Chapter 4

4

Automated Acceptance Test Procedures

Automated Acceptance Test Procedure - Introduction

Introduction

General

The Acceptance Test Procedures (ATP) allow Cellular Field Engineers (CFEs) to run automated acceptance tests on all BTS subsystem devices equipped in the CDF using the LMF and the test equipment it supports.

Test Reports

The CFE can choose to save the results of ATP tests to a report file from which *ATP reports* are generated for later printing. See the Generating an ATP Report section in this chapter.

Test Equipment Selection

Because test equipment functions during acceptance testing are controlled by the LMF through the GPIB, only the test equipment models supported by the LMF can be used.

NOTE	
	1. Before using the LMF, read the Developer Release Notes section in the *LMF Help function on-line documentation* for any applicable information. 2. The ATP test is to be performed on out-of-service sectors *only.* 3. DO NOT substitute test equipment with other models not supported by the LMF.

Test Equipment Set Calibration

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

Reduced ATP

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

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

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

Should failures occur while performing the specified tests, refer to the Basic Troubleshooting section of this manual for help in determining the failure point. Once the point of failure has been identified and corrected, refer to the BTS Optimization and ATP Test Matrix (Table B-1) in the FRU Optimization/ATP Test Matrix section of Appendix B to determine the applicable test that must be performed.

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

ATP Test Options

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

- **All TX:** TX tests verify the performance of the BTS transmit elements. These include the GLI, MCC, BBX, trunking modules, the LPAs, and passive components including splitters, combiners, bandpass filter(s), and RF cables.
- **All RX:** The RX test verifies the performance of the BTS receive elements. These include the MPC, EMPC (for companion frames), BBX, MCC, GLI modules, and the passive components including RX filters and RF cables.
- **All TX/RX:** Executes all TX and RX tests.
- **Full Optimization:** Executes the TX calibration, downloads BLO, and executes the TX audit before running all TX and RX tests.

ATP Prerequisites

Before attempting to run *any* ATP tests, be sure the following have been completed:

- BTS has been optimized (BBXs calibrated and BLOs downloaded) (Chapter 3)
- The carrier(s) and/or sector(s) to be tested have been taken out of service at the CBSC.
- LMF is logged into the BTS.
- CSMs, GLIs, BBXs, MCCs and TSU (if the RFDS is installed) have correct code and data loads.
- Primary CSM and GLI are INS_ACT (bright green).
- MCCs are INS_ACT (bright green).
- No BBXs are keyed (transmitting).
- BBXs are OOS_RAM (yellow).
- Test cables are calibrated.
- Test equipment has been selected, warmed up 60 minutes, and calibrated.
- GPIB is on.
- BTS transmit connectors are properly terminated for the test(s) to be performed.

WARNING	
	1. All transmit connectors must be properly terminated for all ATP tests. 2. Before the FER is run, be sure that one of the following is done: - All transmitter connectors are properly terminated OR - All LPAs are turned OFF (circuit breakers pulled) Failure to observe these warnings may result in bodily injury or equipment damage.

TX/RX Antenna Connections

Starter (Stand-alone) Frames

Refer to Figure 1-7 or Figure 1-8 for identification of starter frame transmit and receive antenna connections where measurements are to be taken. All ATP test equipment connections for starter frames are made at the ANTENNAS connectors on the RF interface panel.

Companion Frames

TX ATP Antenna Connections - Each companion frame at a site connects independently to transmit antennas. Test equipment connections for TX ATPs on each companion frame are made at the ANTENNAS connectors as on starter frames. Companion frame ANTENNAS connectors are shown in Figure 1-9 and Figure 1-10.

Antenna Connections for RX main ATP - Each companion frame at a site uses independent receive antennas for *main* RX signals. The main RX signals are either routed through TRDC RX ANTENNAS connectors (Figure 1-10) or duplexed with TX signals through the single DRDC ANTENNAS connectors (Figure 1-9).

Antenna Connections for RX diversity ATP - Companion frame *diversity* RX signals are obtained from the RX *main* antenna of the *collocated* companion frame. The main RX signals are sent from the collocated companion frame through inter-frame diversity RX cables to the RX EXPANSION 1B, 2B, or 3B connectors of the frame where they are used for diversity RX (refer to Figure 4-1). Diversity RX ATP test equipment connections are made at one of two different locations depending on whether or not the companion frame under test is connected to a collocated companion frame. Connection points for each situation are as follows:

- **Connected companion frames:** When inter-frame diversity RX cables are connected, connect test equipment for diversity RX ATP at the ANTENNAS connectors of the *collocated* companion frame as shown in Figure 4-1 and listed in Table 4-1. Be sure *MPC* is selected before logging the LMF into the frame or FER will fail.

- ***Dis*connected companion frames:** When inter-frame diversity RX cables are *dis*connected, connect test equipment for diversity RX ATP at the RX EXPANSION connectors 1B, 2B, or 3B *on the frame under test*. Refer to Figure 4-1 and Table 4-2. Be sure *EMPC* is selected before logging the LMF into the frame or FER will fail.

Figure 4-1: SC4812ET Lite Companion Frame Diversity RX Simplified Interconnection Diagram

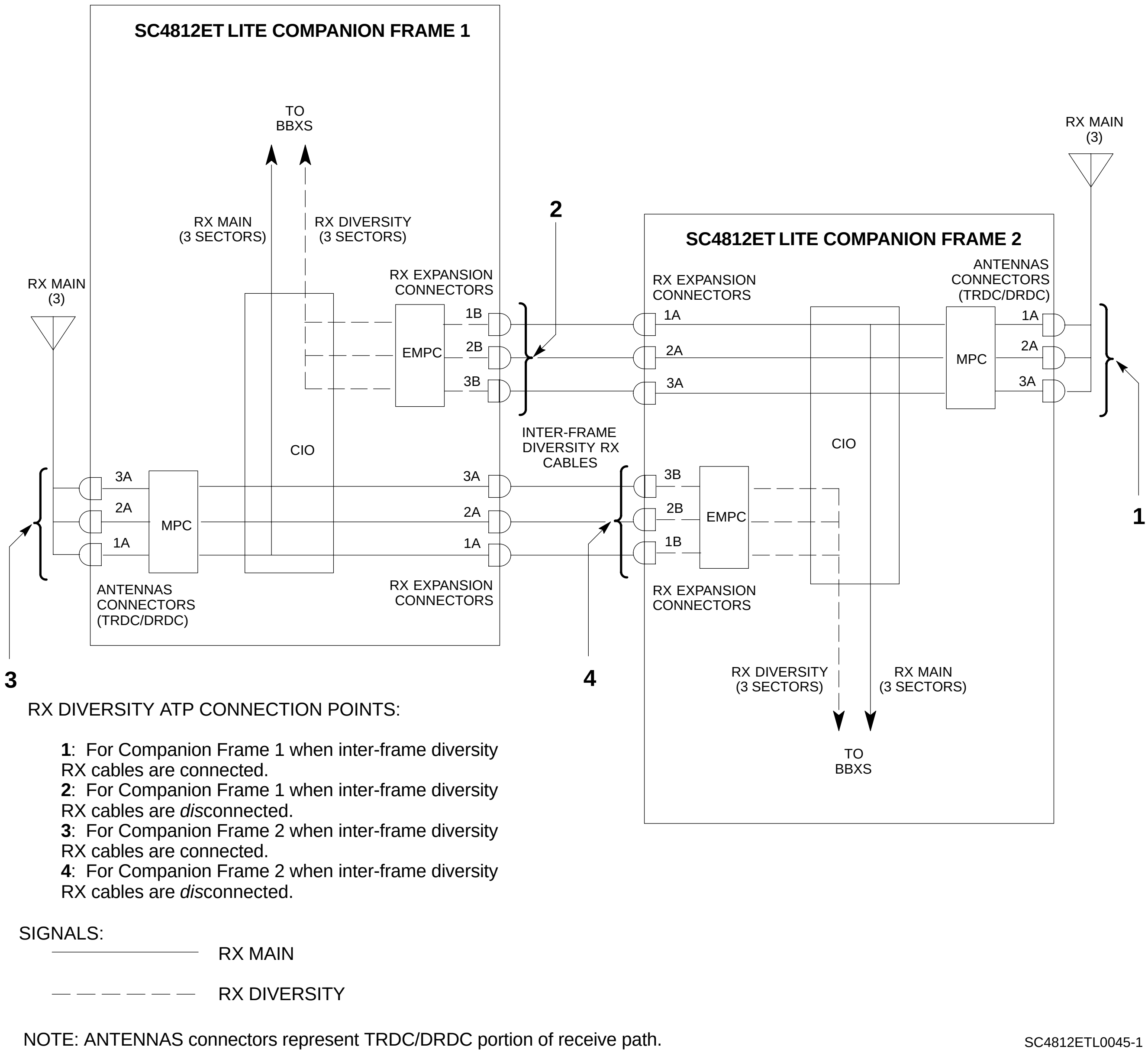

Table 4-1: To Perform Companion Frame Diversity RX FER, Inter-frame RX Cables *Connected* (Set Multi-Channel Preselector to *MPC*)

On		Connect RX Test Cable to *Collocated* Companion Frame RX or Duplexed TX/RX ANTENNAS Connector
Carrier	**Sector**	
1	1	1A
	2	2A
	3	3A
2	1	1A
	2	2A
	3	3A

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Table 4-2: To Perform Companion Frame Diversity RX FER, Inter-frame RX Cables *Dis*connected (Set Multi-Channel Preselector to *EMPC*)

On		Connect RX Test Cable to *Frame Under Test* RX EXPANSION Connector
Carrier	**Sector**	
1	1	1B
	2	2B
	3	3B
2	1	1B
	2	2B
	3	3B

Acceptance Tests - Test Set-up

Required Test Equipment

The following test equipment is required:

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

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

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

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Acceptance Test Equipment Set Up

All ATP testing - Follow the steps in Table 4-3 to set up test equipment for all tests.

Table 4-3: Set Up Test Equipment - TX Output Verify/Control Tests

Step	Action
1	***If it has not already been done***, interface the LMF computer to the BTS (refer to Table 3-10 and Figure 3-6).
2	***If it has not already been done***, refer to Table 3-11 to start a *GUI* LMF session and log into the BTS.
3	***If it has not already been done***, refer to Figure 3-16, Figure 3-17, Figure 3-18, Figure 3-19, Figure 3-20, or Figure 3-21, as applicable, for the test equipment and antenna duplexing being used, to connect test equipment for acceptance testing.
	NOTE LMF-based measurements factor in TX test cable loss between the RFMF and test equipment. If additional attenuation, such as external TX combiners, is inserted in the path, it must be identified to the LMF by including it in the TX test cable calibration. If this is not possible, include the attenuation in the TX path by editing cable loss values (refer to Table 3-34). Failure to do this will result in test inaccuracies and potential for erroneous ATP failures *because the additional losses would not be compensated for in the test measurements.*

Companion frame All TX/RX, All RX, and FER for Diversity RX - When performing All TX/RX, All RX, or FER ATP for *companion frame* diversity RX, perform the additional test equipment set-up procedures in Table 4-4.

Table 4-4: Additional Diversity RX Test Set-up for Companion Frames

Step	Action
1	If the LMF is logged into the BTS, log out of the BTS.
2	If the inter-frame diversity RX cabling to a collocated companion frame is: • *Connected* to the companion frame under test, proceed to step 3. • *Dis*connected from the companion frame under test, proceed to step 7.
3	For companion frames with inter-frame diversity RX cables *connected*, click on the LMF **Login** tab.
4	In the **Equipage Information** box, select **MPC** from the **Multi-Channel Preselector** picklist.
5	Make RX test cable connections for diversity RX FER according to Figure 4-1 and Table 4-1.
6	Proceed to step 10.
7	For companion frames with inter-frame diversity RX cables *dis*connected, click on the LMF **Login** tab.
8	In the **Equipage Information** box, select **EMPC** from the **Multi-Channel Preselector** picklist.
9	Make RX test cable connections for diversity RX FER according to Figure 4-1 and Table 4-2.
10	Click on the LMF **BTS#** tab, and return to the procedure for the ATP being performed.

Abbreviated (All-inclusive) Acceptance Tests

All-inclusive Tests

General - The all-inclusive acceptance tests are performed from the LMF *GUI* environment. These all-inclusive tests are called *abbreviated ATPs* because they execute various combinations of individual acceptance tests *with a single command*. This allows verification of multiple aspects of BTS performance while minimizing time needed for individual test set up and initiation.

Abbreviated ATP Options - There are three abbreviated acceptance tests which evaluate different performance aspects of the BTS. This allows the CFE to select testing to meet the specific requirements for individual maintenance and performance verification situations. The following summarizes the coverage of each abbreviated test:

- **All TX/RX**. Performs all transmit and receive ATPs on the selected MCCs and BBXs.
- **All TX**. Performs complete set of transmit ATPs on the selected MCCs and BBXs. Testing is the equivalent of performing all of the following individual tests:
  - **TX Mask** Test
  - **Rho** Test
  - **Pilot Time Offset** Test
  - **Code Domain Power** Test
- **All RX**. Performs complete receive ATP on the selected MCCs and BBXs. Testing is the equivalent of performing the following:
  - **FER** Test

Abbreviated ATP Procedures - Procedures to accomplish each type of abbreviated ATP are included in the following subsections.

All TX/RX ATP Test

Follow the procedures in Table 4-5 to perform the abbreviated, all-inclusive **transmit and receive** test.

Table 4-5: All TX/RX ATP Test Procedure

Step	Action
1	Set up the test equipment initially for abbreviated tests as described in Table 4-3.
2	If a *companion* frame is being tested and either **BOTH** or **DIV** is to be selected in step 7, perform the additional test equipment set-up in Table 4-4 for the *diversity* RX portion of the ATP. **NOTE** If the LMF has been logged into the BTS with a different **Multi-Channel Preselector** setting than the one to be used for this test, the LMF *must be logged out of the BTS and logged in again* with the *new* **Multi-Channel Preselector** setting. Using the wrong MPC setting can cause a false test failure.
3	Select the BBXs and MCCs to be tested.
4	Click on **Tests** in the BTS menu bar, and select **All TX/RX ATP...** from the pull-down menu.
5	Select the appropriate carrier(s) and sector(s) (carrier-bts#-sector#-carrier#) from those displayed in the **Channels/Carrier** pick list. **NOTE** To select multiple items, hold down the **Shift** or **Ctrl** key while clicking on pick list items to select multiple carrier(s)-sector(s).
6	Verify that the correct channel number for the selected carrier is shown in the **Carrier # Channels** box. - If it is not, obtain the latest **bts-#.cdf** and **cbsc-#.cdf** files from the CBSC. **NOTE** If necessary, the correct channel number may be manually entered into the **Carrier # Channels** box.
7	**NOTE** If a companion frame with the inter-frame diversity RX cabling *dis*connected is being tested *do not select* **BOTH** in this step. The RX main and diversity paths must be tested separately for this configuration because each requires a different **Multi-Coupler Preselector** type to provide the proper test signal gain. Select the appropriate **RX branch** (**BOTH**, **MAIN**, or **DIV**ersity) in the drop-down list.
8	In the **Rate Set** box, select the appropriate data rate (**1**=9600 **3**=9600 1X) from the drop-down list. **NOTE** The **Rate Set** selection of **3** is only available if 1X cards are selected for the test.
9	Enter the channel elements to be tested for the RX ATP in the **Channel Element(s)** box. By default, all channel elements are specified. Use one of thefollowing methods to enter more than one channel element: - Enter non-sequential channel elements separated by a comma and no spaces (for example; 0,5,15). - Enter a range of sequential channel elements by typing the first and last channel elements separated by two periods (for example; 0..15). **NOTE** The channel element numbers are 0.based; that is the first channel element is 0.

