds and returns. Also, make sure the cables have been properly installed into each connector.

Common Power Supply Verification

The procedure in Table 2-5 must be performed on any BTS frame connected to a common power supply at the site *after the common power supply has been installed and verified per the power supply OEM suggested procedures.*

Perform the following steps to verify the power input is within specification *before* powering up the individual cards/modules with the frames themselves.

Table 2-5: Common Power Supply Verification

Step	Action
1	Physically verify that all DC power sources supplying the frame are **OFF** or disabled.
2	On the RFDS (for +27 V systems only), set the input power switch **P1** to the **OFF** position (see Figure 2-7).
3	*On each frame:* • *Unseat* all circuit boards (except CCD and CIO cards) in the C–CCP shelf and LPA shelves, but leave them in their associated slots. • Set breakers to the **OFF** position by *pulling out* C–CCP and LPA breakers (see Figure 2-3 on page 2-7 or Figure 2-5 on page 2-9 for breaker panel layout if required). – C–CCP shelf breakers are labeled **CCCP–1**, **2**, **3** in the +27 V BTS and labeled **POWER 1,4,5,2,6,7,3,8,9** in the –48 V BTS. – LPA breakers are labeled **1A–1B** through **4C–4D.**
4	Inspect input cables, verify correct input power polarity via decal on top of frame (**+27 Vdc** or **–48 Vdc**).
5	Apply power to BTS frames, *one at a time*, by setting the appropriate breaker in the power supply that supplies the frame to the **ON** position.
6	After power is applied to each frame, use a digital voltmeter to verify power supply output voltages at the top of each BTS frame are within specifications: **+27.0 Vdc** or **–48 Vdc** nominal.

Initial Power-up (RFDS)

The procedure in Table 2-6 must be performed on the RFDS after input power from the common power supply has been verified. Perform the following steps to apply initial power to the cards/modules within the frame itself, verifying that each is operating within specification.

IMPORTANT

Visual inspection of card placement and equipage for each frame vs. site documentation **must be completed**, as covered in Table 2-1, on page 2-2, before proceeding with this test.

Table 2-6: Initial Power-up (RFDS)

Step	Action
1	On the RFDS, set the input power rocker switch (**P1**) to the **ON** position (see Figure 2-7).
2	Verify power supply output voltages (at the top of BTS frame), using a digital voltmeter, are within specifications: **+27.0 V** nominal.

Initial Power-up (BTS)

The procedure must be performed on each frame after input power from the common power supply has been verified. Follow the steps in Table 2-7 to apply initial power to the cards/modules within the frame itself, verifying that each is operating within specification.

Table 2-7: Initial Power–up (BTS)

Step	Action
1	At the BTS, set the C–CCP (POWER) power distribution breakers (see Figure 2-3 on page 2-7 or Figure 2-5 on page 2-9) to the **ON** position by *pushing in* the breakers.
2	Insert the C–CCP fan modules. Observe that the fan modules come on line.
3	**! CAUTION** Verify the correct power/converter modules by observing the locking/retracting tabs appear as follows: – STPN4009 PWR CONV CDMA RCVR (in +27 V BTS C–CCP shelf) – STPN 4045A PWR CONV CDMA RCVR (in –48 V BTS C–CCP shelf) – STPN 4044A PWR CONV LPA (in –48 V BTS power conversion shelf) Insert and lock the converter/power supplies into their associated slots *one at a time*. • If no boards have been inserted, all three **PWR/ALM** LEDs would indicate RED to notify the user that there is no load on the power supplies. – If the LED is RED, do not be alarmed. After Step 4 is performed, the LEDs should turn GREEN; if not, then a faulty converter/power supply module is indicated and should be replaced *before proceeding*.
4	Seat and lock all remaining circuit cards and modules in the C–CCP shelf into their associated slots.

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Table 2-7: Initial Power–up (BTS)	
Step	**Action**
5	Seat the first equipped LPA module pair into the assigned slot in the upper LPA shelf including LPA fan. • In +27 V systems, observe that the LPA internal fan comes on line.
6	Repeat step 5 for all remaining LPAs.
7	Set the LPA breakers to the ON position *(per configuration*) by pushing them IN *one at a time*. See Figure 1-13 on page 1-30 or Figure 1-14 on page 1-31 for configurations and Figure 2-3 on page 2-7 or Figure 2-5 on page 2-9 for LPA breaker panel layout. On +27 V frames, engage (push) LPA circuit breakers. • Confirm LEDs on LPAs light. On –48 V frames, engage (push) LPA PS circuit breakers. • Confirm LPA PS fans start. • Confirm LEDs on –48 V power converter boards light. • Confirm LPA fans start. • Confirm LEDs on LPAs light.
8	After all cards/modules have been seated and verified, use a digital voltmeter to verify power supply output voltages at the top of the frame remain within specifications: **+27.0 Vdc** or **–48 Vdc** nominal.
9	Repeat Steps 1 through 8 for additional co–located frames (if equipped).

2

Notes

Chapter 3: Optimization/Calibration

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Notes

Introduction

This section describes procedures for isolating the BTS from the span lines, preparing and using the LMF, downloading system operating software, CSM reference verification/optimization, set up and calibration of the supported test equipment, transmit/receive path verification, using the RFDS, and verifying the customer defined alarms and relay contacts are functioning properly.

IMPORTANT

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

Optimization Process

After a BTS is physically installed and the preliminary operations (power up) have been completed, the LMF is used to calibrate and optimize the BTS. Motorola recommends that the optimization be accomplished as follows:

1. Download MGLI2–1 with code and data and then enable MGLI2–1.
2. Use the status function and verify that all of the installed devices of the following types respond with status information: CSM, BBX, GLI2, MCC, and TSU (if RFDS is installed). If a device is installed and powered up but is not responding and is colored gray in the BTS display, the device is not listed in the CDF file. The CDF file will have to be corrected before the device can be accessed by the LMF.
3. Download code and data to all devices of the following types:
   - CSM
   - BBX (may be BBX2 or BBX–1X)
   - GLI2 (other than MGLI2–1)
   - MCC (may be MCC–8E, MCC24, or MCC–1X)
4. Download the RFDS TSIC (if installed).
5. Verify the operation of the GPS and HSO signals.
6. Enable the following devices (in the order listed):
   - Secondary CSM
   - Primary CSM
   - All MCCs
7. Connect the required test equipment for a full optimization.
8. Select the test equipment.
9. Calibrate the TX and RX test cables if they have not previously been calibrated using the CDMA LMF that is going to be used for the optimization/calibration. The cable calibration values can also be entered manually.

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10. Select all of the BBXs and all of the MCCs, and use the full optimization function. The full optimization function performs TX calibration, BLO download, TX audit, all TX tests, and all RX tests for all selected devices.
11. If the TX calibration fails, repeat the full optimization for any failed paths.
12. If the TX calibration fails again, correct the problem that caused the failure and repeat the full optimization for the failed path.
13. If the TX calibration and audit portion of the full optimization passes for a path but some of the TX or RX tests fail, correct the problem that caused the failure and run the individual tests as required until all TX and RX tests have passed for all paths.

Cell Site Types

Sites are configured as Omni/Omni or Sector/Sector (TX/RX). Each type has unique characteristics and must be optimized accordingly.

NOTE

For more information on the differences in site types, please refer to the applicable *BTS/Modem Frame Hardware Installation and Functional Hardware Description* manuals.

Cell–Site Data File

The Cell–SiteData File (CDF) contains information that defines the BTS and data used to download files to the devices. A CDF file must be placed in the applicable BTS folder before the LMF can be used to log into that BTS. CDF files are normally obtained from the CBSC using a floppy disk. A file transfer protocol (ftp) method can be used if the LMF computer has that capability.

The CDF includes the following information:

- Download instructions and protocol
- Site specific equipage information
- C–CCP shelf allocation plan
  - BBX equipage (based on cell–site type) including redundancy
  - CSM equipage including redundancy
  - MCC (MCC24E, MCC8E, or MCC–1X) channel element allocation plan. This plan indicates how the C–CCP shelf is configured, and how the paging, synchronization, traffic, and access channel elements (and associated gain values) are assigned among the (up to 12) MCCs in the shelf.
- CSM equipage including redundancy

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- Effective Rated Power (ERP) table for all TX channels to antennas respectively. Motorola System Engineering specifies the ERP of a transmit antenna based on site geography, antenna placement, and government regulations. Working from this ERP requirement, the antenna gain, (dependent on the units of measurement specified) and antenna feed line loss can be combined to determine the required power at the top of the BTS frame. The corresponding BBX output level required to achieve that power level on any channel/sector can also be determined.

NOTE

Refer to the *CDMA LMF Operator's Guide, 68P64114A78*, for additional information on the layout of the LMF directory structure (including CDF file locations and formats).

BTS System Software Download

BTS system software must be successfully downloaded to the BTS processor boards before optimization can be performed. BTS operating code is loaded from the LMF computer terminal.

IMPORTANT

Before using the LMF for optimization/ATP, the correct **bts–#.cdf** and **cbsc–#.cdf** files for the BTS must be obtained from the CBSC and put in a **bts–#** folder in the LMF. Failure to use the correct CDF files can cause wrong results. **Failure to use the correct CDF files to log into a live (traffic carrying) site can shut down the site**.

The CDF is normally obtained from the CBSC on a DOS formatted diskette, or through a file transfer protocol (ftp) if the LMF computer has ftp capability. Refer to the *CDMA LMF Operator's Guide*, or the LMF Help screen, for the procedure.

Site Equipage Verification

If you have not already done so, use an editor to view the CDF, and review the site documentation. Verify the site engineering equipage data in the CDF matches the actual site hardware using a CDF conversion table.

CAUTION

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

3

Isolate BTS from T1/E1 Spans

IMPORTANT

At active sites, the OMC/CBSC must disable the BTS and place it out of service (OOS). **DO NOT** remove the 50–pin TELCO cable connected to the BTS frame site I/O board **J1** connector until the OMC/CBSC has disabled the BTS!

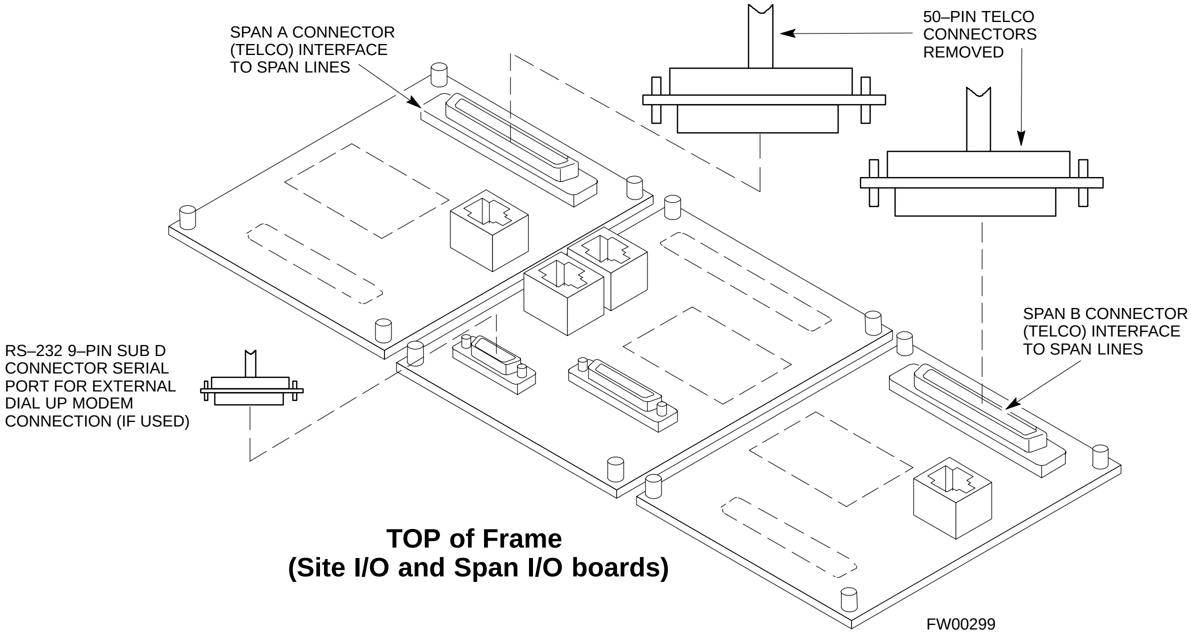
Each frame is equipped with one Site I/O and two Span I/O boards. The Span I/O J1 connector provides connection of 25 pairs of wire. A GLI2 card can support up to six spans. In the SC 4812T configuration, the odd spans (1, 3, and 5) terminate on the Span ”A” I/O; and the even spans (2, 4, and 6) terminate on the Span ”B” I/O.

Before connecting the LMF to the frame LAN, the OMC/CBSC must disable the BTS and place it OOS to allow the LMF to control the CDMA BTS. This prevents the CBSC from inadvertently sending control information to the CDMA BTS during LMF based tests. Refer to Figure 3-1 and Figure 3-2 as required.

Table 3-1: T1/E1 Span Isolation

Step	Action
1	From the OMC/CBSC, disable the BTS and place it OOS. Refer to *SC OMC–R/CBSC System Operator Procedures.* – The T1/E1 span 50–pin TELCO cable connected to the BTS frame SPAN I/O board **J1** connector can be removed from both Span I/O boards, if equipped, to isolate the spans. **NOTE** If a third party is used for span connectivity, the third party must be informed before disconnecting the span line. *** IMPORTANT** Verify that you remove the SPAN cable, *not* the “MODEM/TELCO” connector.

Figure 3-1: Span I/O Board T1 Span Isolation



LMF to BTS Connection

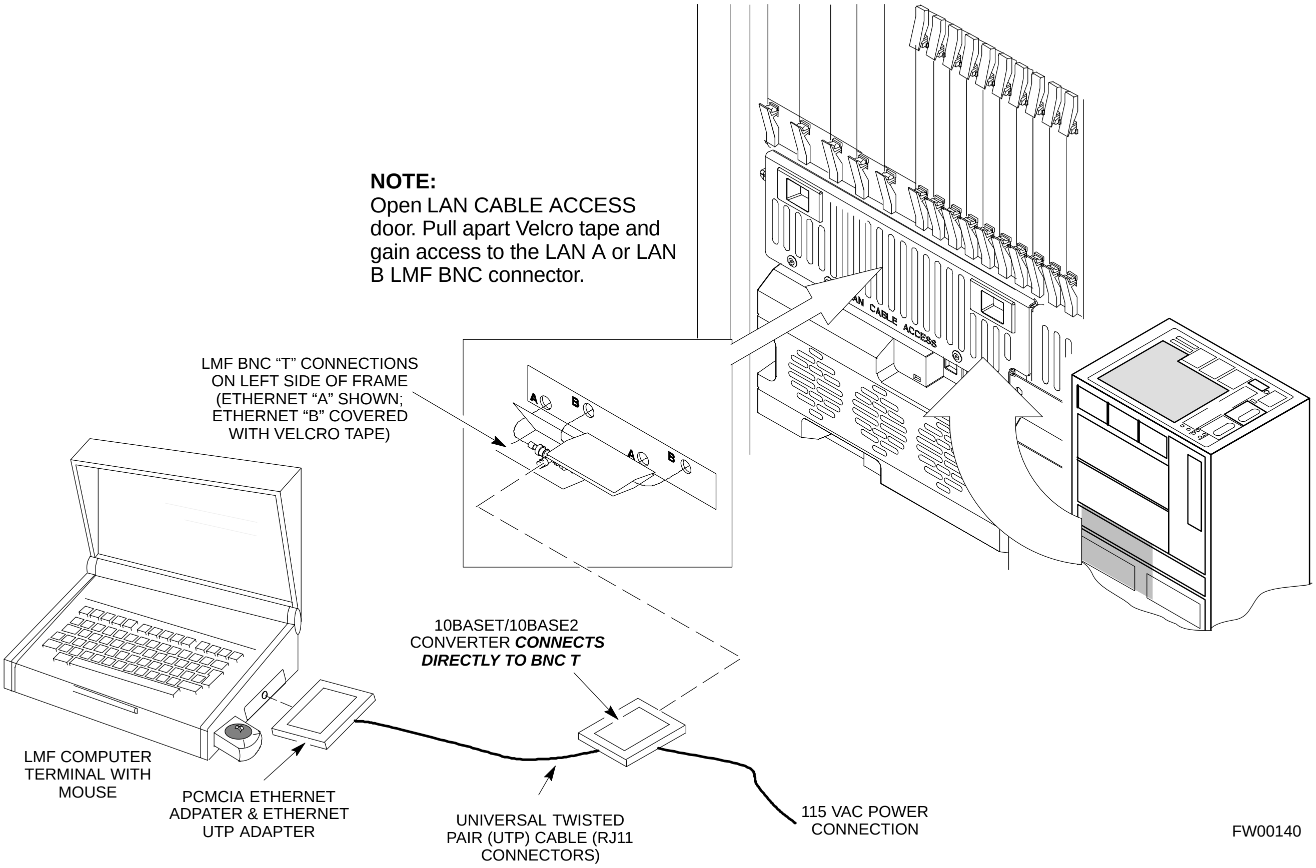
The LMF is connected to the LAN A or B connector located on the left side of the frame's lower air intake grill, behind the LAN Cable Access door (see Figure 3-2).

Table 3-2: LMF to BTS Connection

Step	Action
1	To gain access to the connectors on the BTS, open the LAN Cable Access door, then pull apart the Velcro® tape covering the BNC "T" connector (see Figure 3-2).
2	Connect the LMF to the LAN A BNC connector via PCMCIA Ethernet Adapter with an unshielded twisted–pair (UTP) Adapter and 10BaseT/10Base2 converter (powered by an external AC/DC transformer). – If there is no login response, connect the LMF to the LAN B connector. – If there is still no login response, see Table 6-1, Login Failure Troubleshooting Procedures. **NOTE** – Xircom Model PE3–10B2 or equivalent can also be used to interface the LMF Ethernet connection to the frame connected to the PC parallel port, powered by an external AC/DC transformer. In this case, ***the BNC cable must not exceed 91 cm (3 ft) in length***. *** IMPORTANT** – The LAN shield is isolated from chassis ground. The LAN shield (exposed portion of BNC connector) **must not touch the chassis** during optimization.

3

Figure 3-2: LMF Connection Detail



Preparing the LMF

Overview

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

- LMF Program on CD ROM
- LMF Binaries on CD ROM
- CDF for each supported BTS (on diskette or available from the CBSC)
- CBSC File for each supported BTS (on diskette or available from the CBSC)

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

IMPORTANT

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

LMF Operating System Installation

Follow the procedure in Table 3-3 to install the LMF operating system.

Table 3-3: LMF Operating System Installation

✓	Step	Action
	1	Insert the LMF Program CD ROM into the LMF CD ROM drive. – If the Setup screen is displayed, go to step 5. – If the Setup screen is not displayed, proceed to step 2.
	2	Click on the **Start** button**.**
	3	Select **Run.**
	4	In the Open box, enter **d:\autorun** and click on the **OK** button. **NOTE** If applicable, replace the letter **d** with the correct CD ROM drive letter.

