Initial Power Up

Introduction

The following information is used to check for any electrical short circuits and to verify the operation and tolerances of the cellsite and BTS power supply units before applying power for the first time. It contains instructional information on the initial proper power up procedures for the SC 4812ET power cabinet and RF cabinet. Also presented are tests to be preformed on the power cabinet. Please pay attention to all cautions and warning statements in order to prevent accidental injury to personnel.

Required Tools

The following tools are used in the procedures.

- DC current clamp (600 Amp capability with jaw size to accommodate 2/0 cable).
- Hot Air Gun – (optional for part of the Alarm Verification)
- Digital Multimeter (DMM)

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

IMPORTANT

For positive power applications (+27 V):

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

Initial Inspection and Setup

CAUTION

Ensure all battery breakers for unused battery positions are open (pulled out) during any part of the power up process, and remain in the off position when leaving the site.

Table 2-2: Initial Inspection and Setup

Step	Action
1	Verify that ALL AC and DC breakers are turned OFF in both the Power and RF cabinets. Verify that the DC power cables between the Power and RF cabinets are connected with the correct polarity
2	The RED cables connect to the uppermost three (3) terminals (marked +) in both cabinets. Confirm that the split phase 240/120 AC supply is correctly connected to the AC load center input.

CAUTION

Failure to connect the proper AC feed will damage the surge protection module inside the AC load center.

Power Up Sequence

The first task in the power up sequence is to apply AC power to the Power cabinet. Once power is applied a series of AC Voltage measurements is required.

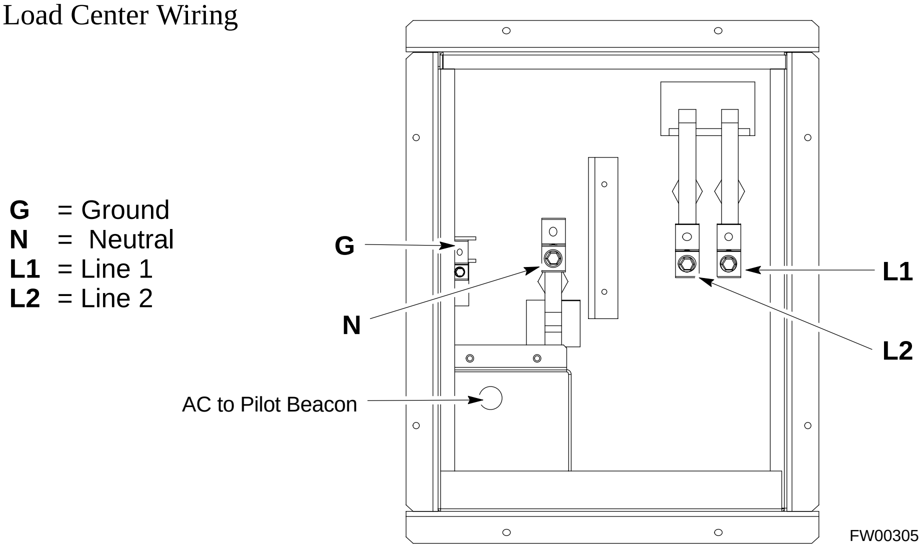
Table 2-3: AC Voltage Measurements

Step	Action
1	Measure the AC voltages connected to the AC load center (access the terminals from the rear of the cabinet after removing the AC load center rear panel). See Figure 2-2.
2	Measure the AC voltage from terminal L1 to neutral. This voltage should be in the range of nominally 115 to 120 V AC.
3	Measure the AC voltage from terminal L1 to ground. This voltage should be in the range of nominally 115 to 120 V AC.
4	Measure the AC voltage from terminal L2 to neutral. This voltage should be in the range of nominally 115 to 120 V AC.
5	Measure the AC voltage from terminal L2 to ground. This voltage should be in the range of nominally 115 to 120 V AC.
6	Measure L1 – L2 – should be from 208 to 240 V AC.

CAUTION

If the AC voltages are in excess of 120 V (or exceed 200 V) when measuring between terminals L1 or L2 to neutral or ground, **STOP** and Do Not proceed until the cause of the higher voltages are determined. The power cabinet **WILL** be damaged if the Main breaker is turned on with excessive voltage on the inputs.

Figure 2-2: AC Load Center Wiring



Applying AC Power

Once AC Voltage Measurements are complete, apply AC power to the Power Cabinet. Table 2-4 provides the procedure for applying AC power.

Table 2-4: Applying AC Power

Step	Action
1	When the input voltages are verified as correct, turn the Main AC breaker (located on the front of the AC Load Center) ON. Observe that all eight (8) green LEDs on the front of the AC Load Center are illuminated (see Figure 2-7).
2	Turn Rectifier 1 and Rectifier 2 AC branch breakers (on the AC Load Center) ON. All the installed rectifier modules (see Figure 2-7) will start up and should each have two green LEDs (DC and Power) illuminated.
3	Turn the Meter Alarm Panel module, ON (see Figure 2-3), while observing the K2 contact in the PDA assembly (see Figure 2-9). The contact should close. The Meter Alarm Panel voltage meter should read approximately 27.4 $\pm$ 0.2 Vdc.
4	Turn the Temperature Compensation Panel (TCP) ON, (see Figure 2-4). Verify that the Meter Alarm Control Panel does not have any alarm LEDs illuminated.
5	Check the rectifier current bargraph displays (green LED display on the rectifier module). None should be illuminated at this point.

NOTE

If batteries are fitted, turn on the two battery heater AC breakers on the AC Load Center.

Figure 2-3: Meter Alarm Panel

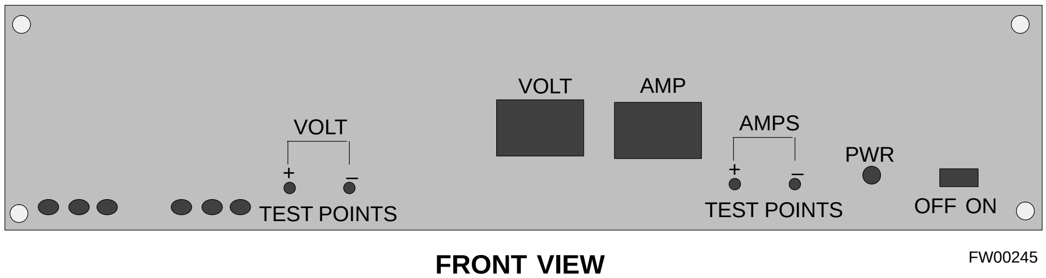
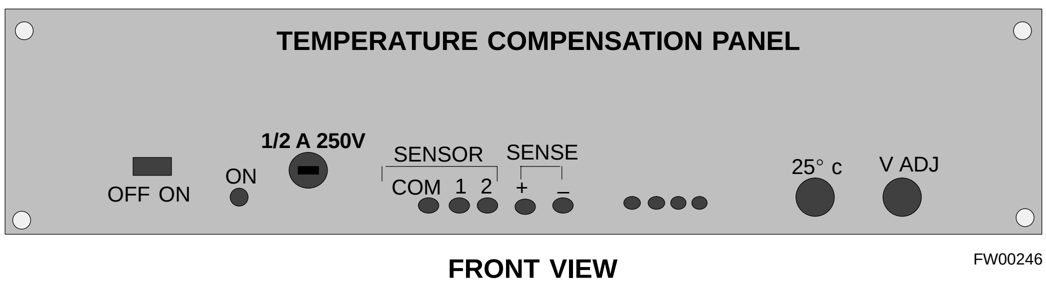


Figure 2-4: Temperature Compensation Panel



Power Cabinet Power Up Tests

Table 2-5 lists the step–by–step instructions for Power Up Tests.

Table 2-5: Power Cabinet Power Up Tests

Step	Action
1	Probe the output voltage test point on the Meter Alarm Panel while pressing the 25° C set button on the TCP (see Figure 2-4). The voltage should read 27.4 ± 0.2 Vdc. Adjust Master Voltage on Meter Alarm Panel if necessary. Release the TCP 25° C set button.
2	Depending on the ambient temperature, the voltage reading may now change by up to ± 1.5 V compared to the reading just measured. If it is cooler than 25°C, the voltage will be higher, and if it is warmer than 25°C, the voltage will be lower.
3	Ensure the RF cabinet 400 Amp main DC breaker is OFF.
4	Close the three (3) Main DC breakers on the Power Cabinet ONLY. Close by holding in the reset button on the front of the PDA, and engaging one breaker at a time.
5	Measure the voltage between the + and – terminals at the rear of the Power Cabinet and the RF Cabinet, observing that the polarity is correct. The voltage should be the same as the measurement in step 2.
6	Place the probes across the black and red battery buss bars in each battery compartment. Place the probe at the bottom of the buss bars where the cables are connected. The DC voltage should measure the same as the previous step.

DC Power Pre-test (BTS Frame)

Before applying any power to the BTS cabinet, verify there are no shorts in the RF or power DC distribution system (see Figure 2-5).

Table 2-6: DC Power Pre–test (BTS Frame)

Step	Action
1	*Physically verify* that all AC rectifiers supplying power to the RF cabinets are **OFF** or disabled (see Figure 2-5). There should be no 27 Vdc on DC feed terminals.
2	*On each RF cabinet:* • *Unseat* all circuit boards/ modules in the distribution shelf, transceiver shelf, and Single Carrier Linear Power Amplifier (SCLPA) shelves, but leave them in their associated slots. • *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** – located on the power distribution panel). • Set LPA breakers to the **OFF** position by *pulling out* power distribution breakers (8 breakers, labeled **1A–1B** through **4C–4D** – located on the power distribution panel).
3	Verify that the resistance from the power (+) feed terminals with respect to the ground terminal on the cabinet measures ≥ **500** Ω (see Figure 2-5). • 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** MΩ could indicate an open (or missing) bleeder resistor (installed across the filter capacitors behind the breaker panel).
4	Set the 400 Amp Main Breaker and the C–CCP breakers (**C–CCP 1, 2, 3**) to the **ON** position by pushing them IN *one at a time*. Repeat step 3 after turning on each breaker.
	*** IMPORTANT** If, after inserting any board/module, the ohmmeter stays at **0** Ω, 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 into their associated slots *one at a time*. Repeat step3 after inserting each module. • A typical response is that the ohmmeter will steadily climb 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 volt systems)
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 will steadily climb in resistance as capacitors charge, stopping at approximately **500** Ω.

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Table 2-6: DC Power Pre–test (BTS Frame)	
Step	**Action**
7	Set the 8 **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	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.
9	Seat the Heat Exchanger, ETIB, and Options breakers one at a time. Repeat step 3.

RF Cabinet Power Up

Table 2-7 covers the procedures for properly powering up the RF Cabinet.

Table 2-7: RF Cabinet Power Up	
Step	**Action**
1	Ensure the 400 Amp Main DC breaker and all other breakers in the RF Cabinet are OFF.
2	Proceed to the DC Power Pre–test (BTS Frame) sequence (see Table 2-6) (for initial power–up as required).
3	Ensure the power cabinet is turned on (see Table 2-5). Verify that 27 volts is applied to the terminals on the back of the RF cabinet.
4	Engage the main DC circuit breaker on the RF cabinet (see Figure 2-5).
5	*On each RF cabinet:* • Set C–CCP shelf breakers to the **ON** position by pushing them in one at a time (labeled **C–CCP 1, 2, 3** – located on the power distribution panel). • Set LPA breakers to the **ON** position by pushing them in one at a time (8 breakers, labeled **1A–1B** through **4C–4D** – located on the power distribution panel). • Set the two heat exchanger breakers to the **ON** position by pushing them in one at a time. • Set the ETIB breaker to the **ON** position by pushing it in. • Set the OPTION breaker to the **ON** position by pushing it in.

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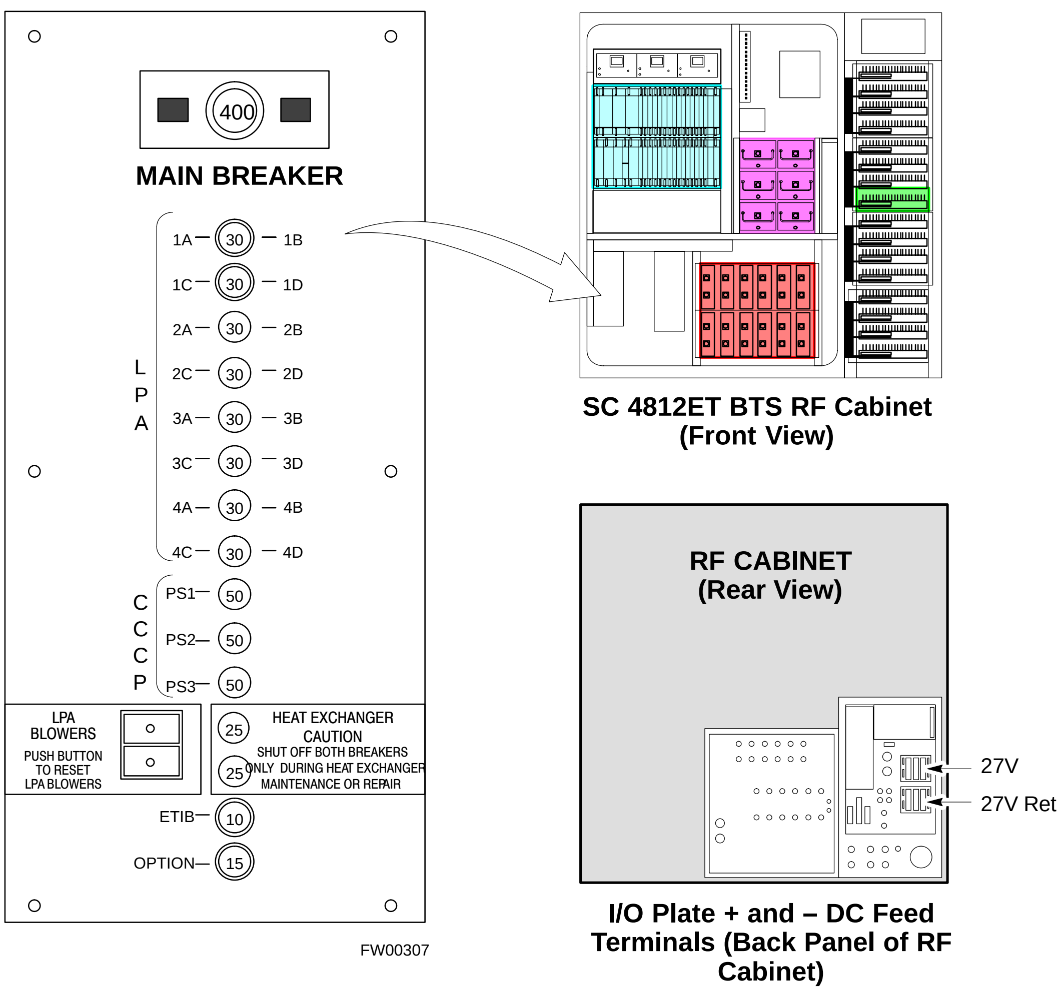
Table 2-7: RF Cabinet Power Up	
Step	**Action**
6	Measure the voltage drop between the Power Cabinet meter test point and the 27 V buss bar inside the RF Cabinet PDA while the RF Cabinet is transmitting. **NOTE** For a three (3) sector carrier system, the voltage drop should be less than 0.2 V. For a twelve (12) sector carrier system, the voltage drop should be less than 0.3 V.
7	Using a DC current probe, measure the current in each of the six (6) DC cables that are connected between the RF and Power Cabinet. The DC current measured should be approximately the same. If there is a wide variation between one cable and the others (>20 A), check the tightness of the connections (torque settings) at each end of the cable.