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Table 4-5: All TX/RX ATP Test Procedure

Step	Action
10	In the **Test Pattern** box, select the test pattern to use for the acceptance tests from the drop-down list (refer to “Test Pattern Drop-down Pick List” under “TX Calibration and the LMF” in the Bay Level Offset Calibration section of Chapter 3).
11	Click **OK** to display a status bar followed by a **Directions** pop-up window.
12	**NOTE** When testing diversity RX paths on companion frames, be sure to follow the RX test cable connection information in Table 4-1 or Table 4-2, as applicable, during this step. Follow cable connection directions as they are displayed, and click the **Continue** button to begin testing. - As the ATP process is completed, results will be displayed in the status report window.
13	Click the **Save Results** or **Dismiss** button. **NOTE** If **Dismiss** is used, the test results *will not* be saved in the test report file.

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All TX ATP Test

Follow the procedures in Table 4-6 to perform the abbreviated, all-inclusive **transmit** test.

Table 4-6: All TX ATP Test Procedure

Step	Action
1	Set up the test equipment for abbreviated tests per Table 4-3.
2	Select the BBXs and MCCs to be tested.
3	Click on **Tests** in the BTS menu bar, and select **All TX ATP...** from the pull-down menu.
4	Select the appropriate carrier(s) and sector(s) (carrier-bts#-sector#-carrier#) from those displayed in the **Channels/Carrier** pick list. **NOTE** To select multiple items, hold down the **Shift** or **Ctrl** key while clicking on pick list items to select multiple carrier(s)-sector(s).
5	Verify that the correct channel number for the selected carrier is shown in the **Carrier # Channels** box. - If it is not, obtain the latest **bts-#.cdf** and **cbsc-#.cdf** files from the CBSC. **NOTE** If necessary, the correct channel number may be manually entered into the **Carrier # Channels** box.
6	In the **Rate Set** box, select the appropriate transfer rate (**1** = 9600, **3** = 9600 1X) from the drop-down list. **NOTE** The Rate Set Selection of **3** is only available if 1X cards are selected for the test.
7	In the **Test Pattern** box, select the test pattern to use for the acceptance test from the drop-down list (refer to “Test Pattern Drop-down Pick List” under “TX Calibration and the LMF” in the Bay Level Offset Calibration section of Chapter 3).

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Table 4-6: All TX ATP Test Procedure	
Step	**Action**
8	Click **OK** to display a status bar followed by a **Directions** pop-up window.
9	Follow cable connection directions as they are displayed, and click the **Continue** button to begin testing. - As the ATP process is completed, results will be displayed in the status report window.
10	Click the **Save Results** or **Dismiss** button. **NOTE** If **Dismiss** is used, the test results *will not* be saved in the test report file.

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All RX ATP Test

Follow the procedure in Table 4-7 to perform the abbreviated, all-inclusive **receive** test.

Table 4-7: All RX ATP Test Procedure	
Step	**Action**
1	Set up the test equipment for abbreviated tests per Table 4-3.
2	If a *companion* frame is being tested and either **BOTH** or **DIV** is to be selected in step 7, perform the additional test equipment set-up in Table 4-4 for the *diversity* RX portion of the ATP. **NOTE** If the LMF has been logged into the BTS with a different **Multi-Channel Preselector** setting than the one to be used for this test, the LMF *must be logged out of the BTS and logged in again* with the *new* **Multi-Channel Preselector** setting. Using the wrong MPC setting can cause a false test failure.
3	Select the BBXs and MCCs to be tested.
4	Click on **Tests** in the BTS menu bar, and select **All RX ATP...** from the pull-down menu.
5	Select the appropriate carrier(s) and sector(s) (carrier-bts#-sector#-carrier#) from those displayed in the **Channels/Carrier** pick list. **NOTE** To select multiple items, hold down the **Shift** or **Ctrl** key while clicking on pick list items to select multiple carrier(s)-sector(s).
6	Verify that the correct channel number for the selected carrier is shown in the **Carrier # Channels** box. - If it is not, obtain the latest **bts-#.cdf** and **cbsc-#.cdf** files from the CBSC. **NOTE** If necessary, the correct channel number may be manually entered into the **Carrier # Channels** box.
7	**NOTE** If a companion frame with the inter-frame diversity RX cabling *dis*connected is being tested *do not select* **BOTH** in this step. The RX main and diversity paths must be tested separately for this configuration because each requires a different **Multi-Coupler Preselector** type to provide the proper test signal gain. Select the appropriate **RX branch** (**BOTH**, **MAIN**, or **DIV**ersity) in the drop-down list.

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Table 4-7: All RX ATP Test Procedure

Step	Action
8	In the **Rate Set** box, select the appropriate data rate (**1**=9600, **2**=14400, **3**=9600 1X) from the drop-down list. **NOTE** The **Rate Set** selection of **1** is only available if non-1X cards are selected for the test. The **Rate Set** selection of **3** is only available if 1X cards are selected for the test.
9	Enter the channel elements to be tested for the RX ATP in the **Channel Element(s)** box. By default, all channel elements are specified. Use one of thefollowing methods to enter more than one channel element: - Enter non-sequential channel elements separated by a comma and no spaces (for example; 0,5,15). - Enter a range of sequential channel elements by typing the first and last channel elements separated by two periods (for example; 0..15). **NOTE** The channel element numbers are 0.based; that is the first channel element is 0.
10	Click **OK** to display a status bar followed by a **Directions** pop-up window.
11	**NOTE** When testing diversity RX paths on companion frames, be sure to follow the RX test cable connection information in Table 4-1 or Table 4-2, as applicable, during this step. Follow cable connection directions as they are displayed, and click the **Continue** button to begin testing. - When the ATP process is completed, results will be displayed in the status report window.
12	Click the **Save Results** or **Dismiss** button. **NOTE** If **Dismiss** is used, the test results *will not* be saved in the test report file.

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Individual Acceptance Tests

The following individual ATP tests can be used to evaluate specific aspects of BTS operation against individual performance requirements. All testing is performed using the LMF *GUI* environment.

TX Testing

TX tests verify any given transmit antenna path and output power control. All tests are performed using the external, calibrated test equipment. All measurements are made at the appropriate BTS **TX OUT** connector(s).

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

RX Testing

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

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

Individual Tests

Spectral Purity TX Mask

This test verifies that the transmitted CDMA carrier waveform generated on each sector meets the transmit spectral mask specification (as defined in IS-97) with respect to the assigned CDF file values.

Waveform Quality (Rho)

This test verifies that the transmitted Pilot channel element digital waveform quality (rho) exceeds the minimum specified value in IS-97. *Rho* represents the correlation between the actual and perfect CDMA modulation spectrums. 1.0000 represents 100% (or perfect correlation).

Pilot Time Offset

The Pilot Time Offset is the difference between the communications system test set measurement interval (based on the BTS system time reference) and the incoming block of transmitted data from the BTS (Pilot only, Walsh code 0).

Code Domain Power/Noise Floor

This test verifies the code domain power levels, which have been set for all ODD numbered Walsh channels, using the OCNS command. This is done by verifying that the ratio of PILOT divided by OCNS is equal to **10.2 ± 2 dB**, and, that the noise floor of all EVEN numbered “OFF” Walsh channels measures ≤ **-27 dB** for IS-95A/B and CDMA2000 1X with respect to total CDMA channel power.

BTS FER

This test verifies the BTS receive FER on all traffic channel elements currently configured on all equipped MCCs (full rate at one percent FER) at an RF input level of -119 dBm on the *main* RX antenna paths using operator-selected, CDF-*equipped* MCCs and BBXs at the site. *Diversity* RX antenna paths are also tested using the lowest equipped MCC channel element ONLY.

NOTE	There are no pass/fail criteria associated with FER readings taken at levels below -119 dBm, other than to verify that the FER measurement reflects changes in the RX input signal level.

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TX Spectral Purity Transmit Mask Acceptance Test

Background

Overview - This test verifies the spectral purity of each operator-selected BBX carrier keyed up at a specific frequency *specified in the current CDF*. All tests are performed using the external, calibrated test equipment controlled by the same command. All measurements are made at the appropriate BTS TX antenna connector.

Test Patterns - There are four operator-selectable test patterns with which this acceptance test can be performed. The patterns, along with the channels tested and gain setting for each, are listed in Table 3-39. Refer to "TX Calibration and the LMF" in the Bay Level Offset Calibration section of Chapter 3 for more information on the test patterns.

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Equipment Operation During Testing - At least one MCC must be selected to perform the Standard, CDF Pilot, and CDF test patterns. For these test patterns, forward links will be enabled for synch channel (SCH), paging channel (PCH), and traffic channel (TCH) elements from the selected MCC(s), as shown in Table 3-39. Gain will be set for the applicable channels on each antenna as shown in the table. The operator-selected BBXs will be keyed using a BLO-corrected `bbxlvl` value to generate a CDMA carrier. RF output power, as measured at the appropriate frame TX antenna connector, will be set to one of the following depending on the operating frequency spectrum:

- 800 MHz: 33.5 dBm
- 1.9 GHz: 31.0 dBm

Test Measurements - The test equipment will measure and return the attenuation level in dB of all spurious and IM products with respect to the mean power of the CDMA channel measured in a 1.23 MHz bandwidth, verifying that results meet system tolerances at the following test points (see also Figure 4-2):

- For 800 MHz:
  - At least **-45 dB** @ **+ 750 kHz** from center frequency
  - At least **-45 dB** @ **- 750 kHz** from center frequency
  - At least **-60 dB** @ **- 1980 kHz** from center frequency
  - At least **-60 dB** @ **+ 1980 kHz** from center frequency
- For 1.9 GHz:
  - At least **-45 dB** @ **+ 885 kHz** from center frequency
  - At least **-45 dB** @ **- 885 kHz** from center frequency
  - At least **-55 dB** @ **- 1980 kHz** from center frequency
  - At least **-55 dB** @ **+ 1980 kHz** from center frequency

Redundant BBX Testing - The BBX will then de-key, and if selected, the redundant BBX will be assigned to the current TX antenna path under test. The test will then be repeated.

Spectral Purity TX Mask Acceptance Test

Follow the steps in Table 4-8 to verify the transmit spectral mask specification on the TX antenna paths for the selected BBXs.

Table 4-8: Test Spectral Purity Transmit Mask

Step	Action
1	Set up the test equipment for TX acceptance tests per Table 4-3.
2	Select the BBXs to be tested.
3	If the **Test Pattern** to be used is **Standard**, **CDFPilot**, or **CDF**; select at least one MCC (Refer to “Test Pattern Drop-down Pick List” on page 3-83.)
4	Click on **Tests** in the BTS menu bar, and select **TX > TX Mask...** from the pull-down menus.
5	Select the appropriate carrier(s) and sector(s) (carrier-bts#-sector#-carrier#) from those displayed in the **Channels/Carrier** pick list. **NOTE** To select multiple items, hold down the **Shift** or **Ctrl** key while clicking on pick list items to select multiple carrier(s)-sector(s).
6	Verify that the correct channel number for the selected carrier is shown in the **Carrier # Channels** box. - If it is not, obtain the latest **bts-#.cdf** and **cbsc-#.cdf** files from the CBSC. **NOTE** If necessary, the correct channel number may be manually entered into the **Carrier # Channels** box.
7	If at least one MCC was selected in Step 3, select the appropriate transfer rate (**1** = 9600, **3** = 9600 1X) from the drop-down list in the **Rate Set** box. **NOTE** The **Rate Set** selection of **3** is only available if 1X cards are selected for the test.
8	In the **Test Pattern** box, select the test pattern to use for the calibration from the drop-down list (refer to “Test Pattern Drop-down Pick List” under “TX Calibration and the LMF” in the Bay Level Offset Calibration section of Chapter 3).
9	Click **OK** to display a status bar followed by a **Directions** pop-up window.
10	Follow the cable connection directions as they are displayed, and click the **Continue** button to begin testing. - As the ATP process is completed, results will be displayed in a status report window.
11	Click the **Save Results** or **Dismiss** button. **NOTE** If **Dismiss** is used, the test results *will not* be saved in the test report file.

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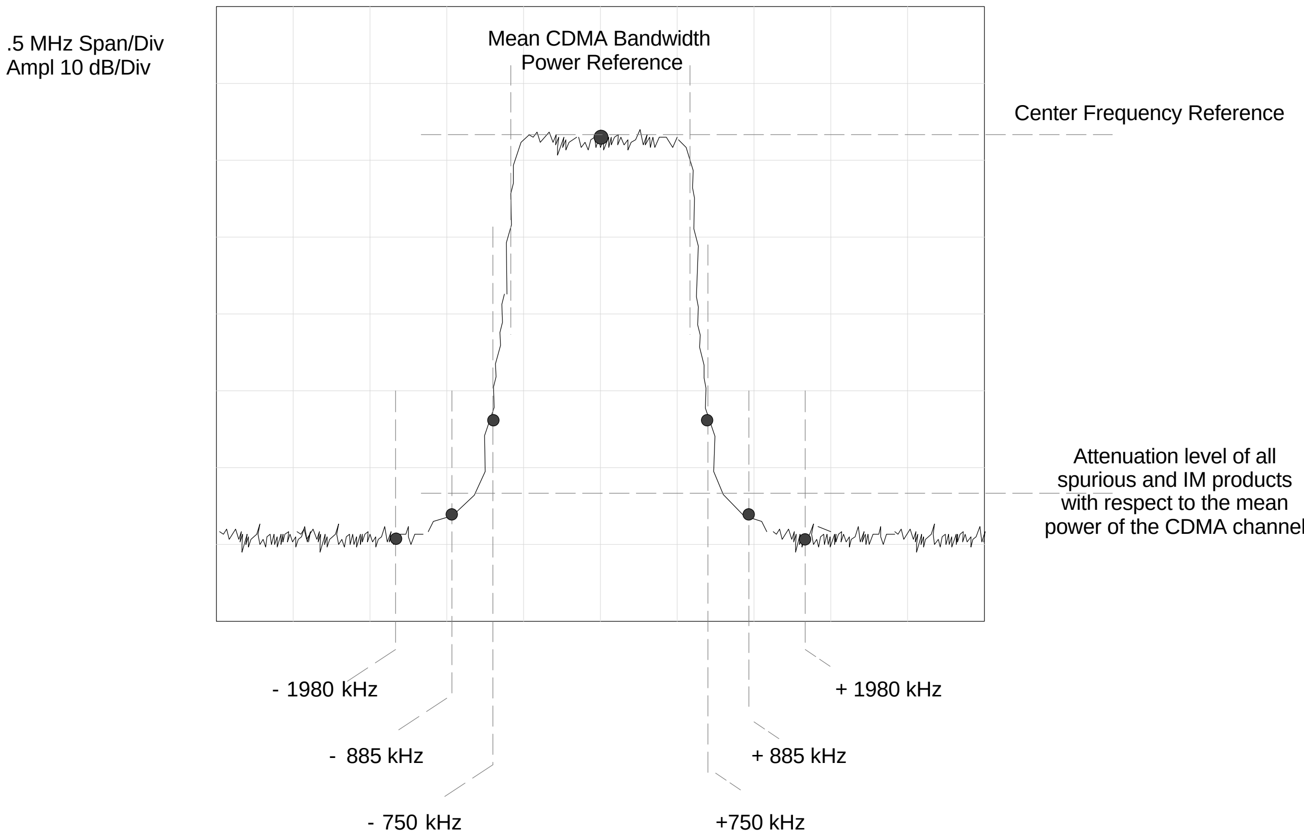
Figure 4-2: TX Mask Verification Spectrum Analyzer Display



TX Waveform Quality (Rho) Acceptance Test

Background

Overview - This test verifies the transmitted pilot channel element digital waveform quality of each operator-selected BBX carrier keyed up at a specific frequency *specified in the current CDF.* All tests are performed using the external, calibrated test equipment controlled by the same command. All measurements are made at the appropriate TX antenna connector.

Equipment Operation During Testing - Pilot gain will be set to 262 for each antenna, and all TCH elements from the MCCs will be forward-link disabled. The selected BBXs will be keyed up using both `bbxlvl` and BLO to generate a CDMA carrier (with pilot channel element only, Walsh code 0). RF output power is set at 40 dBm as measured at the appropriate BTS TX antenna connector.

