SC™ 4812ET Optimization/ATP Manual

Software Release R16.1.x.x

800 and 1900 MHz

CDMA

PRELIMINARY

English
Aug 2002
68P09255A57-2

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SC™ 4812ET Optimization/ATP Manual

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FCC Requirements

Content

This section presents Federal Communications Commission (FCC) Rules Parts 15 and 68 requirements and compliance information for the SC™ 4812T/ET/ET Lite series Radio Frequency Base Transceiver Stations.

FCC Part 15 Requirements

Part 15.19a(3) - INFORMATION TO USER

NOTE	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: 1. This device may not cause harmful interference, and 2. This device must accept any interference received, including interference that may cause undesired operation.

Part 15.21 - INFORMATION TO USER

CAUTION	Changes or modifications not expressly approved by Motorola could void your authority to operate the equipment.

15.105(b) - INFORMATION TO USER

NOTE	This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment OFF and ON, the user is encouraged to try to correct the interference by one or more of the following measures: • Reorient or relocate the receiving antenna. • Increase the separation between the equipment and receiver. • Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. • Consult the dealer or an experienced radio/TV technician for help.

FCC Part 68 Requirements

This equipment complies with Part 68 of the Federal Communications Commission (FCC) Rules. A label on the GLI3 board, easily visible with the board removed, contains the FCC Registration Number for this equipment. If requested, this information must be provided to the telephone company.

FCC Part 68 Registered Devices	
Device	**FCC Part 68 ID**
Group Line Interface (GLI3) See Note	US: IHEXDNANGLI3-1X
Cisco Model 1900-27 Router	US: 5B1DDNDN0006
ADC KENTROX Model 537	US: F81USA-31217-DE-N

NOTE
The BTS equipment is always equipped with the GLI3, < US: IHEXDNANGLI3-1X>, and may be used in conjunction with one or both of the listed registered CSU devices, or another registered CSU device not listed above.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of your T1. If this happens, the telephone company will provide advance notice so that you can modify your equipment as required to maintain uninterrupted service.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. If advance notice is not practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

If you experience trouble operating this equipment with the T1, please contact:

Global Customer Network Resolution Center (CNRC)
1501 W. Shure Drive, 3436N
Arlington Heights, Illinois 60004
Phone Number: (847) 632-5390

for repair and/or warranty information. You should not attempt to repair this equipment yourself. This equipment contains no customer or user-serviceable parts.

Changes or modifications not expressly approved by Motorola could void your authority to operate this equipment.

Foreword

Scope of manual

This manual is intended for use by cellular telephone system craftspersons in the day-to-day operation of Motorola cellular system equipment and ancillary devices.

This manual is not intended to replace the system and equipment training offered by Motorola, although it can be used to supplement or enhance the knowledge gained through such training.

Obtaining Manuals

To view, download, order manuals (original or revised), visit the Motorola Lifecycles Customer web page at http://services.motorola.com, or contact your Motorola account representative.

If Motorola changes the content of a manual after the original printing date, Motorola publishes a new version with the same part number but a different revision character.

Text conventions

The following special paragraphs are used in this manual to point out information that must be read. This information may be set-off from the surrounding text, but is always preceded by a bold title in capital letters. The three categories of these special paragraphs are:

NOTE	Presents additional, helpful, non-critical information that you can use. **Bold-text notes indicate information to help you avoid an undesirable situation or provides additional information to help you understand a topic or concept.**

CAUTION	Presents information to identify a situation in which equipment damage could occur, thus avoiding damage to equipment.

WARNING	Presents information to warn you of a potentially hazardous situation in which there is a possibility of personal injury.

The following typographical conventions are used for the presentation of software information:

- In text, sans serif **BOLDFACE CAPITAL** characters (a type style without angular strokes: i.e., SERIF versus SANS SERIF) are used to name a command.
- In text, `typewriter` style characters represent prompts and the system output as displayed on an operator terminal or printer.
- In command definitions, sans serif **boldface** characters represent those parts of the command string that must be entered exactly as shown and `typewriter` style characters represent command output responses as displayed on an operator terminal or printer.
- In the command format of the command definition, `typewriter` style characters represent the command parameters.

Reporting manual errors

To report a documentation error, call the CNRC (Customer Network Resolution Center) and provide the following information to enable CNRC to open an MR (Modification Request):
- the document type
- the manual title, part number, and revision character
- the page number(s) with the error
- a detailed description of the error and if possible the proposed solution

Motorola appreciates feedback from the users of our manuals.

Contact us

Send questions and comments regarding user documentation to the email address below:
cdma.documentation@motorola.com

Motorola appreciates feedback from the users of our information.

Manual banner definitions

A banner (oversized text on the bottom of the page, for example, **PRELIMINARY**) indicates that some information contained in the manual is not yet approved for general customer use.