Figure 2-5: RF Cabinet Circuit Breaker Panel and 27V DC Terminal Locations



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Battery Charge Test (Connected Batteries)

Table 2-8 lists the step–by–step instructions for testing the batteries.

Table 2-8: Battery Charge Test (Connected Batteries)

Step	Action
1	Close the battery compartment breakers for connected batteries ONLY. This process should be completed quickly to avoid individual battery strings with excess charge current **NOTE** If the batteries are sufficiently discharged, the battery circuit breakers may not engage individually due to the surge current. If this condition is observed, turn off the Meter Alarm Panel power switch, and then engage all the connected battery circuit breakers, the Meter Alarm Panel power switch should then be turned ON.
2	Using the DC current probe, measure the current in each of the battery string connections to the buss bars in each battery cabinet. The charge current may initially be high but should quickly reduce in a few minutes if the batteries have a typical new battery charge level.
3	The current in each string should be approximately equal (± 5 A).
4	The bargraph meters on the rectifier modules can be used as a rough estimate of the total battery charge current. Each rectifier module has eight (8) LEDs to represent the output current. Each illuminated LED indicates that approximately 12.5% (1/8 or 8.75 A) of the rectifiers maximum (70 A) current is flowing. **EXAMPLE:** **Question:** A system fitted with three (3) rectifier modules each have three bargraph LEDs illuminated. What is the total output current into the batteries? **Answer:** Each bargraph is approximately indicating 12.5% of 70 A, therefore, 3 X 8.75 equals 26.25 A. As there are three rectifiers, the total charge current is equal to (3 X 26.25 A) 78.75 A. This charge current calculation only applies at this part of the start up procedure, when the RF Cabinet is not powered on, and the power cabinet heat exchanger is turned off.
5	Allow a few minutes to ensure that the battery charge current stabilizes before taking any further action. Recheck the battery current in each string. If the batteries had a reasonable charge, the current in each string should reduce to less than 5 A.
6	Recheck the DC output voltage. It should remain the same as measured in step 4 of the Power Up Test. **NOTE** If discharged batteries are installed, all bargraphs may be illuminated on the rectifiers during the charge test. This indicates that the rectifiers are at full capacity and are rapidly charging the batteries. It is recommended in this case that the batteries are allowed to charge and stabilize as in the above step before commissioning the site. This could take several hours.

Battery Discharge Test

Perform the test procedure in Table 2-9 only when the battery current is less than 5 A per string. Refer to Table 2-8 on the procedures for checking current levels.

Table 2-9: Battery Discharge Test	
Step	**Action**
1	Turn the battery test switch on the Meter Alarm Panel, ON (see Figure 2-3). The rectifier output voltage and current should decrease by approximately 10% as the batteries assume the load. Alarms for the Meter Alarm Panel may occur.
2	Measure the individual battery string current using the DC current probe. The battery discharge current in each string should be approximately the same (within ± 5 A).
3	Turn Battery Test Switch OFF.

CAUTION

Failure to turn OFF the Battery Test Switch before leaving the site, will result in low battery capacity and reduce battery life.

Heat Exchanger Power Up

Table 2-10: Heat Exchanger Power Up	
Step	**Action**
1	Turn the Power Cabinet Heat Exchanger breakers ON (seeFigure 2-6 for breaker location).
2	The Heat Exchanger will now go into a 5 minute test sequence. Ensure that the internal and external fans are operating. Place a hand on the internal and external Heat Exchanger grills to feel for air draft.