Test Measurements - The test equipment will measure and return the pilot channel element digital waveform quality (rho) percentage, verifying that the result meets the following specification:

Waveform quality (Rho) should be > **0.912**.

Redundant BBX Testing - The BBX will then de-key, and if selected, the redundant BBX will be assigned to the current TX antenna path under test. The test will then be repeated for the redundant BBX.

Waveform Quality (Rho) Acceptance Test

Follow the steps in Table 4-9 to verify the pilot channel element waveform quality (rho) on the TX antenna paths for the selected BBXs.

Table 4-9: Test Waveform Quality (Rho)

Step	Action
1	Set up the test equipment for TX acceptance tests per Table 4-3.
2	Select the BBXs to be tested.
3	Click on **Tests** in the BTS menu bar, and select **TX** > **Rho...** from the pull-down menus.
4	Select the appropriate carrier(s) and sector(s) (carrier-bts#-sector#-carrier#) from those displayed in the **Channels/Carrier** pick list. **NOTE** To select multiple items, hold down the **Shift** or **Ctrl** key while clicking on pick list items to select multiple carrier(s)-sector(s).
5	Verify that the correct channel number for the selected carrier is shown in the **Carrier # Channels** box. - If it is not, obtain the latest **bts-#.cdf** and **cbsc-#.cdf** files from the CBSC. **NOTE** If necessary, the correct channel number may be manually entered into the **Carrier # Channels** box.

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Table 4-9: Test Waveform Quality (Rho)	
Step	**Action**
6	Click **OK** to display a status bar followed by a **Directions** pop-up window.
7	Follow the cable connection directions as they are displayed, and click the **Continue** button to begin testing. - As the ATP process is completed, results will be displayed in a status report window.
8	Click the **Save Results** or **Dismiss** button. **NOTE** If **Dismiss** is used, the test results *will not* be saved in the test report file.

4

TX Pilot Time Offset Acceptance Test

Background

Overview - This test verifies the transmitted pilot channel element Pilot Time Offset of each operator-selected BBX carrier keyed up at a specific frequency *specified in the current CDF.* All tests will be performed using the external, calibrated test equipment controlled by the same command. All measurements will be made at the BTS TX antenna connector.

Equipment Operation During Testing - The pilot gain will be set to 262 for each antenna and all TCH elements from the MCCs will be forward-link disabled. The selected BBXs will be keyed using both `bbxlvl` and BLO to generate a CDMA carrier (with pilot channel element only, Walsh code 0). TX power output is set at 40 dBm as measured at the TX output.

Test Measurements - The test equipment will measure and return the Pilot Time Offset in µs, verifying that results meet the following specification:

> Pilot Time Offset should be within **3 µs** of the target PT Offset (zero µs).

Redundant BBX Testing - The BBX will then de-key, and if selected, the redundant BBX will be assigned to the current TX antenna path under test. The test will then be repeated for the redundant BBX.

NOTE	This test also executes and returns the TX Frequency and TX Waveform Quality (rho) ATP tests, however, only *Pilot Time Offset* results are written to the ATP test report.

Pilot Time Offset Acceptance Test

Follow the steps in Table 4-10 to verify the Pilot Time Offset on the TX antenna paths for the selected BBXs.

Table 4-10: Test Pilot Time Offset

Step	Action
1	Set up the test equipment for TX acceptance tests per Table 4-3.
2	Select the BBXs to be tested.
3	Click on **Tests** in the BTS menu bar, and select **TX > Pilot Time Offset...** from the pull-down menus.
4	Select the appropriate carrier(s) and sector(s) (carrier-bts#-sector#-carrier#) from those displayed in the **Channels/Carrier** pick list. **NOTE** To select multiple items, hold down the **Shift** or **Ctrl** key while clicking on pick list items to select multiple carrier(s)-sector(s).

. . . continued on next page

Table 4-10: Test Pilot Time Offset

Step	Action
5	Verify that the correct channel number for the selected carrier is shown in the **Carrier # Channels** box. - If it is not, obtain the latest **bts-#.cdf** and **cbsc-#.cdf** files from the CBSC. **NOTE** If necessary, the correct channel number may be manually entered into the **Carrier # Channels** box.
6	Click **OK** to display a status bar followed by a **Directions** pop-up window.
7	Follow the cable connection directions as they are displayed, and click the **Continue** button to begin testing. - As the ATP process is completed, results will be displayed in a status report window.
8	Click the **Save Results** or **Dismiss** button. **NOTE** If **Dismiss** is used, the test results *will not* be saved in the test report file.

TX Code Domain Power/Noise Floor Acceptance Test

Background

Overview - This test verifies the Code Domain Power and Noise Floor of each operator-selected BBX carrier keyed at a specific frequency *specified in the current CDF.* All tests are performed using the external, calibrated test equipment controlled by the same command. All measurements are made at the appropriate BTS TX antenna connector.

CDMA Channel Test Set-up - Pilot gain will be set to 262 for each antenna and the selected MCCs will be configured to supply all odd-numbered Walsh code traffic channel elements by enabling Orthogonal Channel Noise Source (OCNS) on all odd MCC channel elements (maximum 32 full rate channels with an OCNS gain of 81). All even-numbered Walsh code traffic channel elements will not have OCNS enabled, and are considered "OFF". Selected MCCs will be forward-link enabled for the antenna (sector) under test.

4

Equipment Operation During Testing - The BBX will be keyed up using a BLO-corrected `bbxlvl` value to generate a CDMA carrier consisting of pilot and OCNS channels. RF output power, as measured at the appropriate frame TX antenna connector, is set at one of the following values depending on the operating frequency spectrum:

- 800 MHz: 33.5 dBm
- 1.9 GHz: 31.0 dBm

Test Measurements - The test equipment will measure and return the channel element power in dB of all specified Walsh channels within the CDMA spectrum. Additional calculations will be performed to verify the following parameters are met (refer to Figure 4-3 for graphic representations):

- Traffic channel element power level will be verified by calculating the ratio of Pilot power to OCNS gain of all traffic channels (root sum of the square (RSS) of each OCNS gain divided by the Pilot power). This value should be **10.2 dB ± 2.0 dB**.
- Noise floor (unassigned "OFF" even-numbered Walsh channels) is verified to be ≤ **-27 dB** for IS-95A/B and CDMA2000 1X with respect to total CDMA channel power.

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

Redundant BBX Testing - The BBX will then de-key, and if selected, the redundant BBX will be assigned to the current TX antenna path under test. The test will then be repeated for the redundant BBX. Upon completion of the test, OCNS channels will be disabled on the specified MCC channel elements.

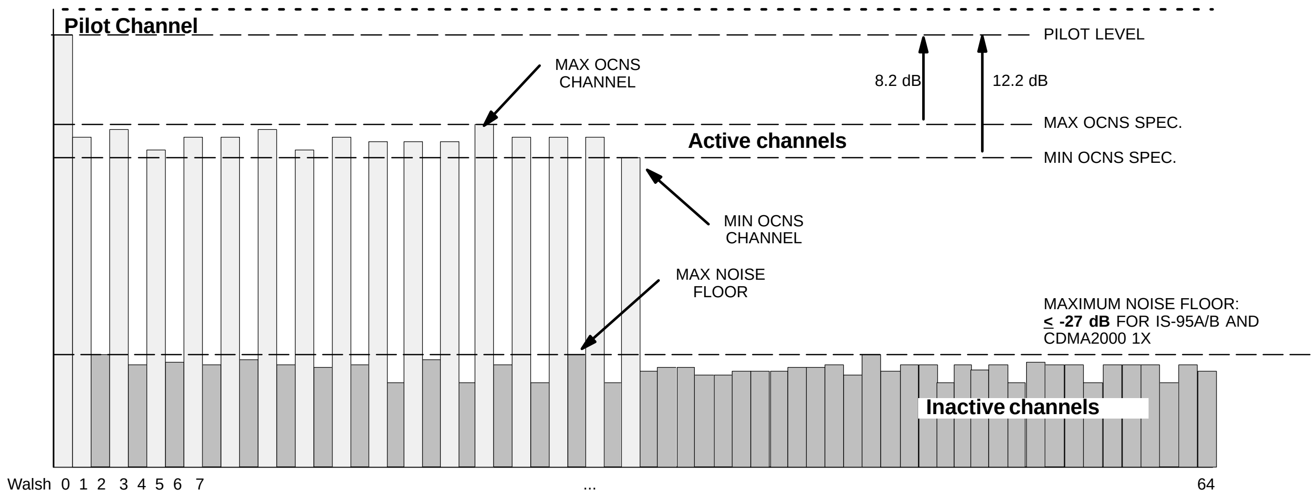
Code Domain Power/Noise Floor Test

Follow the steps in Table 4-11 to verify the Code Domain Power/Noise floor of each selected BBX carrier keyed up at a specific frequency.

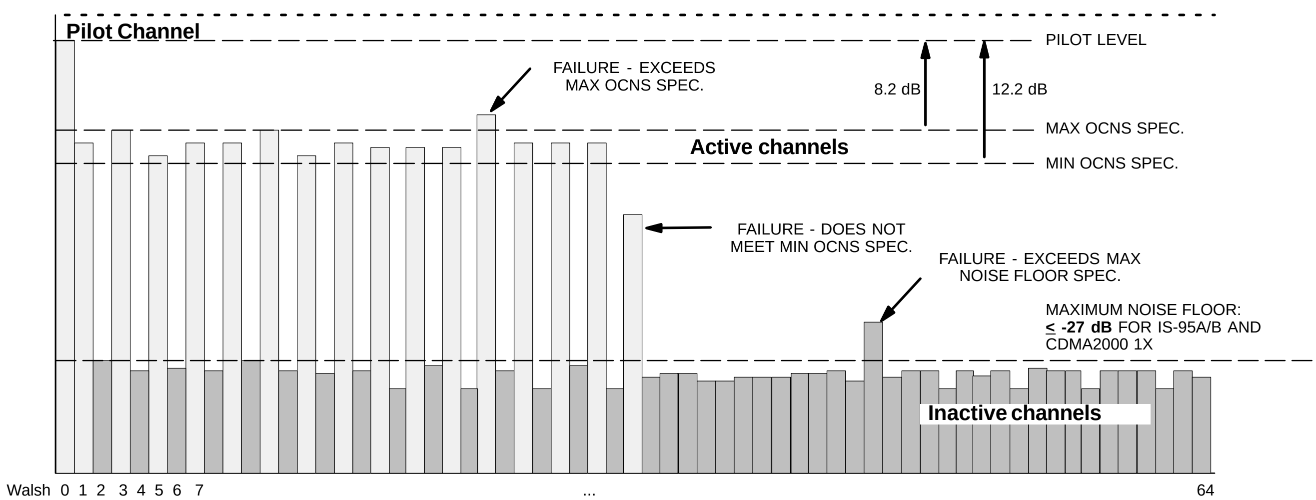
Table 4-11: Test Code Domain Power/Noise Floor

Step	Action
1	Set up the test equipment for TX acceptance tests per Table 4-3.
2	Select the BBXs and MCCs to be tested.
3	Click on **Tests** in the BTS menu bar, and select **TX > Code Domain Power...** from the pull-down menus.
4	Select the appropriate carrier(s) and sector(s) (carrier-bts#-sector#-carrier#) from those displayed in the **Channels/Carrier** pick list. **NOTE** To select multiple items, hold down the **Shift** or **Ctrl** key while clicking on pick list items to select multiple carrier(s)-sector(s).
5	Verify that the correct channel number for the selected carrier is shown in the **Carrier # Channels** box. - If it is not, obtain the latest **bts-#.cdf** and **cbsc-#.cdf** files from the CBSC. **NOTE** If necessary, the correct channel number may be manually entered into the **Carrier # Channels** box.
6	If at least one MCC was selected in Step 3, select the appropriate transfer rate (**1** = 9600, **3** = 9600 1X) from the drop-down list in the **Rate Set** box. **NOTE** The **Rate Set** selection of **3** is only available if 1X cards are selected for the test.
7	Click **OK** to display a status bar followed by a **Directions** pop-up window.
8	Follow the cable connection directions as they are displayed, and click the **Continue** button to begin testing. - As the ATP process is completed, results will be displayed in a status report window.
9	Click the **Save Results** or **Dismiss** button. **NOTE** If **Dismiss** is used, the test results *will not* be saved in the test report file.

Figure 4-3: Code Domain Analyzer CD Power/Noise Floor Display Examples



Code Domain Power/Noise Floor (OCNS Pass) Example



Code Domain Power/Noise Floor (OCNS Failure) Example

RX FER Acceptance Test

Background

Overview - This test verifies the BTS Frame Erasure Rate (FER) on *all* TCHs currently configured on operator-selected MCCs (full rate at 1% FER) at -119 dBm. All tests are performed using the external, calibrated test equipment as the signal source controlled by the same command. Measurements are made at the specified BTS RX antenna connection.

Equipment Operation During Testing - The pilot gain on each MCC will be set to 262 for each TX antenna, and the forward link for all TCH elements from the MCCs will be enabled. Appropriate BBX(s) must be keyed in order to enable the RX receive circuitry. Operator-selected BBXs will be keyed using only `bbxlvl`, to generate a CDMA carrier with pilot channel element only. Transmit power output is set at -40 dBm. Test equipment output power is set so that the received power at the BBX is -119 dBm. The final output power setting of the test equipment takes into account the MPC type, BTS RF path losses, and test cable losses. If selected, the redundant BBX will be assigned to the current RX antenna paths under test.

Test Measurements - The LMF will prompt the MCC channel element under test to measure all-zero longcode and provide the FER report on the selected active MCC on the reverse link for the main and, if selected, diversity RX antenna paths. Results are evaluated to ensure they meet the following specification:

FER returned less than **1%** and Total Frames measured is **1500**

Redundant BBX Testing - After the test, the BBX and the test equipment will be de-keyed to shut down the pilot signal and the active channel element, respectively. If the redundant BBX was tested, BBXR assignment to an active sector will also be reset.

Antenna Connections for Companion Frame RX Diversity Tests - At a site equipped with companion frames, RX diversity for each SC4812ET Lite frame is provided by the receive antennas for the *collocated* companion frame. Because of this, performing FER on companion frame diversity RX requires different RX test cable connections than on a starter frame. When performing companion frame diversity RX FER, use Figure 4-1 and Table 4-1 or Table 4-2 to determine the correct location for the RX test cable connections.

4

FER Acceptance Test

Follow the steps in Table 4-12 to verify the FER on RX antenna paths using selected MCCs and BBXs.

Table 4-12: Test FER

Step	Action
1	Set up the test equipment for RX acceptance tests per Table 4-3.
2	If a *companion* frame is being tested and either **BOTH** or **DIV** is to be selected in step 7, perform the additional test equipment set-up in Table 4-4 for the *diversity* RX portion of the ATP. **NOTE** If the LMF has been logged into the BTS with a different **Multi-Channel Preselector** setting than the one to be used for this test, the LMF *must be logged out of the BTS and logged in again* with the *new* **Multi-Channel Preselector** setting. Using the wrong MPC setting can cause a false test failure.
3	Select the BBXs and MCCs to be tested.
4	Click on **Tests** in the BTS menu bar, and select **RX > FER...** from the pull-down menu.
5	Select the appropriate carrier(s) and sector(s) (carrier-bts#-sector#-carrier#) from those displayed in the **Channels/Carrier** pick list. **NOTE** To select multiple items, hold down the **Shift** or **Ctrl** key while clicking on pick list items to select multiple carrier(s)-sector(s).
6	Verify that the correct channel number for the selected carrier is shown in the **Carrier # Channels** box. - If it is not, obtain the latest **bts-#.cdf** and **cbsc-#.cdf** files from the CBSC. **NOTE** If necessary, the correct channel number may be manually entered into the **Carrier # Channels** box.
7	**NOTE** If a companion frame with the inter-frame diversity RX cabling *dis*connected is being tested *do not select* **BOTH** in this step. The RX main and diversity paths must be tested separately for this configuration because each requires a different **Multi-Coupler Preselector** type to provide the proper test signal gain. Select the appropriate **RX branch** (**Both**, **Main**, or **Div**ersity) in the drop-down list.
8	In the **Rate Set** box, select the appropriate data rate (**1**=9600, **2**=14400, **3**=9600 1X) from the drop-down list. **NOTE** The **Rate Set** selection of **2** is only available if non-1X cards are selected for the test. The **Rate Set** selection of **3** is only available if 1X cards are selected for the test.
9	Click **OK** to display a status bar followed by a **Directions** pop-up window.
10	**NOTE** When testing diversity RX paths on companion frames, be sure to follow the RX test cable connection information in Table 4-1 or Table 4-2, as applicable, during this step. Follow cable connection directions as they are displayed, and click the **Continue** button to begin testing. - As the ATP process is completed, results will be displayed in the status report window.