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Table 3-3: LMF Operating System Installation		
✓	Step	Action
	5	Follow the instructions displayed on the **Setup** screen. *** IMPORTANT** First Time Installations: – Install U/WIN (**First**) – Install Java Runtime Environment (**Second**) – Install LMF Software (**Third**) – Install BTS Binaries (**Fourth**) – Install/Create BTS Folders (**Fifth**) Any time you install U/WIN, you must install the LMF software because the installation of the LMF modifies some of the files that are installed during the U/Win installation. Installing U/Win over–writes these modifications. **NOTE** There are multiple binary image packages for installation on the CD–ROM. When prompted, choose the load that corresponds to the switch release that you currently have installed. Perform the Device Images install after the WinLMF installation. If applicable, a separate CD ROM of BTS Binaries may be available for binary updates.

Copy CDF Files from CBSC

Before the LMF can execute the optimization/ATP procedures for the BTS, the correct `bts-#.cdf` and `cbsc-#.cdf` files must be obtained from the CBSC and put in a `bts-# f`older in the LMF notebook. This requires copying the CBSC CDF files to a DOS formatted diskette, and using the diskette to install the CDF file in the LMF.

Follow the procedure in Table 3-4 to obtain the CDF files from the CBSC and copy the files to a diskette. For any further information, refer to the CDMA LMF Operator's Guide (Motorola part number 68P64114A78) or the LMF Help screen..

NOTE

If the LMF has ftp capability, the ftp method can be used to copy the CDF files from the CBSC.

On Sun OS workstations, the **unix2dos** command can be used in place of the **cp** command (e.g., unix2dos bts–248.cdf bts–248.cdf). This should be done using a copy of the CBSC CDF file so the original CBSC CDF file is not changed to DOS format.

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IMPORTANT

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

– The numbers used in the **bts–#.cdf** and **cbsc–#.cdf** filenames must correspond to the locally assigned numbers for each BTS and its controlling CBSC.

– The generic **cbsc–1.cdf** file supplied with the LMF work with locally numbered BTS CDF files. Using this file *does not provide a valid optimization* unless the generic file is edited to replace default parameters (e.g., channel numbers) with the operational parameters used locally.

Table 3-4: Copying CBSC CDF Files to the LMF

✓	Step	Action
AT THE CBSC:		
	1	Login to the CBSC workstation.
	2	Insert a DOS formatted diskette in the workstation drive.
	3	Type **eject –q** and press the **<Enter>** key.
	4	Type **mount** and press the **<Enter>** key. **NOTE** • Look for the “*floppy/no_name*” message on the last line displayed. • If the **eject** command was previously entered, *floppy/no_name* will be appended with a number. Use the explicit *floppy/no_name* reference displayed when performing step 7.
	5	Change to the directory containing the file by typing **cd** *<directory name>* (ex. **cd bts–248**) and pressing **<Enter>**.
	6	Type **ls <Enter>** to display the list of files in the directory.
	7	With *Solaris versions of Unix, create DOS–formatted versions* of the **bts–#.cdf** and **cbsc–#.cdf** files on the diskette by entering the following command: **unix2dos** *<source filename>* **/floppy/no_name/***<target filename>* *(e.g.,* **unix2dos bts–248.cdf /floppy/no_name/bts–248.cdf**). **NOTE** • Other versions of Unix do not support the unix2dos and dos2unix commands. In these cases, use the Unix **cp** (copy) command. The *copied* files will be difficult to read with a DOS or Windows text editor because Unix files do not contain line feed characters. Editing copied CDF files on the LMF computer is, therefore, not recommended. • Using **cp,** multiple files can be *copied* in one operation by separating each filename to be copied with a space and ensuring the destination directory (*floppy/no_name*) is listed at the end of the command string following a space (e.g., **cp bts–248.cdf cbsc–6.cdf /floppy/na_name**).

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Table 3-4: Copying CBSC CDF Files to the LMF		
✓	Step	Action
	8	Repeat steps 5 through 7 for each bts–# that must be supported by the LMF.
	9	When all required files have been copied to the diskette, type **eject** and press the **<Enter>** key.
	10	Remove the diskette from the CBSC.
AT THE LMF:		
	11	Start the Windows operating system.
	12	Insert the diskette into the LMF.
	13	Using Windows Explorer (or equivalent program), create a corresponding bts–# folder in the wlmf\cdma directory for each bts–#.cdf/cbsc–#.cdf file pair copied from the CBSC.
	14	Use Windows Explorer (or equivalent program) to transfer the **cbsc–#.cdf** and **bts–#.cdf** files from the diskette to the corresponding **wlmf\cdma\bts–#** folders created in step 13.

3

Creating a Named HyperTerminal Connection for MMI Connection

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

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

Follow the procedure in Table 3-5 to establish a named HyperTerminal connection and create a WIndows desktop shortcut for it.

NOTE

There are differences between Windows NT and Windows 98 in the menus and screens for creating a HyperTerminal connection. In the following procedure, items applicable to:
– Windows NT will be identified with *Win NT*
– Windows 98 will be identified with *Win 98*

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Table 3-5: Creating a Named Hyperlink Connection for MMI Connection	
Step	**Action**
1	From the Windows Start menu, select: **Programs>Accessories**
2	Perform one of the following: • For *Win NT*, select **Hyperterminal a**nd then click on **HyperTerminal** • For *Win 98*, select **Communications,** double click the **Hyperterminal** folder, and then double click on the **Hyperterm.exe** icon in the window that opens. **NOTE** • If a **Location Information Window** appears, enter the required information, then click **Close**. (This is required the first time, even if a modem is not to be used.) • If a **You need to install a modem.....** message appears, click **NO**.
3	When the **Connection Description** box opens: – Type a name for the connection being defined (e.g., MMI Session) in the **Name:** window. – Highlight any icon preferred for the named connection in the **Icon:** chooser window. – Click **OK.**
4	**NOTE** For LMF configurations where COM1 is used by another interface such as test equipment and a physical port is available for COM2, select COM2 to prevent conflicts. From the **Connect using**: pick list in the **Connect To** box displayed, select the RS–232 port to be used for the connection (e.g., **COM1** or **COM2** (*Win NT)* – or **Direct to Com 1** or **Direct to Com 2** (*Win 98*), and click **OK.**
5	In the **Port Settings** tab of the **COM# Properties** window displayed, configure the RS–232 port settings as follows: • Bits per second: 9600 • Data bits: 8 • Parity: None • Stop bits: 1 • Flow control: None
6	Click **OK**.
7	Save the defined connection by selecting: **File>Save**
8	Close the HyperTerminal window by selecting: **File>Exit**
9	Click **Yes** to disconnect when prompted.

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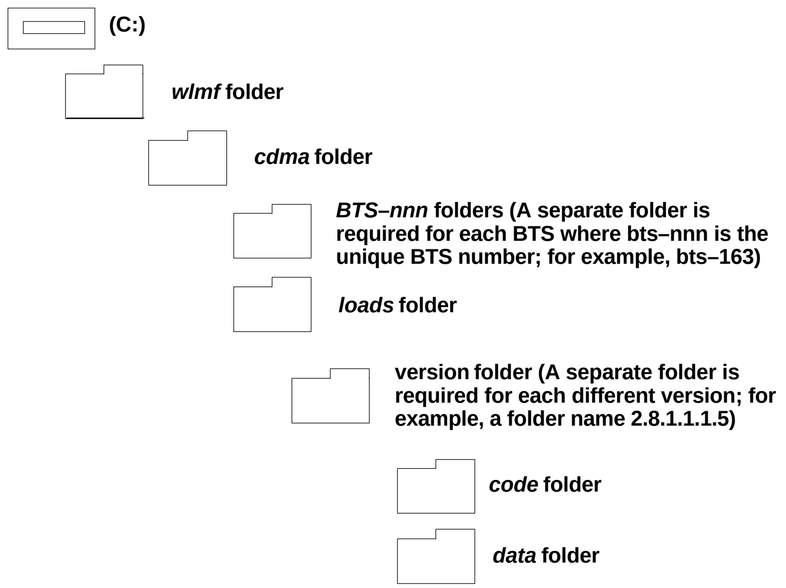
Table 3-5: Creating a Named Hyperlink Connection for MMI Connection	
Step	**Action**
10	Perform one of the following: • If the **Hyperterminal** folder window is still open (*Win 98)* proceed to step 12 • From the Windows Start menu, select **Programs > Accessories**
11	Perform one of the following: • For *Win NT*, select **Hyperterminal** and release any pressed mouse buttons. • For *Win 98*, select **Communications** and double click the **Hyperterminal** folder.
12	Highlight the newly created connection icon by moving the cursor over it (*Win NT*) or clicking on it (*Win 98*).
13	*Right click and drag* the highlighted connection icon to the Windows desktop and release the right mouse button.
14	From the pop–up menu displayed, select **Create Shortcut(s) Here**.
15	If desired, reposition the shortcut icon for the new connection by dragging it to another location on the Windows desktop.

Folder Structure Overview

The LMF uses a *wlmf* folder that contains all of the essential data for installing and maintaining the BTS. The list that follows outlines the folder structure for the LMF. Except for the bts–nnn folders, these folders are created as part of the the LMF installation. Refer to the *CDMA LMF Operator's Guide* for a complete description of the folder structure.

Figure 3-3: LMF Folder Structure

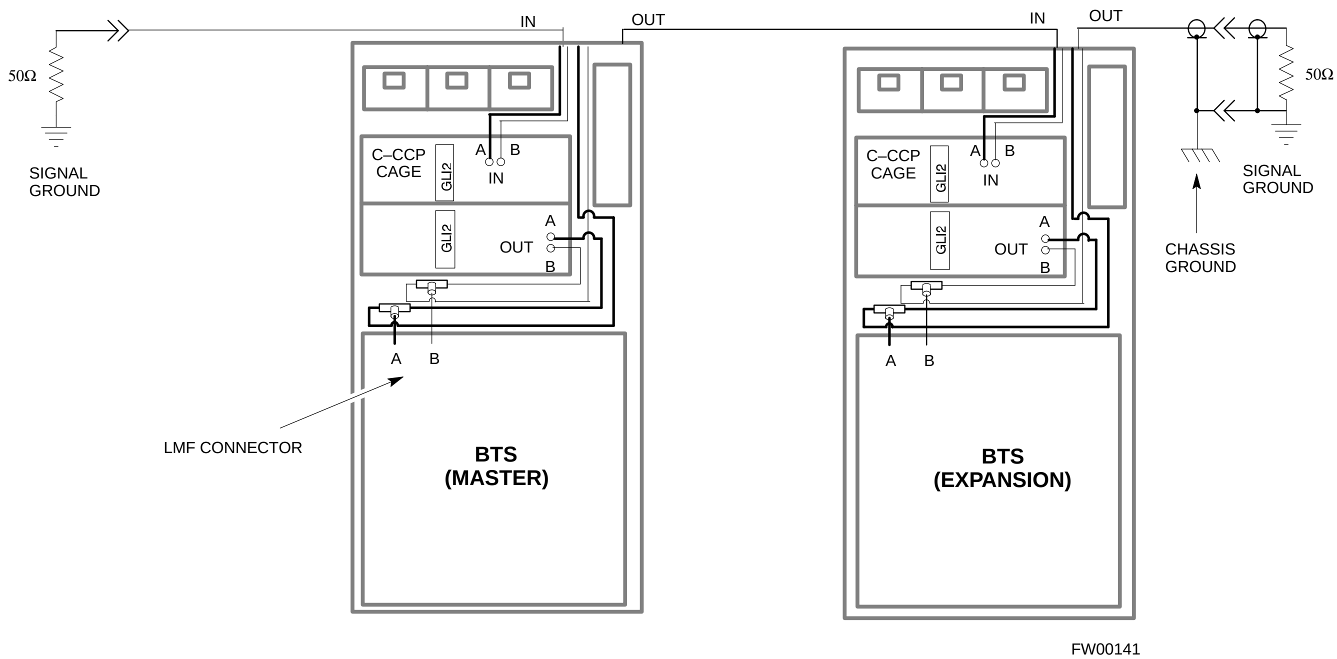


Pinging the Processors

For proper operation, the integrity of the Ethernet LAN A and B links must be be verified. Figure 3-4 represents a typical BTS Ethernet configuration. The drawing depicts one (of two identical) links, A and B.

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

Figure 3-4: BTS LAN Interconnect Diagram



Follow the procedure in Table 3-6 and refer to Figure 3-5 or Figure 3-6, as required, to ping each processor (on both LAN A and LAN B) and verify LAN redundancy is operating correctly.

CAUTION

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

IMPORTANT

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

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Table 3-6: Pinging the Processors		
✓	**Step**	**Action**
	1	If you have not already done so, connect the LMF to the BTS (see Table 3-2 on page 3-5).
	2	From the Windows desktop, click the **Start** button and select **Run.**
	3	In the **Open** box, type **ping** and the *<MGLI IP address>* (*for* example, **ping 128.0.0.2**). **NOTE** 128.0.0.2 is the default IP address for MGLI–1 in field BTS units. 128.0.0.1 is the default IP address for MGLI–2.
	4	Click on the **OK** button.

	5	If the connection is successful, text similar to the following is displayed:
		`Reply from 128 128.0.0.2: bytes=32 time=3ms TTL=255`
		If there is no response the following is displayed:
		`Request timed out`
		If the MGLI fails to respond, reset and perform the ping process again. If the MGLI still fails to respond, typical problems are shorted BNC to inter-frame cabling, open cables, crossed A and B link cables, missing 50–Ohm terminators, or the MGLI itself.

Figure 3-5: +27 V SC 4812T Starter Frame I/O Plate

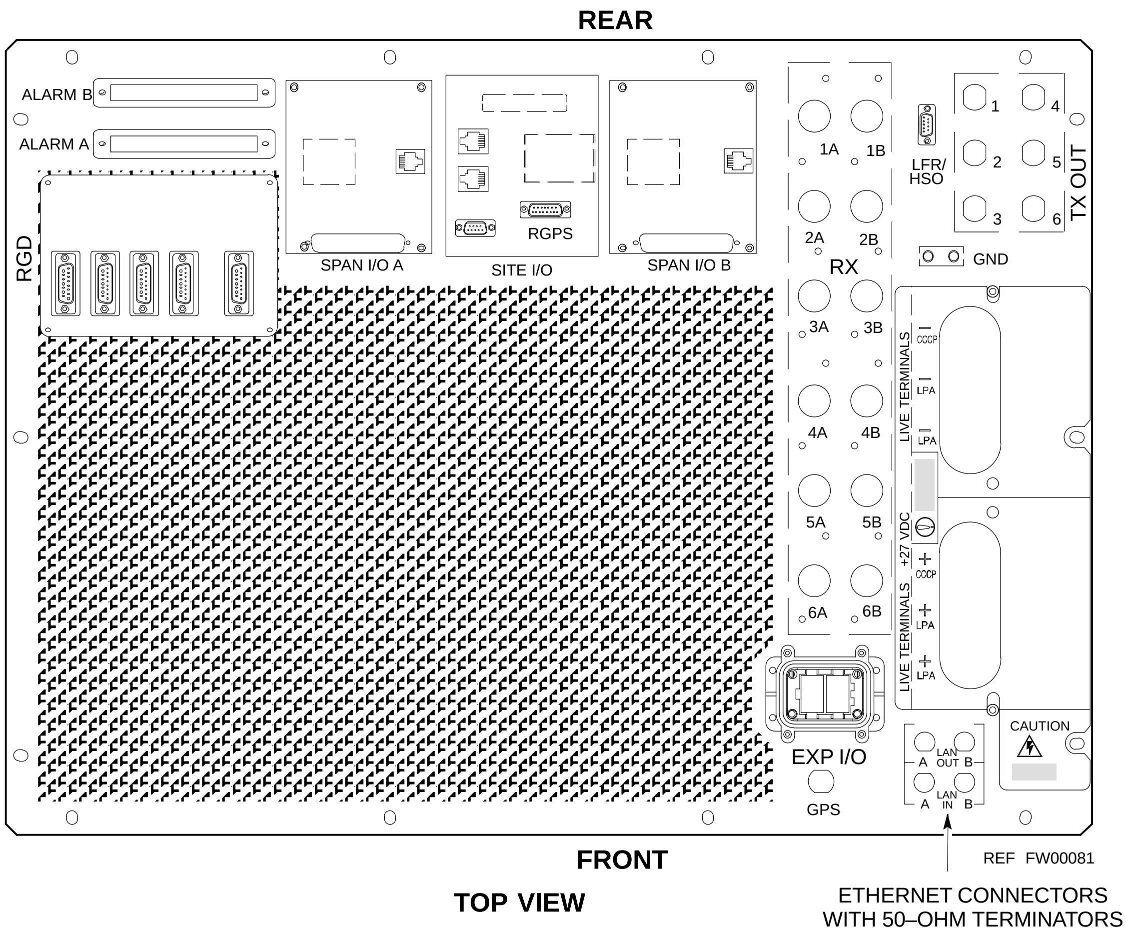
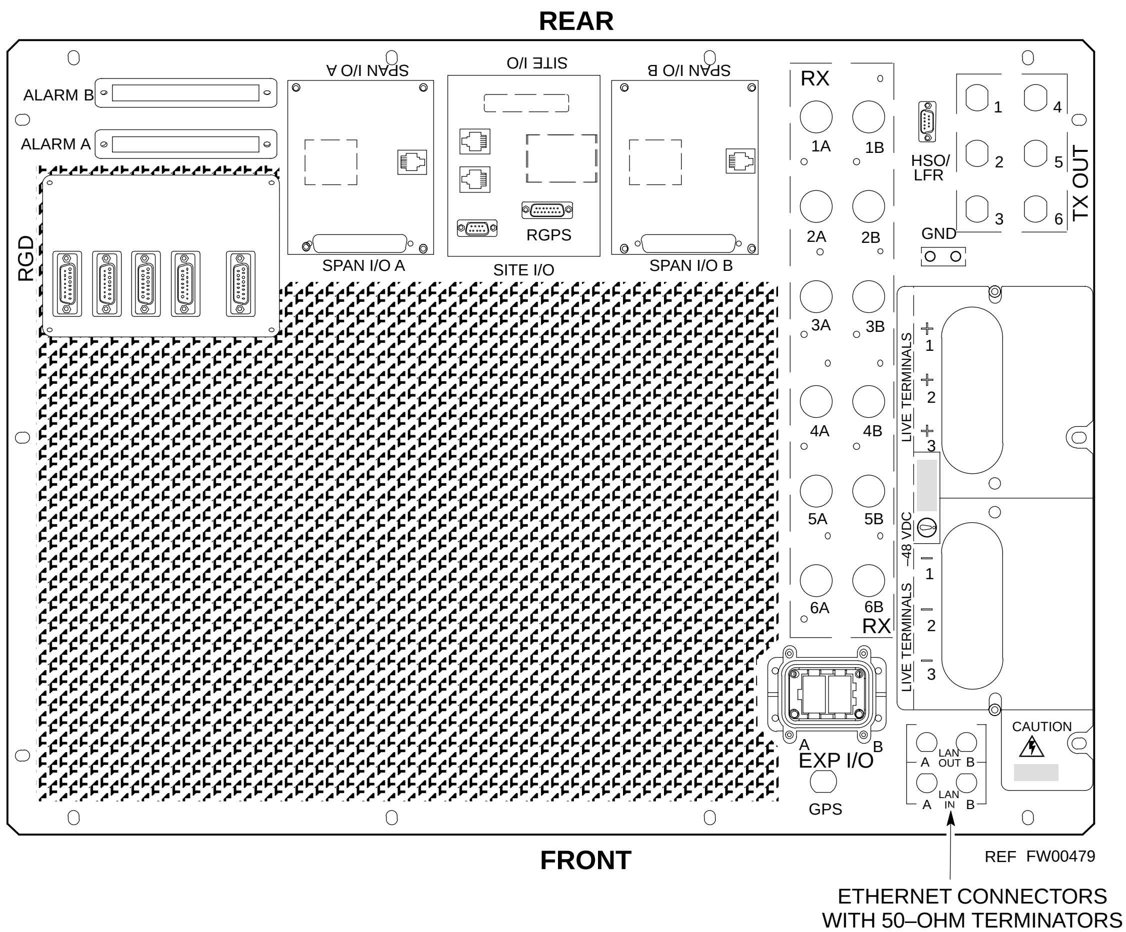


Figure 3-6: –48 V SC 4812T Starter Frame I/O Plate



Basic LMF Operation

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

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

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

Basic operation of the LMF GUI includes the following:

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

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

Graphical User Interface Overview

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

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

Command Line Interface Overview

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

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

> The CLI handler is already running.
> This may cause conflicts with the LMF.
> Are you sure that you want to start the application?