Figure 2-6: Heat Exchanger Blower Assembly

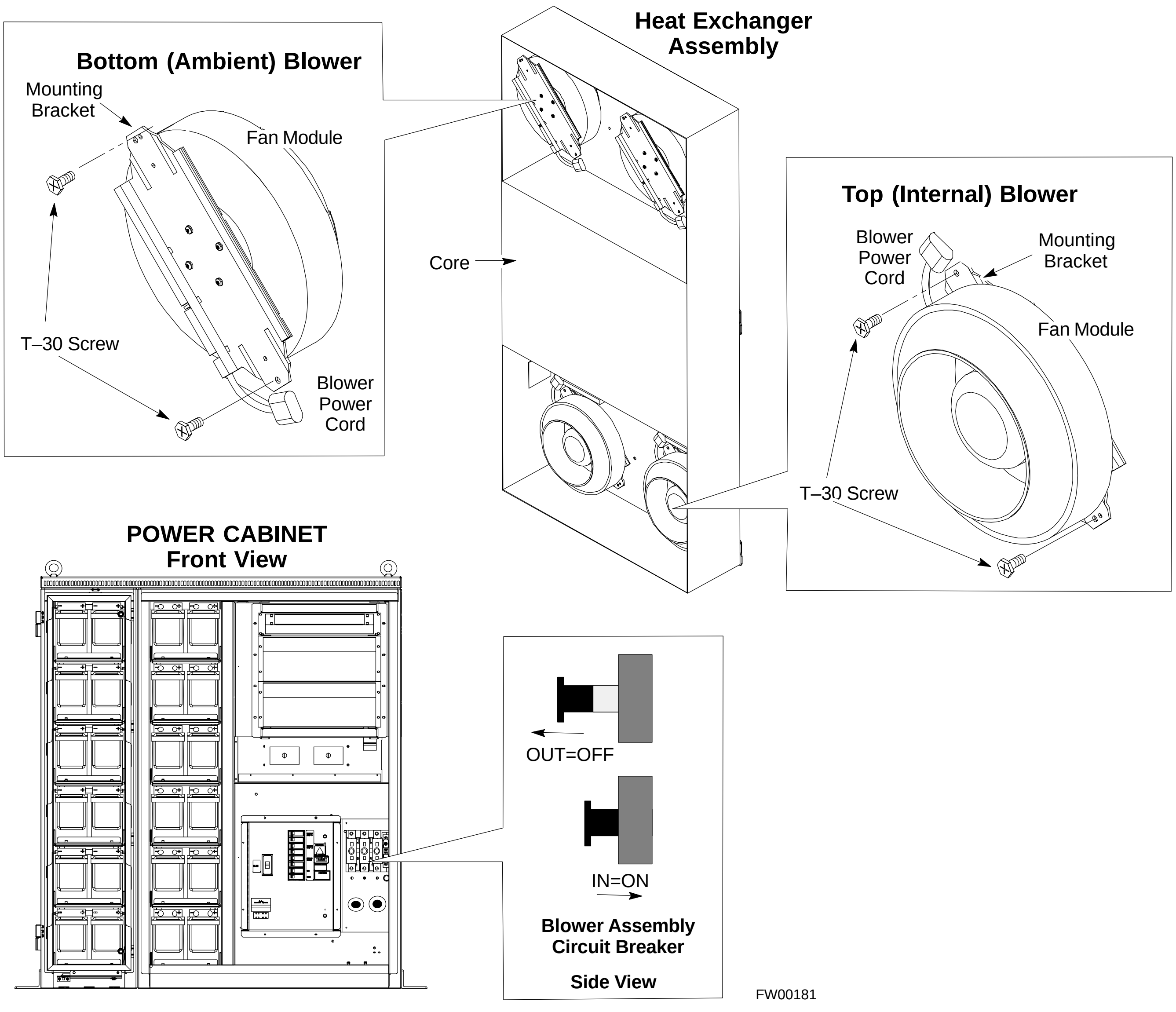


Figure 2-7: Power Cabinet Circuit Breaker Assemblies

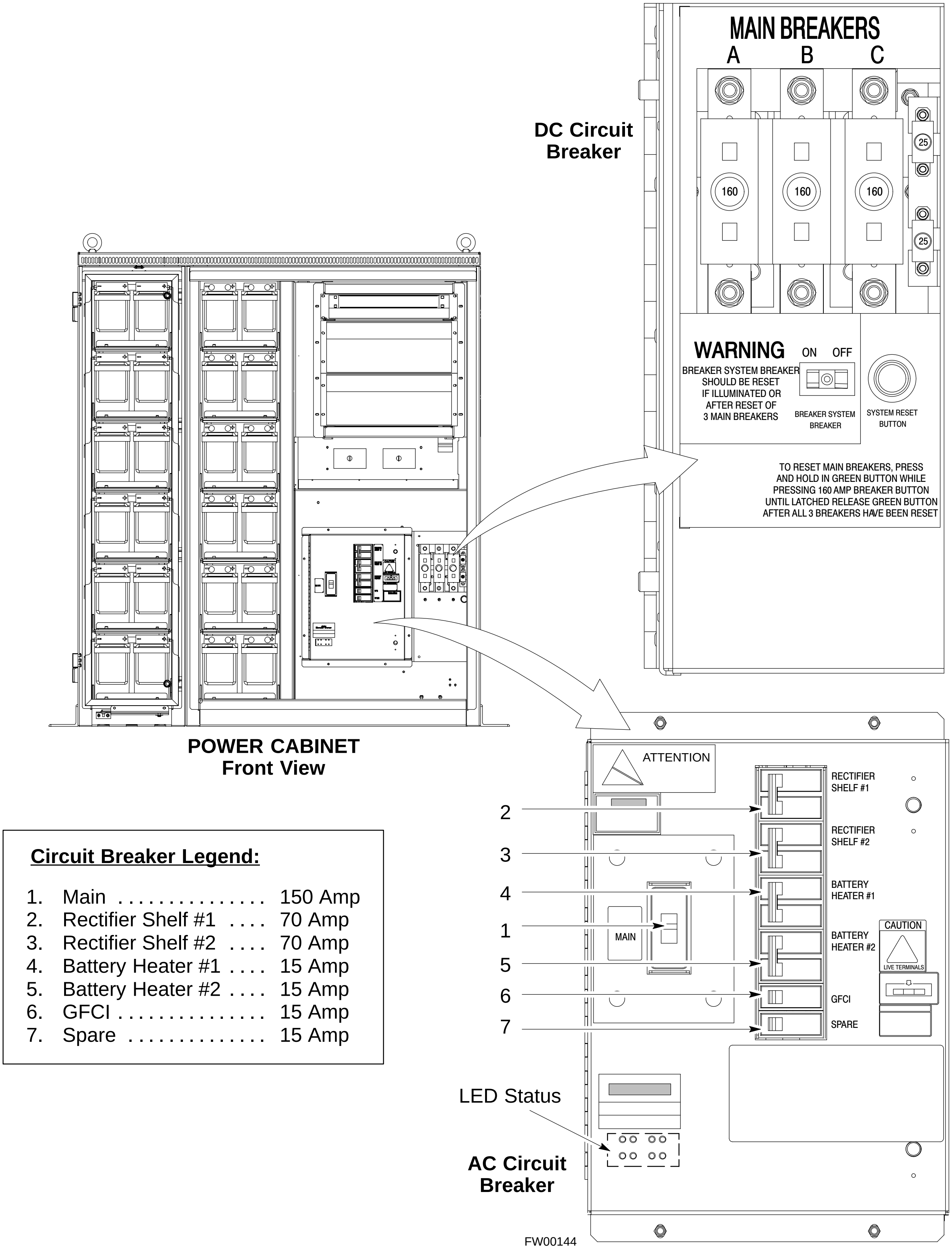


Figure 2-8: Power Cabinet AC Circuit Breakers

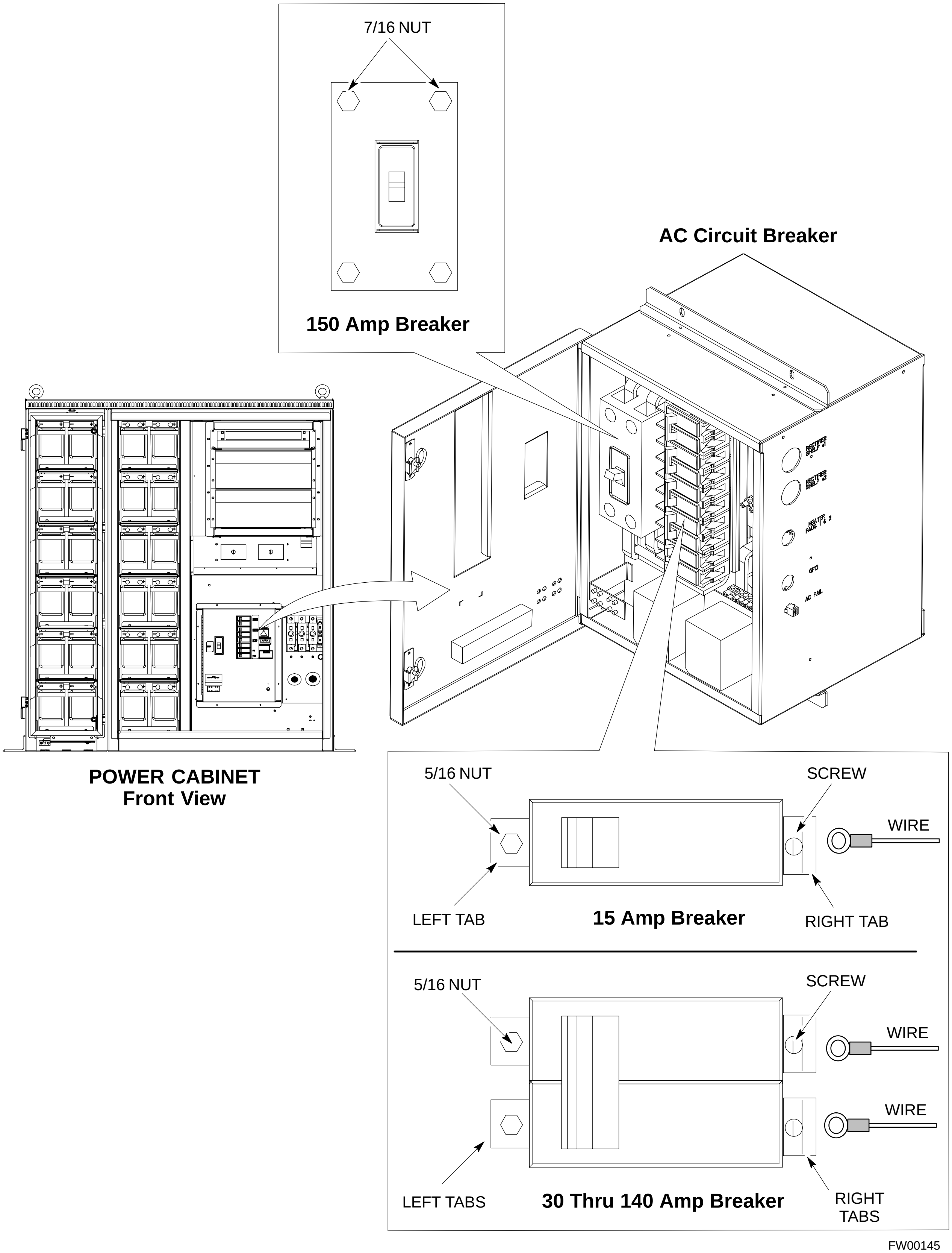
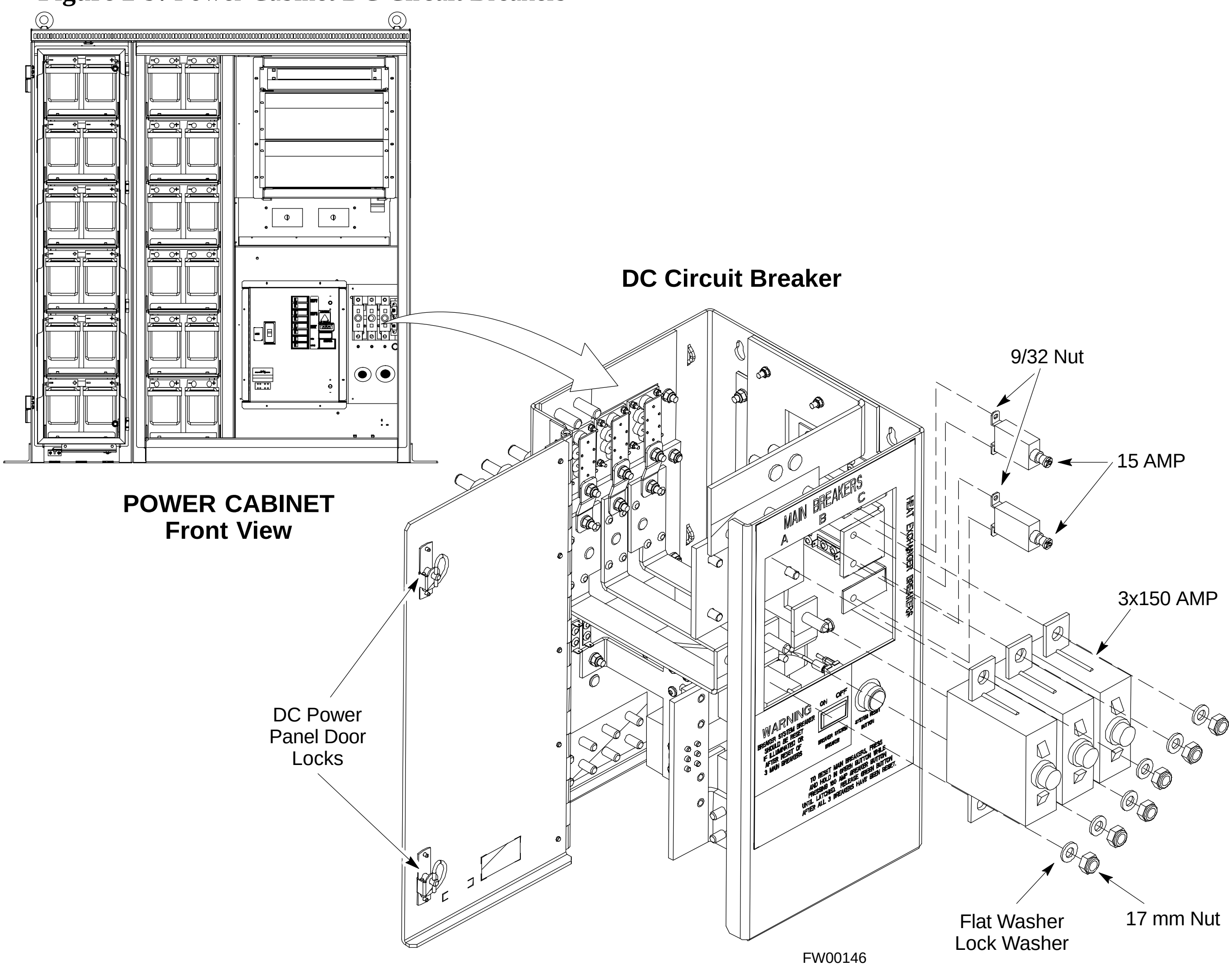


Figure 2-9: Power Cabinet DC Circuit Breakers



2

Notes

Introduction

This chapter provides procedures for downloading system operating software, set up of the supported test equipment, CSM reference verification/optimization, and transmit/receive path verification.

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 CDMA LMF is used to calibrate and optimize the BTS. The basic optimization process can be accomplished as follows:

- Download MGLI2–1 with code and data and then enable MGLI2–1.
- Use the status function and verify that all of the installed devices of the following types respond with status information: CSM2, BBX2, GLI2, and 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 CDMA LMF.
- Download code and data to all devices of the following types:
  – CSM2
  – BBX
  – GLI2 (other than MGLI2–1)
  – MCC
- Download the RFDS TSIC (if installed).
- Verify the operation of the GPS and HSO signals.
- Enable the following devices (in the order listed):
  – Secondary CSM (slot 2)
  – Primary CSM (slot 1)
  – All MCCs
- Connect the required test equipment for a full optimization.
- Select the test equipment.
- 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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- 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.
- If the TX calibration fails, repeat the full optimization for any failed paths.
- If the TX calibration fails again, correct the problem that caused the failure and repeat the full optimization for the failed path.
- 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.

Cell–site Data File

The CDF includes the following information:

- Download instructions and protocol
- Site specific equipage information
- C–CCP shelf allocation plan
  - BBX2 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
- 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 BBX2 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*, 68P64114A78, or the LMF Help screen, for more information.

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 to the actual site hardware.

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.

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 span surge protectors until the OMC/CBSC has disabled the BTS.

Each frame is equipped with one 50–pair punch block for spans, customer alarms, remote GPS, and power cabinet alarms. See Figure 3-2 and refer to Table 3-1 for the physical location and pin call–out information. To disable the span, pull the surge protectors for the respective span.

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.

Configure Channel Service Unit

The M–PATH 537 Channel Service Unit (CSU) provides in–band SNMP–managed digital service access to T1 and fractional T1 lines. M–PATH units plug into the ADC Kentrox 2–slot frame (see Figure 3-1).

Remote M–PATH management is available via SNMP over an in–band data link on the T1 line (using a facility data link or 8–64 Kbps of a DS0 channel). The unit at the near end of the management path can be an SNMP manager or another M–PATH CSU.

Each 19 inch rack can support two CSU M–PATH 537 modules. Each M–PATH 537 module supports one and only one span connection.

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

Setting the Control Port

Whichever control port is chosen, it must first be set up so the control port switches match the communication parameters being used by the control device. If using the rear–panel DTE control port, set the shelf–address switch SA5 to "up" (leave the switch down for the rear–panel DCE control port).

For more information, refer to the Kentrox Installation Guide, manual number 65–77538001 which is provided with each CSU.

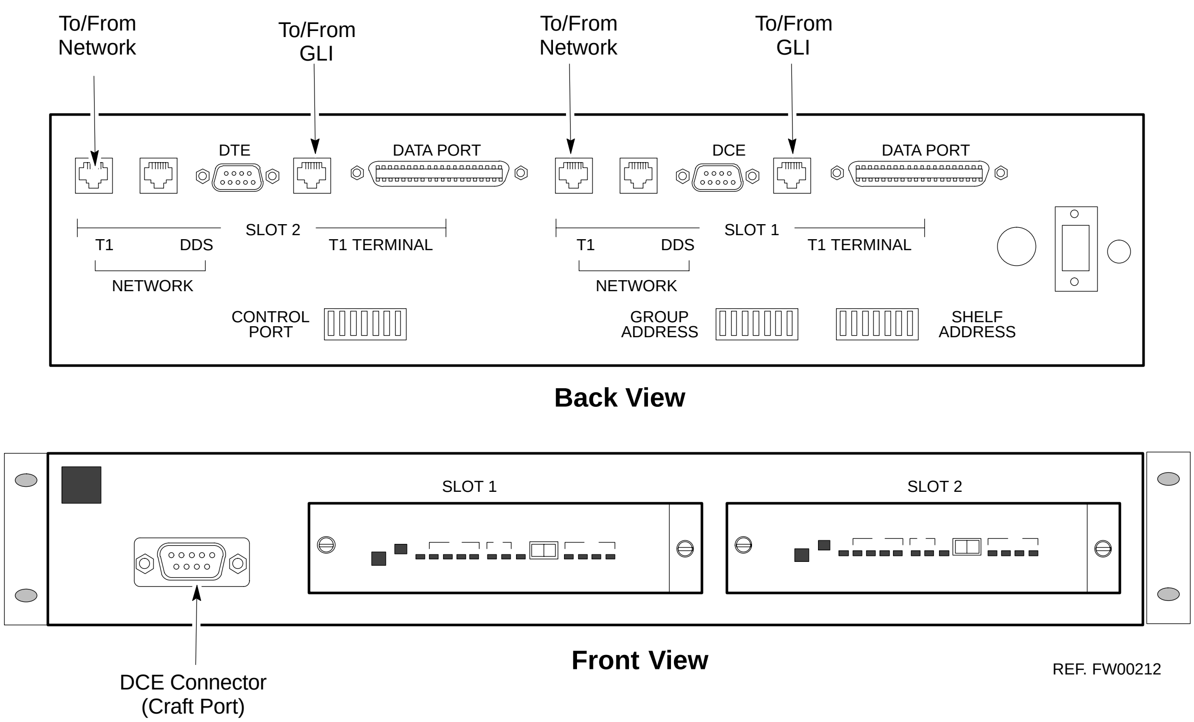
Plug one of the cables listed below into the Control Port connectors:

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

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

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

Figure 3-1: Back and Front View of the CSU



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Alarm and Span Line Cable Pin/Signal Information

See Figure 3-2 and refer to Table 3-1 for the physical location and pin call–out information for the 50–pin punch block.

Figure 3-2: 50 Pair Punch Block

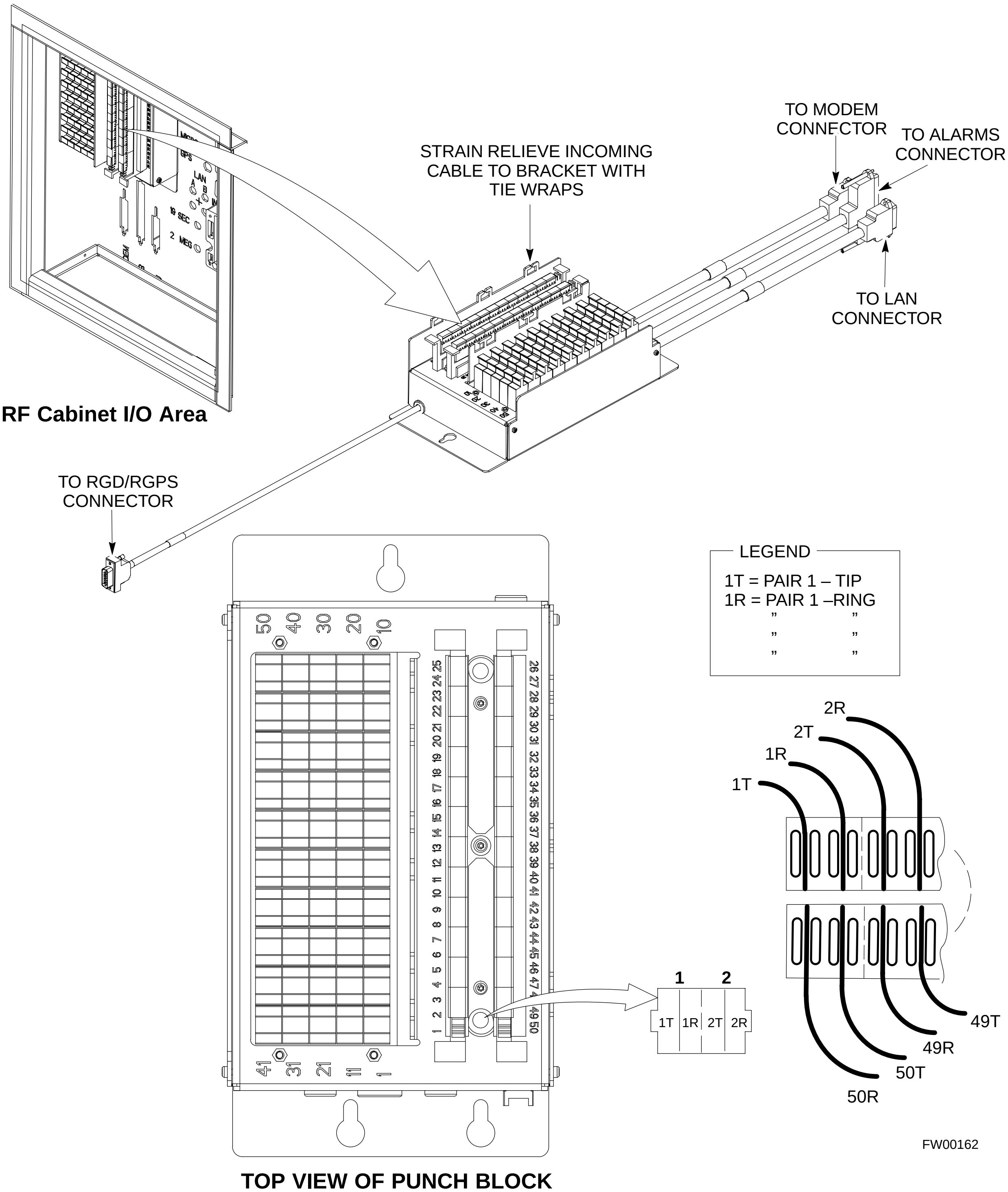

Table 3-1: Pin–Out for 50 Pin Punch Block			
Site Component	**Signal Name**	**Pin**	**Color**
POWER CABINET	Power Cab Control – NC	1T	Blue
	Power Cab Control – NO	1R	Blk/Blue
	Power Cab Control – Com	2T	Yellow
	Reserved	2R	N/C
	Rectifier Fail	3T	Blk/Yellow
	AC Fail	3R	Green
	Power Cab Exchanger Fail	4T	Blk/Grn
	Power Cab Door Alarm	4R	White
	Power Cab Major Alarm	5T	Blk/Whit
	Battery Over Temp	5R	Red
	Power Cab Minor Alarm	6T	Blk/Red
	Reticifier Over Temp	6R	Brown
	Power Cab Alarm Rtn	7T	Blk/Brn
LFR / HSO	LFR_HSO_GND	7R	
	EXT_1PPS_POS	8T	
	EXT_1PPS_NEG	8R	
	CAL_+	9T	
	CAB_–	9R	
	LORAN_+	10T	
	LORAN_–	10R	
PILOT BEACON	Pilot Beacon Alarm – Minor	11T	
	Pilot Beacon Alarm – Rtn	11R	
	Pilot Beacon Alarm – Major	12T	
	Pilot Beacon Control – NO	12R	
	Pilot Beacon Control–COM	13T	
	Pilot Beacon Control – NC	13R	
CUSTOMER OUTPUTS / INPUTS	Customer Outputs 1 – NO	14T	
	Customer Outputs 1 – COM	14R	
	Customer Outputs 1 – NC	15T	
	Customer Outputs 2 – NO	15R	
	Customer Outputs 2 – COM	16T	
	Customer Outputs 2 – NC	16R	
	Customer Outputs 3 – NO	17T	
	Customer Outputs 3 – COM	17R	
	Customer Outputs 3 – NC	18T	
	Customer Outputs 4 – NO	18R	
	Customer Outputs 4–COM	19T	
	Customer Outputs 4 – NC	19R	
	Customer Inputs 1	20T	
	Cust_Rtn_A_1	20R	
	Customer Inputs 2	21T	
	Cust_Rtn_A_2	21R	
	Customer Inputs 3	22T	
	Cust_Rtn_A_3	22R	
	Customer Inputs 4	23T	
	Cust_Rtn_A_4	23R	
	Customer Inputs 5	24T	
	Cust_Rtn_A_5	24R	
	Customer Inputs 6	25T	
	Cust_Rtn_A_6	25R	
	Customer Inputs 7	26T	
	Cust_Rtn_A_7	26R	
	Customer Inputs 8	27T	
	Cust_Rtn_A_8	27R	
	Customer Inputs 9	28T	
	Cust_Rtn_A_9	28R	
	Customer Inputs 10	29T	
	Cust_Rtn_A_10	29R	