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Table 4-12: Test FER

Step	Action
11	Click the **Save Results** or **Dismiss** button. **NOTE** If **Dismiss** is used, the test results *will not* be saved in the test report file.

Generating an ATP Report

Background

Each time an ATP test is run, ATP data is updated and must be saved to an ATP report file using the **Save Results** button to close the status report window. The ATP report file *will not* be updated if the status reports window is closed using the **Dismiss** button.

ATP Report

A separate report is created for each BTS and includes the following for each test:

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

Follow the procedures in the Table 4-13 to view and create a printable file for the ATP report.

Table 4-13: Generating an ATP Report

Step	Action
1	Click on the **Login** tab (if not in the forefront).
2	Click on the desired BTS in the **Available Base Stations** pick list to select it.
3	Click on the **Report** button.
4	If a printable file is not needed, click on the **Dismiss** button.
5	If a printable file is required, perform the following:
5a	- Select the desired file type (text, comma-delimited, HTML) for the report file from the drop-down list at the bottom of the screen.
5b	- Click the **Save** button to save the file. -- The file will be saved in the selected format in the bts-# folder for the BTS selected.

Chapter 5

Leaving the Site

5

Updating Calibration Data Files

After completing the TX calibration and audit, updated CAL file information must be moved from the LMF *Windows* environment back to the CBSC, a Unix environment. The following procedures detail moving files from one environment to the other.

Copying CAL files from LMF to a Diskette

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

Table 5-1: Copying CAL Files to a Diskette

Step	Action
1	With *Windows* running on the LMF computer, insert a disk into Drive A:\.
2	Launch the ***Windows* Explorer** application program from the **Start > Programs** menu list.
3	Select the applicable **<*x*>:\<*lmf home directory*/cdma/bts-#** folder.
4	Drag the **bts-#.cal** file to Drive A.
5	Repeat Steps 3 and 4, as required, for other **bts-#** folders.

Copying CAL Files from Diskette to the CBSC

Follow the procedures in Table 5-2 to copy CAL files from a diskette to the CBSC.

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

Step	Action
1	Log into the CBSC on the OMC-R Unix workstation using your account name and password.
2	Place the diskette containing calibration file(s) in the workstation diskette drive.
3	Type in **eject -q** and press the Enter key.
4	Type in **mount** and press the Enter key. **NOTE** • Check to see that the message "*floppy/no_name*" is displayed on the last line. • If the **eject** command was previously entered, *floppy/no_name* will be appended with a number. Use the explicit *floppy/no_name* reference displayed.
5	Type in **cd /floppy/no_name** and press the Enter key.
6	Type in **ls -lia** and press the Enter key. - Verify the **bts-#.cal** file filename appears in the displayed directory listing.
7	Type in **cd** and press the Enter key.
8	Type in **pwd** and press the Enter key. - Verify the displayed response shows the correct home directory (**/home/**<*user's name*>).
9	With *Solaris versions of Unix*, create a Unix-formatted version of the **bts-#.cal** file in the home directory by performing the following:

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

Step	Action
9a	- Type the following command: **dos2unix /floppy/no_name/bts-#.cal bts-#.cal** Where: **#** = BTS number for which the CAL file was created
9b	- Press the **Enter** key. **NOTE** Other versions of Unix do not support the `dos2unix` command. In these cases, use the Unix **cp** (copy) command. The *copied* files will contain DOS line feed characters which must be edited out with a Unix text editor.
10	Type in **ls -l *.cal** and press the Enter key. Verify the CAL files have been copied. - Verify all CAL files to be transferred appear in the displayed listing.
11	Type **eject**, and press the Enter key.
12	Remove the diskette from the workstation.

5

Prepare to Leave the Site

Removing External Test Equipment

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

Table 5-3: Remove External Test Equipment

Step	Action
1	△ **WARNING** Be sure no BBXs are keyed before performing this step. Failure to do so can result in personal injury and damage to BTS LPAs. Disconnect all external test equipment from all TX and RX connectors at the rear of the frame.
2	Reconnect and visually inspect all TX and RX antenna feed lines at the frame RF interface panel. **NOTE** Verify that all sector antenna feed lines are connected to the correct antenna connectors on the frame. Crossed antenna cables will degrade call processing.

Reset All Devices and Initialize Site Remotely

Generally, devices in the BTS should not be left with data and code loaded from the LMF. The configuration data and code loads used for normal operation could be different from those stored in the LMF files. By resetting all devices, the required data and code can be loaded from the CBSC using the DLM when spans are again active.

To reset all devices and have the OMCR/CBSC bring up the site remotely, perform the procedure in Table 5-4.

Table 5-4: Reset BTS Devices and Remote Site Initialization

Step	Action
1	Terminate the LMF session by following the procedures in Table 5-6.
2	Cycle BTS power *off*, as specified in Table 2-9 and Table 2-10, and *on*, as specified in Table 2-11 and Table 2-12.
3	Reconnect spans by following the procedure in Table 5-7.
4	Notify the OMCR/CBSC to take control of the site and download code and data to the BTS.
5	Verify the CBSC can communicate with the GLIs.

Bringing Modules into Service with the LMF

NOTE	Whenever possible, have the CBSC/MM bring up the site and enable all devices at the BTS.

If there is a reason code and/or data should or could not be loaded remotely from the CBSC, follow the steps outlined in Table 5-5 *as required* to bring BTS processor modules from OOS to INS state.

Table 5-5: Bring Modules into Service

Step	Action
1	In the LMF *GUI* environment, select the device(s) to be enabled by clicking on each one. **NOTE** • The MGLI and CSM must be INS_ACT (bright green) before an MCC can be enabled. • Processors which must be enabled and the order of enabling are as follows: 1. MGLI 2. CSMs 3. MCCs
2	Click on **Device** in the BTS menu bar, and select **Enable** from the pull-down list. - A status report window is displayed. **NOTE** If a BBX is selected, a transceiver parameters window is displayed to collect keying information. *Do not enable the BBX*.
3	Click **Cancel** to close the transceiver parameters window, if applicable.
4	Click **OK** to close the status report window. - The color of devices which successfully change to INS will change bright green.

Terminating LMF Session/Removing Terminal

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

Table 5-6: Remove LMF

Step	Action
1	**! CAUTION** Do not power down the LMF terminal without performing the procedure below. Corrupted/lost data files may result. Log out of all BTS sessions and exit LMF by clicking on **File** in the LMF window menu bar and selecting **Logout and Exit** from the pull-down list.
2	In the *Windows* Task Bar, click **Start** and select **Shutdown**.
3	Click **Yes** when the Shut Down Windows message appears
4	Wait for the system to shut down and the screen to go blank.

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Table 5-6: Remove LMF	
Step	**Action**
5	Disconnect the LMF terminal Ethernet port from the BTS frame.
6	Disconnect the LMF terminal serial port, the RS-232-to-GPIB interface box, and the GPIB cables as required for equipment transport.

Connecting BTS T1/E1 Spans

Before leaving the site, connect any T1 or E1 span connectors removed previously to allow the LMF to control the BTS. Refer to Table 5-7 and Figure 3-2.

Table 5-7: Connect T1 or E1 Spans	
Step	**Action**
1	Re-connect any disconnected span connectors to the Span I/O A and B boards.
2	If equipped, ensure the CSU is powered on.
3	Verify span status, ensuring the OMC-R/CBSC can communicate with the BTS.

Before Leaving the site

Be sure all requirements listed in Table 5-8 are completed before leaving the site.

Table 5-8: Check Before Leaving the Site	
Step	**Action**
1	When backup batteries are installed, *all* battery circuit breakers are **ON** (pushed in).
2	*Both* heat exchanger circuit breakers on the DC PDA are set to **ON** (pushed in), and the heat exchanger blowers are running.
3	The External Blower Assembly (EBA) power cable is connected, and the EBA is running.
4	The MAP power switch is set to **ON**, and the POWER (green) LED is lighted.
5	The MAP TCP switch is set to **ON**.
6	The BATT TEST switch on the MAP is set to **OFF**, and the BATT. TEST (amber) LED is *not lighted*.
7	No alarm conditions are being reported to the CBSC with all frame doors closed.

Chapter 6

Basic Troubleshooting

6

Basic Troubleshooting: Overview

Overview

The information in this chapter addresses some of the scenarios likely to be encountered by Customer Field Engineering (CFE) team members while performing BTS optimization and acceptance testing. This troubleshooting guide was created as an interim reference document for use in the field. It provides “what to do if” basic troubleshooting suggestions when the BTS equipment does not perform according to the procedures documented in the manual.

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

Troubleshooting: Installation

Cannot Log into Cell-Site

Table 6-1: Login Failure Troubleshooting Procedures

✓	Step	Action
	1	If the MGLI LED is solid RED, it implies a hardware failure. Reset MGLI by re-seating it. If this persists, install GLI card in MGLI slot and retry. A Red LED may also indicate no termination on an external LAN connector (power entry compartment at rear of frame).
	2	Verify that the span line is disconnected at the Span I/O card. If the span is still connected, verify the CBSC has disabled the BTS.
	3	Try to *'ping'* the MGLI.
	4	Verify the LMF is connected to the *primary* LAN (LAN A) at the LAN shelf below the SCCP cage. If LAN A is not the active LAN, force a LAN switch to LAN A by following the procedure in Table 6-2.
	5	Verify the LMF was configured properly.
	6	If a Xircom parallel BNC LAN interface is being used, verify the BTS-LMF cable is RG-58 (flexible black cable less than 2.5 feet in length).
	7	Verify the external LAN connectors are properly terminated (power entry compartment at rear of frame).
	8	Verify a T-adapter is *not* used on LMF computer side connector when connected to the primary LAN at the LAN shelf.
	9	Try connecting to the Ethernet Out port in the power entry compartment (rear of frame). Use a TRB-to-BNC (triax-to-coax) adapter at the LAN connector for this connection.
	10	Re-boot the LMF and retry.
	11	Re-seat the MGLI and retry.
	12	Verify GLI IP addresses are configured properly by following the procedure in Table 6-3.

6

Table 6-2: Force Ethernet LAN A to Active State as Primary LAN

✓	Step	Action
	1	If LAN A is not the active LAN, make certain all external LAN connectors are either terminated with 50Ω loads or cabled to another frame.
	2	*If it has not already been done*, connect the LMF computer to the stand-alone or starter frame, as applicable (Table 3-10).
	3	*If it has not already been done*, start a *GUI* LMF session and log into the BTS on the active LAN (Table 3-11).
	4	Remove the 50Ω termination from the LAN B IN connector in the power entry compartment at the rear of the stand-alone or starter frame. The LMF session will become inactive.
	5	Disconnect the LMF computer from the LAN shelf LAN B connector and connect it to the LAN A connector.

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Table 6-2: Force Ethernet LAN A to Active State as Primary LAN		
✓	**Step**	**Action**
	6	If the LAN was successfully forced to an active state (the cards in any cage can be selected and statused), proceed to step 13.
	7	With the 50Ω termination still removed from the LAN B IN connector, remove the 50Ω termination from LAN B OUT connector. If more than one frame is connected to the LAN, remove the termination from the last frame in the chain.
	8	If the LAN was successfully forced to an active state (the cards in any cage can be selected and statused), proceed to step 13.
	9	With the 50Ω terminations still removed from LAN B, unseat each GLI card in each frame connected to the LAN, until all are disconnected from the shelf backplanes.
	10	Reseat each GLI card until all are reconnected.
	11	Allow the GLIs to power up, and attempt to select and status cards in the CCP shelves. If LAN A is active, proceed to step 13.
	12	If LAN A is still not active, troubleshoot or continue troubleshooting following the procedures in Table 6-1.
	13	Replace the 50Ω terminations removed from the LAN B IN and OUT connectors.

6

Table 6-3: GLI IP Address Setting		
✓	**Step**	**Action**
	1	If it has not previously been done, establish an MMI communication session with the GLI card as described in Table 3-15.

	2	Enter the following command to display the IP address and subnet mask settings for the card:
		
		config lg0 current
		
		A response similar to the following will be displayed:
		
		`GLI2>config lg0 current`
		
		`lg0: IP address is set to`
		`DEFAULT (configured based on card location)`
		
		`lg0: netmask is set to`
		`DEFAULT (255.255.255.128)`

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Table 6-3: GLI IP Address Setting

✓	Step	Action

	3	If the IP address setting response shows an IP address rather than "`Default (configured based on card location)`," enter the following:
		
		config lg0 ip default
		
		A response similar to the following will be displayed:
		
		`GLI2>config lg0 ip default`
		
		`_param_config_lg0_ip(): param_delete(): 0x00050001`
		`lg0: ip address set to DEFAULT`

	4	If the GLI subnet mask setting does not display as "`DEFAULT (255.255.255.128)`," set it to default by entering the following command:
		
		config lg0 netmask default
		
		A response similar to the following will be displayed:
		
		`GLI2>config lg0 netmask default`
		
		`_param_config_lg0_netmask(): param_delete(): 0x00050001`
		`lg0: netmask set to DEFAULT`

	5	Set the GLI route default to default by entering the following command:
		
		config route default default
		
		A response similar to the following will be displayed:
		
		`GLI2>config route default default`
		
		`_esh_config_route_default(): param_delete(): 0x00050001`
		`route: default gateway set to DEFAULT`

	6	**NOTE** Changes to the settings will not take effect unless the GLI is reset. When changes are completed, close the MMI session, and reset the GLI card.

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Table 6-3: GLI IP Address Setting		
✓	**Step**	**Action**

	7	Once the GLI is reset, re-establish MMI communication with it and issue the following command to confirm its IP address and subnet mask settings:
		
		config lg0 current
		
		A response similar to the following will be displayed:
		
		`GLI2>config lg0 current`
		
		`lg0: IP address is set to`
		`DEFAULT (configured based on card location)`
		
		`lg0: netmask is set to`
		`DEFAULT (255.255.255.128)`

	8	Repeat steps 1 through 7 for all remaining GLIs, including those in any additional, inter-connected frames.

Cannot Communicate with Power Meter

Table 6-4: Troubleshooting a Power Meter Communication Failure		
✓	**Step**	**Action**
	1	Verify power meter is connected to LMF with GPIB adapter.
	2	Verify cable connections as specified in Chapter 3.
	3	Verify the GPIB address of the power meter is set to the same value displayed in the applicable GPIB address box of the **LMF Options** window **Test Equipment** tab. Refer to Table 3-28 or Table 3-29 and the Setting GPIB Addresses section of Appendix NO TAG for details.
	4	Verify the GPIB adapter DIP switch settings are correct. Refer to Test Equipment Preparation section of Appendix NO TAG for details.
	5	Verify the GPIB adapter is not locked up. Under normal conditions, only 2 green LEDs must be ‘ON’ (Power and Ready). If any other LED is continuously ‘ON’, then cycle GPIB box power and retry.
	6	Verify the LMF computer COM1 port is not used by another application; for example, if a HyperTerminal window is open for MMI, close it.
	7	Reset *all* test equipment by clicking **Util** in the BTS menu bar and selecting **Test Equipment > Reset** from the pull-down lists.