24-hour support service

If you have problems regarding the operation of your equipment, please contact the Customer Network Resolution Center for immediate assistance. The 24 hour telephone numbers are:

NA CNRC	+1-800-433-5202
EMEA CNRC	+44- (0) 1793-565444
ASPAC CNRC	+86-10-88417733
Japan & Korea CNRC	+81-3-5463-3550
LAC CNRC	+51-1-212-4020

For further CNRC contact information, contact your Motorola account representative.

General Safety

Remember! . . . Safety depends on you!!

The following general safety precautions must be observed during all phases of operation, service, and repair of the equipment described in this manual. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment. Motorola, Inc. assumes no liability for the customer's failure to comply with these requirements. The safety precautions listed below represent warnings of certain dangers of which we are aware. You, as the user of this product, should follow these warnings and all other safety precautions necessary for the safe operation of the equipment in your operating environment.

Ground the instrument

To minimize shock hazard, the equipment chassis and enclosure must be connected to an electrical ground. If the equipment is supplied with a three-conductor ac power cable, the power cable must be either plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter. The three-contact to two-contact adapter must have the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable must meet International Electrotechnical Commission (IEC) safety standards.

NOTE	Refer to *Grounding Guideline for Cellular Radio Installations - 68P81150E62.*

Do not operate in an explosive atmosphere

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

Keep away from live circuits

Operating personnel must:

- not remove equipment covers. Only Factory Authorized Service Personnel or other qualified maintenance personnel may remove equipment covers for internal subassembly, or component replacement, or any internal adjustment.
- not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed.
- always disconnect power and discharge circuits before touching them.

Do not service or adjust alone

Do not attempt internal service or adjustment, unless another person, capable of rendering first aid and resuscitation, is present.

Use caution when exposing or handling the CRT

Breakage of the Cathode-Ray Tube (CRT) causes a high-velocity scattering of glass fragments (implosion). To prevent CRT implosion, avoid rough handling or jarring of the equipment. The CRT should be handled only by qualified maintenance personnel, using approved safety mask and gloves.

Do not substitute parts or modify equipment

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of equipment. Contact Motorola Warranty and Repair for service and repair to ensure that safety features are maintained.

Dangerous procedure warnings

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed. You should also employ all other safety precautions that you deem necessary for the operation of the equipment in your operating environment.

WARNING	Dangerous voltages, capable of causing death, are present in this equipment. Use extreme caution when handling, testing, and adjusting.

Revision History

Manual Number

68P09255A57-2

Manual Title

SC™ 4812ET Optimization/ATP Manual Software Release R16.1.x.x

Version Information

The following table lists the manual version, date of version, and remarks on the version. Revision bars printed in page margins (as shown to the side) identify material which has changed from the previous release of this publication.

Version Level	Date of Issue	Remarks
1	Mar 2002	Preliminary manual submitted for engineering markup
2	Jul 2002	LMF software updates. Preliminary manual submitted for DV&V evaluation

MOTOROLA

Chapter 1

Introduction

Introduction

Scope of This Document

This document provides information pertaining to the optimization and audit tests of Motorola SC 4812ET Base Transceiver Subsystem (BTS) equipment frames equipped with trunked high-power Linear Power Amplifiers (LPAs) and their associated internal and external interfaces.

Also covered is software release 2.16.1.X and can support the following versions of SC 4812ET BTS sites:

- 1X Packet Backhaul BTS
- 1X Circuit BTS
- 1X Packet backhaul BTS

The 1X packet BTS has a packet backhaul network interface which provided via a pair of external routers together with a GLI upgrade (GLI3) that can handle voice (IS-95A/B, 1X) and data (IS-95B, 1X).

This BTS equipment is configured with all 1X cards (BBX-1X andMCC1X) or a mix of 1X cards and non-1X cards (BBX2 and MCC8E/24E). This configuration is compliant with all applicable cdma2000 1X specifications. It provides the forward link and reverse link RF functions to support 2G features and 3G-1X features (i.e., high capacity voice & high bit rate data).

The 1X circuit BTS has a split backhaul (circuit/packet pipe) network interface that can handle circuit based voice (IS-95A/B, 1X) and data (IS-95B) as well as packet based data (1X).

This document assumes the following prerequisites: The BTS frames and cabling have been installed per the *BTS Hardware Installation Manual* which covers the physical "bolt down" of all SC series equipment frames, and the specific cabling configurations.

Document Composition

This document covers the following major areas:

- Introduction, consisting of preliminary background information (such as component and subassembly locations and frame layouts) to be considered by the Cell Site Field Engineer (CFE) before optimization or tests are performed.
- Preliminary Operations, consisting of cabinet power up and power down procedures.
- Optimization/calibration, covering topics of Local Maintenance Facility (LMF) connection to the BTS equipment, Global Positioning System (GPS) Verification, test equipment setup, downloading all BTS processor boards, RF path verification, Bay Level Offset (BLO) calibration and calibration audit, and Radio Frequency Diagnostic System (RFDS) calibration.
- Acceptance Test Procedures (ATPs), consisting of ATP tests executed by the LMF and used to verify all major transmit (TX) and receive (RX) performance characteristics on all BTS equipment.
- Preparing to leave the site, presents instructions on how to properly exit customer site, ensure that all equipment is operating properly, and all work is complete according to Motorola guidelines.