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

CLI Format Conventions

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

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

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

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

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

3

Logging into a BTS

IMPORTANT

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

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

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

Prerequisites

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

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

BTS Login from the GUI Environment

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

Table 3-7: BTS GUI Login Procedure

Step	Action

1	Start the CDMA LMF GUI environment by clicking on the WinLMF desktop icon (if the LMF is not running).
	NOTE
	If a warning similar to the following is displayed, select **No**, shut down other LMF sessions which may be running, and start the CDMA LMF GUI environment again:
	`The CLI handler is already running.`
	`This may cause conflicts with the LMF`
	`Are you sure you want to start the application?`
	`Yes No`

2	Click on the **Login** tab (if not displayed).

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Table 3-7: BTS GUI Login Procedure	
Step	**Action**
3	If no base stations are displayed in the **Available Base Stations** pick list, double click on the **CDMA** icon.
4	Click on the desired BTS number.
5	Click on the **Network Login** tab (if not already in the forefront).
6	Enter the correct IP address (normally **128.0.0.2** for a field BTS) if not correctly displayed in the **IP Address** box. **NOTE** 128.0.0.2 is the default IP address for MGLI–1 in field BTS units. 128.0.0.1 is the default IP address for MGLI–2.
7	Type in the correct IP Port number (normally **9216**) if not correctly displayed in the **IP Port** box.
8	Change the **Multi-Channel Preselector** (from the **Multi-Channel Preselector** pick list), normally **MPC,** corresponding to your BTS configuration, if required. **NOTE** When performing RX tests on expansion frames, do not choose EMPC if the test equipment is connected to the starter frame.
9	Click on the **Use a Tower Top Amplifier**, if applicable.
10	Click on **Login**. A BTS tab with the BTS is displayed.
	NOTE • If you attempt to login to a BTS that is already logged on, all devices will be gray. • There may be instances where the BTS initiates a log out due to a system error (i.e., a device failure). • If the MGLI is OOS_ROM (blue), it will have to be downloaded with code before other devices can be seen. • If the MGLI is OOS–RAM (yellow), it must be enabled before other installed devices can be seen.

BTS Login from the CLI Environment

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

IMPORTANT

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

Table 3-8: BTS CLI Login Procedure

Step	Action
1	Double click the WinLMF CLI desktop icon (if the LMF CLI environment is not already running). **NOTE** If a BTS was logged into under a GUI session when the CLI environment was started, the CLI session will be logged into the same BTS, and step 2 is not required.
2	At the `/wlmf` prompt, enter the following command: **login bts–**<*bts#*> **host=**<*host*> **port=**<*port*> where: host = MGLI card IP address (defaults to address last logged into for this BTS or 128.0.0.2 if this is first login to this BTS). port = IP port of the BTS (defaults to port last logged into for this BTS or 9216 if this is first login to this BTS).

Logging Out

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

IMPORTANT

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

Logging Out of a BTS from the GUI Environment

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

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Table 3-9: BTS GUI Logout Procedure	
Step	**Action**
1	Click on **Select** on the BTS tab menu bar.
2	Click the **Logout** item in the pull–down menu (a **Confirm Logout** pop–up message appears).
3	Click on **Yes** or press the **<Enter>** key to confirm logout. You are returned to the **Login** tab. **NOTE** If a logout was previously performed on the BTS from a CLI window running at the same time as the GUI, a **Logout Error** pop–up message appears stating the system should not log out of the BTS. When this occurs, the GUI must be exited and restarted before it can be used for further operations.
4	If a **Logout Error** pop–up message appears stating that the system could not log out of the Base Station because the given BTS is not logged in, perform the following actions: – Click **OK.** – Select **File>Exit** in the window menu bar. – Click **Yes** in the **Confirm Logout** pop–up. – Click **Yes** in the **Logout Error** pop–up which appears again.
5	If further work is to be done in the GUI, restart it.

3

3

Logging Out of a BTS from the CLI Environment

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

Table 3-10: BTS CLI Logout Procedure

Step	Action

1	*** IMPORTANT**
	If the BTS is also logged into from a GUI running at the same time and further work must be done with it in the GUI, proceed to step 2.
	Logout of a BTS by entering the following command:
	logout bts–<*bts#*>
	A response similar to the following is displayed:
	`LMF>`
	`12:22:58.028 Command Received and Accepted`
	`Command=logout bts–33`
	`12:22:58.028 Command Received and Accepted`
	`12:22:58.028 Command Successfully Completed`
	`REASON_CODE=”No Reason”`

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

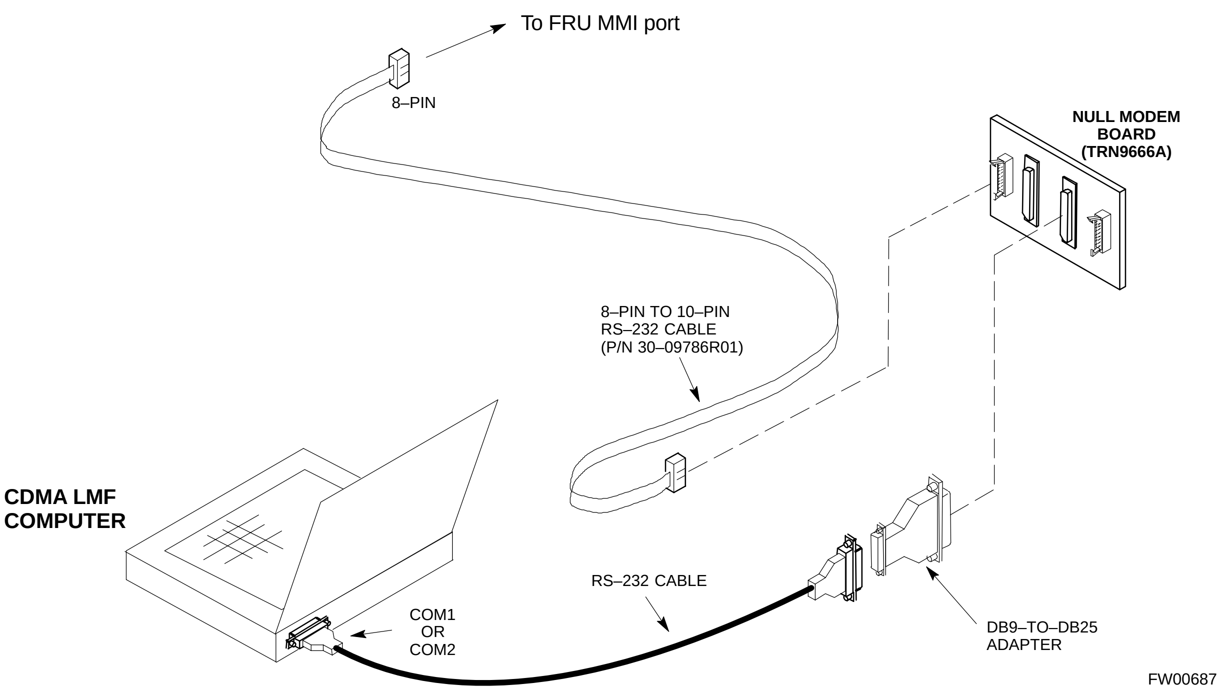
Establishing an MMI Communication Session

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

Table 3-11: Establishing MMI Communications

Step	Action
1	Connect the LMF computer to the equipment as detailed in the applicable procedure that requires the MMI communication session.
2	Start the named HyperTerminal connection for MMI sessions by double clicking on its desktop shortcut. **NOTE** If a desktop shortcut was not created for the MMI connection, access the connection from the Start menu by selecting: **Programs>Accessories>Hyperterminal>HyperTerminal><*Named HyperTerminal Connection (e.g., MMI Session)*.**
3	Once the connection window opens, establish MMI communication with the BTS FRU by pressing the LMF computer **<Enter>** key until the prompt identified in the applicable procedure is obtained.

Figure 3-7: CDMA LMF Computer Common MMI Connections



Download the BTS – Overview

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

ROM Code

Downloading ROM code to BTS devices from the LMF is *NOT routine maintenance nor a normal part of the optimization process.* It is only done in unusual situations where the resident ROM code in the device does not match the release level of the site operating software *AND* the CBSC cannot communicate with the BTS to perform the download. If you must download ROM code, refer to Appendix H.

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

RAM Code

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

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

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

Download Code to Devices

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

The following are the devices to be downloaded:

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

IMPORTANT

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

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

Prerequisite

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

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WARNING

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

Table 3-12: Download and Enable MGLI2

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

DRAFT

Download Code and Data to Non–MGLI2 Devices

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

NOTE

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

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

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

Select CSM Clock Source

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

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

Prerequisites

MGLI=INS_ACT

CSM= OOS_RAM or INS_ACT

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

Table 3-14: Select CSM Clock Source

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

Enable CSMs

Each BTS CSM system features two CSM boards per site. In a typical operation, the primary CSM locks its Digital Phase Locked Loop (DPLL) circuits to GPS signals. These signals are generated by either an on–board GPS module (RF–GPS) or a remote GPS receiver (R–GPS). The CSM2 card is required when using the R–GPS. The GPS receiver (mounted on CSM–1) is the primary timing reference and synchronizes the entire cellular system. CSM–2 provides redundancy but does not have a GPS receiver.

The BTS may be equipped with a remote GPS, LORAN–C LFR, or HSO 10 MHz Rubidium source, which the CSM can use as a secondary timing reference. In all cases, the CSM monitors and determines what reference to use at a given time.

IMPORTANT

- CSMs are code loaded at the factory. This data is retained in EEPROM. The download code procedure is required in the event it becomes necessary to code load CSMs with updated software versions. Use the status function to determine the current code load versions.
- For non–RGPS sites only, verify the CSM configured with the GPS receiver "daughter board" is installed in the CSM–1 slot before continuing.
- The CSM(s) and MCC(s) to be enabled must have been downloaded with code (Yellow, OOS–RAM) and data.

. . . continued on next page

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

Table 3-15: Enable CSMs

✓	Step	Action
	1	Verify the CSM(s) have been downloaded with code (Yellow, OOS–RAM) and data.
	2	Click on the target CSM. From the **Device** pull down, select **Enable**. **NOTE** If equipped with two CSMs, enable CSM–2 first and then CSM–1. A status report confirms change in the device(s) status. Click **OK** to close the status window. **NOTE** FAIL may be shown in the status table for enable action. If Waiting For Phase Lock is shown in the Description field, the CSM changes to the enabled state after phase lock is achieved. CSM–1 houses the GPS receiver. The enable sequence can take up to ***one hour*** to complete. *** IMPORTANT** The GPS satellite system satellites are not in a geosynchronous orbit and are maintained and operated by the United States Department of Defense (D.O.D.). The D.O.D. periodically alters satellite orbits; therefore, satellite trajectories are subject to change. A GPS receiver that is INS contains an “almanac” that is updated periodically to take these changes into account. If an installed GPS receiver has not been updated for a number of weeks, it may take up to one hour for the GPS receiver “almanac” to be updated. Once updated, the GPS receiver must track at least four satellites and obtain (hold) a 3-D position fix for a minimum of 45 seconds before the CSM will come in-service. (In some cases, the GPS receiver needs to track only one satellite, depending on accuracy mode set during the data load.)
	3	**NOTE** If equipped with two CSMs, the LMF should display CSM-1 as bright GREEN (INS–ACT) and CSM–2 as dark green (INS–STB). After the CSMs have been successfully enabled, the PWR/ALM LEDs are steady green (alternating green/red indicates the card is in an alarm state). If more than an hour has passed, refer to Table 3-19 and Table 3-20 to determine the cause.

Enable MCCs

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

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

IMPORTANT

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

Table 3-16: Enable MCCs

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

Enable Redundant GLIs

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

Table 3-17: Enable Redundant GLIs

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

CSM & LFR Background

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

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

In a typical operation, the primary CSM locks its Digital Phase Locked Loop (DPLL) circuits to GPS signals. These signals are generated by either an on–board GPS module (RF–GPS) or a remote GPS receiver (R–GPS). The CSM2 card is required when using the R–GPS. DPLL circuits employed by the CSM provide switching between the primary and redundant unit upon request. Synchronization between the primary and redundant CSM cards, as well as the LFR or HSO back–up source, provides excellent reliability and performance.

Each CSM board features an ovenized, crystal oscillator that provides 19.6608 MHz clock, even second tick reference, and 3 MHz sinewave reference, referenced to the selected synchronization source (GPS, LORAN–C Frequency Receiver (LFR), or High Stability Oscillator (HSO), T1 Span, or external reference oscillator sources). The 3 MHz signals are also routed to the RDM EXP 1A & 1B connectors on the top interconnect panel for distribution to co–located frames at the site.

Fault management has the capability of switching between the GPS synchronization source and the LFR/HSO backup source in the event of a GPS receiver failure on CSM–1. During normal operation, the CSM–1 board selects GPS as the primary source (see Table 3-19). The source selection can also be overridden via the LMF or by the system software.

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

Low Frequency Receiver/ High Stability Oscillator

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

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

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

Upgrades and Expansions: LFR2/HSO2/HSOX

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

NOTE

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

Front Panel LEDs

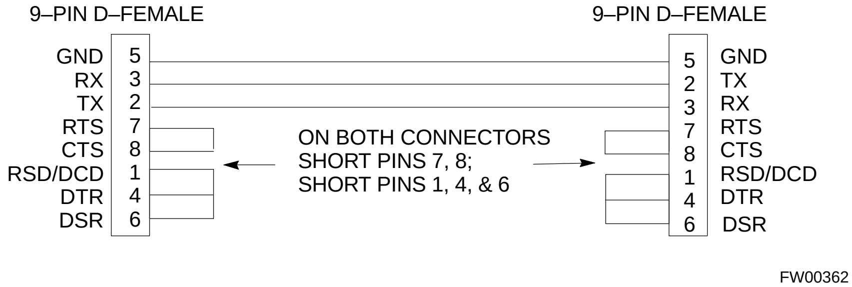
The status of the LEDs on the CSM boards are as follows:

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

Null Modem Cable

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

Figure 3-8: Null Modem Cable Detail



Prerequisites

Ensure the following prerequisites have been met before proceeding:

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

CSM Frequency Verification

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

Test Equipment Setup: GPS & LFR/HSO Verification

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

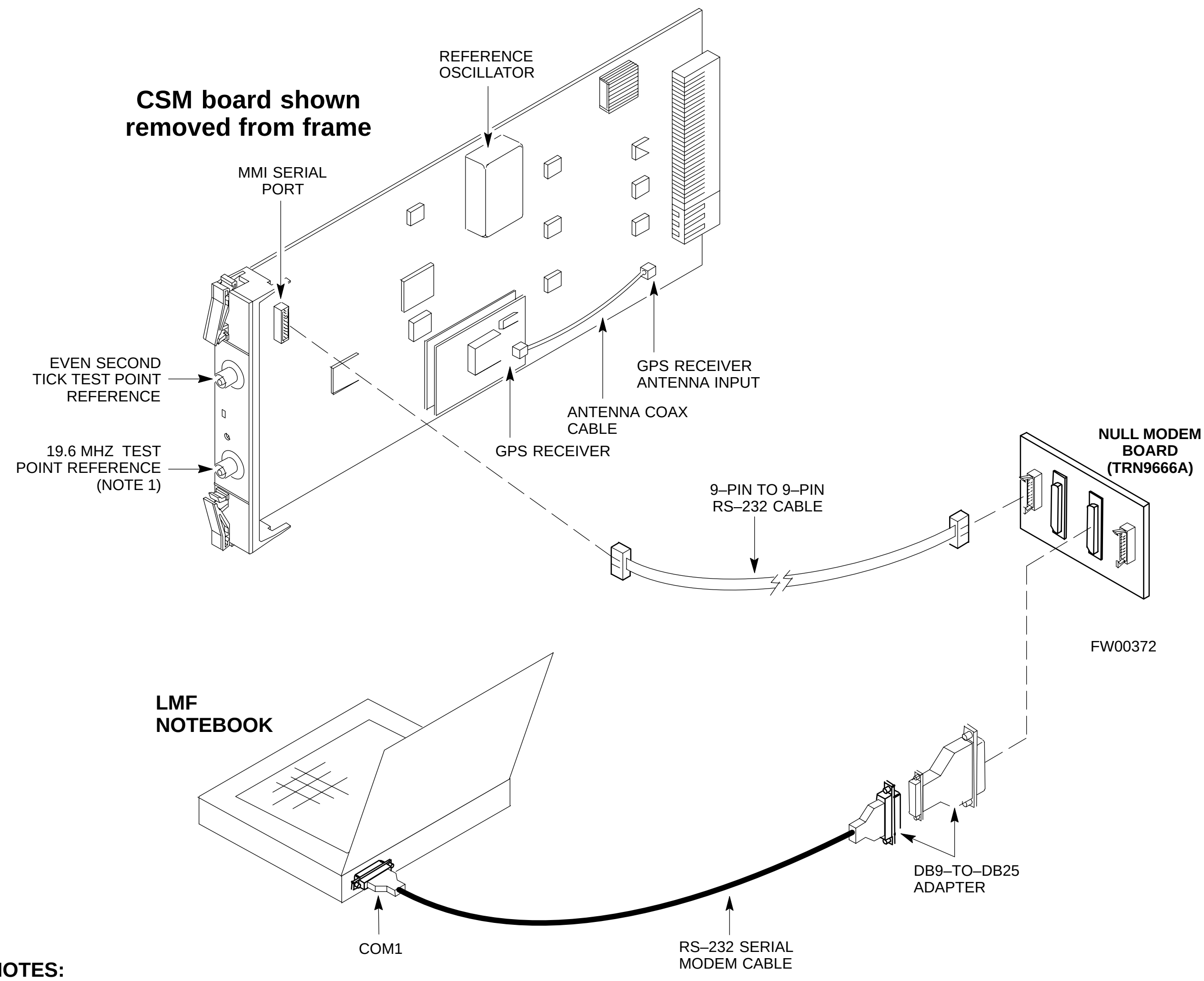
Table 3-18: Test Equipment Setup (GPS & LFR/HSO Verification)

Step	Action
1	Perform one of the following operations: – For **local GPS** (RF–GPS), verify a CSM board with a GPS receiver is installed in primary CSM slot 1 and that CSM–1 is INS. **NOTE** This is verified by checking the board ejectors for kit number **SGLN1145** on the board in slot 1. – For **Remote GPS** (RGPS), verify a CSM2 board is installed in primary slot 1 and that CSM–1 is INS **NOTE** This is verified by checking the board ejectors for kit number **SGLN4132CC** (or subsequent).
2	Remove CSM–2 (if installed) and connect a serial cable from the LMF COM 1 port (via null modem board) to the MMI port on CSM–1.