Cannot Communicate with Communications System Analyzer

Table 6-5: Troubleshooting a Communications System Analyzer Communication Failure

✓	Step	Action
	1	Verify analyzer is connected to LMF with GPIB adapter.
	2	Verify cable connections as specified in Chapter 3.
	3	Verify the analyzer GPIB address is set to the same value displayed in the applicable GPIB address box of the **LMF Options** window **Test Equipment** tab. Refer to Table 3-28 or Table 3-29 and the Setting GPIB Addresses section of Appendix F for details.
	4	Verify the GPIB adapter DIP switch settings are correct. Refer to Test Equipment Preparation section of Appendix NO TAG for details.
	5	Verify the GPIB adapter is not locked up. Under normal conditions, only 2 green LEDs must be ‘ON’ (Power and Ready). If any other LED is continuously ‘ON’, then cycle GPIB box power and retry.
	6	Verify the LMF computer COM1 port is not used by another application; for example, if a HyperTerminal window is open for MMI, close it.
	7	Reset *all* test equipment by clicking **Util** in the BTS menu bar and selecting **Test Equipment >** **Reset** from the pull-down lists.

Cannot Communicate with Signal Generator

Table 6-6: Troubleshooting a Signal Generator Communication Failure

✓	Step	Action
	1	Verify signal generator is connected to LMF with GPIB adapter.
	2	Verify cable connections as specified in Chapter 3.
	3	Verify the signal generator GPIB address is set to the same value displayed in the applicable GPIB address box of the **LMF Options** window **Test Equipment** tab. Refer to Table 3-28 or Table 3-29 and the Setting GPIB Addresses section of Appendix NO TAG for details.
	4	Verify the GPIB adapter DIP switch settings are correct. Refer to Test Equipment Preparation section of Appendix NO TAG for details.
	5	Verify the GPIB adapter is not locked up. Under normal conditions, only 2 green LEDs must be ‘ON’ (Power and Ready). If any other LED is continuously ‘ON’, then cycle GPIB box power and retry.
	6	Verify the LMF computer COM1 port is not used by another application; for example, if a HyperTerminal window is open for MMI, close it.
	7	Reset *all* test equipment by clicking **Util** in the BTS menu bar and selecting **Test Equipment >** **Reset** from the pull-down lists.

Troubleshooting: Download

Table 6-7: Troubleshooting Code Download Failure		
✓	Step	Action
	1	Verify T1 or E1 span is disconnected from the BTS at Site I/O boards (Figure 3-2).
	2	Verify LMF can communicate with the BTS devices using the LMF **Status** function.
	3	Communication with MGLI must first be established before trying to communicate with any other BTS device. MGLI must be INS_ACT state (bright green).
	4	Verify the target card is physically present in the cage and powered-up.
	5	If the target card LED is solid RED, it implies hardware failure. Reset card by re-seating it. If LED alarm persists, replace with *same type of* card from another slot and retry.
	6	Re-seat card and try again.
	7	If a BBX reports a failure message and is OOS_RAM, the code load was OK. Use the LMF **Status** function to verify the load.
	8	If a BBX or an MCC remains OOS_ROM (blue) after code download, use the LMF **Device > Status** function to verify that the code load was accepted.
	9	If the code load was accepted, use LMF **Device > Download > Flash** to load RAM code into flash memory.

Cannot Download DATA to Any Device (Card)

Table 6-8: Troubleshooting Data Download Failure		
✓	Step	Action
	1	Re-seat card and repeat code and data load procedure.
	2	Verify the ROM and RAM code loads are of the same release by statusing the card. Refer to Download the BTS section of Chapter G for more information.

6

Cannot ENABLE Device

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

The four device states that can be displayed by the LMF are:

- Enabled (bright green, INS_ACT)
- Stand-by (olive green, INS_SBY - redundant CSM and GLI only)
- Disabled (yellow, OOS_RAM)
- Reset (blue, OOS_ROM)

Table 6-9: Troubleshooting Device Enable (INS) Failure

✓	Step	Action
	1	Re-seat card and repeat code and data load procedure.
	2	If CSM cannot be enabled, verify the CDF has correct latitude and longitude data for cell site location and GPS sync.
	3	Ensure primary CSM is in INS_ACT (bright green) state. **NOTE** MCCs will not enable without the CSM being INS.
	4	Verify 19.6608 MHz CSM clock is present; MCCs will not enable without it.
	5	BBXs should not be enabled for ATP tests.
	6	If MCCs give “invalid or no system time,” verify the CSM is enabled.
	7	Log out of the BTS, exit the LMF, restart the application, log into the BTS, and re-attempt device-enable actions.

6

LPA Errors

Table 6-10: LPA Errors

✓	Step	Action
	1	If LPAs give continuous alarms, cycle power with the applicable DC PDA circuit breakers.
	2	Establish an MMI session with the LPA (Table 3-15), connecting the cable to the applicable MMI port on the ETIB.
	2a	- Type **`alarms`** at the HyperTerminal window prompt and press **Enter**. -- The resulting display may provide an indication of the problem.
	2b	- Call Field Support for further assistance.

Troubleshooting: Calibration

Bay Level Offset Calibration Failure

Table 6-11: Troubleshooting BLO Calibration Failure

✓	Step	Action
	1	Verify the power meter or communications system analyzer is configured correctly (see the Test Equipment Set-up section of Chapter 3), and is connected to the proper BTS TX antenna connector.
	2	If a power meter is being used:
	2a	- Re-calibrate the Power Meter and verify it is calibrated correctly with cal factors from the power sensor (refer to Appendix F).
	2b	- Verify the power sensor is functioning properly by checking it with the 1-mW (0 dBm) Power Ref signal.
	2c	- Verify communication between the LMF and Power Meter is working by checking that the meter display is showing ***RES :***
	3	Verify the parameters in the **`bts-#.cdf`** file are set correctly for the BTS operating band as follows: For 1900 MHz: Bandclass=1; Freq_Band=16 For 800 MHz: Bandclass=0; Freq_Band=8
	4	Verify that no LPA on the carrier is in alarm state (rapidly flashing red LED).
	4a	- If any are, reset the LPA(s) by pulling the applicable circuit breaker on the DC PDA, and, after 5 seconds, pushing back in.
	5	Verify GPIB adapter is not locked up. Under normal conditions, only 2 green LEDs must be ‘ON’ (Power and Ready). If any other LED is continuously ‘ON’, power-cycle (turn power off and on) the GPIB Box and retry.

Calibration Audit Failure

Table 6-12: Troubleshooting Calibration Audit Failure

✓	Step	Action
	1	Verify the power meter or communications system analyzer is configured correctly (see the Test Equipment Set-up section of Chapter 3), and is connected to the proper BTS TX antenna connector.
	2	If a power meter is being used:
	2a	- Re-calibrate the Power Meter and verify it is calibrated correctly with cal factors from the power sensor (refer to Appendix F).
	2b	- Verify the power sensor is functioning properly by checking it with the 1-mW (0 dBm) Power Ref signal.
	2c	- Verify communication between the LMF and Power Meter is working by checking that the meter display is showing ***RES :***
	3	Verify that no LPA on the carrier is in alarm state (rapidly flashing red LED).
	3a	- If any are, reset the LPA(s) by pulling the applicable circuit breaker on the DC PDA, and, after 5 seconds, pushing back in.
	4	After calibration, the BLO data must be re-loaded to the BBXs before auditing. Click on the BBX(s), and in the BTS menu bar select **Device > Download >BLO**. Re-try the audit.
	5	Verify GPIB adapter is not locked up. Under normal conditions, only 2 green LEDs must be ‘ON’ (Power and Ready). If any other LED is continuously ‘ON’, power-cycle (turn power off and on) the GPIB Box and retry.
	6	If calibration was being performed for the *redundant* BBX, be sure the **Single-Sided BLO** checkbox was *not* checked in the **CDMA Test Parameters** test set-up window.
	7	If additional items, such as directional couplers or combiners, have been installed in the TX path, be sure that *one* of the following has been done: • **Verify BLO** checkbox in the **CDMA Test Parameters** test set-up window is *un*checked. • The additional path losses have been added into each applicable sector using the **Util > Edit > TX Coupler Loss...** function.

6

Basic Troubleshooting: RF Path Fault Isolation

Overview

The optimization (RF path characterization or calibration) and post-calibration (audit) procedures measure and limit-check the BTS reported transmit and receive levels of the path from each BBX to the back of the frame. When a fault is detected, it is specific to a receive or transmit path. The troubleshooting process in this section determines the most probable cause of the fault.

As the calibration and audit tests are performed, results are displayed in the LMF test status report window. When faults are encountered, the test procedure in progress continues running and displaying any further faults. If it appears that there are major faults, the test can be aborted.

The test results can be saved to a **`bts-#.rpt`** file in the**<*x*>:\<*lmf home directory*** **`\cdma\bts-`***#* folder. To do this, close the test status report window using the *Save Results* button.

NOTE	Closing the test status report window with the *Dismiss* button will delete the test results without saving them.

If a test is re-run or a new calibration, audit, or test is run and the results are saved, the previous test results in the **`bts-#.rpt`** file are overwritten. To prevent losing previous test results in the **`bts-#.rpt`** file, refer to the procedure in Table 4-13 before performing further testing with the LMF.

6

If there are major faults, recheck the test equipment attachments for errors. If none are found, close the test status report window using the **Save Results** button, and save the contents of the resulting **`bts-#.rpt`** file as described in Table 4-13. Also, note other specifics about the failure, and proceed with the fault isolation procedure.

If Every Test Fails

Check the calibration equipment for proper operation by manually setting the signal generator output attenuator to the lowest output power setting. Connect the output port to the spectrum analyzer RF input port. Set the signal generator output attenuator to -90 dBm, and switch on the RF output. Verify that the spectrum analyzer can receive the signal, indicate the correct signal strength (accounting for the cable insertion loss), and indicate the approximate frequency.

Verify BLO Checkbox

When performing a calibration with the **TX Calibration...** or **All Cal/Audit...** functions, the **Verify BLO** checkbox should normally be checked. When a calibration fails, determine if any items such as directional couplers or combiners have been added to the TX path. If additional items have been installed in the path, try re-running the calibration with **Verify BLO** *un*checked. If calibration still does not pass, refer to the following paragraphs and use the TX output fault isolation flowchart to identify the most probable cause of the failure.

Single-Sided BLO Checkbox

When performing a calibration with the **TX Calibration...** or **All Cal/Audit...** functions, the **Single-Sided BLO** checkbox should *not* be checked when the *redundant* BBX is being calibrated. When a calibration fails with the redundant BBX selected, try re-running the calibration with the **Single-Sided BLO** checkbox *un*checked. If the calibration still fails, refer to the following paragraphs and use the TX output fault isolation flowchart to identify the most probable cause of the failure.

If Faults Are Isolated

If the fault reports are isolated between successful path checks, the root cause of the faults most likely lies with one or more of the Field Replaceable Unit (FRU) modules. If more than one failure was reported, look for a common denominator in the data. For example, if any TX test fails on one sector only, the BBX assigned to that sector (Table 1-5) is a likely cause. Also, look at the severity of the failure. If the path loss is just marginally out of the relaxed specification limit during the post-calibration TX audit, suspect excessive cable loss. If limits are missed by a wide margin, suspect mis-wired cables or total device failure. Use the TX output fault isolation flowchart in Figure 6-1 to identify the strongest possible cause for a failed TX test.

Fault Isolation Flowchart

The flowchart covers the transmit path. Transmit paths usually fail the lower test limit, indicating excessive loss in some component in the BTS site or mis-wiring. A failure of an upper limit usually indicates a problem with the test setup or external equipment. Before replacing a suspected FRU, always repeat and verify the test results to rule out a transient condition. If a BBX fails an upper limit in the post-calibration audit procedure, re-calibrate and verify the out-of-tolerance condition for that BBX and/or sector before replacement.

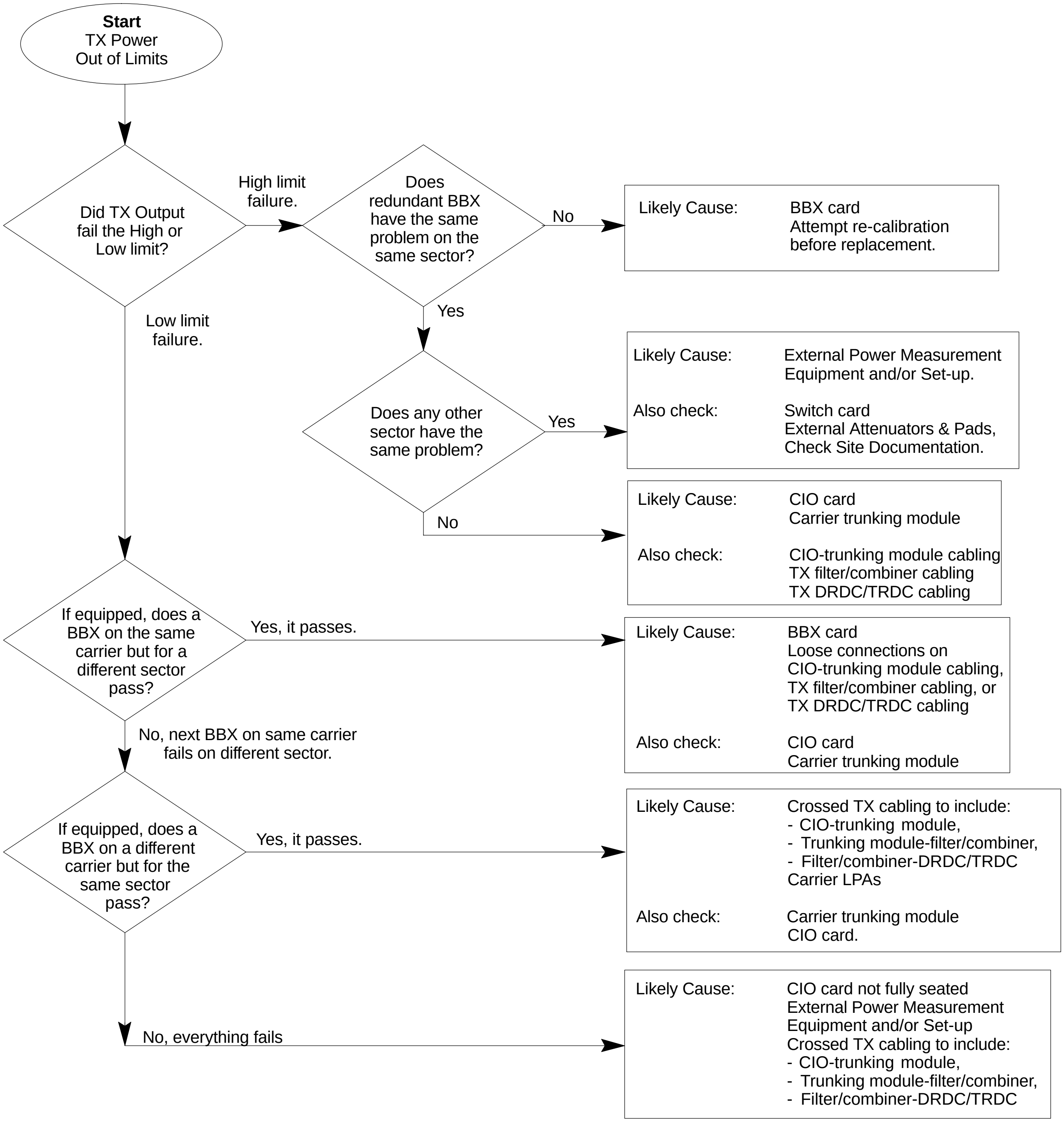
Flowchart Prerequisites

Before entering the fault isolation sequence outlined in the flowchart, be sure the following have been completed:

- GLIs, MCCs, and BBXs have been downloaded with the correct ROM code, RAM code, and data (Table 3-17, Table 3-18, and Table 3-19).
- MGLI, CSMs, and MCCs are enabled (Table 3-18, Table 3-21, and Table 3-22, respectively)
- Be sure the LED on the correct CCD card is *solid green.*
- Be sure no alarms are being reported by opening an LMF alarm window as outlined in Table 3-53.