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Table 3-1: Pin–Out for 50 Pin Punch Block

Site Component	Signal Name	Pin	Color
SPAN	RVC_TIP_A	30T	
	RVC_RING_A	30R	
	XMIT_TIP_A	31T	
	XMIT_RING_A	31R	
	RVC_TIP_B	32T	
	RVC_RING_B	32R	
	XMIT_TIP_B	33T	
	XMIT_RING_B	33R	
	RVC_TIP_C	34T	
	RVC_RING_C	34R	
	XMIT_TIP_C	35T	
	XMIT_RING_C	35R	
	RVC_TIP_D	36T	
	RVC_RING_D	36R	
	XMIT_TIP_D	37T	
	XMIT_RING_D	37R	
	RVC_TIP_E	38T	
	RVC_RING_E	38R	
	XMIT_TIP_E	39T	
	XMIT_RING_E	39R	
	RVC_TIP_F	40T	
	RVC_RING_F	40R	
	XMIT_TIP_F	41T	
	XMIT_RING_F	41R	
RGPS	GPS_POWER_1+	42T	Blue
	GPS_POWER_1–	42R	Bk/Blue
	GPS_POWER_2+	43T	Yellow
	GPS_POWER_2–	43R	Bk/Yellow
	GPS_RX+	44T	White
	GPS_RX–	44R	White
	GPS_TX+	45T	Green
	GPS_TX–	45R	Green
	Signal Ground (TDR+)	46T	Red
	Master Frame (TDR–)	46R	Bk/Red
	GPS_lpps+	47T	Brown
	GPS_lpps–	47R	Bk/Brn
Phone Line	Telco_Modem_T	48T	
	Telco_Modem_R	48R	
Miscellaneous	Chasis Ground	49T	
	Reserved	49R	
	Reserved	50T	
	Reserved	50R	

T1/E1 Span Isolation

Table 3-2 describes the action required for span isolation.

Table 3-2: T1/E1 Span Isolation

Step	Action
1	The OMC/CBSC must disable the BTS and place it OOS. The Span Lines can be disabled by removing the surge protectors on the 50–pin punch block. Using Table 3-1 locate the span or spans which need to be disabled and remove the respective surge protector. **NOTE** If a third party is used for span connectivity, the third party must be informed before disabling the span line.

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.

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.

. . . continued on next page

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.

3

CDMA LMF Home Directory

The CDMA LMF installation program creates the default home directory **`c:\wlmf,`** and installs the application files and subdirectories (folders) in it. Because this can be changed at installation, the CDMA LMF home directory will be referred to with the generic convention of:

<x>:\<lmf home directory>

Where:

<*x*> = the LMF computer drive letter where the CDMA LMF home directory is located.

<lmf home directory> = the directory path or name where the CDMA LMF is installed

NOTE

The CDMA LMF installation program creates the default home directory **`c:\wlmf`** when the CDMA LMF is installed.

Copy CBSC CDF Files to the LMF Computer

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

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 will work with locally numbered BTS CDF files. Using this file *will not provide a valid optimization* unless the generic file is edited to replace default parameters (e.g., channel numbers) with the operational parameters used locally.

The procedure in Table 3-4 lists the steps required to transfer the CDF files from the CBSC to the LMF computer. For any further information, refer to the CDMA LMF Operator's Guide (Motorola part number 68P64114A21) or the LMF Help screen..

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

Step	Action
1	Login to the CBSC workstation.
2	Insert a DOS–formatted floppy diskette in the workstation drive.
3	Type **eject –q** and press <Enter>**.**
4	Type **mount** and press <Enter>**.** **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, where the files to be copied reside, by typing **cd <directoryname>** (e.g., **cd bts–248)** and pressing <Enter>.
6	Type **ls** and press the Enter key to display the list of files in the directory.

. . . continued on next page

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

Step	Action
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)**
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 a**nd press <Enter>.
10	Remove the diskette from the CBSC drive.
11	If it is not running, start the Windows operating system on the LMF computer.
12	Insert the diskette containing the bts–#.cdf and cbsc–#.cdf files into the LMF computer.
13	Using Windows Explorer (or equivalent program), create a corresponding bts–# folder in the *<lmf home directory>* 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 ***<lmf home directory>*\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 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 procedures 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*

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** or • 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, and – 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

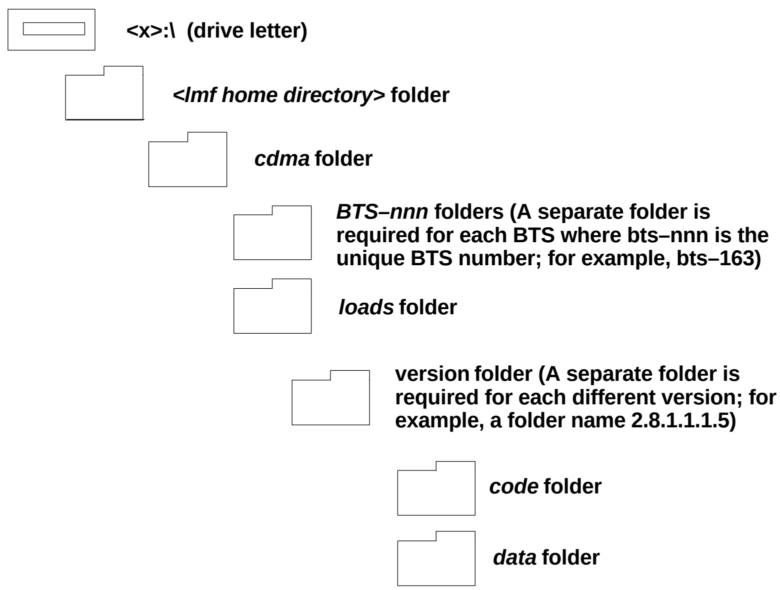
. . . continued on next page

Table 3-5: Creating a Named Hyperlink Connection for MMI Connection	
Step	**Action**
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.
10	Perform one of the following: • If the **Hyperterminal** folder window is still open (*Win 98*) proceed to step 12 or • 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 popup 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 an *<lmf home directory>* 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.

Figure 3-3: LMF Folder Structure



LMF to BTS Connection

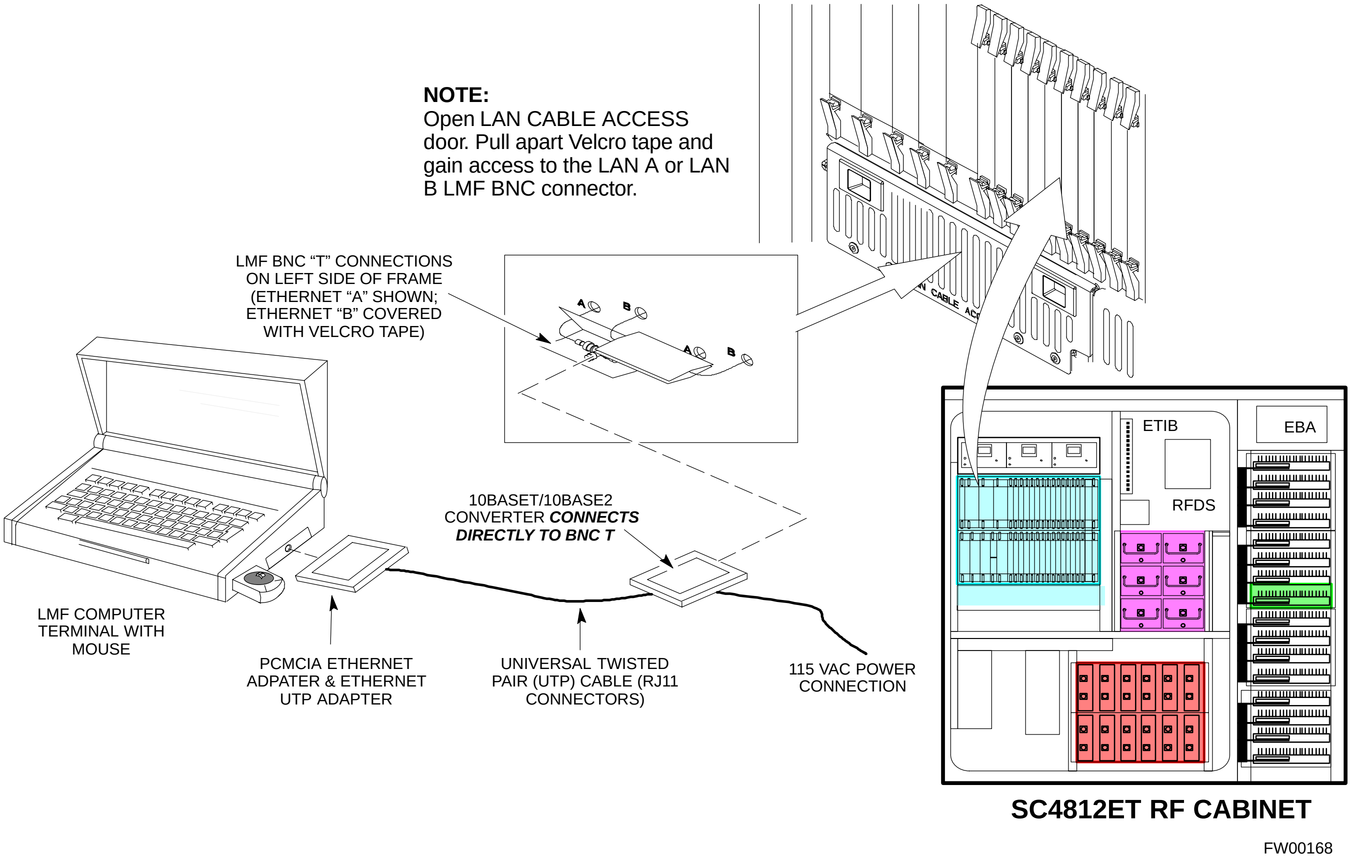
The LMF is connected to the LAN A or B connector located on the left side of the frame's lower air intake grill, behind the LAN Cable Access door (see Figure 3-4).

Table 3-6: LMF to BTS Connection

Step	Action
1	To gain access to the connectors, open the LAN Cable Access door, then *pull apart the Velcro® tape covering the BNC "T" connector* and slide out the computer service tray, if desired (see Figure 3-4).
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 BNC connector. If there is still no login response, see Table 6-1, Login Failure Troubleshooting Procedure. **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 3-4: LMF Connection Detail



Pinging the Processors

For proper operation, the integrity of the Ethernet LAN A and B links must be be verified. Figure 3-5 represents a typical BTS Ethernet configuration. The drawing depicts one (of two identical) links, A and B.

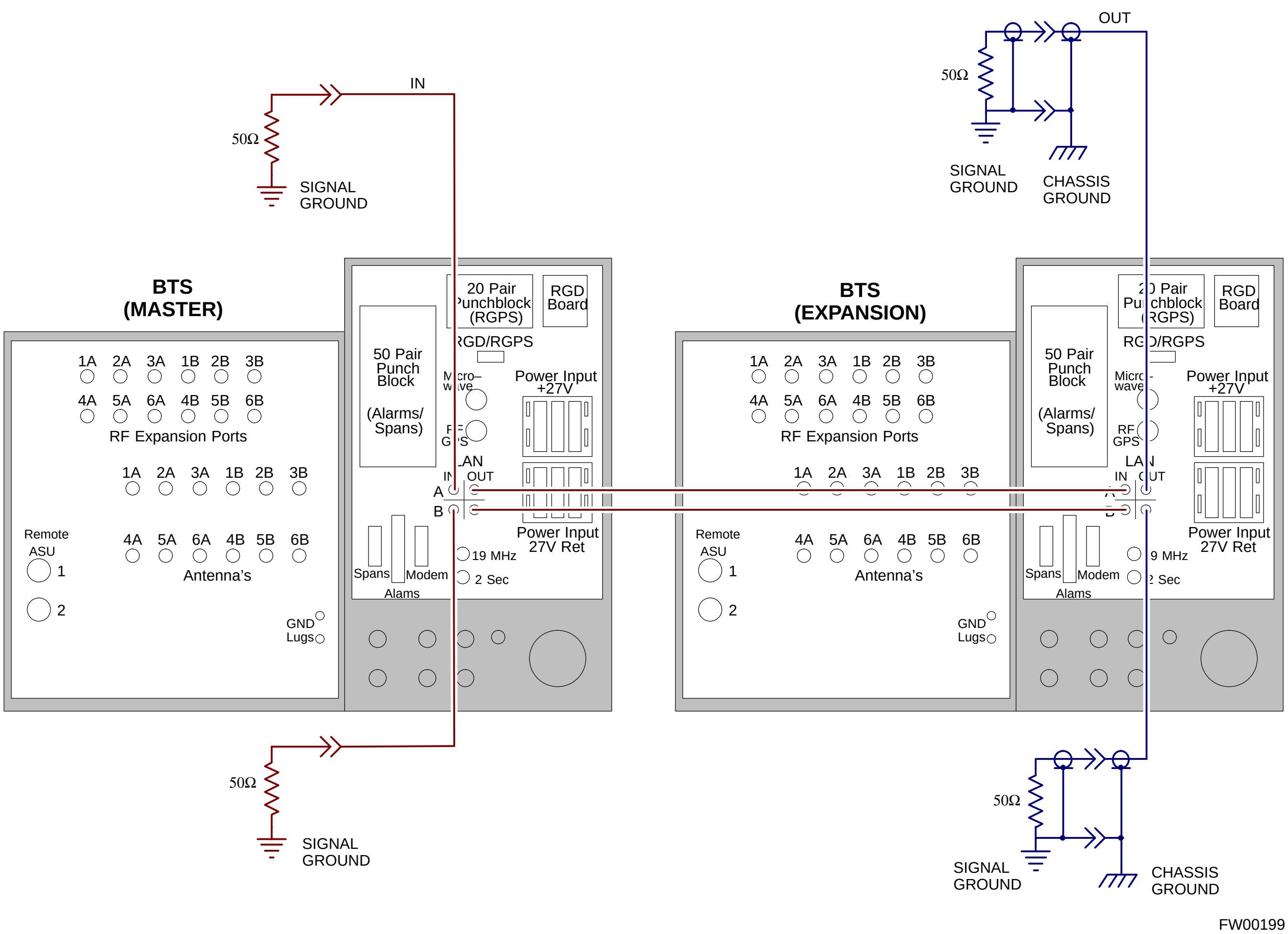
Ping is a program that sends request packets to the LAN network modules to get a response from the specified “target” module.