. . . continued on next page

Table 3-18: Test Equipment Setup (GPS & LFR/HSO Verification)	
Step	**Action**
3	Reinstall CSM–2.
4	Start an MMI communication session with CSM–1 by using the Windows desktop shortcut icon (see Table 3-5) **NOTE** The LMF program must not be running when a Hyperterminal session is started if COM1 is being used for the MMI session.
5	When the terminal screen appears, press the **<Enter>** key until the **CSM**> prompt appears.

Figure 3-9: CSM MMI terminal connection



NOTES:
1. One LED on each CSM:
   Green = IN–SERVICE ACTIVE
   Fast Flashing Green = OOS–RAM
   Red = Fault Condition
   Flashing Green & Red = Fault

GPS Initialization/Verification

Follow the procedure in Table 3-19 to initialize and verify proper GPS receiver operation.

Prerequisites

Ensure the following prerequisites have been met before proceeding:

- The LMF is not logged into the BTS.
- The COM1 port is connected to the MMI port of the primary CSM via a null modem board (see Figure 3-9).
- The primary CSM and HSO (if equipped) have been warmed up for at least 15 minutes.

CAUTION

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

Table 3-19: GPS Initialization/Verification

Step	Action

1	To verify that `Clock alarms (0000)`, `Dpll is locked and has a reference source`, and `GPS self test passed` messages are displayed within the report, issue the following MMI command
	bstatus
	– Observe the following typical response:
	`CSM Status INS:ACTIVE Slot A Clock MASTER.`
	`BDC_MAP:000, This CSM's BDC Map:0000`
	<u>`Clock Alarms (0000):`</u>
	`DPLL` <u>`is locked and has a reference source.`</u>
	`GPS receiver self test result:` <u>`passed`</u>
	`Time since reset 0:33:11, time since power on: 0:33:11`

2	HSO information (underlined text above, verified from left to right) is usually the #1 reference source. If this is not the case, have the *OMCR* determine the correct BTS timing source has been identified in the database by entering the **display bts csmgen** command and correct as required using the **edit csm csmgen refsrc** command.
	*** IMPORTANT** If any of the above mentioned areas fail, verify: – If LED is RED, verify that HSO had been powered up for at least 5 minutes. After oscillator temperature is stable, LED should go GREEN ***Wait for this to occur before continuing !*** – If "timed out" is displayed in the Last Phase column, suspect the HSO output buffer or oscillator is defective – Verify the HSO is FULLY SEATED and LOCKED to prevent any possible board warpage

. . . continued on next page

Table 3-19: GPS Initialization/Verification

Step	Action
3	Verify the following GPS information (underlined text above): – GPS information is usually the 0 reference source. – At least one Primary source must indicate “Status = good” and “Valid = yes” to bring site up.

4	Enter the following command at the `CSM>` prompt to verify that the GPS receiver is in tracking mode.
	gstatus
	– Observe the following typical response:
	`24:06:08 GPS Receiver Control Task State: tracking satellites.`
	`24:06:08 Time since last valid fix: 0 seconds.`
	`24:06:08`
	`24:06:08 Recent Change Data:`
	`24:06:08 Antenna cable delay 0 ns.`
	`24:06:08 Initial position: lat 117650000 msec, lon –350258000 msec, height 0 cm (GPS)`
	`24:06:08 Initial position accuracy (0): estimated.`
	`24:06:08`
	`24:06:08 GPS Receiver Status:`
	`24:06:08 Position hold:  lat 118245548 msec, lon –350249750 msec, height 20270 cm`
	`24:06:08 Current position: lat 118245548 msec, lon –350249750 msec, height 20270 cm (GPS)`
	`24:06:08 8 satellites tracked, receiving 8 satellites, 8 satellites visible.`
	`24:06:08 Current Dilution of Precision (PDOP or HDOP): 0.`
	`24:06:08 Date & Time: 1998:01:13:21:36:11`
	`24:06:08 GPS Receiver Status Byte: 0x08`
	`24:06:08 Chan:0, SVID: 16, Mode: 8, RSSI: 148, Status: 0xa8`
	`24:06:08 Chan:1, SVID: 29, Mode: 8, RSSI: 132, Status: 0xa8`
	`24:06:08 Chan:2, SVID: 18, Mode: 8, RSSI: 121, Status: 0xa8`
	`24:06:08 Chan:3, SVID: 14, Mode: 8, RSSI: 110, Status: 0xa8`
	`24:06:08 Chan:4, SVID: 25, Mode: 8, RSSI:  83, Status: 0xa8`
	`24:06:08 Chan:5, SVID:  3, Mode: 8, RSSI:  49, Status: 0xa8`
	`24:06:08 Chan:6, SVID: 19, Mode: 8, RSSI: 115, Status: 0xa8`
	`24:06:08 Chan:7, SVID: 22, Mode: 8, RSSI: 122, Status: 0xa8`
	`24:06:08`
	`24:06:08 GPS Receiver Identification:`
	`24:06:08 COPYRIGHT 1991–1996 MOTOROLA INC.`
	`24:06:08 SFTW P/N # 98–P36830P`
	`24:06:08 SOFTWARE VER # 8`
	`24:06:08 SOFTWARE REV # 8`
	`24:06:08 SOFTWARE DATE  6 AUG 1996`
	`24:06:08 MODEL #    B3121P1115`
	`24:06:08 HDWR P/N # _`
	`24:06:08 SERIAL #   SSG0217769`
	`24:06:08 MANUFACTUR DATE 6B07`
	`24:06:08 OPTIONS LIST    IB`
	`24:06:08 The receiver has 8 channels and is equipped with TRAIM.`

5	**Verify** the following GPS information (shown above in underlined text): – At least 4 satellites are tracked, and 4 satellites are visible. – GPS Receiver Control Task State is “tracking satellites”. ***Do not continue until this occurs!*** – Dilution of Precision indication is not more that 30. **Record** the current position base site latitude, longitude, height and height reference (height reference to Mean Sea Level (MSL) or GPS height (GPS). (GPS = 0 MSL = 1).

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<table>
<tr><th colspan="2">Table 3-19: GPS Initialization/Verification</th></tr>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>6</td><td>If steps 1 through 5 pass, the GPS is good.

* IMPORTANT
If any of the above mentioned areas fail, verify that:
– If Initial position accuracy is “estimated” (typical), at least 4 satellites must be tracked and visible (1 satellite must be tracked and visible if actual lat, log, and height data for this site has been entered into CDF file).
– If Initial position accuracy is “surveyed”, position data currently in the CDF file is assumed to be accurate. GPS will not automatically survey and update its position.
– The GPS antenna is not obstructed or misaligned.
– GPS antenna connector center conductor measures approximately +5 Vdc with respect to the shield.
– There is no more than 4.5 dB of loss between the GPS antenna OSX connector and the BTS frame GPS input.
– Any lightning protection installed between GPS antenna and BTS frame is installed correctly.</td></tr>
<tr><td>7</td><td>Enter the following commands at the <code>CSM></code> prompt to verify that the CSM is warmed up and that GPS acquisition has taken place.
debug dpllp
Observe the following typical response if the CSM is not warmed up (15 minutes from application of power) (If warmed–up proceed to step 8)
<code>CSM>DPLL Task Wait. 884 seconds left.</code>
<code>DPLL Task Wait. 882 seconds left.</code>
<code>DPLL Task Wait. 880 seconds left. ....etc.</code>

NOTE
The warm command can be issued at the MMI port used to force the CSM into warm–up, but the reference oscillator will be unstable.</td></tr>
<tr><td>8</td><td>Observe the following typical response if the CSM is warmed up.
<code>c:17486 off: <u>–11</u>, 3, <u>6</u> <u>TK SRC:0</u> S0: 3 S1:–2013175,–2013175</code>
<code>c:17486 off: <u>–11</u>, 3, <u>6</u> <u>TK SRC:0</u> S0: 3 S1:–2013175,–2013175</code>
<code>c:17470 off: <u>–11</u>, 1, <u>6</u> <u>TK SRC:0</u> S0: 1 S1:–2013175,–2013175</code>
<code>c:17486 off: <u>–11</u>, 3, <u>6</u> <u>TK SRC:0</u> S0: 3 S1:–2013175,–2013175</code>
<code>c:17470 off: <u>–11</u>, 1, <u>6</u> <u>TK SRC:0</u> S0: 1 S1:–2013175,–2013175</code>
<code>c:17470 off: <u>–11</u>, 1, <u>6</u> <u>TK SRC:0</u> S0: 1 S1:–2013175,–2013175</code></td></tr>
<tr><td>9</td><td>Verify the following GPS information (underlined text above, from left to right):
– Lower limit offset from tracked source variable is not less than –60 (equates to 3µs limit).
– Upper limit offset from tracked source variable is not more than +60 (equates to 3µs limit).
– TK SRC: 0 is selected, where SRC 0 = GPS.</td></tr>
<tr><td>10</td><td>Enter the following commands at the <code>CSM></code> prompt to exit the debug mode display.
debug dpllp</td></tr>
</table>

3

LFR Initialization/Verification

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

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

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

If the BTS is equipped with an LFR, follow the procedure in Table 3-20 to initialize the LFR and verify proper operation as a backup source for the GPS.

NOTE

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

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Table 3-20: LFR Initialization/Verification

Step	Action	Note

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

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<table>
<tr><th colspan="3">Table 3-20: LFR Initialization/Verification</th></tr>
<tr><th>Step</th><th>Action</th><th>Note</th></tr>
<tr><td>2</td><td colspan="2">Verify the following LFR information (highlighted above in boldface type):
– Locate the “dot” that indicates the current phase locked station assignment (assigned by MM).
– Verify that the station call letters are as specified in site documentation as well as M X Y Z assignment.
– Verify the signal to noise (S/N) ratio of the phase locked station is greater than 8.</td></tr>
<tr><td>3</td><td colspan="2">At the CSM> prompt, enter sources <cr> to display the current status of the the LORAN receiver.
– Observe the following typical response.<pre>
Num Source Name Type   TO Good   Status Last Phase Target Phase Valid
----
 0   Local GPS   Primary   4   Yes   Good   –3   0   Yes
 1   LFR ch A   Secondary 4   <u>Yes</u>   <u>Good</u>   –2013177   –2013177   <u>Yes</u>
 2   Not used
Current reference source number: 1
</pre></td></tr>
<tr><td>4</td><td colspan="2">LORAN–C LFR information (highlighted above in boldface type) is usually the #1 reference source (verified from left to right).

* IMPORTANT
If any of the above mentioned areas fail, verify:
– The LFR antenna is not obstructed or misaligned.
– The antenna pre–amplifier power and calibration twisted pair connections are intact and < 91.4 m (300 ft) in length.
– A dependable connection to suitable Earth Ground is in place.
– The search list and PLL station for cellsite location are correctly configured .</td></tr>
<tr><td></td><td colspan="2">NOTE
LFR functionality should be verified using the “source” command (as shown in Step 3). Use the <u>underlined</u> responses on the LFR row to validate correct LFR operation.</td></tr>
<tr><td>5</td><td colspan="2">Close the Hyperterminal window.</td></tr>
</table>

HSO Initialization/Verification

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

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

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

Prerequisites

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

If the BTS is equipped with an HSO, follow the procedure in Table 3-21 to configure the HSO.

Table 3-21: HSO Initialization/Verification

Step	Action
1	At the BTS, slide the HSO card into the cage. **NOTE** The LED on the HSO should light *red* for no longer than 15-minutes, then switch to *green*. The CSM must be locked to GPS.

2	On the LMF at the **CSM**> prompt, enter **sources <cr>**.
	– Observe the following typical response for systems equipped with HSO:
	`Num  Source Name  Type     TO  Good   Status  Last Phase  Target Phase Valid`
	`-------------------------------------------------------------------------------`
	`0   Local GPS    Primary  4   Yes    Good        0           0      Yes`
	`1   HSO``          Backup   4   `**`Yes`**`    N/A      xxxxxxx     –69532    `**`Yes`**
	`2   Not used`
	`Current reference source number: 0`
	When the CSM is locked to GPS, verify that the HSO “Good” field is *Yes* and the “Valid” field is *Yes*.

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

Connecting Test Equipment to the BTS

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

The following equipment is required to perform optimization:

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

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

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

Supported Test Sets

Optimization and ATP testing may be performed using one of the following test sets:

- CyberTest
- Advantest R3465 and HP 437B or Gigatronics Power Meter
- Hewlett–Packard HP 8935
- Hewlett–Packard HP 8921 (W/CDMA and PCS Interface for 1.7/1.9 GHz) and HP 437B or Gigatronics Power Meter
- Spectrum Analyzer (HP8594E) – *optional*
- Rubidium Standard Timebase – *optional*

CAUTION

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

Test Equipment Reference Chart

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

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

3

Table 3-22: Test Equipment Setup

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

Equipment Warm-up

IMPORTANT

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

Calibrating Cables

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

WARNING

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

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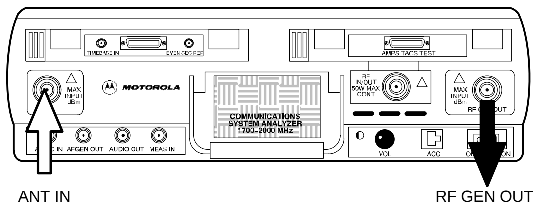
Figure 3-10: Cable Calibration Test Setup

SUPPORTED TEST SETS

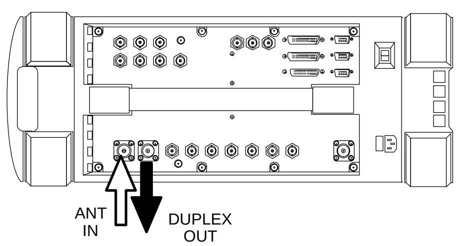
Motorola CyberTest



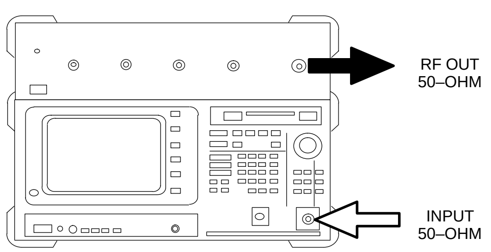
Note: The Directional Coupler is not used with the Cybertest Test Set. The TX cable is connected directly to the Cybertest Test Set.