TX Power Output Fault Isolation Flowchart

Figure 6-1: TX Output Fault Isolation Flowchart



6

Troubleshooting: Transmit ATP

BTS Passed Reduced ATP Tests but Has Forward Link Problem in Normal Operation

Follow the procedure in Table 6-13 to troubleshoot a forward link problem during normal operation after passing a reduced ATP.

Table 6-13: Troubleshooting Forward Link Failure (BTS Passed Reduced ATP)

✓	Step	Action
	1	Perform the following additional tests to troubleshoot a forward link problem:
	1a	- TX mask
	1b	- TX rho
	1c	- TX code domain

Cannot Perform TX Mask Measurement

Table 6-14: Troubleshooting TX Mask Measurement Failure

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

Cannot Perform Rho or Pilot Time Offset Measurement

Table 6-15: Troubleshooting Rho and Pilot Time Offset Measurement Failure

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

Cannot Perform Code Domain Power and Noise Floor Measurement

Table 6-16: Troubleshooting Code Domain Power and Noise Floor Measurement Failure

✓	Step	Action
	1	Verify presence of RF signal by switching to spectrum analyzer screen on the communications system analyzer.
	2	Verify PN offset displayed on analyzer is same as PN offset being used in the CDF file.
	3	Disable and re-enable MCC (one or more MCCs based on extent of failure).

Troubleshooting: Receive ATP

Multi-FER Test Failure

Table 6-17: Troubleshooting Multi-FER Failure

✓	Step	Action
	1	Verify test equipment is configured correctly for a FER test.
	2	Verify test equipment is locked to 19.6608 and even second clocks. On the HP 8921 analyzer, the yellow LED (REF UNLOCK) must be **OFF**.
	3	Verify MCCs have been loaded with data and are INS_ACT.
	4	Disable and re-enable the MCC (1 or more based on extent of failure).
	5	Disable, re-load code and data, and re-enable MCC (one or more MCCs based on extent of failure).
	6	Verify antenna connections to frame are correct based on the LMF directions messages.
	7	For diversity RX FER failures in companion frame configurations, verify the following:
	7a	- Inter-frame diversity RX cables are correctly connected between RX EXPANSION connectors on each frame (refer to *SC4812ET Lite Installation; 68P09253A36*.
	7b	- The RX test cable is connected to the correct RX antenna connector on the *opposite* companion frame (refer to Table 4-1).

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Troubleshooting: CSM Check-list

Problem Description

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

Intermittent 19.6608 MHz Reference Clock / GPS Receiver Operation

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

No GPS Reference Source

Correct Hardware

Check the CSM boards for proper hardware configuration for the type of GPS in use and the cage slot where they are installed.

RF-GPS (Local GPS) - CSM kit SGLN1145, which should be installed in Slot l, has an on-board GPS receiver; while kit SGLN4132, in Slot 2, does not have a GPS receiver.

Remote GPS (RGPS) - Kit SGLN4132ED or later, which should be installed in *both* Slot 1 and Slot 2, does not have a GPS receiver.

Any incorrectly configured board *must* be returned to the repair center. *Do not attempt to change hardware configuration in the field.* Also, verify the GPS antenna is not damaged and is installed per recommended guidelines.

RGPS Expansion Cabling

20-pair Punchblock Connections - For companion frame installations with RGPS, verify the 20-pair punchblock RGPS distribution connections in the RGPS expansion *primary* frame are correctly punched down in accordance with Table 3-9.

50-pair Punchblock Connections - For companion frame installations with RGPS, verify the 50-pair punchblock RGPS distribution connections in both the RGPS expansion *primary* and *secondary* frames are correctly punched down in accordance with Table 3-7 and Table 3-8.

Checksum Failure

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

GPS Bad RX Message Type

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

CSM Reference Source Configuration Error

This is caused by incorrect reference (clock) source configuration performed in the field by software download. CSM kit SGLN1145 and SGLN4132 must have proper reference sources configured, as shown in Table 6-18, to function correctly.

<table>
<tr><th colspan="5">Table 6-18: CSM Reference (Clock) Sources by GPS Type and Kit Number</th></tr>
<tr><th>GPS Type</th><th>CSM Kit No.</th><th>Hardware Configuration</th><th>CSM Slot No.</th><th>Reference Source Configuration</th></tr>
<tr><td rowspan="2">RF GPS</td><td>SGLN1145</td><td>With GPS Receiver</td><td>1</td><td>Primary = Local GPS
Backup = Either LFR or HSO</td></tr>
<tr><td>SGLN4132</td><td>Without GPS Receiver</td><td>2</td><td>Primary = Mate GPS
Backup = Either LFR or HSO</td></tr>
<tr><td rowspan="2">REMOTE GPS</td><td rowspan="2">SGLN4132ED or later</td><td rowspan="2">Without GPS Receiver</td><td>1</td><td>Primary = Remote GPS
Backup = Either LFR or HSO</td></tr>
<tr><td>2</td><td>Primary = Remote GPS
Backup = Either LFR or HSO</td></tr>
</table>

Takes Too Long for CSM to Come INS

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

Troubleshooting: SCCP Backplane

Introduction

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

Connector Functionality

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

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

Span Line Connector

The span line input is an 8 pin RJ-45 connector that provides a primary and secondary (if used) span line interface to each GLI in the SCCP shelf. The span line is used for MM/EMX switch control of the Master GLI and also all the BBX traffic.

Power Input (Return A and B connectors)

Provides 27 volt input for use by the power supply modules.

Power Supply Module Interface

Each power supply module has a series of three different connectors to provide the needed inputs/outputs to the SCCP backplane. These include a VCC/Ground input connector, a Harting-style multiple pin interface, and a +15V/Analog Ground output connector. The Transceiver Power Module converts 27/48 Volts to a regulated +15, +6.5, +5.0 volts to be used by the SCCP shelf cards.

GLI Connector

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

GLI Ethernet “A” and “B” Connections

These SMB connectors are located on the SCCP backplane and connect to the GLI board. This interface provides all the control and data communications over the Ethernet LAN between the master GLI, the redundant GLI, and the LMF.

BBX Connector

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

CIO Connectors

- RF RX antenna path signal inputs are routed through RX paths of the DRDCs or TRDCs at the RF interface panel (rear of frame), and through coaxial cables to the two MPC modules. The three “A” (main) signals go to one MPC; the three “B” (diversity) to the other. The MPC outputs the low-noise-amplified signals through the SCCP backplane to the CIO where the signals are split and sent to the appropriate BBX.
- A digital bus then routes the baseband signal through the BBX, to the backplane, and then on to the MCC slots.
- Digital TX antenna path signals originate at the MCCs. Each output is routed from the MCC slot through the backplane to the appropriate BBX.
- TX RF path signal originates from the BBX, travels through the backplane to the CIO, through the CIO, and then through multi-conductor coaxial cabling to the trunking module and LPAs in the LPA shelf.

SCCP Backplane Troubleshooting Procedure

The following tables provide standard procedures for troubleshooting problems that appear to be related to a defective SCCP backplane. The tables are broken down into possible problems and steps which should be taken in an attempt to find the root cause.

NOTE	*All* steps in all tables should be followed before any attempt to replace the SCCP backplane.

Digital Control Problems

No GLI Control via LMF (all GLIs)

Table 6-19: No GLI Control Through LMF (All GLIs)

Step	Action
1	Check the Ethernet LAN for proper connection, damage, shorts, or opens.
2	Be sure the LAN IN and OUT connectors in the power entry compartment are properly terminated.
3	Be sure the proper IP address is entered in the Network Login tab of the LMF login screen.
4	Logout and Exit the LMF, restart the LMF, and re-login to the BTS.
5	Verify SCCP backplane Shelf ID DIP switch is set correctly.
6	Visually check the master GLI connectors (both module and backplane) for damage.
7	Replace the master GLI with a known good GLI.

No GLI Control through Span Line Connection (All GLIs)

Table 6-20: No GLI Control Through Span Line Connection (Both GLIs)

Step	Action
1	Verify SCCP backplane Shelf ID DIP switch is set correctly.
2	Verify that the BTS and GLIs are correctly configured in the OMCR/CBSC database.
3	Verify the span configurations set in the GLIs match those in the OMC-R/CBSC database (refer to Table 6-31).
4	Visually check the master GLI connectors (both module and backplane) for damage.
5	Replace the master GLI with a known good GLI.
6	Check the span line cabling from the punchblock to the master GLI for proper connection and damage.

6

Table 6-21: MGLI Control Good - No Control Over Co-located GLI

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

No AMR Control (MGLI good)

Table 6-22: MGLI Control Good - No Control Over AMR

Step	Action
1	Visually check the master GLI connectors (both module and backplane) for damage.
2	Replace the master GLI with a known good GLI.
3	Replace the AMR with a known good AMR.

No BBX Control in the Shelf

Table 6-23: MGLI Control Good - No Control over Co-located BBXs

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

No (or Missing) Span Line Traffic

Table 6-24: BBX Control Good - No (or Missing) Span Line Traffic

Step	Action
1	Visually check all GLI connectors (both module and backplane) for damage.
2	Replace the remaining GLI with a known good GLI.
3	Visually check all span line distribution (both connectors and cables) for damage.
4	If the problem seems to be limited to one BBX, replace the BBX with a known good BBX.

No (or Missing) MCC24E/MCC8E Channel Elements

Table 6-25: No MCC-1X/MCC24E/MCC8E Channel Elements

Step	Action
1	Verify channel elements on a co-located MCC of the same type (CDF MccType codes: MCC8E = 0; MCC24E = 2; MCC-1X = 3)
2	Check MCC connectors (both module and backplane) for damage.
3	If the problem seems to be limited to one MCC, replace it with a known good MCC of the same type.
4	If no channel elements on *any* MCC, verify clock reference to CIO.

DC Power Problems

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

No DC Input Voltage to SCCP Shelf Power Supply Modules

Table 6-26: No DC Input Voltage to Power Supply Module

Step	Action
1	Verify DC power is applied to the frame. Determine if any circuit breakers are tripped. **NOTE** If a breaker has tripped, remove all modules from the SCCP shelf and attempt to reset it. - If breaker trips again, there is probably a cable or breaker problem within the frame or DC PDA. - If breaker does not trip, there is probably a defective module or sub-assembly within the shelf. Perform the tests in Table 2-3 to attempt to isolate the module.
2	Verify that the PS1 and PS2 circuit breakers on the DC PDA are functional.
3	Remove the frame rear access panel (Figure 2-1), and use a voltmeter to determine if the input voltage is being routed to the SCCP backplane. Measure the DC voltage level between: • The PWR_IN_A and PWR_RTN_A contacts on the extreme right side at the rear of the backplane • The PWR_IN_B and PWR_RTN_B contacts on the extreme right side at the rear of the backplane - If the voltage is not present, there is probably a cable or circuit breaker problem within the frame or DC PDA.
4	If everything appears to be correct, visually inspect the PS1 and PS2 power supply module connectors.
5	Replace the power supply modules with known good modules.
6	If steps 1 through 4 fail to indicate a problem, an SCCP backplane failure has occurred (possibly an open trace).

No DC Voltage (+5, +6.5, or +15 Volts) to a Specific GLI, BBX, or Switch Module

Table 6-27: No DC Input Voltage to any SCCP Shelf Module

Step	Action
1	If it has not been done, perform the steps in Table 6-26.
2	Inspect SCCP shelf module connectors (both module and backplane) for damage.
3	Replace suspect modules with known good module.

TX and RX Signal Routing Problems

Table 6-28: TX and RX Signal Routing Problems

Step	Action
1	Inspect all Harting cable connectors and backplane connectors for damage in all the affected board slots.
2	Perform steps outlined in the RF path troubleshooting flowchart in Figure 6-1.

6

Troubleshooting: RFDS

Introduction

The RFDS is used to perform Pre-Calibration Verification and Post-Calibration Audits which limit-check the RFDS-generate and reported receive levels of every path from the RFDS through the directional coupler coupled paths. In the event of test failure, refer to the following tables.

All Tests Fail

Table 6-29: RFDS Fault Isolation - All Tests Fail

Step	Action
1	Check the TX calibration equipment for proper operation by manually setting the signal generator output attenuator to the lowest output power setting and connecting the output port to the spectrum analyzer RF input port.
2	Set the signal generator output attenuator to -90 dBm, and switch on the RF output. Verify that the spectrum analyzer can receive the signal, indicate the correct signal strength, (accounting for the cable insertion loss), and the approximate frequency.
3	Visually inspect RF cabling. Make sure each directional coupler forward and reflected port connects to the RFDS antenna select unit on the RFDS.
4	Check the wiring against the site documentation wiring diagram or the *SC4812ET Lite Installation; 68P09253A36*.
5	Verify any changes to the RFDS parameter settings have been downloaded.
6	Status the TSU to verify the TSIC and SUA software versions are correct.
7	Check to see that all RFDS boards show green on the front panel LED indicators. Visually check for external damage.
8	If any board LEDs do not show green, replace the RFDS with a known-good unit. Re-test after replacement.

All RX and TX Paths Fail

If every receive or transmit path fails, the problem most likely lies with the rf converter board or the transceiver board. Replace the RFDS with a known-good unit and retest.

All Tests Fail on a Single Antenna

If all path failures are on one antenna port, forward and/or reflected, make the following checks.

Table 6-30: RFDS Fault Isolation - All Tests Fail on Single Antenna Path

Step	Action
1	Visually inspect the frame internal RFDS cabling to the suspect TRDC or DRDC.
2	Verify the forward and reflected ports connect to the correct RFDS antenna select unit positions on the RFDS ASU card. Refer to the RFDS installation manual for details.
3	Replace the RFDS with a known-good unit.
4	Replace the RF cables between the affected TRDC or DRDC and the RFDS.

Module Front Panel LED Indicators and Connectors

Module Status Indicators

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

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

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

LED Status Combinations for All Modules (except GLI2, CSM, BBXs (2, 1X), and MCCs (8E, 24E, 1X)

PWR/ALM LED

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

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

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

DC/DC Converter LED Status Combinations

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

PWR/ALM LED

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

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

CSM LED Status Combinations

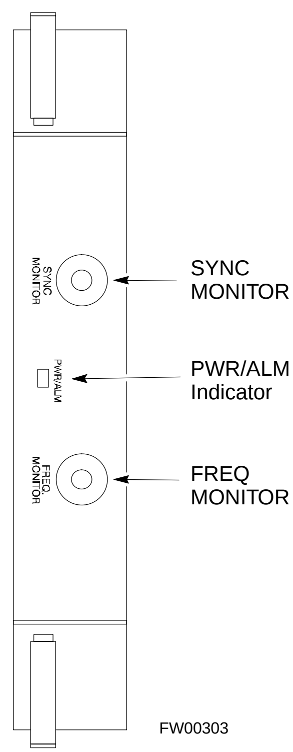
PWR/ALM LED

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

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

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

Figure 6-2: CSM Front Panel Indicators & Monitor Ports



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FREQ Monitor Connector

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

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

SYNC Monitor Connector

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

At this port, the reference signal is a Transistor-Transistor Logic (TTL) active-high signal with a pulse width of 153 nanoseconds.

MMI Connector

Behind front panel - only accessible when card is partially extended from SCCP shelf slot. The RS-232 MMI port connector is intended to be used primarily in the development or factory environment, but may be used in the field for debug/maintenance purposes.

GLI2 LED Status Combinations

The GLI2 module indicators, controls, and connectors are described below and shown in Figure 6-3.