Follow the steps in Table 3-7 to ping each processor (on both LAN A and LAN B) and verify LAN redundancy is working properly.

CAUTION

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

Figure 3-5: BTS Ethernet LAN Interconnect Diagram



IMPORTANT

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

Table 3-7: Pinging the Processors

Step	Action
1	From the Windows desktop, click the **Start** button and select **Run.**
2	In the **Open** box, type **`ping`** **a**nd the **GLI2 IP address** (for example, **`ping 128.0.0.2)`**. **NOTE** 128.0.0.2 is the default IP address for the GLI2 in field BTS units.
3	Click on the **OK** button.
4	If the targeted module responds, 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 GLI2 fails to respond, it should be reset and re–pinged. If it still fails to respond, typical problems are shorted BNC to inter-frame cabling, open cables, crossed A and B link cables, or the GLI2 itself.

Basic LMF Operation

NOTE

The terms “CDMA LMF” and “WinLMF” are interchangeable

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.*

Basic LMF Command Line Interface (CLI) Operation

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

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

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

CLI Format Conventions

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

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

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

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

Refer to the *LMF CLI Commands, R 15.X (68P09251A59)* for a complete explanation of the CLI commands and their use.

Logging into a BTS

IMPORTANT

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

Logging into a BTS establishes a communications link between the BTS and the CDMA LMF. You may be logged into one or more BTS's 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 3-4). Follow the procedure in Table 3-8 to log into a BTS.

Prerequisites

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

- The LMF 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 was 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 3-6 and Figure 3-4).

BTS Login from the GUI Environment

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

Table 3-8: BTS GUI Login Procedure

Step	Action
1	Start the LMF GUI environment by clicking on the WinLMF desktop icon (if the LMF's 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 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 **Login** tab (if not displayed).
3	If no base stations are displayed in the **Available Base Stations** pick list, double click on the **CDMA** icon.
4	Click on the desired BTS number.
5	Click on the **Network Login** tab (if not already in the forefront).
6	Enter correct IP address (normally **128.0.0.2** for a field BTS) if not correctly displayed in the **IP Address** box. **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.
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 log in 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 procedures in Table 3-9 to log into a BTS when using the GUI environment

Table 3-9: 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 TS (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 BTS is logged into in both the GUI and the CLI environments at the same time, logging out of the BTS in either environment will log out of it for both. When either a login or logout is performed in the CLI window, there is no GUI indication that the login or logout has occurred.

Logging Out of a BTS from the GUI Environment

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

Table 3-10: BTS GUI Logout Procedure

Step	Action
1	Click on **Select** on the BTS tab menu bar.
2	Click the **Logout** item in the pulldown menu (a **Confirm Logout** pop–up message will appear).

. . . continued on next page

Table 3-10: BTS GUI Logout Procedure	
Step	**Action**
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** popup message will appear 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** popup message appears stating that the system could not log out of the Base Station because the given BTS is not logged in, click **OK** and proceed to step 5.
5	Select **File** > **Exit** in the window menu bar, click **Yes** in the **Confirm Logout** popup, and click **Yes** in the **Logout Error** popup which appears again.
6	If further work is to be done in the GUI, restart it.

Logging Out of a BTS from the CLI Environment

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

Table 3-11: 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 will be 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 will be displayed before the window closes: `Killing background processes....`

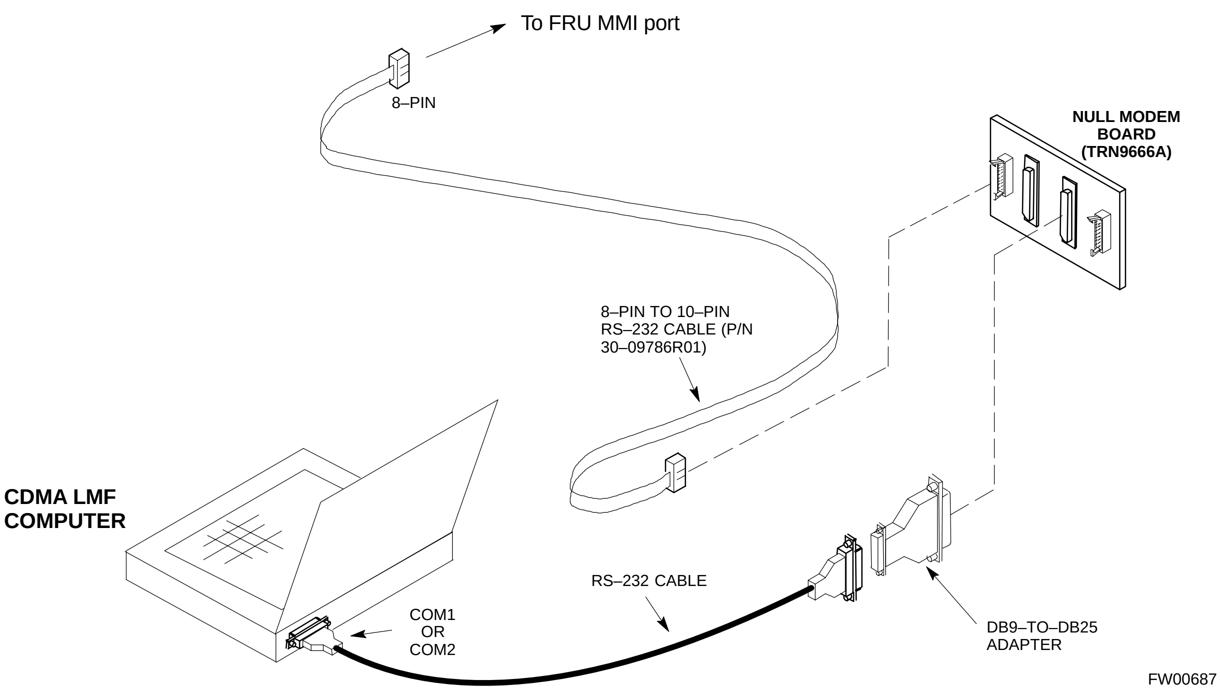
Establishing an MMI Communication Session

For those procedures that require MMI communications between the LMF and BTS FRUs, follow the procedure in Table 3-12 to initiate the communication session.

Table 3-12: Establishing MMI Communications

Step	Action
1	Connect the LMF computer to the equipment as detailed in the applicable procedure that requires MMI communication session.
2	Start the named HyperTerminal connection for MMI sessions by double clicking on its Windows desktop shortcut. **NOTE** If a Windows desktop shortcut was not created for the MMI connection, access the connection from the Windows Start menu by selecting: **Programs>Accessories>Hyperterminal>HyperTerminal><*Named HyperTerminal Connection (e.g., MMI Session)*.**
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 3-6: CDMA LMF Computer Common MMI Connections



Download Code

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 Manager (CSM)
- Multi Channel Card (MCC24E or MCC8E)
- Broadband Transceiver (BBX2)
- 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 3-13 to download the firmware application code for the MGLI2. The download code action downloads data and also enables the MGLI2.

Prerequisites

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

WARNING

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 BTS is to be upgraded, the optimization and ATPs should be accomplished with the prior code load. Then the site should be upgraded by the CBSC. The optimization and ATP procedures do not have to be performed again after the upgrade. If a replacement device needs to be used in a BTS with a later version of software, 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.

Table 3-13: Download and Enable MGLI2

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

Download Code and Data to Non–MGLI2 Devices

Non–MGLI2 devices can be downloaded individually or all equipped devices can be downloaded with one action. Follow the procedure in Table 3-14 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 3-14: 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 Select CSM Source function can be used to select the clock source for each of the three inputs. This function is only used if the clock source for a CSM needs to be changed. The Clock Source function provides the following clock source options.

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

Prerequisites

MGLI=INS_ACT, CSM= OOS_RAM or INS_ACT

Table 3-15: 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 is displayed showing the results of the selection action.
7	Click on the **OK** button to close the status report window.

Enable CSMs

Each BTS CSM system features two CSM boards per site. In a typical operation, the primary CSM locks its Digital Phase Locked Loop (DPLL) circuits to GPS signals. These signals are generated by either an on–board GPS module (RF–GPS) or a remote GPS receiver (R–GPS). The CSM2 card is required when using the R–GPS. The GPS receiver (mounted on CSM 1) is used as 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 LORAN–C LFR, HSO, or external 10 MHz Rubidium source which the CSM can use as a secondary timing reference. In all cases, the CSM monitors and determines what reference to use at a given time.

IMPORTANT

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

Follow the steps outlined in Table 3-16 to enable the CSMs installed in the C–CCP shelves.

Table 3-16: Enable CSMs

Step	Action
1	Click on the target CSM. From the **Device** pull down, select **Enable**. **NOTE** If equipped with two CSMs, enable CSM–2 first A status report is displayed confirming change in the device(s) status. Click **OK** to close the status report 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*** (see below). *** IMPORTANT** The GPS satellite system satellites are not in a geosynchronous orbit and are maintained and operated by the United States Department of Defense (D.O.D.). The D.O.D. periodically alters satellite orbits; therefore, satellite trajectories are subject to change. A GPS receiver that is INS contains an “almanac” that is updated periodically to take these changes into account. If a GPS receiver has not been updated for a number of weeks, it may take up to an hour for the GPS receiver “almanac” to be updated. Once updated, the GPS receiver must track at least four satellites and obtain (hold) a 3–D position fix for a minimum of 45 seconds before the CSM will come in service. (In some cases, the GPS receiver needs to track only one satellite, depending on accuracy mode set during the data load).

. . . continued on next page

Table 3-16: Enable CSMs

Step	Action
2	**NOTE** If equipped with two CSMs, CSM–1 should be bright green (INS–ACT) and CSM–2 should be dark green(INS–STB) If more than an hour has passed, refer to CSM Verification, see Figure 3-7 and Table 3-19 to determine the cause.
	NOTE After the CSMs have been successfully enabled, observe the PWR/ALM LEDs are steady green (alternating green/red indicates the card is in an alarm state).

Enable MCCs

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

Follow the steps outlined in Table 3-17 to enable the MCCs installed in the C–CCP shelves.

IMPORTANT

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

Table 3-17: Enable MCCs

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

Clock Synchronization Manager System Time

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.

Each CSM2 board features an ovenized, crystal oscillator that provides 19.6608 MHz clock, even second pulse, and 3 MHz referenced to the selected synchronization source (see Table 3-19):

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

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.

Synchronization between the primary and redundant CSM CCD pairs, as well as the LFR or HSO back–up to GPS synchronization, increases reliability.

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

NOTE

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

CSM Frequency Verification

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

Test Equipment Setup (GPS & LFR/HSO Verification)

Follow the steps outlined in Table 3-18 to set up test equipment.

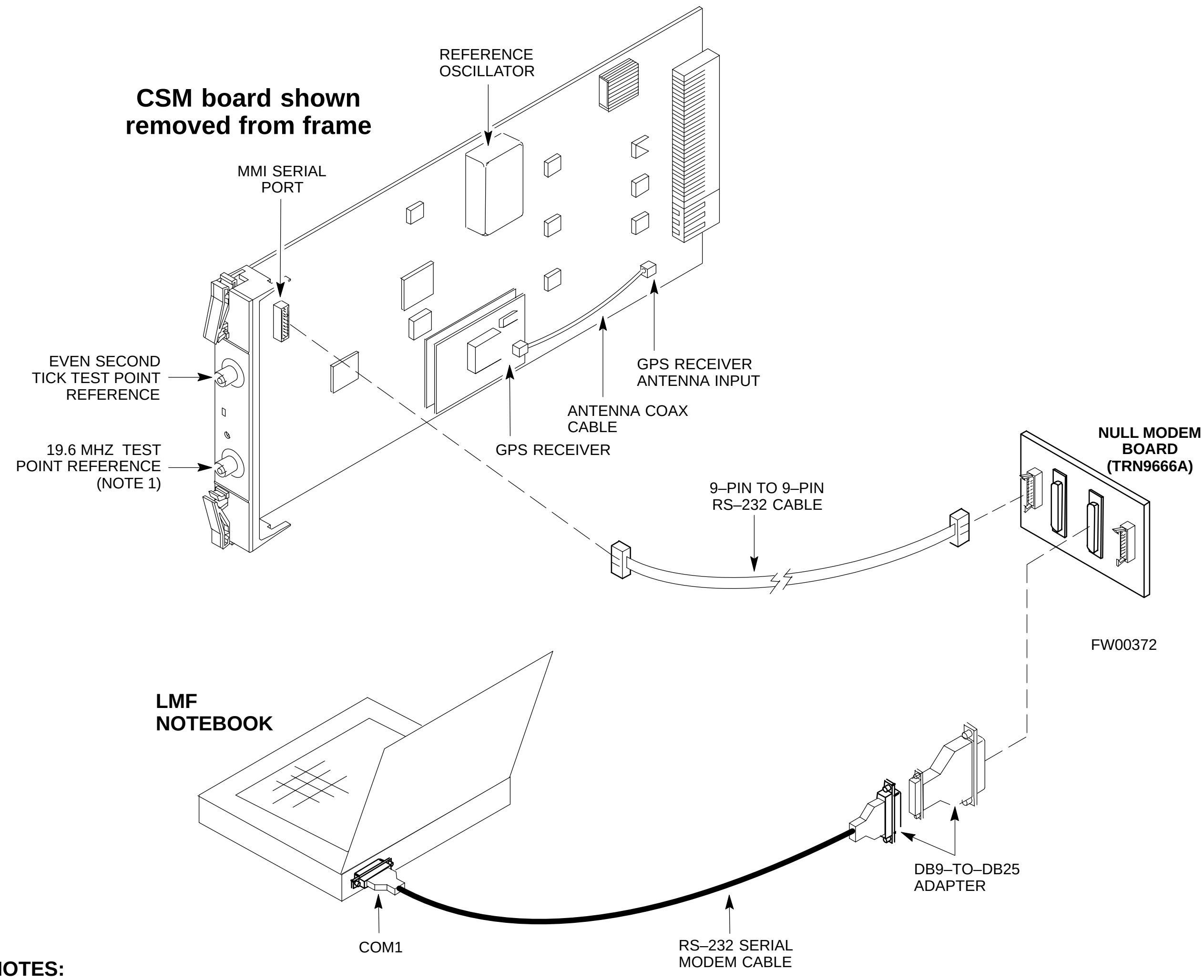
Table 3-18: Test Equipment Setup (GPS & LFR/HSO Verification)

Step	Action
1a	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.
1b	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 (see Figure 3-7).
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 be running when a Hyperterminal session is started.
5	When the terminal screen appears press the **Enter** key until the **CSM>** prompt appears.