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

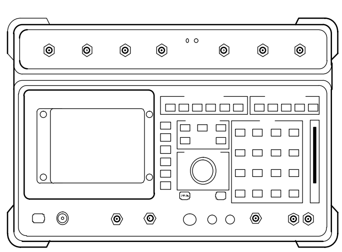
Hewlett–Packard Model HP 8935



Advantest Model R3465



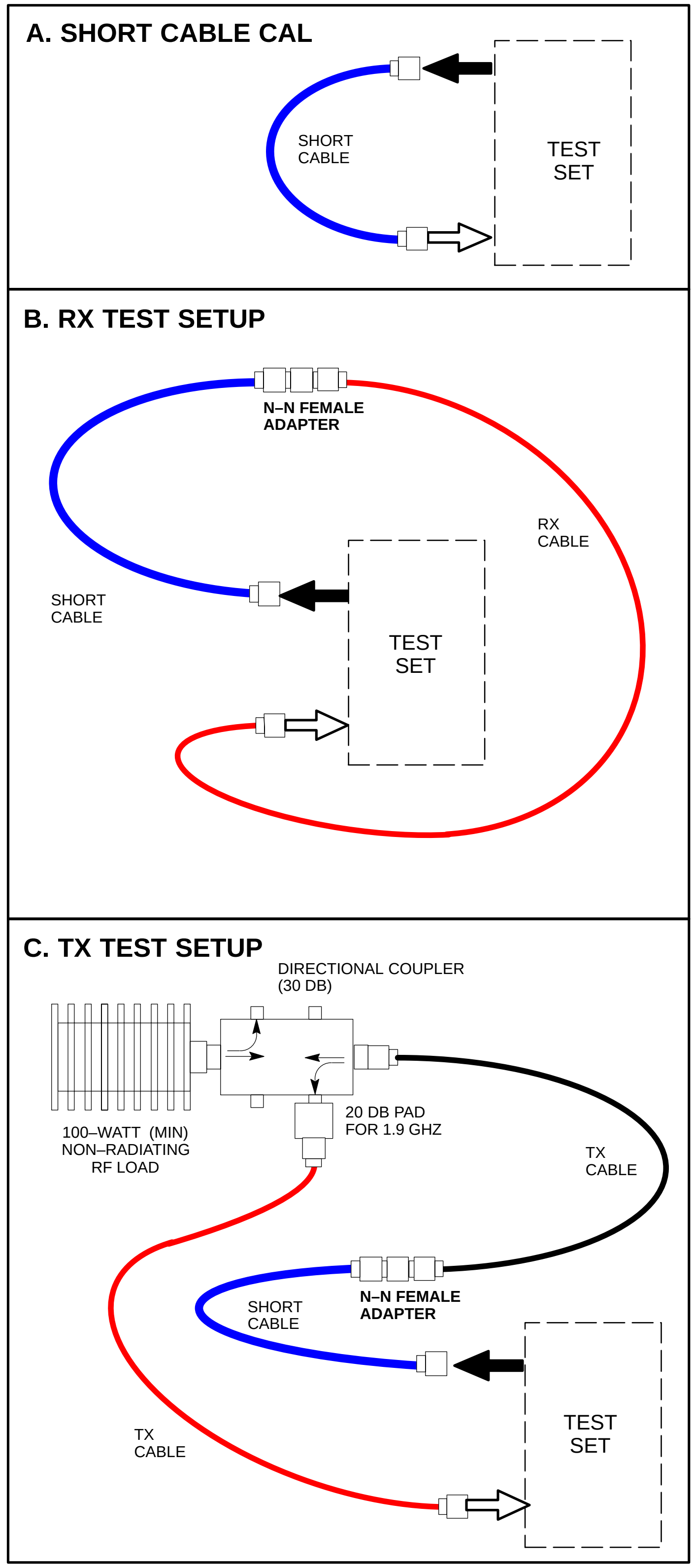
Hewlett–Packard Model HP 8921A



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

FW00089

CALIBRATION SET UP



Setup for TX Calibration

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

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

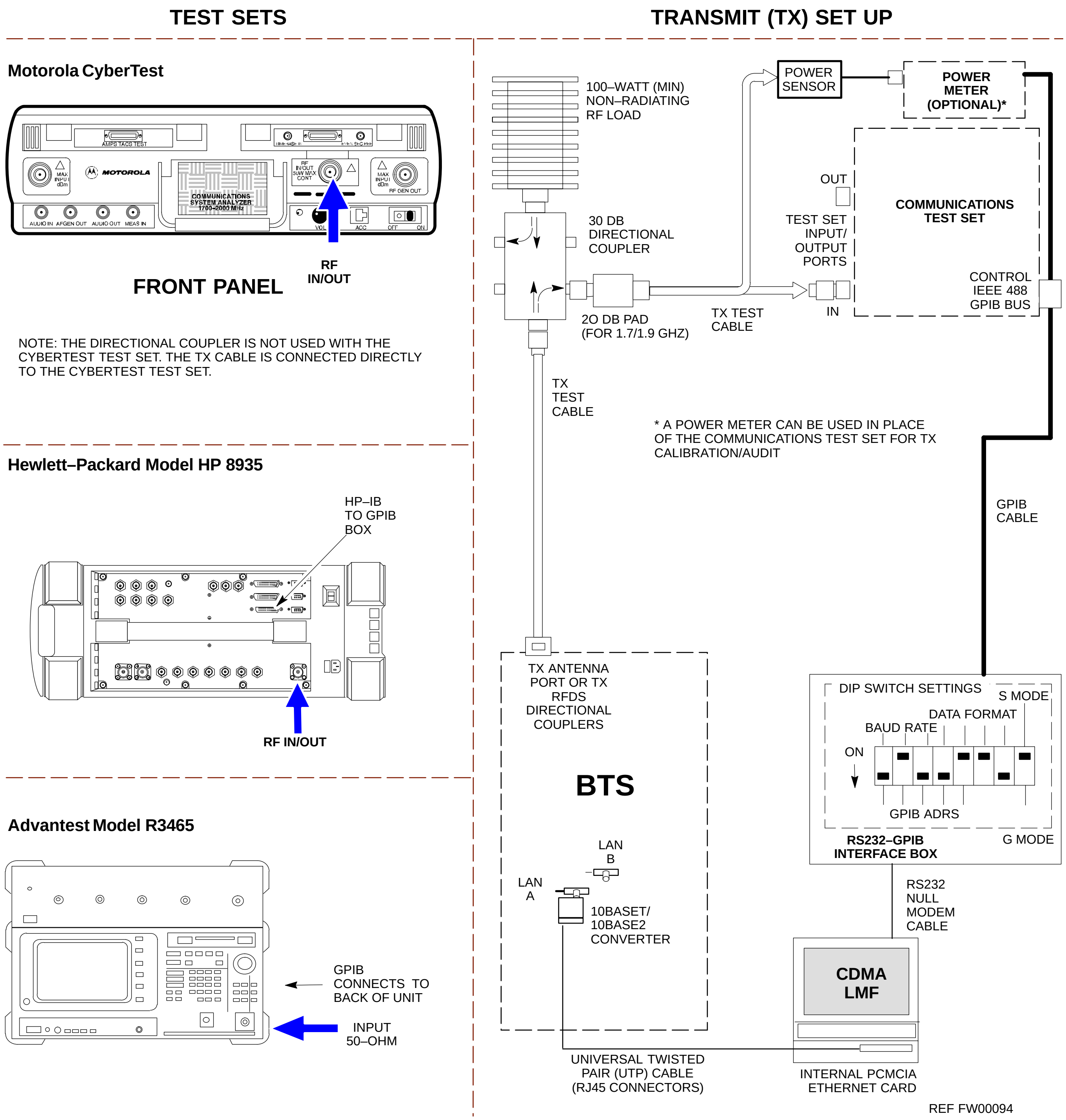
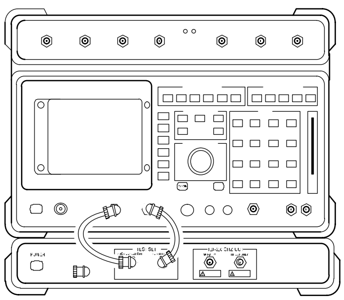


Figure 3-12: TX Calibration Test Setup HP 8921A W/PCS for 1.7/1.9 GHz

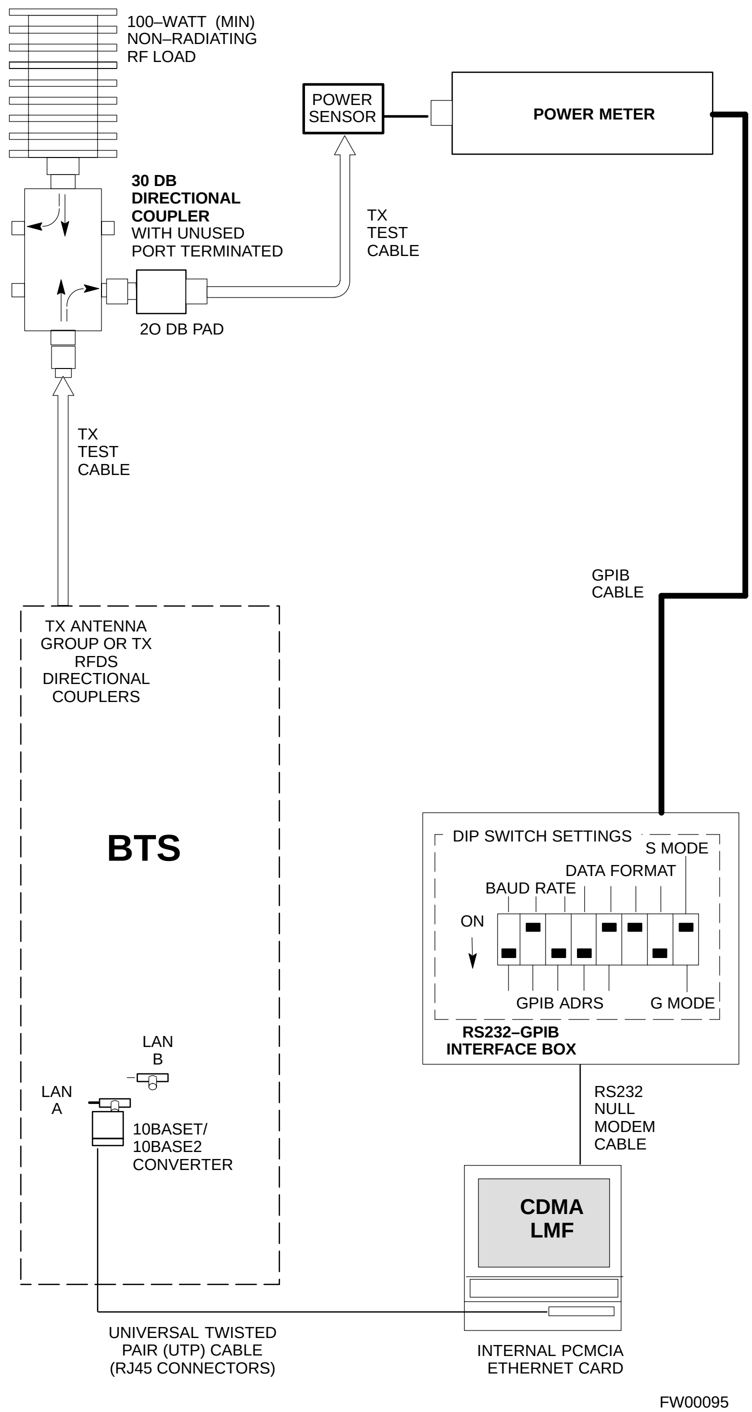
TEST SETS

Hewlett–Packard Model HP 8921A W/PCS Interface



Note: The HP 8921A cannot be used for TX calibration. A power meter must be used.

TRANSMIT (TX) SET UP



Setup for Optimization/ATP

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

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

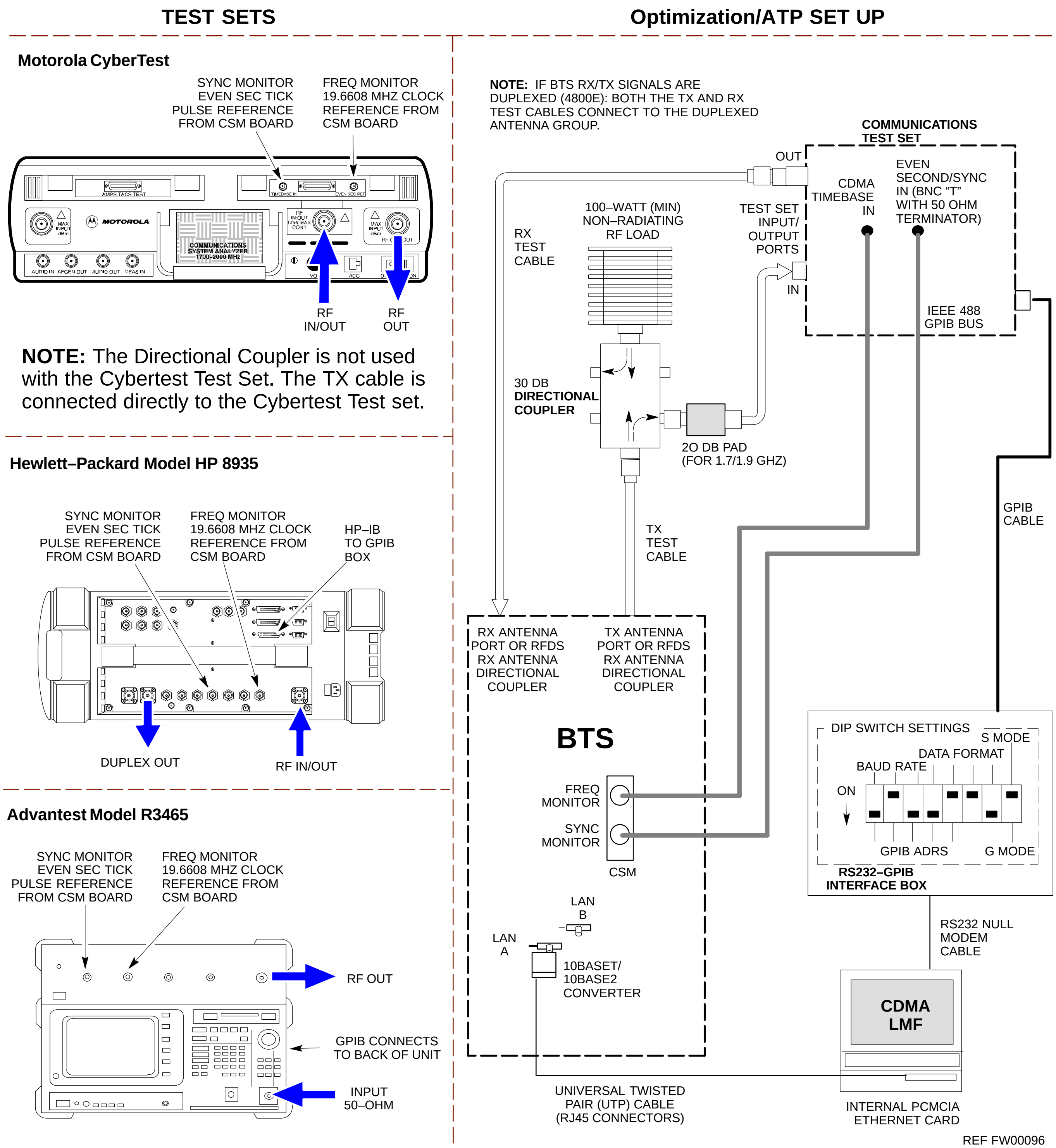
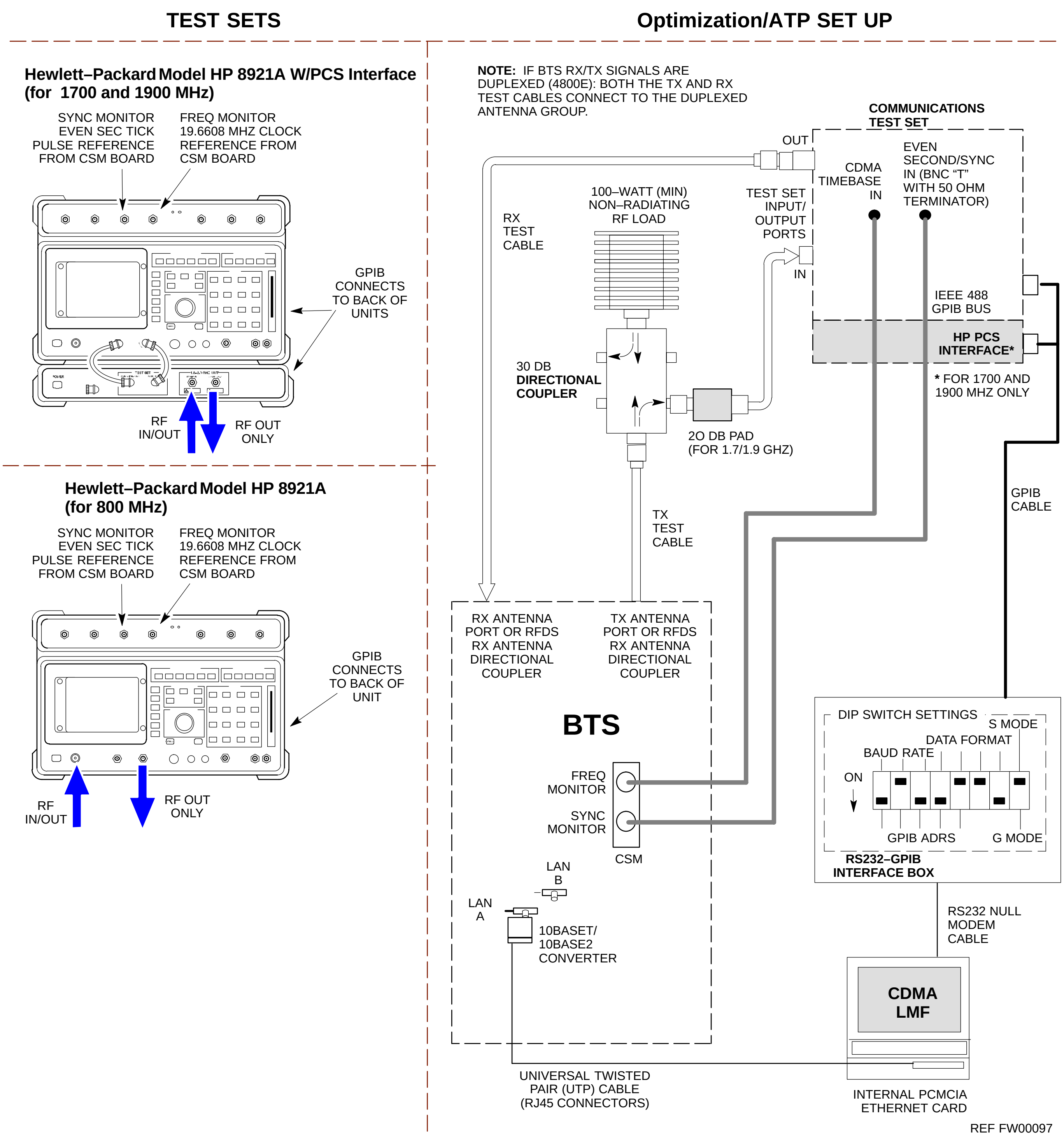


Figure 3-14: Optimization/ATP Test Setup HP 8921A



3

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

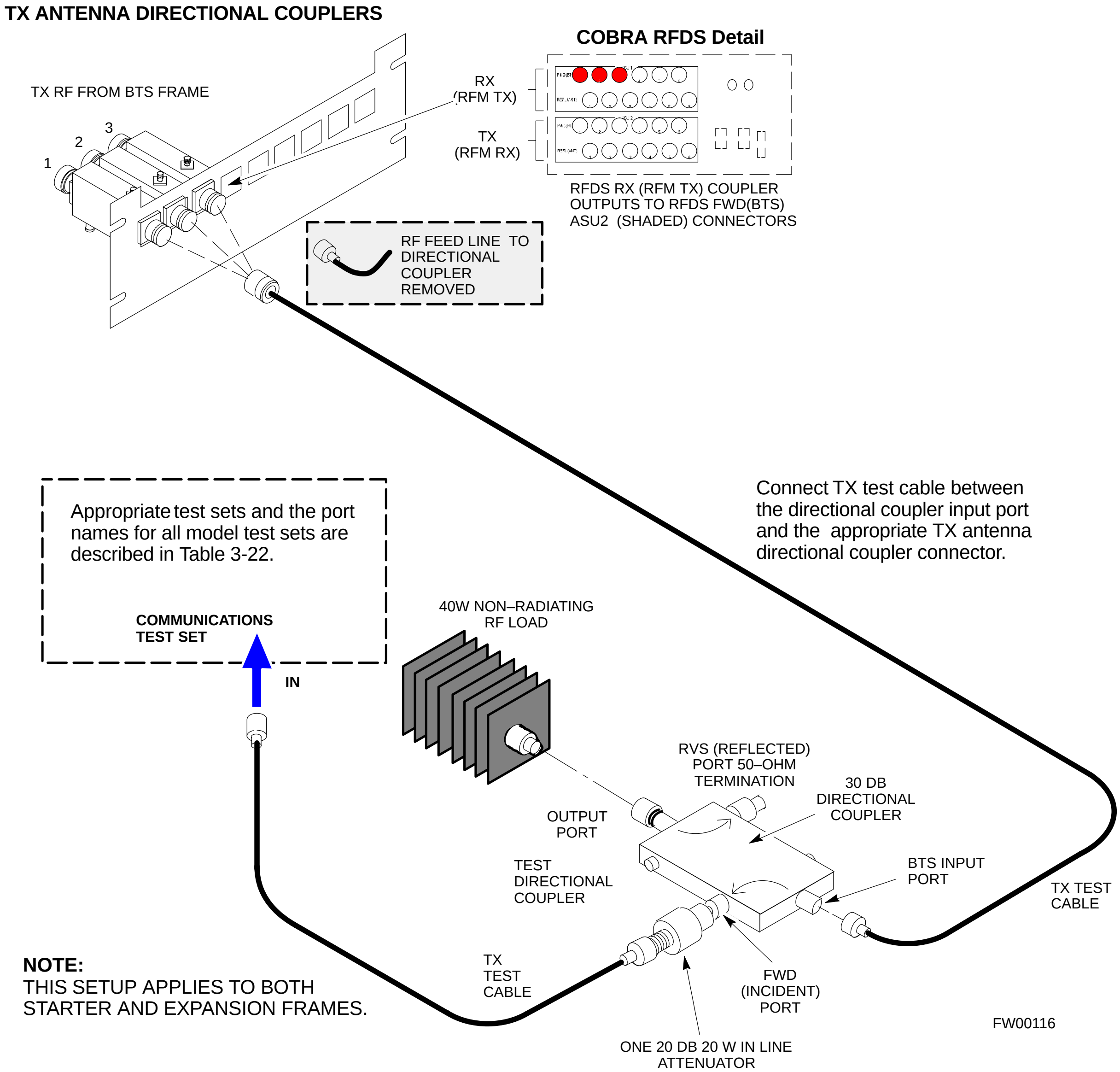
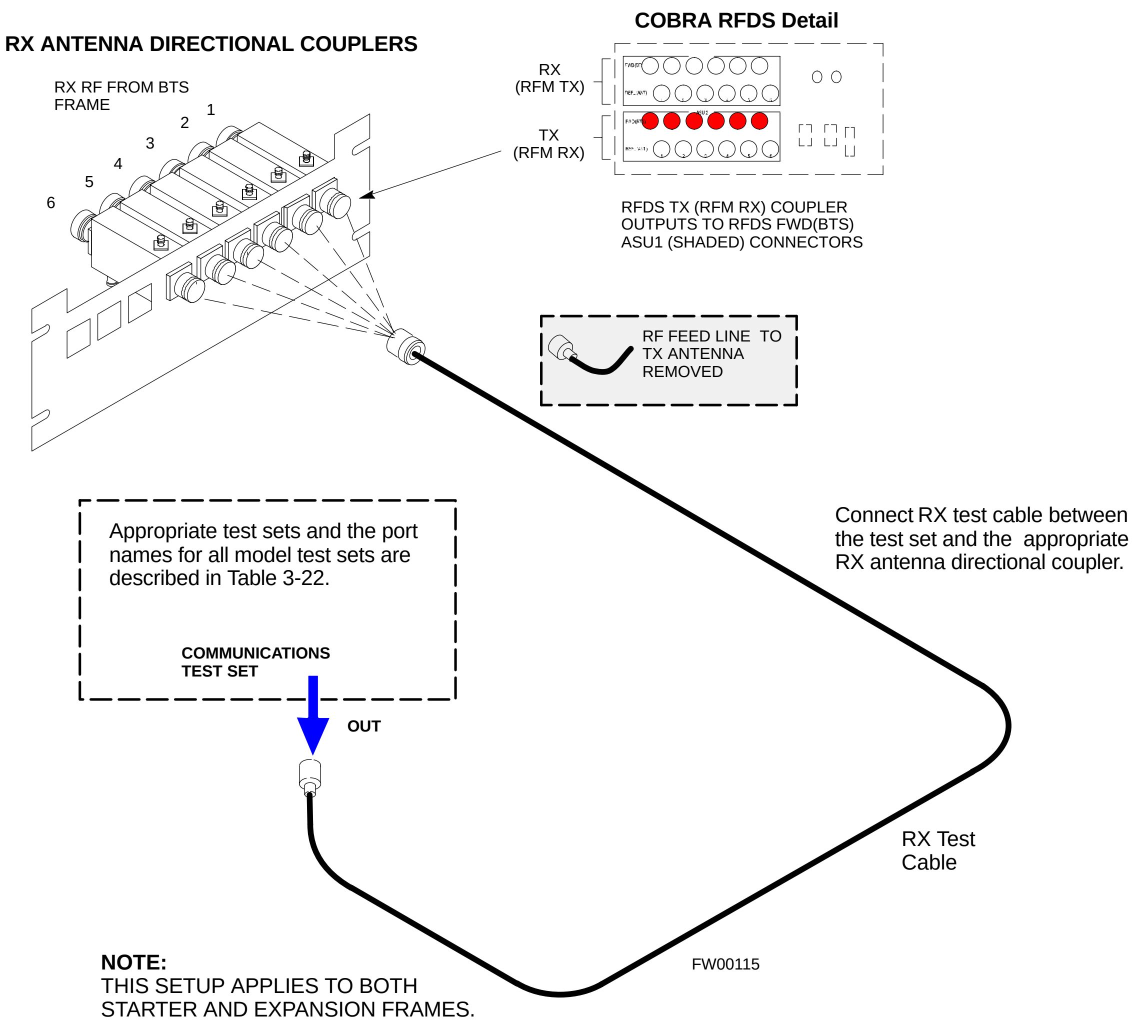