The indicators and controls consist of:

- Four LEDs
- One pushbutton

ACTIVE LED

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

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

MASTER LED

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

ALARM LED

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

STATUS LED

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

SPANS LED

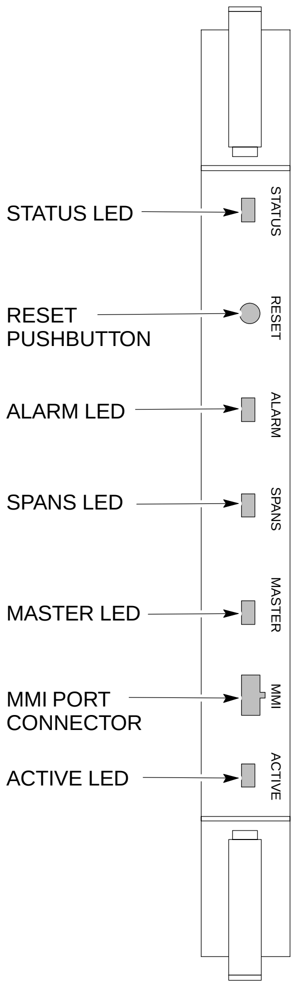
- Solid GREEN - Span line is connected and operating.
- Solid RED - Span line is disconnected or a fault condition exists.

GLI2 Pushbuttons and Connectors

RESET Pushbutton - Depressing the RESET pushbutton causes a partial reset of the CPU and a reset of all board devices. GLI2 will be placed in the OOS_ROM state (blue).

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

Figure 6-3: GLI2 Front Panel Operating Indicators



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

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BBX LED Status Combinations

PWR/ALM LED

The BBX2 and BBX-1X modules have their own alarm (fault) detection circuitry that controls the state of the PWR/ALM LED.

The following list describes the states of the bi-color PWR/ALM LED for both BBX2 and BBX-1X cards:

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

MCC LED Status Combinations

The MCC24E and MCC-1X modules have bi-color LED indicators and two connectors as described below. See Figure 6-4. Note that the figure does not show the connectors because they are concealed by the removable lens.

The LED indicators and their states are as follows:

PWR/ALM LED

- RED - fault on module

ACTIVE LED

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

PWR/ALM and ACTIVE LEDs

- Solid RED - module is powered but is in reset or the Board Control Processor (BCP) is inactive.

MMI Connectors

- The RS-232 MMI port connector (four-pin) is intended primarily for development or factory use but may be used in the field for debugging purposes.
- The RJ-45 Ethernet port connector (eight-pin) is intended primarily for development use but may be used in the field for high data rate debugging purposes.

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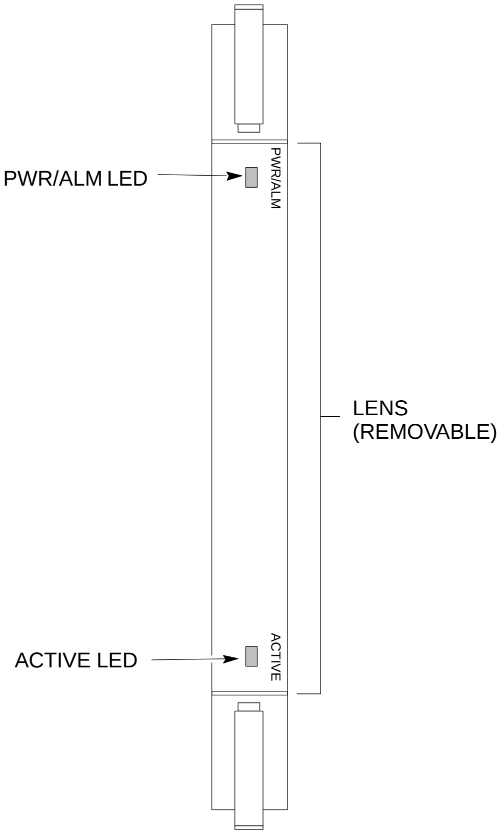
Figure 6-4: MCC24 and MCC-1X Front Panel LEDs and LED Indications



LED	COLOR	OPERATING STATUS
PWR/ALM	RED	OFF - Operating normally ON - Briefly during power-up and during failure conditions *An alarm is generated in the event of a failure*
ACTIVE	GREEN	RAPIDLY FLASHING - Card is code-loaded but not enabled SLOW FLASHING - Card is not code-loaded ON - Card is code-loaded and enabled (INS_ACT)
	RED	ON - 1) Briefly during power-up 2) Continuously during fault conditions SLOW FLASHING (alternately with green) - Concentration Highway Interface (CHI) bus inactive on power-up

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LPA LED Status Combinations

LPA Module LED

Each LPA module is provided with a bi-color LED on the ETIB module next to the MMI connector. Interpret this LED as follows:

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

Troubleshooting: Span Control Link

Span Problems (No Control Link)

Table 6-31: Troubleshoot Control Link Failure

	Step	Action
	1	Connect the LMF computer to the MMI port on the applicable MGLI2/GLI2 as shown in Figure 6-5.
	2	Start an MMI communication session with the applicable MGLI2/GLI2 by using the *Windows* desktop shortcut icon (refer to Table 3-15).
	3	Once the connection window opens, press the LMF computer **Enter** key until the `GLI2>` prompt is obtained.

	4	At the `GLI2>` prompt, enter:
		config ni current <cr> (equivalent of `span view` command)
		The system will respond with a display similar to the following:
		`The frame format in flash is set to use T1_2.`
		`Equalization:`
		`  Span A - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
		`  Span B - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
		`  Span C - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
		`  Span D - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
		`  Span E - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
		`  Span F - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
		
		`Linkspeed: Default (56K for T1 D4 AMI, 64K otherwise)`
		`Currently, the link is running at the default rate`
		`The actual rate is 0`
		NOTE
		Defaults for span equalization are 0-131 feet for T1/J1 spans and 120 Ohm for E1.
		Default linkspeed is 56K for T1 D4 AMI spans and 64K for all other types.
		There is no need to change from defaults unless the OMCR/CBSC span configuration requires it.

	5	The span configurations loaded in the GLI must match those in the OMCR/CBSC database for the BTS. If they do not, proceed to Table 6-32.
	6	Repeat steps 1 through 5 for all remaining GLIs.
	7	If the span settings are correct, verify the edlc parameters using the `show` command. Any alarm conditions indicate that the span is not operating correctly. • Try looping back the span line from the DSX panel to the MM, and verify that the looped signal is good. • Listen for control tone on the appropriate timeslot from the Base Site and MM.
	8	Exit the GLI MMI session and HyperTerminal connection by selecting **File** from the connection window menu bar, and then **Exit** from the pull-down menu.

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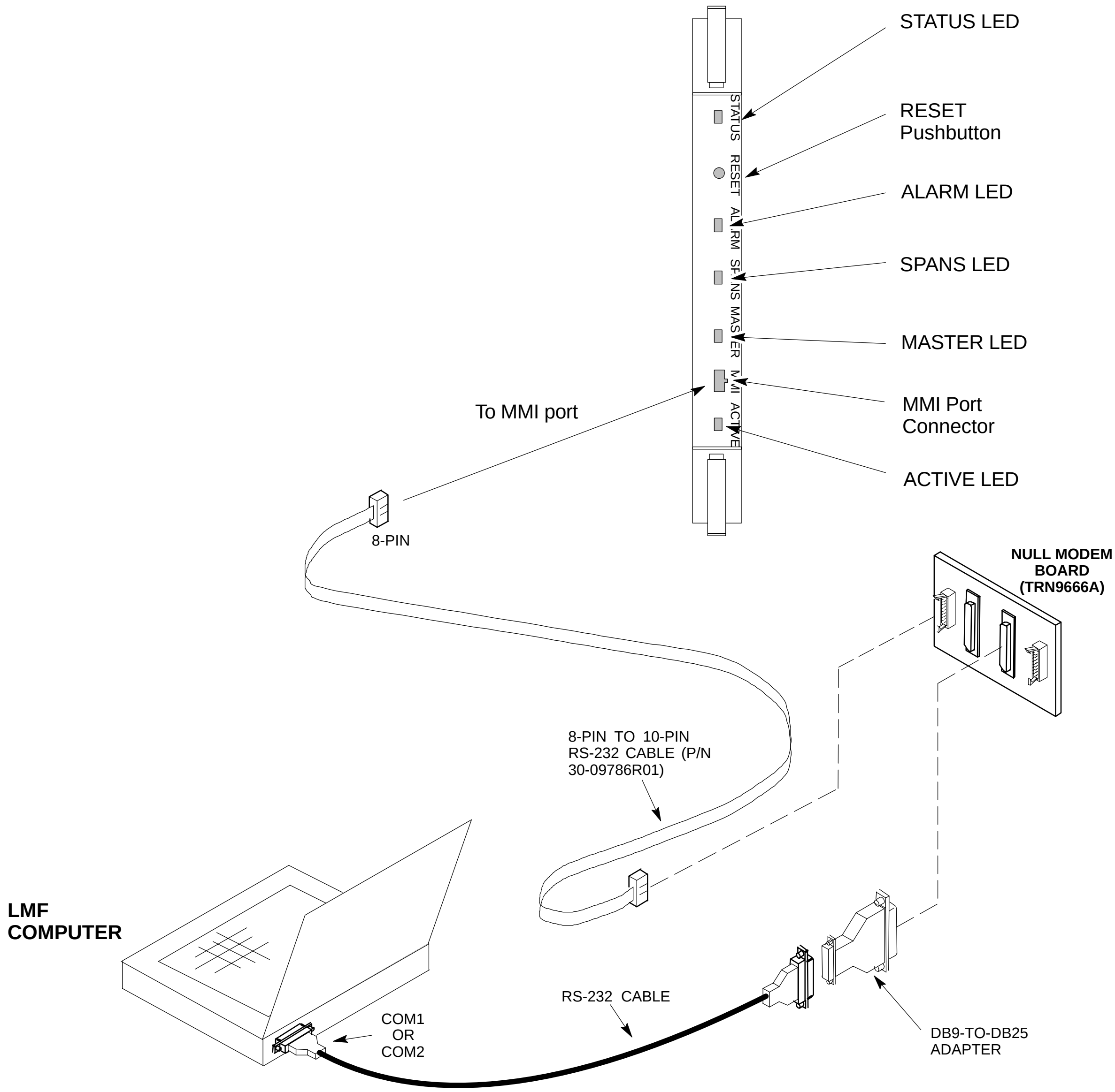
Figure 6-5: MGLI/GLI Board MMI Connection Detail



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Set BTS Site Span Configuration

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

Table 6-32: Set BTS Span Parameter Configuration

✓	Step	Action
	1	If not previously done, connect the LMF computer to the MMI port on the applicable MGLI2/GLI2 as shown in Figure 6-5.
	2	If there is no MMI communication session in progress with the applicable MGLI2/GLI2, initiate one by using the *Windows* desktop shortcut icon (refer to Table 3-15).

	3	At the `GLI2>` prompt, enter:
		config ni format *<option>* **<cr>**
		The terminal will display a response similar to the following:
		`COMMAND SYNTAX: config ni format option`
		`Next available options:`
		`LIST - option : Span Option`
		`E1_1 : E1_1 - E1 HDB3 CRC4 no TS16`
		`E1_2 : E1_2 - E1 HDB3 no CRC4 no TS16`
		`E1_3 : E1_3 - E1 HDB3 CRC4 TS16`
		`E1_4 : E1_4 - E1 HDB3 no CRC4 TS16`
		`T1_1 : T1_1 - D4, AMI, No ZCS`
		`T1_2 : T1_2 - ESF, B8ZS`
		`J1_1 : J1_1 - ESF, B8ZS (Japan) - Default`
		`J1_2 : J1_2 - ESF, B8ZS`
		`T1_3 : T1_3 - D4, AMI, ZCS>`
		NOTE
		With this command, all active (in-use) spans will be set to the same format.

	4	To set or change the span type, enter the correct option from the list at the entry prompt (>), as shown in the following example:
		> **T1_2** *<cr>*
		NOTE
		The entry is case-sensitive and must be typed *exactly* as it appears in the list. If the entry is typed incorrectly, a response similar to the following will be displayed:
		`CP: Invalid command`
		`GLI2>`

	5	An acknowledgement similar to the following will be displayed:
		`The value has been programmed. It will take effect after the next reset.`
		`GLI2>`

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Table 6-32: Set BTS Span Parameter Configuration

✓	Step	Action

	6	If the current MGLI/GLI span rate must be changed, enter the following MMI command:
		config ni linkspeed <cr>
		The terminal will display a response similar to the following:
		`Next available options:`
		`LIST - linkspeed : Span Linkspeed`
		`56K : 56K (default for T1_1 and T1_3 systems)`
		`64K : 64K (default for all other span configurations)`
		`>`
		NOTE
		With this command, all active (in-use) spans will be set to the same linkspeed.

	7	To set or change the span linkspeed, enter the required option from the list at the entry prompt (>), as shown in the following example:
		> **64K <cr>**
		NOTE
		The entry is case-sensitive and must be typed *exactly* as it appears in the list. If the entry is typed incorrectly, a response similar to the following will be displayed:
		`CP: Invalid command`
		`GLI2>`

	8	An acknowledgement similar to the following will be displayed:
		`The value has been programmed. It will take effect after the next reset.`
		`GLI2>`

	9	If the span equalization must be changed, enter the following MMI command:
		config ni equal <cr>
		The terminal will display a response similar to the following:
		`COMMAND SYNTAX: config ni equal span equal`
		`Next available options:`
		`LIST - span : Span`
		`a : Span A`
		`b : Span B`
		`c : Span C`
		`d : Span D`
		`e : Span E`
		`f : Span F`
		`>`

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<table>
<tr><th colspan="3">Table 6-32: Set BTS Span Parameter Configuration</th></tr>
<tr><th>✓</th><th>Step</th><th>Action</th></tr>
<tr><td></td><td>10</td><td>At the entry prompt (>), enter the designator from the list for the span to be changed as shown in the following example:

> a <cr>

The terminal will display a response similar to the following:<pre>
COMMAND SYNTAX: config ni equal a equal
Next available options:
   LIST -   equal : Span Equalization
                       0 : 0-131 feet (default for T1/J1)
                       1 : 132-262 feet
                       2 : 263-393 feet
                       3 : 394-524 feet
                       4 : 525-655 feet
                       5 : LONG HAUL
                       6 : 75 OHM
                       7 : 120 OHM (default for E1)
>
</pre></td></tr>
<tr><td></td><td>11</td><td>At the entry prompt (>), enter the code for the required equalization from the list as shown in the following example:

> 0 <cr>

The terminal will display a response similar to the following:<pre>
> 0
The value has been programmed. It will take effect after the next reset.
GLI2>
</pre></td></tr>
<tr><td></td><td>12</td><td>Repeat steps 9 through 11 for each in-use span.</td></tr>
<tr><td></td><td>13</td><td>* IMPORTANT
After executing the config ni format, config ni linkspeed, and/or config ni equal commands, the affected MGLI/GLI board MUST be reset and reloaded for changes to take effect.

Although defaults are shown, always consult site specific documentation for span type and linkspeed used at the site.

Press the RESET button on the MGLI2/GLI2 for changes to take effect.</td></tr>
</table>

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Table 6-32: Set BTS Span Parameter Configuration

✓	Step	Action

	14	Once the MGLI/GLI has reset, execute the following command to verify span settings are as required:
		config ni current <cr> (equivalent of `span view` command)
		The system will respond with a display similar to the following:
		`The frame format in flash is set to use T1_2.`
		`Equalization:`
		`  Span A - 0-131 feet`
		`  Span B - 0-131 feet`
		`  Span C - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
		`  Span D - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
		`  Span E - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
		`  Span F - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
		
		`Linkspeed: 64K`
		`Currently, the link is running at 64K`
		`The actual rate is 0`

	15	If the span configuration is not correct, perform the applicable step from this table to change it and repeat steps 13 and 14 to verify required changes have been programmed.
	16	Return to step 6 of Table 6-31.