CAUTION

- Connect 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.

Figure 3-7: 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 steps outlined in Table 3-19 to connect to CSM–1 installed in the C–CCP shelf, verifying that it is functioning normally.

Table 3-19: GPS Initialization/Verification

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>To verify that <code>Clock alarms (0000)</code>, <code>Dpll is locked and has a reference source</code>, and <code>GPS self test passed</code> messages are displayed within the report, issue the following MMI command

bstatus

– Observe the following typical response:<pre>
CSM Status INS:ACTIVE Slot A Clock MASTER.
   BDC_MAP:000, This CSM’s BDC Map:0000

Clock Alarms (0000):

   DPLL is locked and has a reference source.
   GPS receiver self test result: passed

   Time since reset 0:33:11, time since power on: 0:33:11
</pre></td></tr>
<tr><td>2</td><td>Enter the following command at the <code>CSM></code> prompt to display the current status of the Loran and the GPS receivers.

sources

– Observe the following typical response for systems equipped with LFR:<pre>
N Source Name Type   TO Good Status   Last Phase Target Phase Valid
----
0 LocalGPS   Primary   4   YES Good   0   0   Yes
1 LFR CHA   Secondary 4   YES Good   –2013177   –2013177   Yes
2 Not Used
Current reference source number: 0
</pre>– Observe the following typical response for systems equipped with HSO:<pre>
Num Source Name Type   TO Good   Status Last Phase Target Phase Valid
----
 0   Local GPS   Primary 4   Yes   Good   3   0   Yes
 1   HSO   Backup   4   No   N/A   timed–out* Timed–out*   No
</pre>*NOTE “Timed–out” should only be displayed while the HSO is warming up. “Not–Present” or “Faulty” should not be displayed. If the HSO does not appear as one of the sources, then configure the HSO as a back–up source by entering the following command at the CSM> prompt:

ss 1 12

After a maximum of 15 minutes, the Rubidium oscillator should reach operational temperature and the LED on the HSO should now have changed from red to green. After the HSO front panel LED has changed to green, enter sources <cr> at the CSM> prompt. Verify that the HSO is now a valid source by confirming that the bold text below matches the response of the “sources” command.

The HSO should be valid within one (1) minute, assuming the DPLL is locked and the HSO rubidium oscillator is fully warmed.<pre>
Num Source Name Type   TO Good   Status Last Phase Target Phase Valid
----
 0   Local GPS   Primary 4   Yes   Good   3   0   Yes
 1   HSO   Backup   4   Yes   N/A   xxxxxxxxxx xxxxxxxxxx   Yes
</pre></td></tr>
</table>

. . . continued on next page

<table>
<tr><th colspan="2">Table 3-19: GPS Initialization/Verification</th></tr>
<tr><th>Step</th><th>Action</th></tr>
<tr><td rowspan="2">3</td><td>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.</td></tr>
<tr><td>* 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</td></tr>
<tr><td>4</td><td>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.</td></tr>
</table>

. . . continued on next page

3

Table 3-19: GPS Initialization/Verification	
Step	**Action**
5	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.`
6	**Verify** the following GPS information (shown above in underlined text): – At least 4 satellites are tracked, and 4 satellites are visible. – GPS Receiver Control Task State is “tracking satellites”. ***Do not continue until this occurs!*** – Dilution of Precision indication is not more that 30. **Record** the current position base site latitude, longitude, height and height reference (height reference to Mean Sea Level (MSL) or GPS height (GPS). (GPS = 0 MSL = 1).

. . . continued on next page

Table 3-19: GPS Initialization/Verification

Step	Action
7	**If steps 1 through 6 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.
8	Enter the following commands at the `CSM>` prompt to verify that the CSM is warmed up and that GPS acquisition has taken place. **debug dpllp** Observe the following typical response if the CSM is not warmed up (15 minutes from application of power) ***(If warmed–up proceed to step 9)*** `CSM>DPLL Task Wait. 884 seconds left.` `DPLL Task Wait. 882 seconds left.` `DPLL Task Wait. 880 seconds left.   ...........etc.`
	NOTE The **warm** command can be issued at the MMI port used to force the CSM into warm–up, but the reference oscillator will be unstable.
9	Observe the following typical response if the CSM is warmed up. `c:17486 off: –11, 3, 6 TK SRC:0 S0: 3 S1:–2013175,–2013175` `c:17486 off: –11, 3, 6 TK SRC:0 S0: 3 S1:–2013175,–2013175` `c:17470 off: –11, 1, 6 TK SRC:0 S0: 1 S1:–2013175,–2013175` `c:17486 off: –11, 3, 6 TK SRC:0 S0: 3 S1:–2013175,–2013175` `c:17470 off: –11, 1, 6 TK SRC:0 S0: 1 S1:–2013175,–2013175` `c:17470 off: –11, 1, 6 TK SRC:0 S0: 1 S1:–2013175,–2013175`
10	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.
11	Enter the following commands at the `CSM>` prompt to exit the debug mode display. **debug dpllp**

LORAN–C Initialization/Verification

Table 3-20: LORAN–C Initialization/Verification

<table>
<tr><th>Step</th><th>Action</th><th>Note</th></tr>
<tr><td>1</td><td>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></td><td>This must be greater than 100 before LFR becomes a valid source.

This shows the LFR is locked to the selected PLL station.

This search list and PLL data must match the configuration for the geographical location of the cell site.</td></tr>
</table>

. . . continued on next page

<table>
<tr><th colspan="2">Table 3-20: LORAN–C 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 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   Yes   Good   –2013177   –2013177   Yes
 2   Not used
Current reference source number: 1
</pre></td></tr>
<tr><td rowspan="2">4</td><td colspan="2">LORAN 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 colspan="2">NOTE
LFR functionality should be verified using the “source” command (as shown in Step 3). Use the underlined responses on the LFR row to validate correct LFR operation.</td></tr>
<tr><td>5</td><td colspan="2">Close the hyperterminal window.</td></tr>
</table>

Connecting Test Equipment to the BTS

All test equipment is controlled by the LMF via 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 test equipment is required to perform optimization, calibration and ATP tests:

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

Refer to Table 3-21 for an overview of connections for test equipment currently supported by LMF. In addition, see the following figures:

- Figure 3-9 and Figure 3-10 show the test set connections for TX calibration
- Figure 3-11 and Figure 3-12 show the test set connections for optimization/ATP tests

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 (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 30 dB directional coupler for an 800 MHz BTS and the 30 dB directional coupler plus a 20 dB in-line attenuator for a 1.9 GHz BTS.

Test Equipment Setup Chart

Table 3-21 depicts the current test equipment available meeting Motorola standards.

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

Table 3-21: 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 IN/ OUT	RF OUT 50–OHM	DUPLEX	DUPLEX OUT	RF OUT ONLY					RX1–12

Equipment Warm-up

IMPORTANT

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

WARNING

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

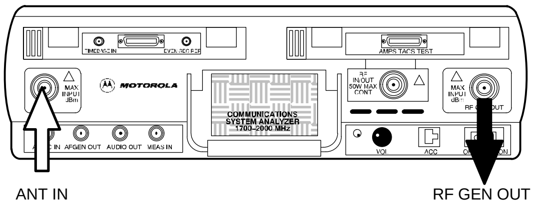
Cable Calibration Setup

Figure 3-8 shows the cable calibration setup for various supported test sets. The left side of the diagram depicts the location of the input and output ports of each test set, and the right side details the set up for each test. Table 3-25 provides a procedure for calibrating cables.

Figure 3-8: Cable Calibration Test Setup

SUPPORTED TEST SETS

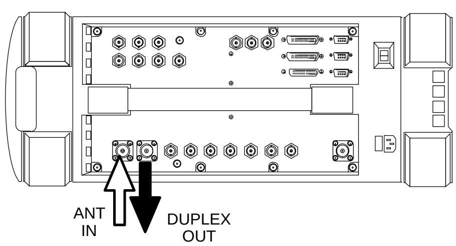
Motorola CyberTest



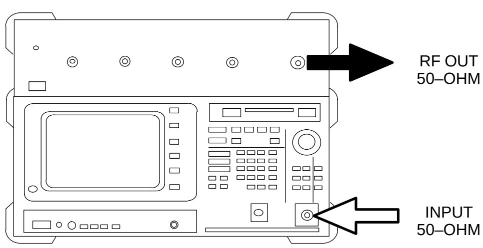
Note: The Directional Coupler is not used with the Cybertest Test Set. The TX cable is connected directly to the Cybertest Test Set.

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.

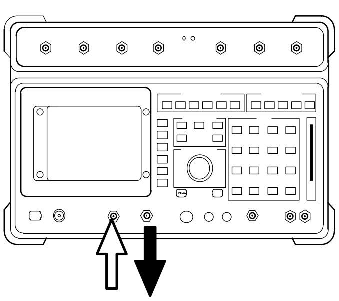
Hewlett–Packard Model HP 8935



Advantest Model R3465



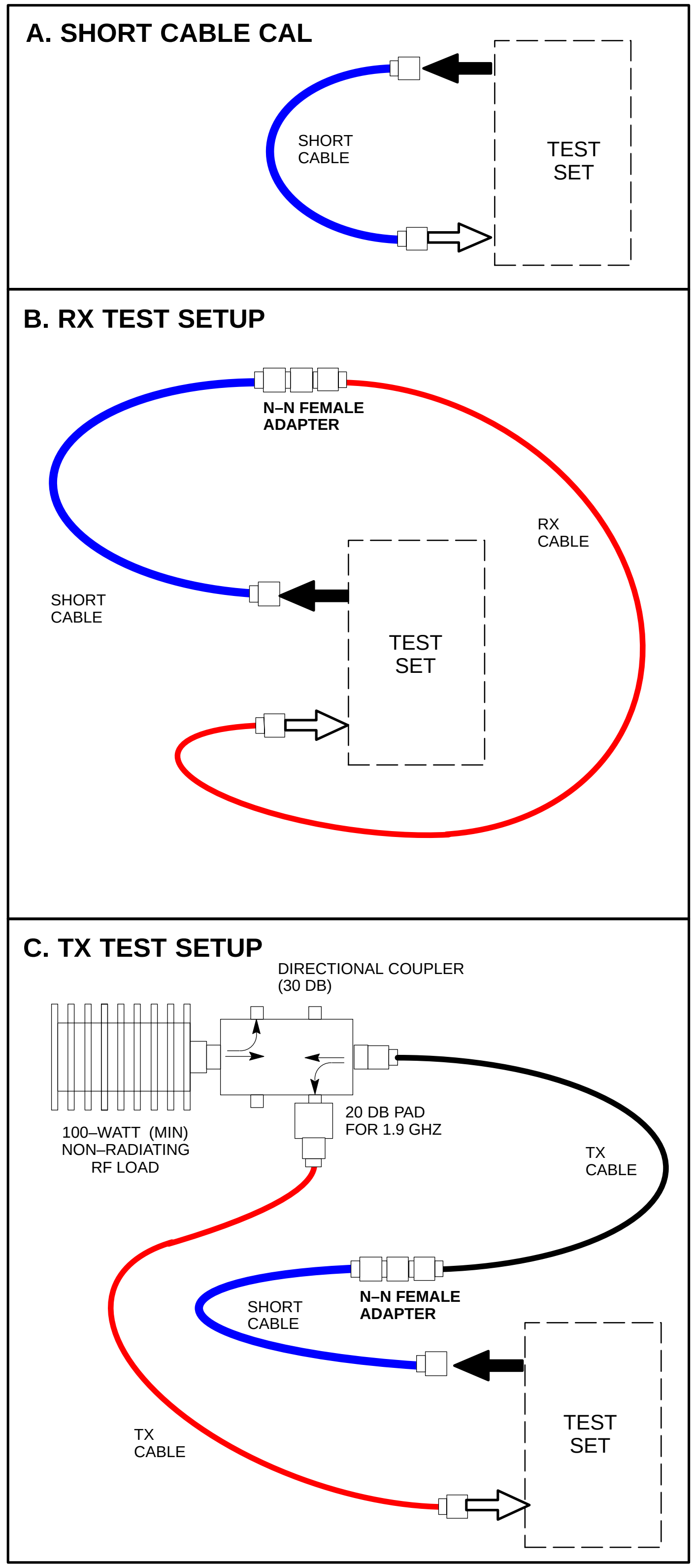
Hewlett–Packard Model HP 8921A



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

FW00089

CALIBRATION SET UP



3

Setup for TX Calibration

Figure 3-9 and Figure 3-10 show the test set connections for TX calibration.