Figure 3-16: Typical RX ATP Setup with Directional Coupler (shown with or without RFDS)



Test Set Calibration Background

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

NOTE

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

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

CAUTION

If any piece of test equipment, test cable, or RF adapter, that makes up the calibrated test equipment set, has been replaced, re-calibration must be performed. Failure to do so can introduce measurement errors, resulting in incorrect measurements and degradation to system performance.

IMPORTANT

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

Purpose of Test Set Calibration

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

Selecting Test Equipment

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

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

Prerequisites

Ensure the following prerequisites have been met before proceeding:

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

Manually Selecting Test Equipment in a Serial Connection Tab

Test equipment can be manually specified before, or after, the test equipment is connected. The LMF does not check to see if the test equipment is actually detected for manual specification. Follow the procedure in Table 3-23 to select test equipment manually.

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

✓	Step	Action
	1	From the **Options** menu, select **LMF Options**. The **LMF Options** window appears.
	2	Click on the **Serial Connection** tab (if not in the forefront).
	3	Select the correct serial port in the **COMM Port** pick list (normally **COM1**).
	4	Click on the **Manual Specification** button (if not enabled).
	5	Click on the check box corresponding to the test item(s) to be used.
	6	Type the GPIB address in the corresponding **GPIB address** box. ***Recommended Addresses*** 13=Power Meter 18=CDMA Analyzer
	7	Click on **Apply**. (The button darkens until the selection has been committed.) **NOTE** With manual selection, the LMF does not detect the test equipment to see if it is connected and communicating with the LMF.
	8	Click on **Dismiss** to close the test equipment window.

3

Automatically Selecting Test Equipment in a Serial Connection Tab

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

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

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

Calibrating Test Equipment

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

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

Prerequisites

Ensure the following prerequisites have been met before proceeding:

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

Table 3-25: Test Equipment Calibration

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

Calibrating Cables

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

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

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

Calibrating Cables with a CDMA Analyzer

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

NOTE

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

Prerequisites

Ensure the following prerequisites have been met before proceeding:

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

Table 3-26: Cable Calibration

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

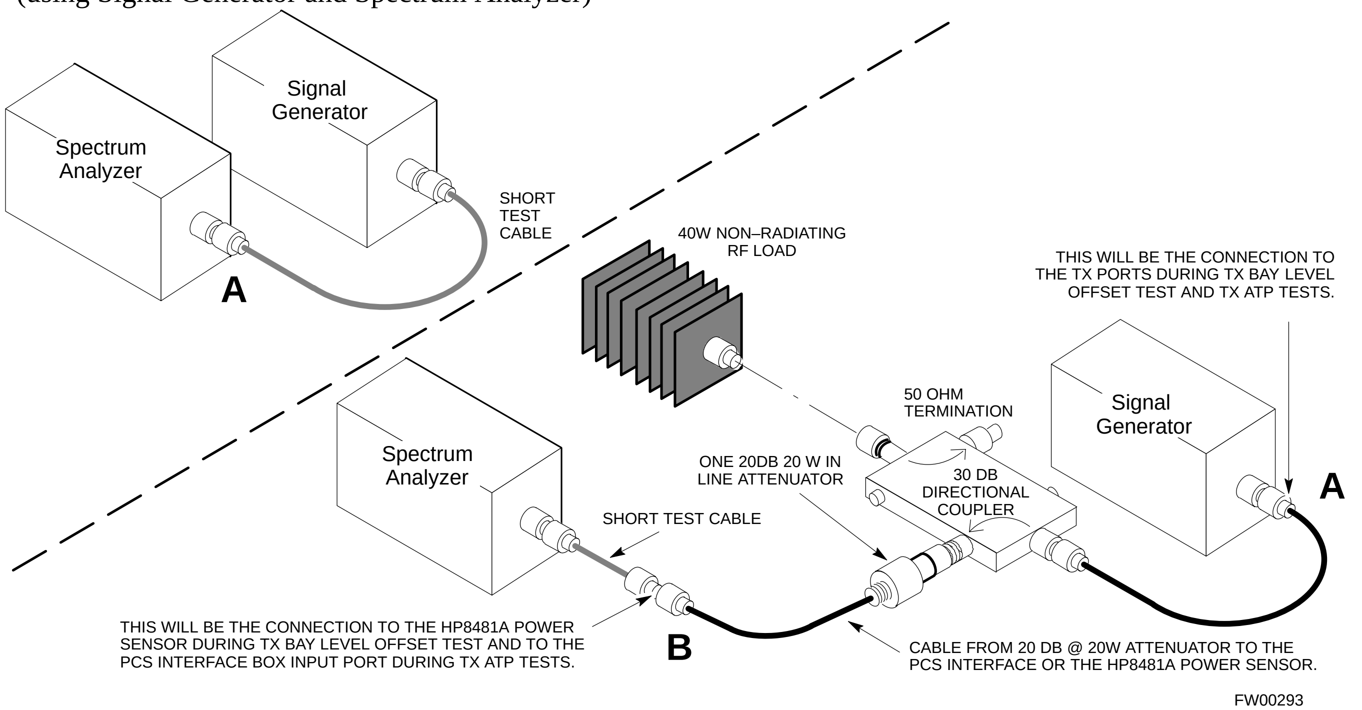
Calibrating TX Cables Using a Signal Generator and Spectrum Analyzer

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

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

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

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



Calibrating RX Cables Using a Signal Generator and Spectrum Analyzer

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

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

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

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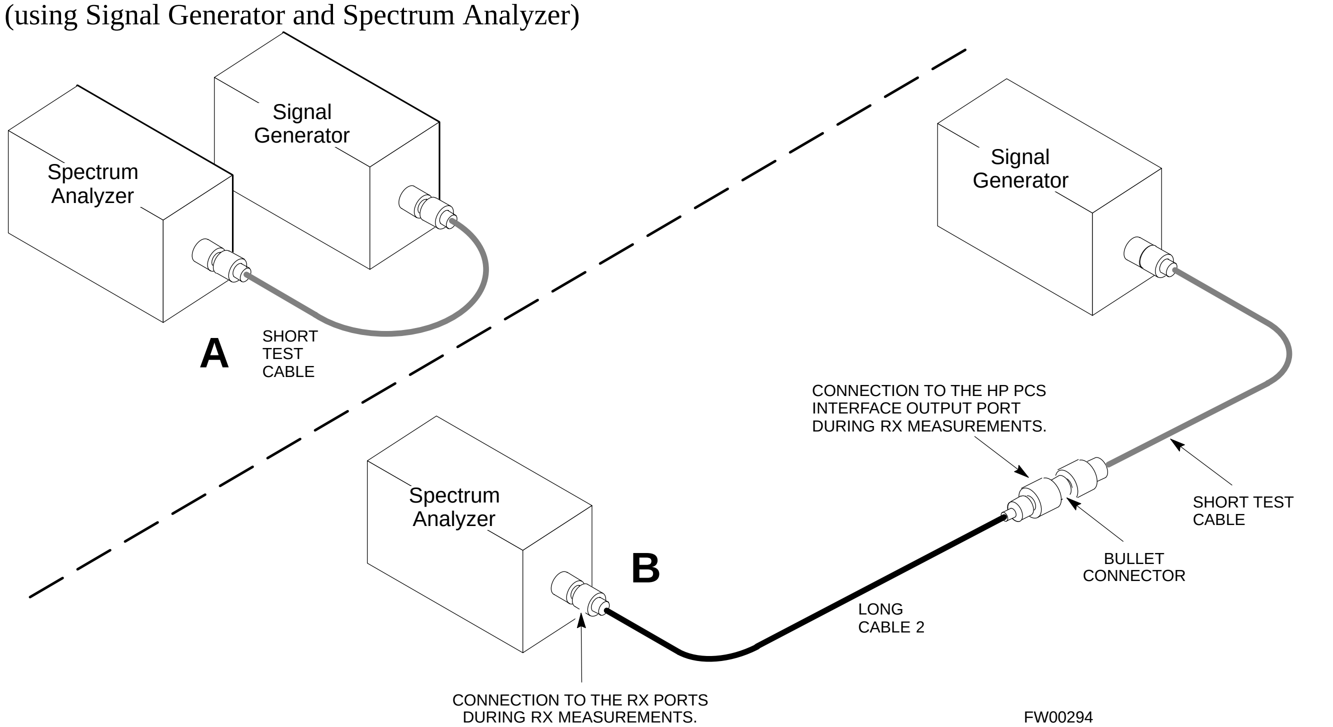
Table 3-28: Calibrating RX Cables Using a Signal Generator and Spectrum Analyzer		
✓	**Step**	**Action**
	5	Calibration factor = A – B Example: Cal = –12 dBm – (–14 dBm) = 2 dBm **NOTE** The short test cable is used for test equipment setup calibration *only*. It is not be part of the final test setup.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

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



Setting Cable Loss Values

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

Prerequisites

- Logged into the BTS

Table 3-29: Setting Cable Loss Values

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

Setting TX Coupler Loss Value

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

Prerequisites

- Logged into the BTS.

Table 3-30: Setting TX Coupler Loss Value

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

Introduction to Bay Level Offset Calibration

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

RF Path Bay Level Offset Calibration

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

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

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

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

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

When to Calibrate BLOs

Calibration of BLOs is required:

- After initial BTS installation
- Once each year
- After replacing any of the following components or associated interconnecting RF cabling:
  - BBX board
  - C–CCP shelf
  - CIO card
  - CIO to LPA backplane RF cable
  - LPA backplane
  - LPA

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– TX filter / TX filter combiner
– TX thru-port cable to the top of frame

TX Path Calibration

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

WARNING

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

CAUTION

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

IMPORTANT

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

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

BLO Calibration Data File

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

NOTE

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

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

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

- A creation Date and Time – broken down into separate parameters of createMonth, createDay, createYear, createHour, and createMin.
- The number of calibration entries – fixed at 720 entries corresponding to 360 calibration points of the CAL file including the slot header and actual calibration data.
- The calibration data for a BBX is organized as a large flat array. The array is organized by branch, sector, and calibration point.
  - The first breakdown of the array indicates which branch the contained calibration points are for. The array covers transmit, main receive and diversity receive offsets as follows:

Table 3-31: BLO BTS.cal File Array Assignments

Range	Assignment
C[1]–C[240]	Transmit
C[241]–C[480]	Main Receive
C[481]–C[720]	Diversity Receive

NOTE

Slot 385 is the BLO for the RFDS.

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

Table 3-32: BTS.cal File Array (Per Sector)

BBX	Sectorization		TX	RX	RX Diversity
Slot[1] (Primary BBXs 1 through 12)					
1 (Omni)	6 Sector, 1st Carrier	3–Sector, 1st Carrier	C[1]–C[20]	C[241]–C[260]	C[481]–C[500]
2			C[21]–C[40]	C[261]–C[280]	C[501]–C[520]
3			C[41]–C[60]	C[281]–C[300]	C[521]–C[540]
4		3–Sector, 3rd Carrier	C[61]–C[80]	C[301]–C[320]	C[541]–C[560]
5			C[81]–C[100]	C[321]–C[340]	C[561]–C[580]
6			C[101]–C[120]	C[341]–C[360]	C[581]–C[600]
7	6 Sector, 2nd Carrier	3–Sector, 2nd Carrier	C[121]–C[140]	C[361]–C[380]	C[601]–C[620]
8			C[141]–C[160]	C[381]–C[400]	C[621]–C[640]
9			C[161]–C[180]	C[401]–C[420]	C[641]–C[660]
10		3–Sector, 4th Carrier	C[181]–C[200]	C[421]–C[440]	C[661]–C[680]
11			C[201]–C[220]	C[441]–C[460]	C[681]–C[700]
12			C[221]–C[240]	C[461]–C[480]	C[701]–C[720]
Slot[20]] (Redundant BBX–13)					
1 (Omni)	6 Sector, 1st Carrier	3–Sector, 1st Carrier	C[1]–C[20]	C[241]–C[260]	C[481]–C[500]
2			C[21]–C[40]	C[261]–C[280]	C[501]–C[520]
3			C[41]–C[60]	C[281]–C[300]	C[521]–C[540]
4		3–Sector, 3rd Carrier	C[61]–C[80]	C[301]–C[320]	C[541]–C[560]
5			C[81]–C[100]	C[321]–C[340]	C[561]–C[580]
6			C[101]–C[120]	C[341]–C[360]	C[581]–C[600]
7	6 Sector, 2nd Carrier	3–Sector, 2nd Carrier	C[121]–C[140]	C[361]–C[380]	C[601]–C[620]
8			C[141]–C[160]	C[381]–C[400]	C[621]–C[640]
9			C[161]–C[180]	C[401]–C[420]	C[641]–C[660]
10		3–Sector, 4th Carrier	C[181]–C[200]	C[421]–C[440]	C[661]–C[680]
11			C[201]–C[220]	C[441]–C[460]	C[681]–C[700]
12			C[221]–C[240]	C[461]–C[480]	C[701]–C[720]

- Ten calibration points per sector are supported for each branch. Two entries are required for each calibration point.
- The first value (all odd entries) refer to the CDMA channel (frequency) where the BLO is measured. The second value (all even entries) is the power set level. The valid range for PwrLvlAdj is from 2500 to 27500 (2500 corresponds to –125 dBm and 27500 corresponds to +125 dBm).

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- The 20 calibration entries for each sector/branch combination must be stored in order of increasing frequency. If less than 10 points (frequencies) are calibrated, the largest frequency that is calibrated is repeated to fill out the 10 points.

  Example:
  C[1]=384, *odd cal entry*
  = 1 "calibration point"
  C[2]=19102, *even cal entry*
  C[3]=777,
  C[4]=19086,
  .
  .
  C[19]=777,
  C[20]=19086, (since only two cal points were calibrated this would be repeated for the next 8 points)

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

Test Equipment Setup: RF Path Calibration

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

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

Step	Action
	NOTE Verify the GPIB controller is properly connected and turned on.
	! CAUTION To prevent damage to the test equipment, all transmit (TX) test connections must be via the 30 dB directional coupler for 800 MHz with an additional 20 dB in–line attenuator for 1.7/1.9 GHz.
1	Connect the LMF computer terminal to the BTS LAN A connector on the BTS (if you have not already done so). Refer to the procedure in Table 3–2 on page 3-6. • If required, calibrate the test equipment per the procedure in Table 3-25 on page 3-57. • Connect the test equipment as shown in Figure 3-11 and Figure 3-12 starting on page 3-48.

TX Path Calibration

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

NOTE

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

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

The TX Bay Level Offset at sites WITHOUT the directional coupler option, is approximately 42.0 dB ±3.0 dB.

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

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

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

The LMF **Tests** menu list items, **TX Calibration** and **All Cal/Audit**, perform the TX BLO Calibration test for a XCVR(s). The **All Cal/Audit** menu item performs TX calibration, downloads BLO, and performs TX audit if the TX calibration passes. All measurements are made through the appropriate TX output connector using the calibrated TX cable setup.

Prerequisites

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

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

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

WARNING

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

IMPORTANT

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

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

Table 3-34: BTS TX Path Calibration

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

Exception Handling

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

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

Download BLO Procedure

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

NOTE

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

Prerequisites

Ensure the following prerequisites have been met before proceeding:

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

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

Table 3-35: Download BLO

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

Calibration Audit Introduction

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

IMPORTANT

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

TX Path Audit

Perform the calibration audit of the TX paths of all equipped BBX slots, per the procedure in Table 3-36

WARNING

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

NOTE

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

TX Audit Test

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

Prerequisites

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

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

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

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Table 3-36: BTS TX Path Audit		
✓	Step	Action
	1	Select the BBX(s) to be audited.
	2	From the **Tests** menu, select **TX Audit**.
	3	Select the appropriate carrier(s) displayed in the **Channels/Carrier** pick list. Press and hold the **<Shift>** or **<Ctrl>** key to select multiple items.
	4	Type the appropriate channel number in the **Carrier n Channels** box.
	5	Click on **OK**.
	6	Follow the cable connection directions as they are displayed. A status report window displays the test results.
	7	Click on **Save Results** or **Dismiss** to close the status report window.