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Appendix A

Data Sheets

Optimization (Pre-ATP) Data Sheets

Verification of Test Equipment Used

Table A-1: Verification of Test Equipment Used

Manufacturer	Model	Serial Number

Comments:____

____

Site Checklist

Table A-2: Site Checklist

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

Preliminary Operations

Table A-3: Preliminary Operations

OK	Parameter	Specification	Comments
❑	Frame ID DIP Switches	Per site equipage	
❑	Ethernet LAN verification	Verified per procedure	

Comments:____

Pre-Power and Initial Power Tests

Table A3a: Pre-power Checklist			
OK	**Parameter**	**Specification**	**Comments**
❑	Pre-power-up tests	Table 2-3 Table 2-4	
	Internal Cables:		
❑	Span	verified	
❑	CSM	verified	
❑	Power	verified	
	Ethernet Connectors		
❑	LAN A ohms	verified	
❑	LAN B ohms	verified	
❑	LAN A shield	isolated	
❑	LAN B shield	isolated	
❑	LAN A IN & OUT terminators	installed	
❑	LAN B IN & OUT terminators	installed	
❑	Ethernet Boots	installed	
❑	Air Impedance Cage (single cage)	installed	
❑	Initial power-up tests	Table 2-4 Table 2-6 Table 2-7	
❑	Frame fans	operational	
❑	LEDs	illuminated	

Comments:____

General Optimization Checklist

Table A3b: General Optimization Checklist

OK	Parameter	Specification	Comments
	Preparing the LMF		
❑	Load LMF software	Table 3-1	
❑	Create site-specific BTS directory	Table 3-2	
❑	Create HyperTerminal connection	Table 3-4	
❑	LMF-to-BTS Connection	Table 3-10	
❑	Verify GLI2 ethernet address settings	Table 6-3	
❑	Ping LAN A	Table 3-16	
❑	Ping LAN B	Table 3-16	
❑	Verify ROM code loads for software release	Table 3-17	
❑	Download/Enable MGLI2	Table 3-18	
❑	Download/Enable GLI2	Table 3-18	
❑	Set Site Span Configuration	Table 6-31	
❑	Set CSM clock source	Table 3-20	
❑	Enable CSMs	Table 3-21	
❑	Download/Enable MCCs (24/8E/1X)	Table 3-19	
❑	Download BBXs (2 or 1X)	Table 3-19	
❑	Program TSU NAM	Table 3-52	
❑	Test Set Calibration	Table 3-30	
❑	Test Cable Calibration	Table 3-31	

Comments:____

GPS Receiver Operation

Table A-4: GPS Receiver Operation

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

Comments:____

LFR Receiver Operation

Table A-5: LFR Receiver Operation

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

Comments:____

LPA IM Reduction

Table A-6: LPA IM Reduction

OK	Parameter			Specification	Comments
	LPA #	CARRIER			
		2:1 3-Sector	BP 3-Sector		
❑	1A	C1	C1	No Alarms	
❑	1B	C1	C1	No Alarms	
❑	1C	C1	C1	No Alarms	
❑	1D	C1	C1	No Alarms	
❑	3A	C2	C2	No Alarms	
❑	3B	C2	C2	No Alarms	
❑	3C	C2	C2	No Alarms	
❑	3D	C2	C2	No Alarms	

Comments:____

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

1-Carrier
2-Carrier Non-adjacent Channels

Table A-7: TX BLO Calibration (3-Sector: 1-Carrier and 2-Carrier Non-adjacent Channels)

OK	Parameter	Specification	Comments
❑	Calibrate carrier 1	TX Bay Level Offset = 42 dB (±5 dB) prior to calibration	BBX2-1, ANT-1A = __dB BBX2-r, ANT-1A = __dB
❑			BBX2-2, ANT-2A = __dB BBX2-r, ANT-2A = __dB
❑			BBX2-3, ANT-3A = __dB BBX2-r, ANT-3A = __dB
❑	Calibrate carrier 2	TX Bay Level Offset = 42 dB (±5 dB) prior to calibration	BBX2-4, ANT-1B = __dB BBX2-r, ANT-1B = __dB
❑			BBX2-5, ANT-2B = __dB BBX2-r, ANT-2B = __dB
❑			BBX2-6, ANT-3B = __dB BBX2-r, ANT-3B = __dB
❑	Calibration Audit carrier 1	0 dB (±0.5 dB) for gain set resolution post-calibration	BBX2-1, ANT-1A = __dB BBX2-r, ANT-1A = __dB
❑			BBX2-2, ANT-2A = __dB BBX2-r, ANT-2A = __dB
❑			BBX2-3, ANT-3A = __dB BBX2-r, ANT-3A = __dB
❑	Calibration Audit carrier 2	0 dB (±0.5 dB) for gain set resolution post-calibration	BBX2-4, ANT-1B = __dB BBX2-r, ANT-1B = __dB
❑			BBX2-5, ANT-2B = __dB BBX2-r, ANT-2B = __dB
❑			BBX2-6, ANT-3B = __dB BBX2-r, ANT-3B = __dB

Comments:____

____

2-Carrier Adjacent Channel

Table A-8: TX Bay Level Offset Calibration (3-Sector: 2-Carrier Adjacent Channels)

OK	Parameter	Specification	Comments
❑	Calibrate carrier 1	TX Bay Level Offset = 42 dB (typical), 38 dB (minimum) prior to calibration	BBX2-1, ANT-1A = __dB BBX2-r, ANT-1A = __dB
❑			BBX2-2, ANT-2A = __dB BBX2-r, ANT-2A = __dB
❑			BBX2-3, ANT-3A = __dB BBX2-r, ANT-3A = __dB
❑	Calibrate carrier 2	TX Bay Level Offset = 42 dB (typical), 38 dB (minimum) prior to calibration	BBX2-4, ANT-1B = __dB BBX2-r, ANT-1B = __dB
❑			BBX2-5, ANT-2B = __dB BBX2-r, ANT-2B = __dB
❑			BBX2-6, ANT-3B = __dB BBX2-r, ANT-3B = __dB
❑	Calibration Audit carrier 1	0 dB (±0.5 dB) for gain set resolution post calibration	BBX2-1, ANT-1A = __dB BBX2-r, ANT-1A = __dB
❑			BBX2-2, ANT-2A = __dB BBX2-r, ANT-2A = __dB
❑			BBX2-3, ANT-3A = __dB BBX2-r, ANT-3A = __dB
❑	Calibration Audit carrier 2	0 dB (±0.5 dB) for gain set resolution post calibration	BBX2-4, ANT-1B = __dB BBX2-r, ANT-1B = __dB
❑			BBX2-5, ANT-2B = __dB BBX2-r, ANT-2B = __dB
❑			BBX2-6, ANT-3B = __dB BBX2-r, ANT-3B = __dB

Comments:____

____

TX Antenna VSWR

Table A-9: TX Antenna VSWR

OK	Parameter	Specification	Data
❑	VSWR - Antenna 1A	< (1.5 : 1)	
❑	VSWR - Antenna 2A	< (1.5 : 1)	

Table A-9: TX Antenna VSWR

OK	Parameter	Specification	Data
❑	VSWR - Antenna 3A	< (1.5 : 1)	
❑	VSWR - Antenna 1B	< (1.5 : 1)	
❑	VSWR - Antenna 2B	< (1.5 : 1)	
❑	VSWR - Antenna 3B	< (1.5 : 1)	

Comments:____

____

RX Antenna VSWR

Table A-10: RX Antenna VSWR

OK	Parameter	Specification	Data
❑	VSWR - Antenna 1A	< (1.5 : 1)	
❑	VSWR - Antenna 2A	< (1.5 : 1)	
❑	VSWR - Antenna 3A	< (1.5 : 1)	
❑	VSWR - Antenna 1B	< (1.5 : 1)	
❑	VSWR - Antenna 2B	< (1.5 : 1)	
❑	VSWR - Antenna 3B	< (1.5 : 1)	

Comments:____

Alarm Verification

Table A-11: CDI Alarm Input Verification

OK	Parameter	Specification	Data
❑	Verify CDI alarm input operation per Table 3-6.	BTS Relay #XX - Contact Alarm Sets/Clears	

Comments:____

Site Serial Number Check List

Date ____________________ Site ____________________

SCCP Shelf

NOTE: For BBXs and MCCs, enter the type as well as serial number; for example, BBX2, BBX-1X, MCC8, MCC24, MCC-1X.

Site I/O A & B	____________________
SCCP Shelf	____________________
CSM-1	____________________
CSM-2	____________________
HSO/LFR	____________________
CCD-1	____________________
CCD-2	____________________
AMR-1	____________________
AMR-2	____________________
MPC-1	____________________
MPC-2	____________________
Fans 1-2	____________________
GLI2-1	____________________
GLI2-2	____________________
BBX-1	____________________
BBX-2	____________________
BBX-3	____________________
BBX-4	____________________
BBX-5	____________________
BBX-6	____________________
BBX-R1	____________________
MCC-1	____________________
MCC-2	____________________
MCC-3	____________________
MCC-4	____________________
CIO	____________________
SWITCH	____________________
PS-1	____________________
PS-2	____________________

LPAs

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

Appendix B

FRU Optimization/ATP Test Matrix

FRU Optimization/ATP Test Matrix

B

Usage & Background

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

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

Detailed Optimization/ATP Test Matrix

Table B-1 outlines in more detail the tests that would need to be performed if one of the BTS components were to fail and be replaced. It is also assumes that all modules are placed OOS-ROM via the LMF until full redundancy of all applicable modules is implemented.

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

NOTE	Not every procedure required to bring the site back in service is indicated in Table B-1. It is meant to be used as a guideline ONLY. The table assumes that the user is familiar enough with the BTS Optimization/ATP procedure to understand which test equipment set ups, calibrations, and BTS site preparation will be required before performing the Table # procedures referenced.

Passive BTS components (such as the bandpass filters and 2:1 combiners) only require a TX calibration audit to be performed in lieu of a full path calibration. If the TX path calibration audit fails, the entire RF path calibration will need to be repeated. If the RF path calibration fails, further troubleshooting is warranted.

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

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

Table B-1: SC 4812ET Lite BTS Optimization and ATP Test Matrix

Doc Tbl #	Description	DRDC or TRDC	RX Cables	TX Cables	MPC / EMPC	CIO	SCCP Shelf Assembly (Backplane)	BBX2/BBX-1X	MCC24E/MCC8E/MCC-1X	CSM/GPS	LFR	HSO/HSOX	50-pair Punchblock (with RGPS)	RGD/20-pair Punchblock with RGD	CCD Card	GLI2	ETIB or Associated Cables	LPAC Cable	LPA or LPA Trunking Module	LPA Bandpass Filter or Combiner	Switch Card	RFDS Cables	RFDS
Table 3-18/ Table 3-19/	Download Code/Data						●	●	●	●						●							●
Table 3-21	Enable CSMs						●			●			●	●			9						
Table 3-24	GPS & HSO Initialization / Verification						●			●	●	●	●	●	●		9						
Table 3-25	LFR Initialization / Verification						●				●				●								
Table 3-41	TX Path Calibration	4		4		1	1	4								*		3	3	4	7		
Table 3-42	Download Offsets to BBX	4					1	4								*							
Table 3-43	TX Path Audit	4		4		1	1	4								*			3	4	7		
Table 3-51	RFDS Path Calibration and Offset Data Download	6	5	4	5	1	1	6								*			3	4		6	6
Table 4-8	Spectral Purity TX Mask	4					1	4								*			*	*	*		
Table 4-9	Waveform Quality (rho)	4				*	1	4		*					*	*	10		*	*			
Table 4-10	Pilot Time Offset	4				*	1	4		*					*	*			*	*			
Table 4-11	Code Domain Power / Noise Floor	4					1	4	8	8	8				8	*			*	*			
Table 4-12	FER Test	5	5		5	2	2	5	8	8	8				8	*					7		
Table 3-54 through Table 3-63	Alarm Tests																●						

. . . continued on next page

Table B-1: SC 4812ET Lite BTS Optimization and ATP Test Matrix

Doc Tbl #	Description	DRDC or TRDC	RX Cables	TX Cables	MPC / EMPC	CIO	SCCP Shelf Assembly (Backplane)	BBX2/BBX-1X	MCC24E/MCC8E/MCC-1X	CSM/GPS	LFR	HSO/HSOX	50-pair Punchblock (with RGPS)	RGD/20-pair Punchblock with RGD	CCD Card	GLI2	ETIB or Associated Cables	LPAC Cable	LPA or LPA Trunking Module	LPA Bandpass Filter or Combiner	Switch Card	RFDS Cables	RFDS

OPTIMIZATION AND TEST LEGEND:

● Required

* Perform if determined necessary for addtional fault isolation, repair assurance, or required for site certification.

1. Perform on all carrier and sector TX paths to the SCCP cage.
2. Perform on all carrier and sector main and diversity RX paths to the SCCP cage.
3. Perform on all primary and redundant TX paths of the affected carrier. (LPAC replacement affects all carriers.)
4. Perform on the affected carrier and sector TX path(s) (BBXR replacement affects *all* carrier and sector TX paths).
5. Perform on the affected carrier and sector RX path(s) (BBXR replacement affects *all* carrier RX paths).
6. Perform on *all RF paths* of the affected carrier and sector (RFDS replacement affects all carriers).
7. Perform with *redundant* BBX for *at least* one sector on one carrier.
8. Verify performance by performing on one sector of one carrier only.
9. Perform only if RGD/RGPS, LFR antenna, or HSO or LFR expansion was installed.
10. Verify performance by performing testing on one sector of *each* carrier.

C

Appendix C

BBX Gain Set Point vs. BTS Output

C

BBX Gain Set Point vs. BTS Output

Usage & Background

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

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

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

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

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

dBm→ Gain↓	44	43	42	41	40	39	38	37	36	35	34	33
381	-	-	-	-	43.3	42.3	41.3	40.3	39.3	38.3	37.3	36.3
374	-	-	-	-	43.1	42.1	41.1	40.1	39.1	38.1	37.1	36.1
366	-	-	-	-	42.9	41.9	40.9	39.9	38.9	37.9	36.9	35.9
358	-	-	-	-	42.7	41.7	40.7	39.7	38.7	37.7	36.7	35.7
350	-	-	-	43.5	42.5	41.5	40.5	39.5	38.5	37.5	36.5	35.5
342	-	-	-	43.3	42.3	41.3	40.3	39.3	38.3	37.3	36.3	35.3
334	-	-	-	43.1	42.1	41.1	40.1	39.1	38.1	37.1	36.1	35.1
326	-	-	-	42.9	41.9	40.9	39.9	38.9	37.9	36.9	35.9	34.9
318	-	-	-	42.7	41.7	40.7	39.7	38.7	37.7	36.7	35.7	34.7
310	-	-	43.5	42.5	41.5	40.5	39.5	38.5	37.5	36.5	35.5	34.5
302	-	-	43.2	42.2	41.2	40.2	39.2	38.2	37.2	36.2	35.2	34.2
294	-	-	43	42	41	40	39	38	37	36	35	34
286	-	-	42.8	41.8	40.8	39.8	38.8	37.8	36.8	35.8	34.8	33.8
278	-	43.5	42.5	41.5	40.5	39.5	38.5	37.5	36.5	35.5	34.5	33.5
270	-	43.3	42.3	41.3	40.3	39.3	38.3	37.3	36.3	35.3	34.3	33.3
262	-	43	42	41	40	39	38	37	36	35	34	33
254	-	42.7	41.7	40.7	39.7	38.7	37.7	36.7	35.7	34.7	33.7	32.7
246	43.4	42.4	41.4	40.4	39.4	38.4	37.4	36.4	35.4	34.4	33.4	32.4
238	43.2	42.2	41.2	40.2	39.2	38.2	37.2	36.2	35.2	34.2	33.2	32.2
230	42.9	41.9	40.9	39.9	38.9	37.9	36.9	35.9	34.9	33.9	32.9	31.9
222	42.6	41.6	40.6	39.6	38.6	37.6	36.6	35.6	34.6	33.6	32.6	31.6
214	42.2	41.2	40.2	39.2	38.2	37.2	36.2	35.2	34.2	33.2	32.2	31.2

Notes

C

Appendix D

D

CDMA Operating Frequency Information

CDMA Operating Frequency Programming Information

Introduction

Programming of each of the BTS BBX synthesizers is performed by the BTS GLI2s via the Concentration Highway Interface (CHI) bus. This programming data determines the transmit and receive transceiver operating frequencies (channels) for each BBX.

1900 MHz PCS Channels

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

Figure D-1: North America PCS Frequency Spectrum (CDMA Allocation)