Figure 3-9: TX Calibration Test Setup (CyberTest and HP 8935)

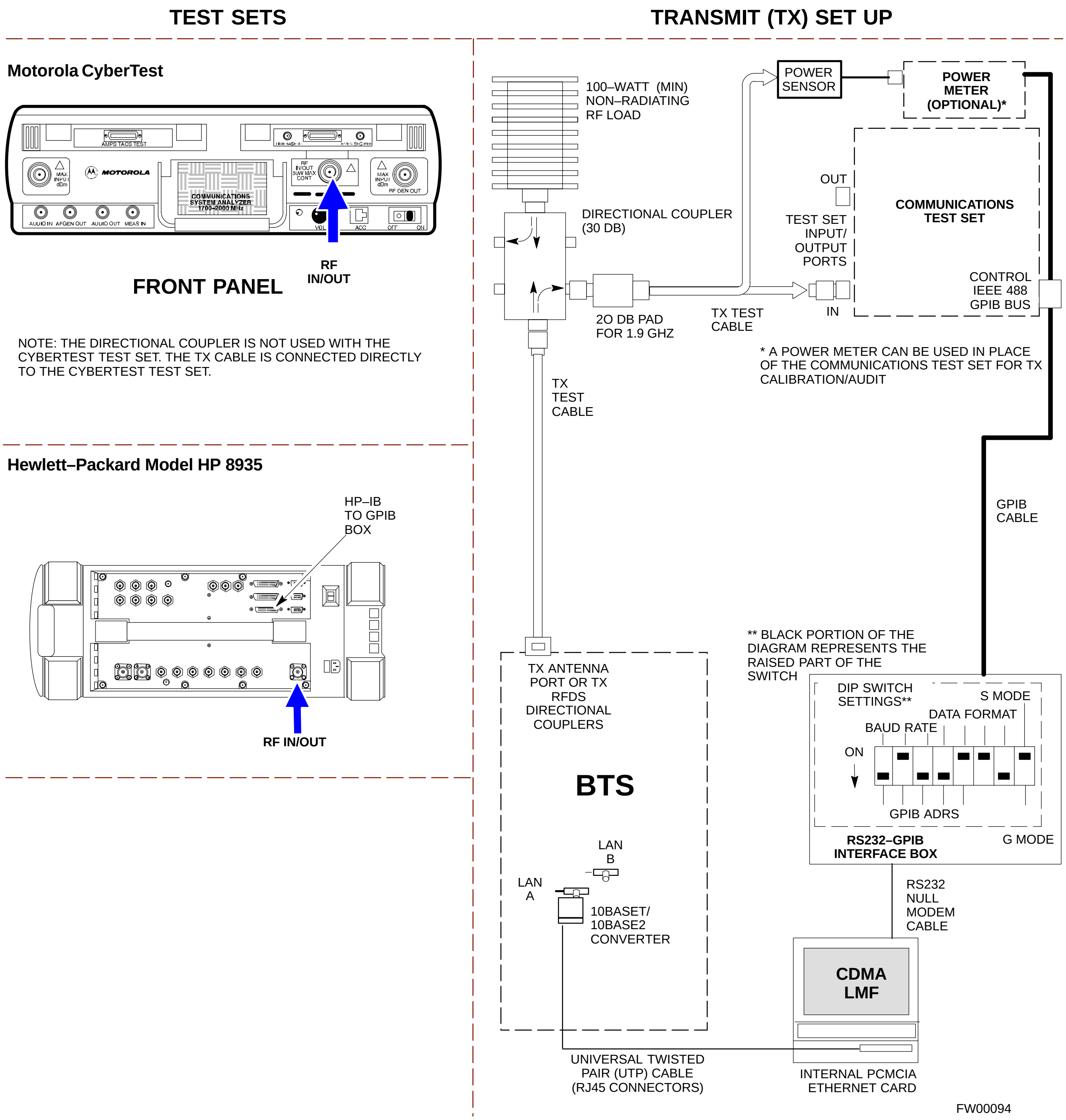
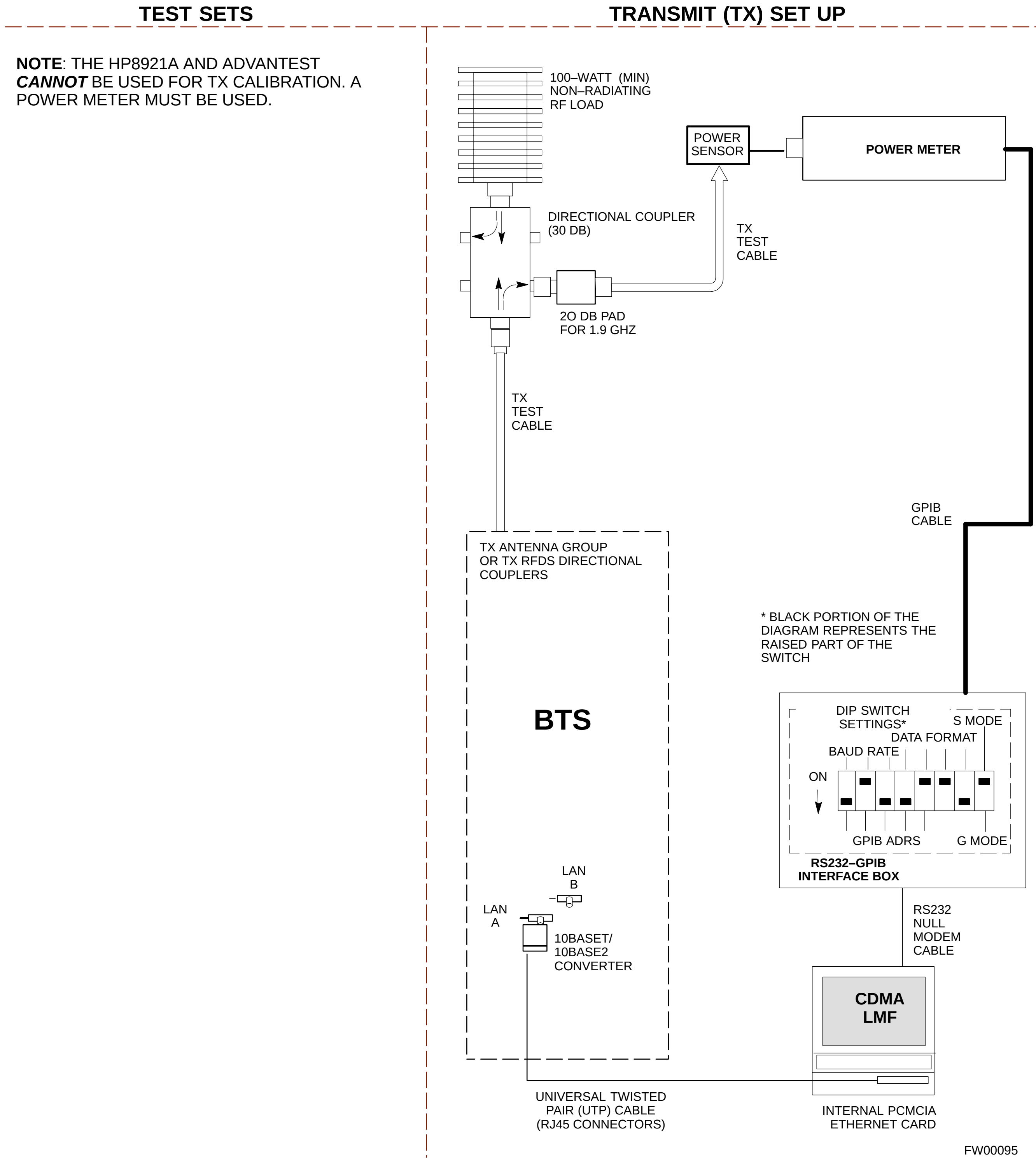


Figure 3-10: TX Calibration Test Setup HP 8921A and Advantest



3

Setup for Optimization/ATP

Figure 3-11 and Figure 3-12 show the test set connections for optimization/ATP tests.

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

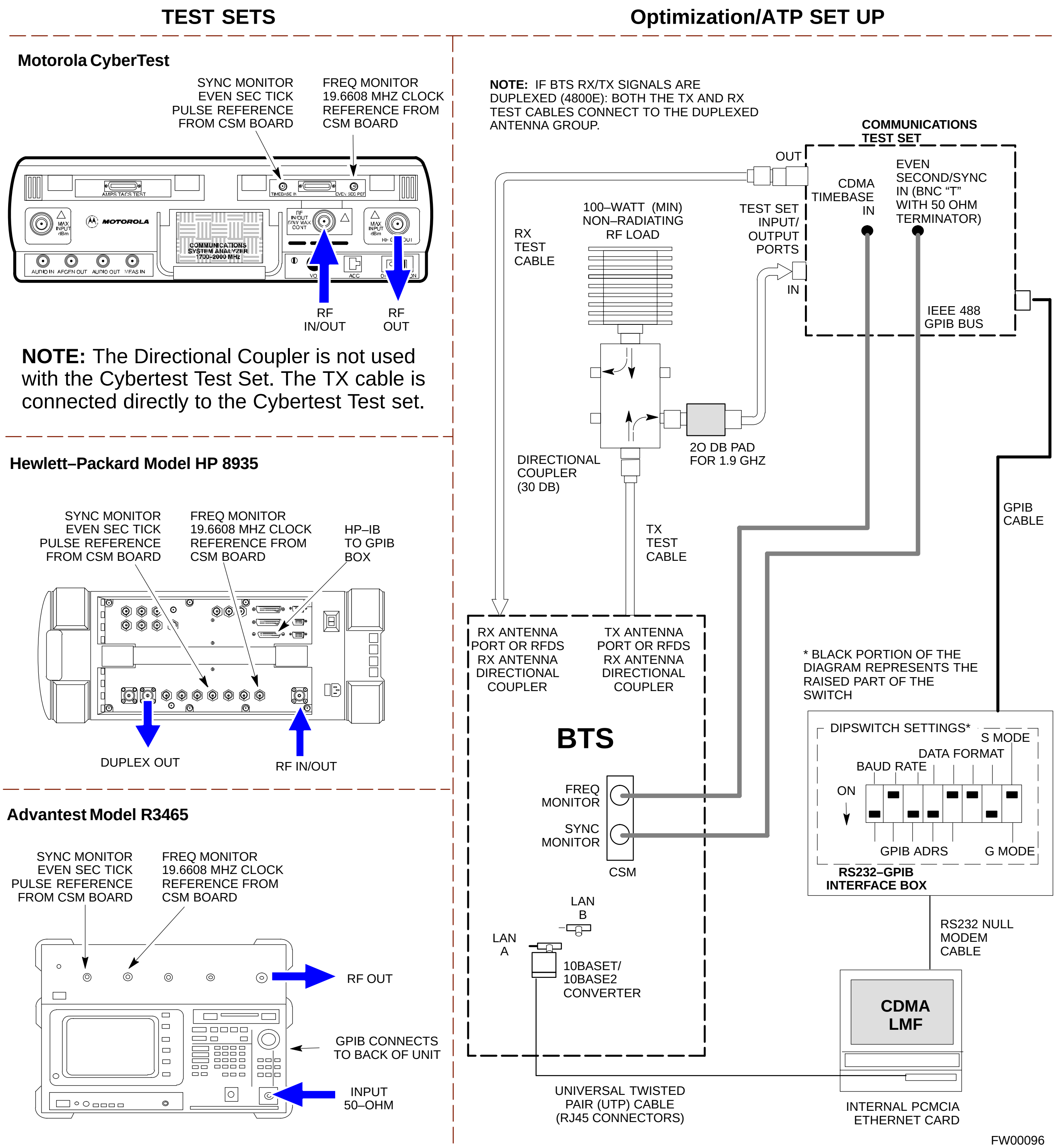
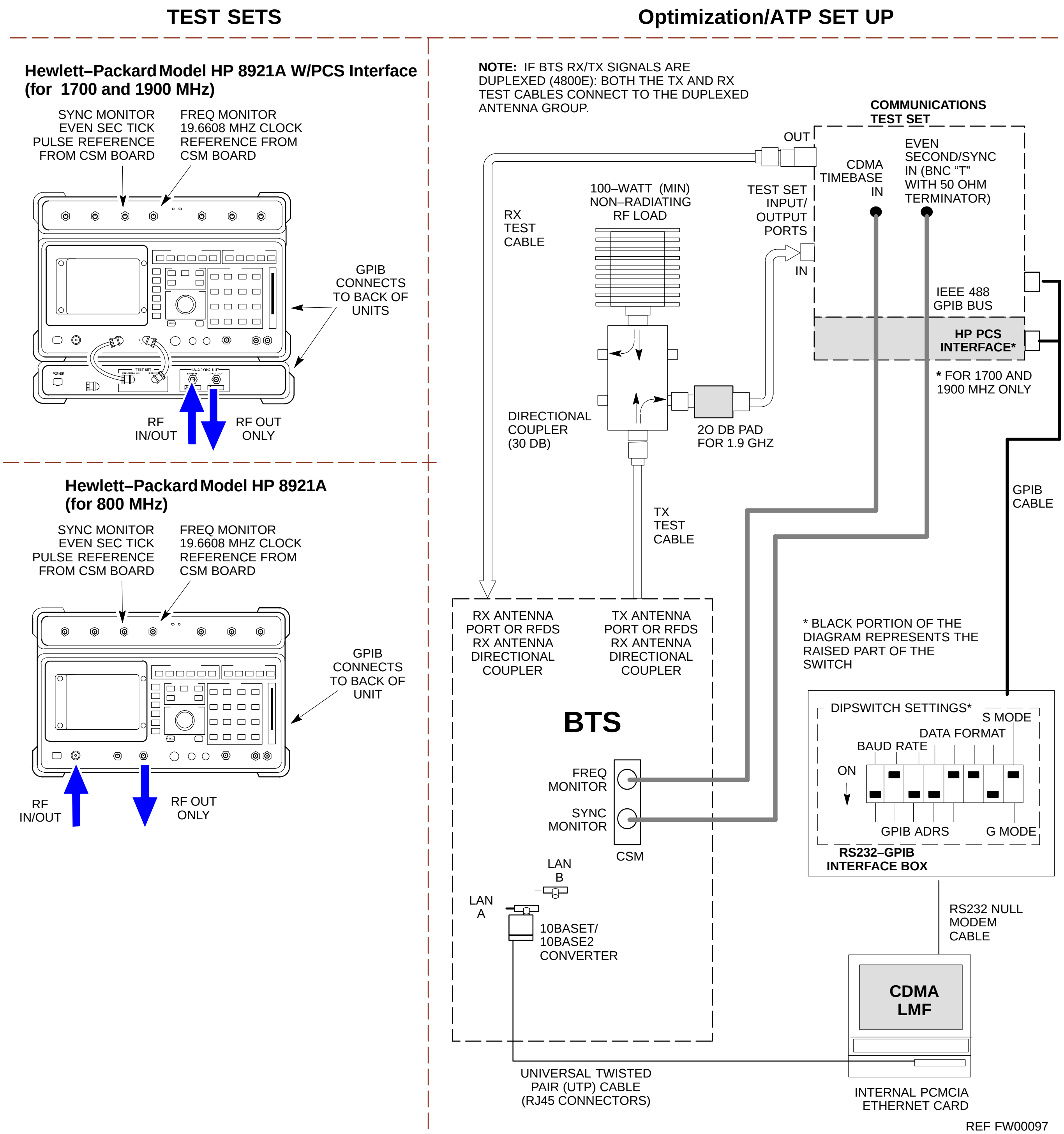


Figure 3-12: Optimization/ATP Test Setup HP 8921A



3

Background

Proper test equipment setup 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

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

Selecting Test Equipment

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

Prerequisites

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

Ensure the following has been completed before selecting test equipment:

- Test equipment is correctly connected and turned on.
- 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. CDMA LMF does not check to see if the test equipment is actually detected for manual specification.

Table 3-22: 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 will darken until the selection has been committed.) **NOTE** With manual selection, CDMA LMF does not detect the test equipment to see if it is connected and communicating with CDMA LMF.
8	Click on **Dismiss** to close the test equipment window.

Automatically Selecting Test Equipment in a Serial Connection Tab

When using the auto-detection feature to select test equipment, the CDMA LMF examines which test equipment items are actually communicating with CDMA LMF. Follow the procedure in Table 3-23 to use the auto-detect feature.

Table 3-23: 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 will be used for RF power measurements (i.e., TX calibration). The address for a power meter is normally **13** and the address for a CDMA analyzer is normally **18**. If **13,18** is included in the **GPIB addresses to search** box, the power meter (13) will be used for RF power measurements. If the test equipment items are manually selected the CDMA analyzer is used only if a power meter is not selected.
6	Click **Apply.** The button will darken until the selection has been committed. A check mark will appear in the **Manual Configuration** section for detected test equipment items.
7	Click **Dismiss** to close the **LMF Options** window.

Calibrating Test Equipment

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

Calibrate Test Equipment from the **Util** menu list is used to calibrate test equipment item *before* being used for testing. The test equipment must be selected before beginning calibration. Follow the procedure in Table 3-24 to calibrate the test equipment.