Exception Handling

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

All Cal/Audit Test

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

NOTE

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

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Prerequisites

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

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

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

WARNING

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

Table 3-37: All Cal/Audit Test

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

Create CAL File

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

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

WARNING

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

Prerequisites

Before running this test, the following should be done:

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

Table 3-38: Create CAL File

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

RFDS Description

NOTE

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

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

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

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

The LMF provides the following functions for RFDS equipment:

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

RFDS Parameter Settings

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

- **RfdsEquip** – valid inputs are 0 through 2.
  0 = (default) RFDS is not equipped
  1 = Non-Cobra/Patzer box RFDS
  2 = Cobra RFDS
- **TsuEquip** – valid inputs are 0 or 1
  0 = (default) TSU not equipped
  1 = TSU is equipped in the system
- **MC1....4** – valid inputs are 0 or 1
  0 = (default) Not equipped
  1 = Multicouplers equipped in RFDS system
  (9600 system RFDS only)
- **Asu1/2Equip** – valid inputs are 0 or 1
  0 = (default) Not equipped
  1 = Equipped
- **TestOrigDN** – valid inputs are ’’’ (default) or a numerical string up to 15 characters. (This is the phone number the RFDS dials when originating a call. A dummy number needs to be set up by the switch, and is to be used in this field.)

> **NOTE**
>
> Any text editor supporting the LMF may be used to open any text files to verify, view, or modify data.

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Table 3-39: RFDS Parameter Settings	
Step	**Action**
	*** IMPORTANT** Log out of the BTS prior to performing this procedure.

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

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

RFDS TSU NAM Programming

The RFDS TSU NAM must be programmed with the appropriate system parameters and phone number during hardware installation. The TSU phone and TSU MSI must be recorded for each BTS used for OMC–R RFDS software configuration. The TSU NAM should be configured the same way that any local mobile subscriber would use.

NOTE

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

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

Explanation of Parameters used when Programming the TSU NAM

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

Table 3-40: Definition of Parameters

Access_Overload_Code Slot_Index System ID Network ID	These parameters are obtained from the switch.
Primary_Channel_A Primary_Channel_B Secondary_Channel_A Secondary_Channel B	These parameters are the channels used in operation of the system.
Lock_Code Security_Code Service_Level Station_Class_Mark	Do ***not*** change.
IMSI_11_12 IMSI_MCC	These fields can be obtained at the OMC using the following command: **OMC000>disp bts–# imsi** If the fields are blank, replace the IMSI fields in the NAM file to 0, otherwise use the values displayed by the OMC.
MIN_1 Phone Number	This field is the phone number assigned to the mobile. The ESN and MIN should be entered into the switch as well. **NOTE:** This field is different from the TestOrigDN field in the **bts.cdf** file. The MIN is the phone number of the RFDS subscriber, and the TestOrigDN is the number is subscriber calls.

Valid NAM Ranges

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

Table 3-41: Valid NAM Field Ranges

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

Set Antenna Map Data

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

Prerequisite

- Logged into the BTS

Table 3-42: Set Antenna Map Data

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

Set RFDS Configuration Data

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

Prerequisite

- Logged into the BTS.

IMPORTANT

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

Table 3-43: Set RFDS Configuration Data

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

RFDS Calibration

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

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

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

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

Prerequisites

Ensure the following prerequisites have been met before proceeding:

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

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

Table 3-44: RFDS Calibration Procedure

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

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

Program TSU NAM

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

Prerequisites

Ensure the following prerequisites have been met before proceeding:

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

Table 3-45: Program the TSU NAM	
Step	**Action**
1	Select the **RFDS** tab.
2	Select the **SUA** (Cobra RFDS) or **TSU** (GLI based RFDS).
3	Click on the **TSU** menu.
4	Click on the **Program TSU NAM** menu item.
5	Enter the appropriate information in the boxes (see Table 3-40 and Table 3-41).
6	Click on the **OK** button to display the status report.
7	Click on the **OK** button to close the status report window.

BTS Redundancy/Alarm Testing

Objective

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

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

- Table 3-48. Miscellaneous Alarm Tests (BTS Frame)
- Table 3-49. BBX Redundancy Tests (BTS Frame)
- Table 3-50. CSM, GPS, & LFR/HSO Redundancy Alarm Tests
- Table 3-51. LPA Redundancy Test
- Table 3-52. MGLI/GLI Redundancy Test

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

Test Equipment

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

- LMF
- Communications Test Set

Redundancy/Alarm Test

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

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

Test Equipment Setup

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

NOTE

All alarm tests are performed using TX antenna 1

Table 3-46: Test Equipment Setup for Redundancy/Alarm Tests

Step	Action
1	Interface the LMF computer to the BTS LAN A connector on the BTS frame (refer to Table 3-2, page 3-5).
2	Login to the BTS.
3	Set up test equipment for TX Calibration at TXOUT1 (see Figure 3-11 or Figure 3-12). *** IMPORTANT** ***If site is not equipped for redundancy***, remove all GLI2 and BBX boards installed in any redundant slot positions at this time.
4	Display the alarm monitor by selecting **Util>Alarm Monitor**.
5	Unequip all customer defined AMR alarms reported via the AMR Alarm connector (A & B) by clicking on **MGLI**, then selecting **Device>Customer Alarm Inputs>Unequipped**. **NOTE** During configuration of MGLI alarm reporting, spurious alarms may report. Allow the BTS to stabilize for 10 seconds. If any alarms are actively being reported after the BTS has stabilized, determine the cause before proceeding further.

Power Supply Redundancy

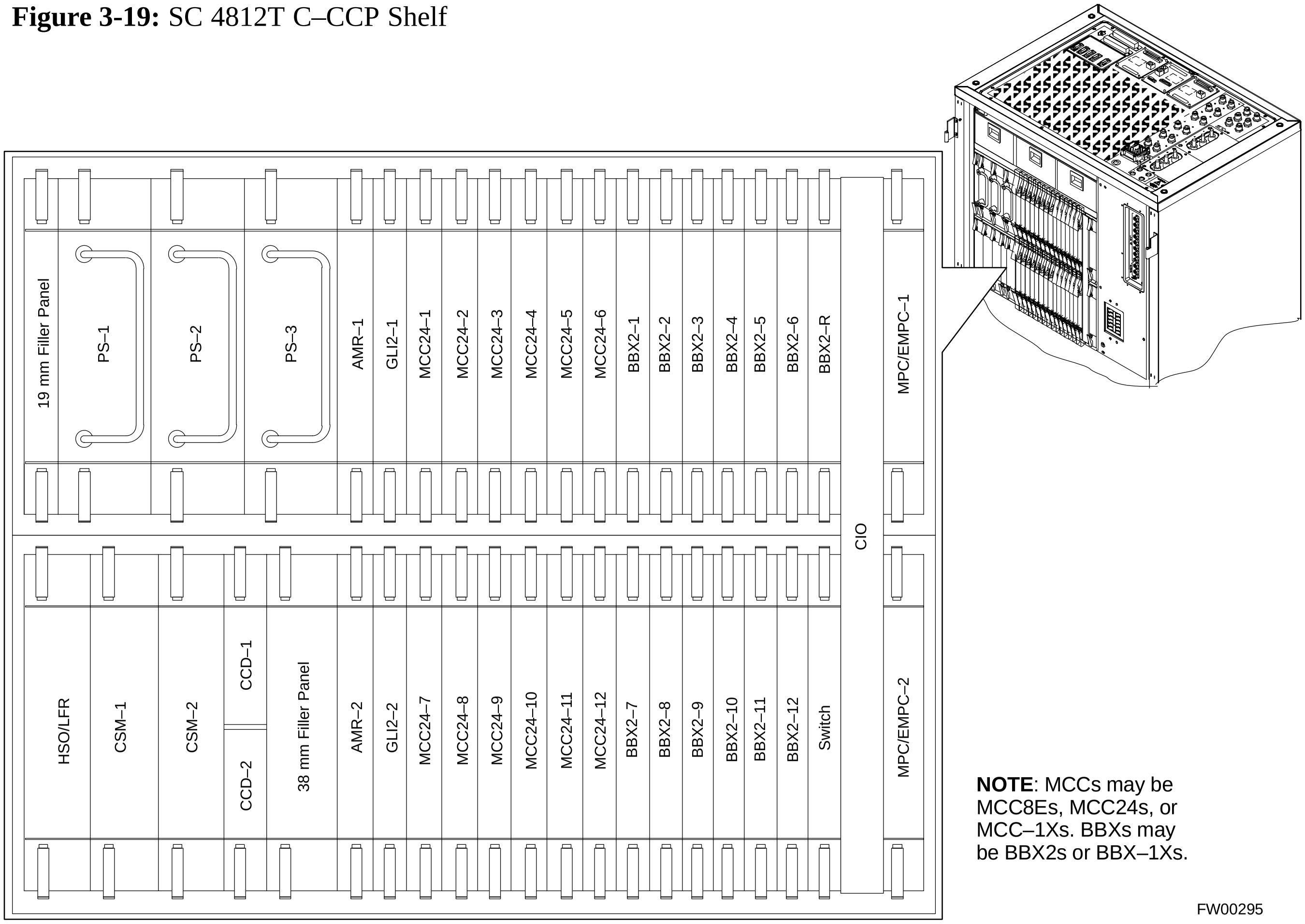
Follow the steps in Table 3-47 to verify redundancy of the power supply modules. Alarms reported by the master GLI (displayed via the alarm monitor) are also verified.

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

Step	Action
1	Select the MGLI (highlight) and from the pulldown menu select: **Device>Set Redundant Sector>None/0** **Device>Set Pilot>Only>Carrier–#–1-1** **Device>Set Pilot>Only>Carrier–#-1-1** and **Pilot Gain = 262**
2	Select (highlight) BBX–1 and from the pulldown menu select **Device>Key XCVR**.
3	Set XCVR gain to 40 and enter the correct XCVR channel number.
4	Remove PS–1 from the power distribution shelf (see Figure 3-19). – Observe that an alarm message is reported via the MGLI as displayed on the alarm monitor. – Verify no other modules went OOS.
5	Re-install PS–1. Observe the alarm clears on the alarm monitor.
6	Repeat steps 4 and 5 for PS–2 and PS–3. **NOTE** For +27 V systems, skip to step 7 through step 10.
7	On –48 V systems, remove PS–4 (see Figure 3-20). – Observe that an alarm message is reported via the MGLI as displayed on the alarm monitor. – Verify no other modules went OOS.
8	Re-install PS–4. Observe the alarm clears on the alarm monitor.
9	Repeat steps 7 and 8 for PS–5 through PS–9.
10	Verify that all PWR/ALM LEDs are GREEN.
11	Select BBX-1 and **Device>Dekey XCVR**

3

Figure 3-19: SC 4812T C–CCP Shelf



NOTE: MCCs may be MCC8Es, MCC24s, or MCC–1Xs. BBXs may be BBX2s or BBX–1Xs.

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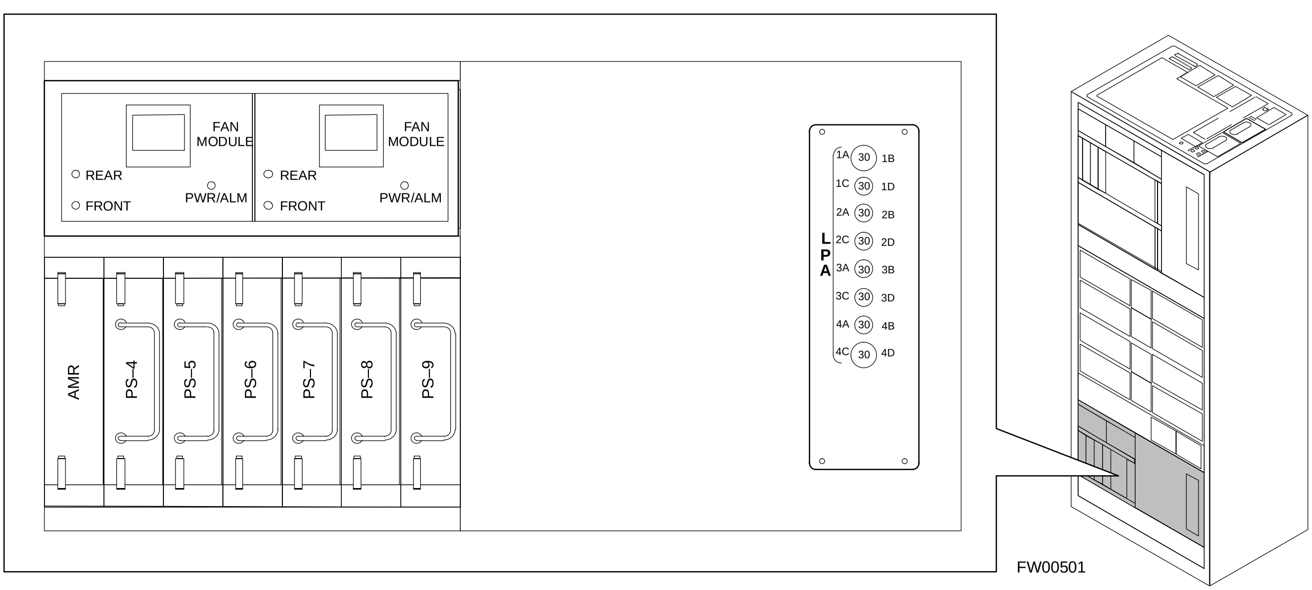
Figure 3-20: –48 V BTS Power Conversion Shelf



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Miscellaneous Alarm/Redundancy Tests

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

Table 3-48: Miscellaneous Alarm Tests

Step	Action
1	Select **Util>Alarm Monitor** to display the alarm monitor window.
2	Perform the following to verify fan module alarms: • Unseat a fan module (see Figure 3-21 or Figure 3-22). • Observe an alarm message was reported via the MGLI (as displayed on the alarm monitor). • Replace fan module and verify the alarm monitor reports that the alarm clears. • Repeat for all other fan modules in the BTS frame.
	NOTE Follow Step 3 for Starter Frames and Step 4 for Expansion Frames.
3	*Starter Frames Only:* Perform the following to verify MPC module alarms. • Unseat MPC modules (see Figure 3-19) one at a time. • Observe that an alarm message was reported via the MGLI as displayed on the alarm monitor. • Replace the MPC modules and verify the alarm monitor reports the alarm clears.
4	*Expansion Frames Only:* Perform the following to verify EMPC module alarms. • Unseat EMPC modules (see Figure 3-19) one at a time • Observe that an alarm message was reported via the MGLI as displayed on the alarm monitor. • Replace the EMPC modules and verify the alarm monitor reports that the alarm clears.
5	If equipped with AMR redundancy, perform the following to verify AMR module redundancy/alarms. • Unseat AMR 2 (see Figure 3-19). • Observe that an alarm message is reported via the MGLI (as displayed on the alarm monitor). • Repeat Steps 1 through 3 and/or 4. • Replace the AMR module and verify the alarm monitor reports that the alarm clears. • Unseat AMR 1 and observe an alarm message was reported via the MGLI (as displayed on the alarm monitor). • Replace the AMR module and verify the LMF reports the alarm has cleared.
	NOTE All PWR/ALM LEDs should be GREEN at the completion of this test.

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

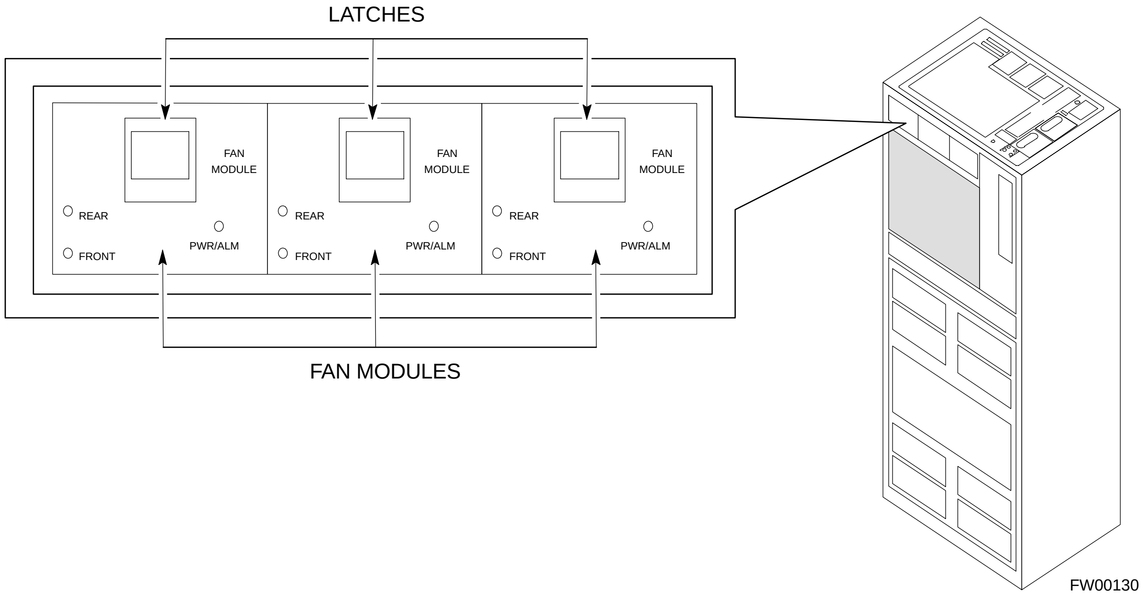
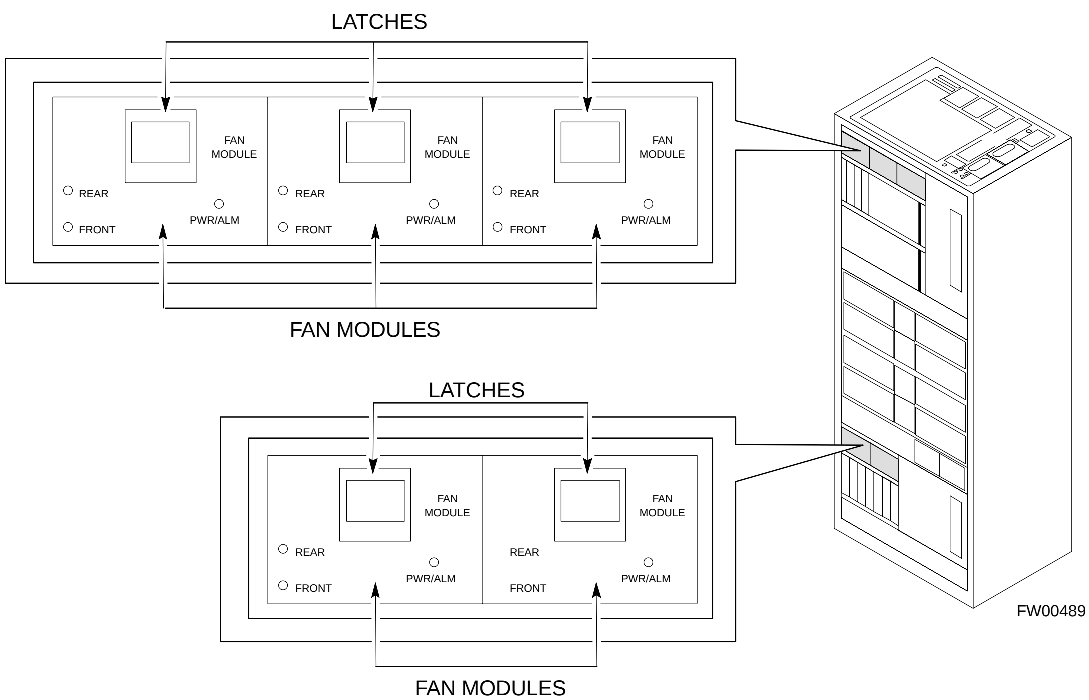


Figure 3-22: –48 V BTS C-CCP and Power Conversion Shelf Fan Modules



BBX Redundancy

Follow the steps in Table 3-49 to verify redundancy of the BBXs in the C–CCP shelf. Alarms reported by the master GLI (displayed via the alarm monitor) are also verified. *This test can be repeated for additional sectors at the customer's discretion.*

Table 3-49: BBX Redundancy Alarms

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

3

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

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

IMPORTANT

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

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

Step	Action
	△ WARNING Any BBXs enabled will immediately key-up. Before enabling any BBX, *always verify* that the TX output assigned to the BBX is terminated into a 50 W non-radiating RF load! Failure to do so could result in serious personal injury and/or damage to the equipment.
1	Enable the **primary**, then the **redundant** BBXs assigned to ANT 1 by selecting the BBX and **Device>Key Xcvr**.
2	Disconnect the GPS antenna cable, located on top of the BTS frame (see Figure 3-23). This forces the LORAN–C LFR or HSO board timebase to become the CDMA timing source.
3	Observe a CDMA timing reference alarm and source change is reported by the alarm monitor.
4	Allow the LFR/HSO to become the active timing source. • Verify the BBXs remain keyed and INS. • Verify no other modules went OOS due to the transfer to **LFR/HSO** reference. • Observe the PWR/ALM LEDs on the **CSM 1** front panel are steady GREEN.
5	Reconnect the GPS antenna cable.
6	Allow the GPS to become the active timing source. • Verify the BBXs remain keyed and INS. • Verify no other modules went OOS due to the transfer back to the **GPS** reference. • Observe the PWR/ALM LEDs on **CSM 1** are steady GREEN.
7	Disable **CSM 1** and enable **CSM 2**. • Various CSM source and clock alarms are now reported and the site comes down. • Alarms clear when the site comes back up.

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Table 3-50: CSM, GPS, & LFR/HSO, Redundancy/Alarm Tests	
Step	**Action**
8	Allow the **CSM 2** board to go **INS_ACT.** • Verify the BBXs are dekeyed and OOS, and the MCCs are OOS_RAM. • Verify no other modules went OOS due to the transfer to **CSM 2** reference. • Observe the PWR/ALM LEDs on **CSM 2** front panels are steady GREEN. **NOTE** It can take up to 20 minutes for the CSM to re-establish the GPS link and go INS. MCCs go OOS_RAM.
9	Key BBXs 1 and R and observe a carrier is present.
10	Repeat Steps 2 through 6 to verify CSM source redundancy with CSM 2.
11	*** IMPORTANT** DO NOT ENABLE the redundant CSM. Disable **CSM 2** and enable **CSM 1**. • Various CSM Source and Clock alarms are reported and the site comes down. • Alarms clear when the site comes back up.
12	De-key the Xcvr by selecting **Device>Dekey Xcvr**.
13	Allow the **CSM 1** board to go **INS_ACT.** • Verify the BBXs are de-keyed and OOS. • Verify no other modules went OOS due to the transfer to **CSM 1** reference. • Observe PWR/ALM LEDs on the **CSM 1** front panels are steady GREEN.
14	Disable the **primary** and **redundant** BBXs.

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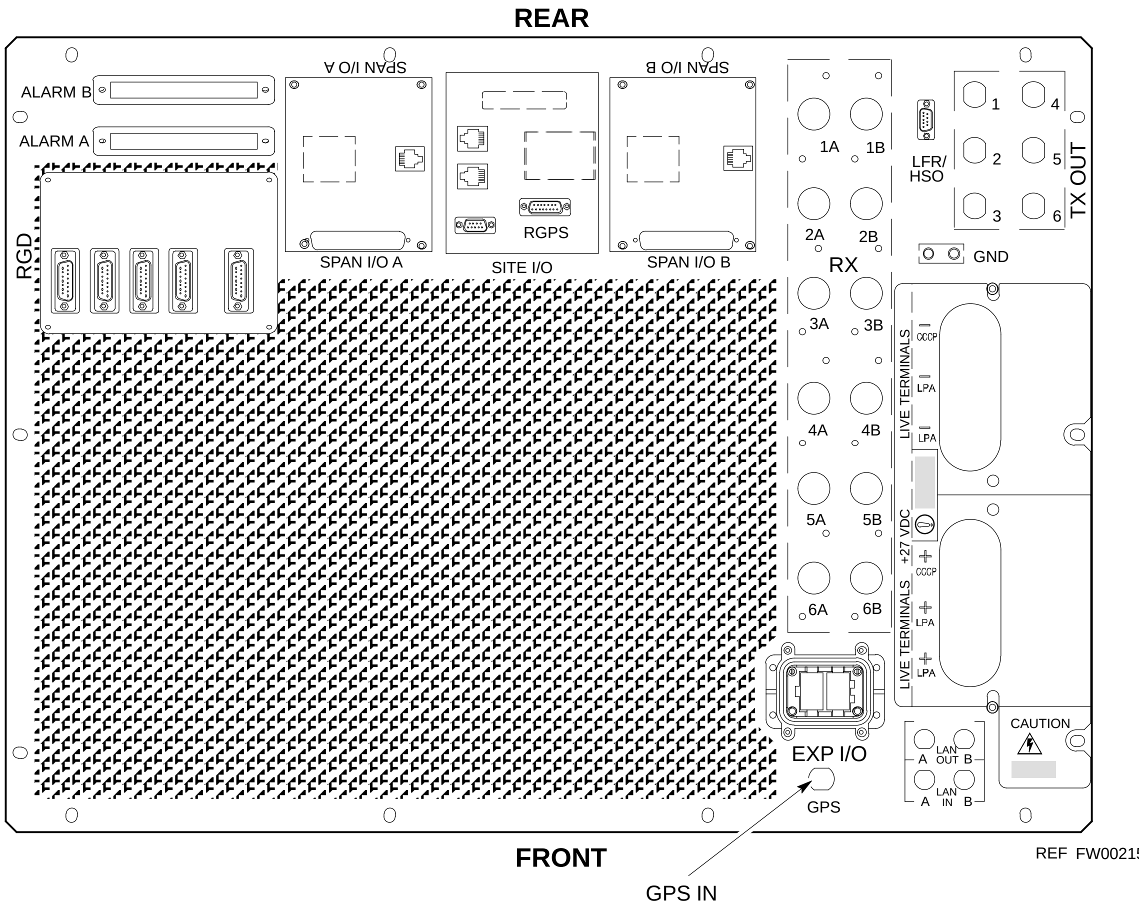
Figure 3-23: +27 V SC 4812T Starter Frame I/O Plate



LPA Redundancy Test

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

WARNING

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

Table 3-51: LPA Redundancy Test

Step	Action
1	From the pulldown menu select: **Device > Set Redundant Sector > None/0** **Device > Set Pilot > Only > Carrier–#–1-1** **Device > Set Pilot > Only > Carrier–#-1-1 and Pilot Gain = 262**
2	Key-up the BBX assigned to the LPAs associated with the sector under test (gain = 40).
3	Adjust the communications test set spectrum analyzer, as required, to observe the overall carrier amplitude and IM Shelf and **note for reference**. These figures will be required later. **NOTE** See Figure 3-13 for test equipment setup, if required.
4	Push-in and release the breaker supplying the 1st LPA of the pair. **NOTE** After power is removed, IM suppression takes a few seconds to settle out while compensating for the removal of the 1st LPA. The overall gain decreases by approximately 6 dB. The process must be complete before proceeding.
5	Verify: • The other LPA module did not go OOS due to the loss of the LPA. • The overall carrier amplitude is reduced by approximately 6 dB and IM suppression on the analyzer display remains basically unchanged. • LPA fault message is reported via the MGLI and displayed on the alarm monitor.
6	Re-apply power to the LPA module and observe the alarm has cleared on the alarm monitor. **NOTE** All PWR/ALM LEDs should be GREEN at completion of test.
7	Repeat Steps 4 through 6 to verify the 2nd LPA of the pair.
8	De-key the BBX.
9	**△ WARNING** ***First verify there are no BBX channels keyed when*** moving the antenna connection. Failure to do so can result in serious personal injury and/or equipment damage. Repeat Steps 1 through 8 to verify LPAs assigned to sectors 2 and 3 (if equipped). Move the test cable on top of the BTS to **TX OUT 2** and **TX OUT 3** antenna connectors as required.

MGLI/GLI Redundancy Test

CAUTION

This test can *only* be performed when the MM path is established by the MM (not just with LAPD link connected). Attempting to force the GLIs to "hot swap" under alarm monitor control, when isolated from the MM, causes MGLIs to hang up.

Table 3-52: MGLI/GLI Redundancy Test (with MM Connection Established)

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

BTS Alarms Testing

Alarm Test Overview

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

The SC 4812T is capable of concurrently monitoring 36 input signals coming into the BTS. These inputs are divided between 2 Alarm connectors marked '**ALARM A**' and '**ALARM B**' located at the top of the frame (see Figure 3-24). The **ALARM A** connector is always functional; **ALARM B** is functional when an AMR module is equipped in the AMR 2 slot in the distribution shelf. **ALARM A** port monitors input numbers 1 through 18, while **ALARM B** port monitors input numbers 19 through 36 (see Figure 3-25). State transitions on these input lines are reported to the LMF and OMCR as MGLI Input Relay alarms.

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

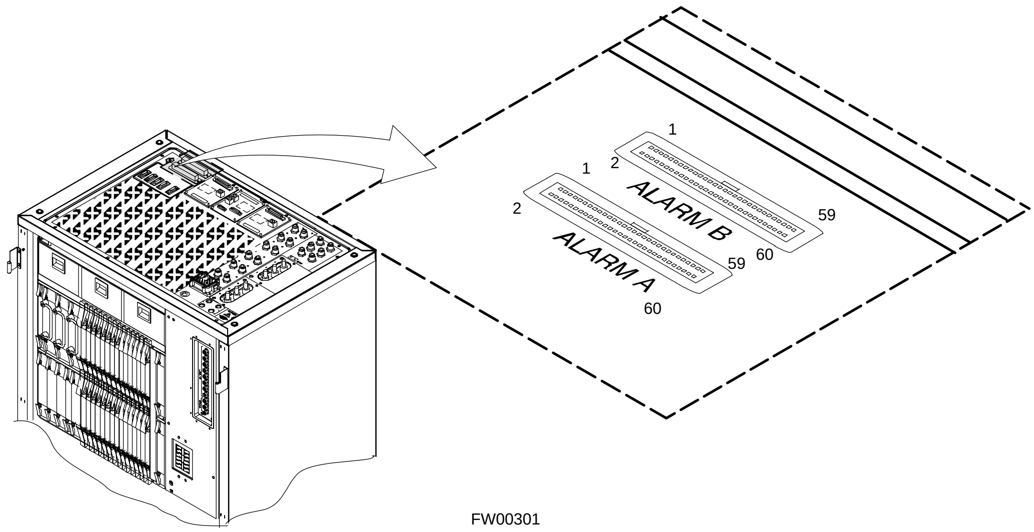
Alarm Reporting Display

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

The following buttons are included:

- The **Options** button allows for a severity level (**Warning, Minor**, and **Major**) selection. The default is all levels. To change the level of alarms reported click on the **Options** button and highlight the desired alarm level(s). To select multiple levels press the **<Ctrl>** key (for individual selections) or **<Shift>** key (for a range of selections) while clicking on the desired levels.
- The **Pause** button pauses/stops the display of alarms. When the **Pause** button is clicked the name of the button changes to **Continue**. When the **Continue** button is clicked, the display of alarms continues. Alarms that occur between the time the **Pause** button is clicked and the **Continue** button is clicked are not displayed.
- The **Clear** button clears the Alarm Monitor display. New alarms that occur after the **Clear** button is clicked are displayed.
- The **Dismiss** button dismisses/closes the Alarm Monitor display.

Figure 3-24: Alarm Connector Location and Connector Pin Numbering



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Purpose

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

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

IMPORTANT

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

Test Equipment

The following test equipment is required to perform these tests:

- LMF
- Alarms Test Box (CGDSCMIS00014) –optional

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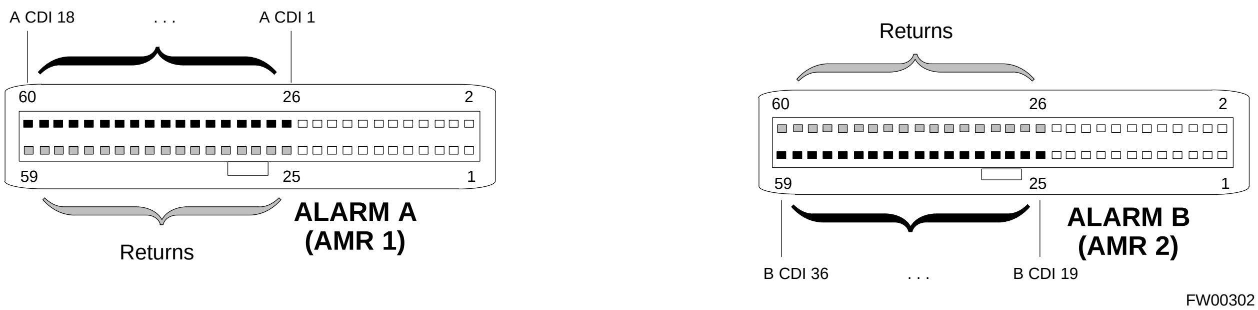
NOTE

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

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

Figure 3-25: AMR Connector Pin Numbering



NOTE

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

CDI Alarm Input Verification with Alarms Test Box

Table 3-53 describes how to test the CDI alarm input verification using the Alarm Test Box. Follow the steps as instructed and compare results with the LMF display.

NOTE

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

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

Step	Action
1	Connect the LMF to the BTS and log into the BTS.
2	Select the MGLI.

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

Step	Action
3	Click on the **Device** menu.
4	Click on the **Customer Alarm Inputs** menu item.
5	Click on **N.O. Inputs**. A status report window displays the results of the action.
6	Click on the **OK** button to close the status report window.
7	Set all switches on the alarms test box to the **Open** position.
8	Connect the alarms test box to the **ALARM A** connector (see Figure 3-24).
9	Set all of the switches on the alarms test box to the **Closed** position. An alarm should be reported for each switch setting.
10	Set all of the switches on the alarms test box to the **Open** position. A clear alarm should be reported for each switch setting.
11	Disconnect the alarms test box from the **ALARM A** connector.
12	Connect the alarms test box to the **ALARM B** connector.
13	Set all switches on the alarms test box to the **Closed** position. An alarm should be reported for each switch setting
14	Set all switches on the alarms test box to the **Open** position. A clear alarm should be reported for each switch setting.
15	Disconnect the alarms test box from the **ALARM B** connector.
16	Select the MGLI.
17	Click on the **Device** menu.
18	Click on the **Customer Alarm Inputs** menu item.
19	Click on **N.C. Inputs**. A status report window displays the results of the action.
20	Click **OK** to close the status report window. Alarms should be reported for alarm inputs 1 through 36.
21	Set all switches on the alarms test box to the **Closed** position.
22	Connect the alarms test box to the **ALARM A** connector. Alarms should be reported for alarm inputs 1 through 18.
23	Set all switches on the alarms test box to the **Open** position. An alarm should be reported for each switch setting.
24	Set all switches on the alarms test box to the **Closed** position. A clear alarm should be reported for each switch setting.
25	Disconnect the alarms test box from the **ALARM A** connector.

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Table 3-53: CDI Alarm Input Verification Using the Alarms Test Box	
Step	**Action**
26	Connect the alarms test box to the **ALARM B** connector. A clear alarm should be reported for alarm inputs 19 through 36.
27	Set all switches on the alarms test box to the **Open** position. An alarm should be reported for each switch setting.
28	Set all switches on the alarms test box to the **Closed** position. A clear alarm should be reported for each switch setting.
29	Disconnect the alarms test box from the **ALARM B** connector.
30	Select the MGLI.
31	Click on the **Device** menu.
32	Click on the **Customer Alarm Inputs** menu item.
33	Click on **Unequipped**. A status report window displays the results of the action.
34	Click on the **OK** button to close the status report window.
35	Connect the alarms test box to the **ALARM A** connector.
36	Set all switches on the alarms test box to both the **Open** and the **Closed** position. No alarm should be reported for any switch settings.
37	Disconnect the alarms test box from the **ALARM A** connector.
38	Connect the alarms test box to the **ALARM B** connector.
39	Set all switches on the alarms test box to both the **Open** and the **Closed** position. No alarm should be reported for any switch settings.
40	Disconnect the alarms test box from the **ALARM B** connector.
41	Load data to the MGLI to reset the alarm relay conditions according to the CDF file.

CDI Alarm Input Verification without Alarms Test Box

Table 3-54 describes how to test the CDI alarm input verification without the use of the Alarms Test Box. Follow the steps as instructed and compare results with the LMF display.

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NOTE

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

Table 3-54: CDI Alarm Input Verification Without the Alarms Test Box

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

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Table 3-54: CDI Alarm Input Verification Without the Alarms Test Box	
Step	**Action**
14	Refer to Figure 3-25 and sequentially short the ALARM A connector CDI 1 through CDI 18 pins (25–26 through 59–60) together. A clear alarm should be reported for each pair of pins that are shorted. An alarm should be reported for each pair of pins when the short is removed.
15	Refer to Figure 3-25 and sequentially short the ALARM B connector CDI 19 through CDI 36 pins (25–26 through 59–60) together. A clear alarm should be reported for each pair of pins that are shorted. An alarm should be reported for each pair of pins when the short is removed.
16	Select the MGLI.
17	Click on the **Device** menu
18	Click on the **Customer Alarm Inputs** menu item.
19	Click on **Unequipped**. A status report window displays the results of the action.
20	Click on **OK** to close the status report window.
21	Refer to Figure 3-25 and sequentially short the ALARM A connector CDI 1 through CDI 18 pins (25–26 through 59–60) together. No alarms should be displayed.
22	Refer to Figure 3-25 and sequentially short the ALARM B connector CDI 19 through CDI 36 pins (25–26 through 59–60) together. No alarms should be displayed.
23	Load data to the MGLI to reset the alarm relay conditions according to the CDF file.

Pin and Signal Information for Alarm Connectors

Table 3-55 lists the pins and signal names for Alarms A and B.

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

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

NOTE
CDO = Customer Defined Output
CDI = Customer Defined Input

Chapter 4: Automated Acceptance Test Procedure (ATP)

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Notes