Table 3-24: Test Equipment Calibration

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

Calibrating Cables

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

- Measure the loss of a short cable. This is done to compensate for any measurement error of the analyzer. The short cable, which is used only for the calibration process, is used in series with both the TX and RX cable configuration when they are measured. The measured loss of the short cable is deducted from the measured loss of the TX and RX cable configuration to determine the actual loss of the TX and RX cable configurations. This deduction is done so any error in the analyzer measurement will be adjusted out of both the TX and RX measurements.
- The short cable plus the RX cable configuration loss is measured. The RX cable configuration normally consists only of a coax cable with type–N connectors that is long enough to reach from the BTS RX port the test equipment.
- The short cable plus the TX cable configuration loss is measured. The TX cable configuration normally consists of two coax cables with type–N connectors and a directional coupler, a load, and an additional attenuator if required by the BTS type. The total loss of the path loss of the TX cable configuration must be as required for the BTS (normally 30 or 50 dB). The Motorola Cybertest analyzer is different in that the required attenuation/load is built into the test set so the TX cable configuration consists only of the required length coax cable.

Calibrating Cables with a CDMA Analyzer

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

NOTE

LMF cable calibration cannot be accomplished with an HP8921A analyzer for 1.9 MHz. A different analyzer type or the signal generator and spectrum analyzer method must be used (refer to Table 3-26 and Table 3-27). Cable calibration values must be manually entered if the signal generator and spectrum analyzer method is used. For the HP8921A, refer to Appendix F.

The test equipment must be selected before this procedure can be started. Follow the procedure in Table 3-25 to calibrate the cables. Figure 3-8 illustrates the cable calibration test equipment setup.

Table 3-25: Cable Calibration

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

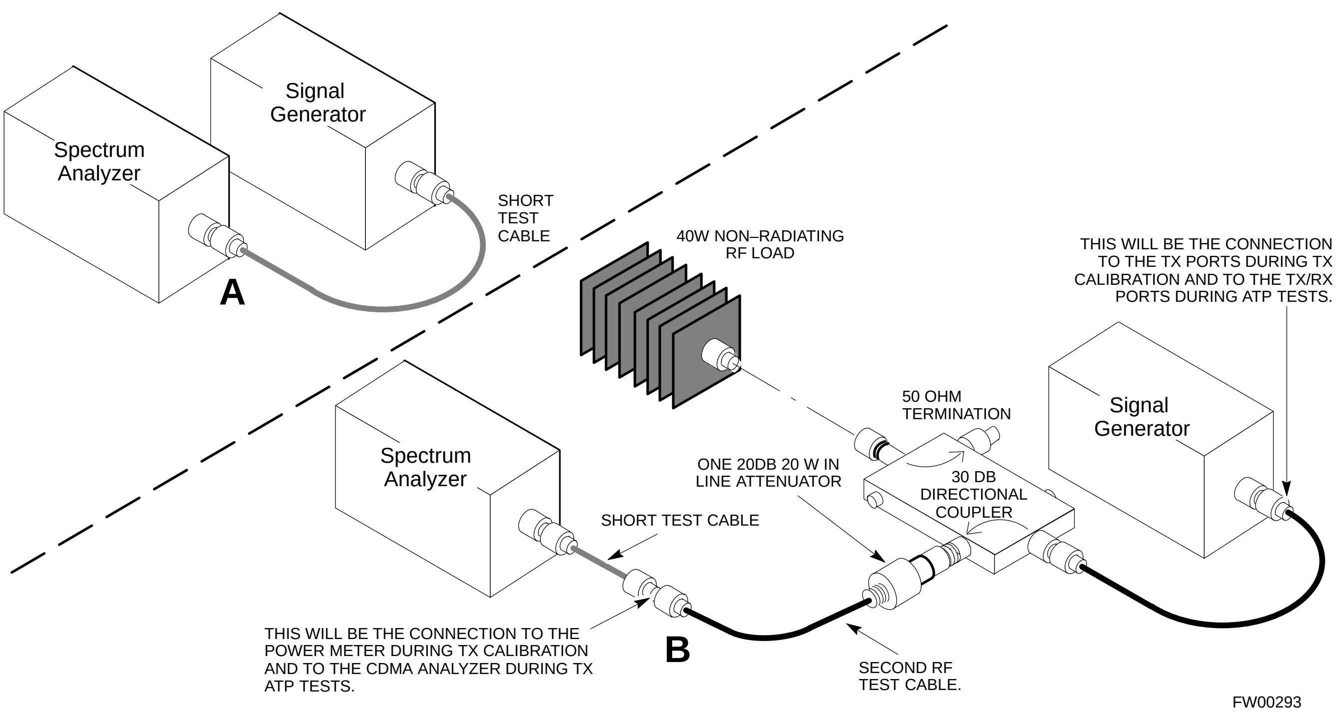
Calibrating TX Cables Using a Signal Generator and Spectrum Analyzer

Follow the procedure in Table 3-26 to calibrate the TX cables using the signal generator and spectrum analyzer. Refer to Figure 3-13 for a diagram of the signal generator and spectrum analyzer.

Table 3-26: 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 1840–1870 MHz band for Korea PCS and 1930–1990 MHz band for North American PCS.
3	Use spectrum analyzer to measure signal generator output (see Figure 3-13, “A”) and record the value.
4	Connect the spectrum analyzer’s short cable to point “B”, as shown in the lower portion of the diagram, to measure cable output at customer frequency (1840–1870 MHz for Korea PCS and 1930–1990 MHz for North American PCS) and record the value at point “B”.
5	Calibration factor = A – B Example: Cal = –1 dBm – (–53.5 dBm) = 52.5 dB **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 3-13: Calibrating Test Equipment Setup for TX Cable Calibration (Using Signal Generator and Spectrum Analyzer)



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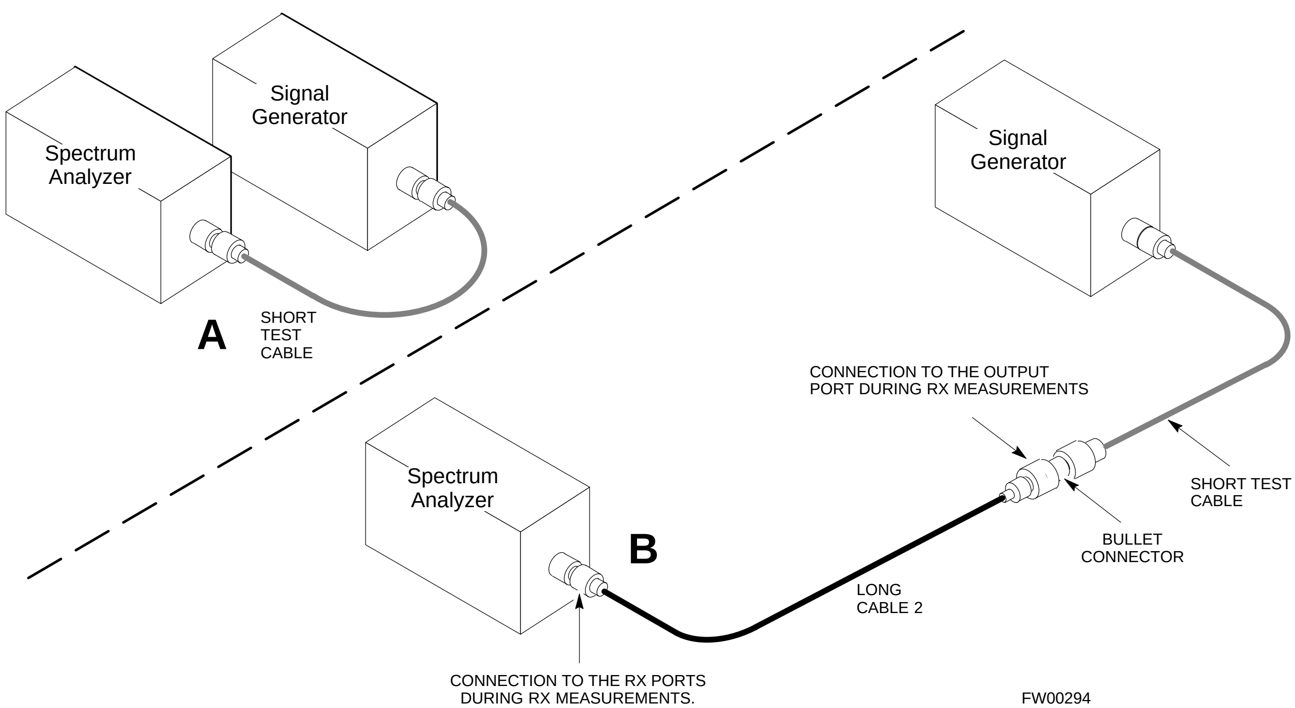
Calibrating RX Cables Using a Signal Generator and Spectrum Analyzer

Follow the procedure in Table 3-27 to calibrate the RX cables using the signal generator and spectrum analyzer. Refer to Figure 3-14, if required.

Table 3-27: 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 1750–1780 MHz for Korean PCS and 1850–1910 MHz band for North American PCS.
3	Use spectrum analyzer to measure signal generator output (see Figure 3-14, "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 in the 1850–1910 MHz band. Record the value at point ''B".
5	Calibration factor = A – B Example: Cal = –12 dBm – (–14 dBm) = 2 dB **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 3-14: 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 with use of the applicable test equipment. The resulting values are stored in the cable loss files. The cable loss values can also be set/changed manually.

Prerequisites

- Logged into the BTS

Table 3-28: Setting Cable Loss Values

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

Setting TX Coupler Loss Value

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

Prerequisites

- Logged into the BTS

Table 3-29: Setting TX Coupler Loss Values

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

Introduction

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 (BBX2 slot) at the BTS site and stores that value in the CAL file. The BLOs are subsequently downloaded to each BBX2.

Each receive path starts at a BTS RX antenna port and terminates at a backplane BBX2 slot. Each transmit path starts at a BBX2 backplane slot, travels through the LPA, and terminates at a BTS TX antenna port.

Calibration identifies the accumulated gain in every transmit path (BBX2 slot) at the BTS site and stores that value in the CAL file. Each transmit path starts at a C–CCP shelf backplane BBX2 slot, travels through the LPA, and ends at a BTS TX antenna port. When the TX path calibration is performed, the RX path BLO will automatically be set to the default value.

When to Calibrate BLOs

Calibration of BLOs is required after initial BTS installation.

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

- BBX2 board
- C–CCP shelf
- CIO card
- CIO to LPA backplane RF cable
- LPA backplane
- LPA
- TX filter / TX filter combiner
- TX thru-port cable to the top of frame

3

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 BBX2 boards), move BBX2 boards from shelves currently not under test and install them into the empty BBX2 slots of the shelf currently being tested to insure that all BBX2 TX paths are tested.

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

BLO Calibration Data File

During the calibration process, the LMF creates a calibration (BLO) data file. After calibration has been completed, this offset data must be downloaded to the BBX2s 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 BBX2 slots. **Slot** 20 contains the calibration data for the redundant BBX2 (see Table 3-31). Each BBX2 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 BBX2 is organized as a large flat array. The array is organized by branch, BBX2 slot, and calibration point.
  - The first breakdown of the array indicates which branch the contained calibration points are for. The array covers transmit, main receive and diversity receive offsets as follows:

Table 3-30: BLO BTS.cal file Array Branch Assignments

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

– The second breakdown of the array is per sector. Three sectors are allowed.

Table 3-31: BTS.cal File Array (Per Sector)

BBX2	Sectorization		TX	RX	RX Diversity
Slot[1] (Primary BBX2s 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 BBX2–13)					
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]

- Refer to the hard copy of the file. As you can see, 10 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) the BLO is measured at. The second value (all even entries) is the power set level. The valid range for PwrLvlAdj is from 2500 to 27500 (2500 corresponds to –125 dBm and 27500 corresponds to +125 dBm).

- The 20 calibration entries for each slot/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 BBX2 is loaded with BLO data, the cal file data for the BBX2 is downloaded to the device in the order it is stored in the CAL file. TxCal data is sent first, C[1] – C[60]. BBX2 slot 1's 10 calibration points are sent (C[1] – C[20]), followed by BBX2 slot 2's 10 calibration points (C[21] – C[40]), etc. The RxCal data is sent next, followed by the RxDCal data.
- Temperature compensation data is also stored in the cal file for each slot.

Test Equipment Setup: RF Path Calibration

Follow the steps outlined in Table 3-32 to set up test equipment.

Table 3-32: Test Equipment Setup (RF Path Calibration)

Step	Action
	NOTE Verify the GPIB 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 or via a 30 dB coupler with a 20 dB in–line attenuator for 1900 MHz.
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 3-6. • If required, calibrate the test equipment per the procedure in Table 3-24. • Connect the test equipment as shown in Figure 3-9 and Figure 3-10.

Transmit (TX) Path Calibration

The assigned channel frequency and power level (as measured at the top of the frame) for transmit calibration is derived from the site CDF file. For each BBX2, 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 BBX2 (located under the `ParentSECTOR` field of the `ParentCARRIER` CDF file parameter).

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 BBX2 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 BBX2 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 BBX2s have correct code load and data load.
- Primary CSM and MGLI are INS.
- All BBX2s are OOS_RAM.
- Test equipment and test cables are calibrated and connected for TX BLO calibration.
- LMF is logged into the BTS.

Connect the test equipment as shown in Figure 3-9 and Figure 3-10 and follow the procedure in Table 3-33 to perform the TX calibration test.

WARNING

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

IMPORTANT

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

Table 3-33: BTS TX Path Calibration

Step	Action
1	Select the BBX2(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. The test results will be displayed in the status report window.
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 BLO calibration file data to the BBX2s. BLO data is extracted from the CAL file for the BTS and downloaded to the selected BBX2 devices.

NOTE

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

3

Prerequisites

Ensure the following prerequisites have been met before proceeding.

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

Follow the steps in Table 3-34 to download the BLO data to the BBX2s.

Table 3-34: Download BLO

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

Calibration Audit Introduction

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

IMPORTANT

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

Transmit (TX) Path Audit

Perform the calibration audit of the TX paths of all equipped BBX2 slots, per the steps in Table 3-35.

WARNING

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

NOTE

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

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TX Audit Test

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

Prerequisites

Before running this test, the following should be done:

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

Connect the test equipment as shown in Figure 3-9 and Figure 3-10 and follow the procedure in Table 3-35 to perform the BTS TX Path Audit test.

Table 3-35: TX Path Audit

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

Exception Handling

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

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

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 passed, the BLO data will automatically be downloaded to the BBX2(s) before the audit portion of the test is run.

Prerequisites

Before running this test, the following should be done:

- CSM–1, GLI2s, BBX2s have correct code and data load.
- 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 procedures in Table 3-36 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 BBX2 channels keyed***. Failure to do so can result in serious personal injury and/or equipment damage.

Table 3-36: All Cal/Audit Test

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

Create CAL File

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

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

WARNING

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

Prerequisites

Before running this test, the following should be done:

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

Table 3-37: Create CAL File

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