- Basic troubleshooting, consisting of procedures for installation, calibration, transmit and receive tests, backplane problems, GPS failures, and module connectors.
- Appendices contain pertinent Pseudorandom Noise (PN) Offset, frequency programming, output power data tables, data sheets that are filled out manually by the CFE at the site, an optimization/ATP test matrix, BBX gain set point information, CDMA operating frequency information, PN Offset programminginformation, information on test equipment preparation, manual cable calibration procedures, power Delta calibration procedures, RF cabinet interconnect cable information, procedures for checking changing GPIB addresses, and proceduress for downloading ROM Code from the LMF.

CDMA LMF Product Description

The Code Division Multiple Access (CDMA) LMF is a graphical user interface (GUI) based LMF. This product is specifically designed to provide cellular communications field personnel the vehicle to support the following CDMA BTS operations:

- Installation
- Maintenance
- Calibration
- Optimization

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

Online Help

Task oriented online help is available in the LMF by clicking on **Help** from the menu bar.

Why Optimize?

Proper optimization and calibration assures:

- Accurate downlink RF power levels are transmitted from the site.
- Accurate uplink signal strength determinations are made by the site.

What Is Optimization?

Optimization compensates for the site-specific cabling and normal equipment variations. Cables that interconnect the BTS and Duplexer assemblies (if used), for example, are cut and installed at the time of the BTS frame installation at the site. Site optimization guarantees that the combined losses of the new cables and the gain/loss characteristics and built-in tolerances of each BTS frame do not accumulate, causing improper site operation.

Optimization identifies the accumulated loss (or gain) for all receive and transmit paths at the BTS site, and stores that value in a database.

- The RX path starts at the ancillary equipment frame RFDS RX directional coupler antenna feedline port, through the RX input port on the rear of the frame, through the DDRCs, Multicoupler Preselector Card (MPC), and additional splitter circuitry, ending at a CDMA Channel Processor (C-CCP) backplane Broad Band Transceiver (BBX) slot in the C-CCP shelf.

- A transmit path starts at the BBX, through the C-CCP backplane slot, travels through the LPA/Combiner TX Filter and ends at the rear of the input/output (I/O) Panel. If the RFDS option is added, then the TX path continues and ends at the top of the RFDS TX directional coupler antenna feedline port installed in the ancillary equipment frame.

These values are factored in by the BTS equipment internally, leaving only site specific antenna feed line loss and antenna gain characteristics to be factored in by the CFE when determining site Effective Radiated Power (ERP) output power requirements.

Each C-CCP shelf BBX board is optimized to a specific RX and TX antenna port. (One BBX board acts in a redundant capacity for BBXs 1-12, and is optimized to all antenna ports). A single value is generated for each path, thereby eliminating the accumulation of error that would occur from individually measuring and summing the gain and loss of each element in the path.

When to Optimize

New Installations

After the initial site installation, the BTS must be prepared for operation. This preparation includes verifying hardware installation, initial power up, and GPS verification. Basic alarm tests are also addressed.

A calibration audit of all RF transmit paths is performed to verify factory calibration.

A series of ATP CDMA verification tests are covered using the actual equipment set up. An ATP is also required before the site can be placed in service.

Site Expansion

Optimization is also required after expansion of a site.

Periodic Optimization

Periodic optimization of a site may also be required, depending on the requirements of the overall system.

Repaired Sites

Verify repair(s) made to the BTS by consulting an Optimization/ATP Test Matrix table. This table outlines the specific tests that must be performed *anytime* a BTS subassembly or RF cable associated with it is replaced.

NOTE	Refer to Appendix B for detailed basic guideline tables and detailed Optimization/ATP Test Matrix.

Documentation
Site Documents

The following documents are required to perform optimization of the cell site equipment:

- Site document (generated by Motorola systems engineering), which includes:
  - General site information
  - Floor plans
  - Power levels
  - Site PN
  - Site paging and traffic channel allocation
  - Board placement
  - Site wiring lists
  - Cell-site Data Files (CDF)
- Demarcation Document (Scope of Work Agreement)
- Equipment manuals for non-Motorola test equipment.

Product Documentation

For other information, refer to the following manuals:

- *CDMA LMF Operator's Guide*; 68P64114A78
- *CDMA RFDS Hardware Installation* manual; 68P64113A93
- *CDMA RFDS User's Guide*
- Equipment Manuals for non-Motorola test equipment
- *SC4812ET Field Replacable Units Guide* Motorola part number 68P09253A48
- *SC 4812ET RF & Power Cabinet Hardware Installation Manual* Motorola part number 68P09253A94
- *LMF CLI Commands R16.X* Motorola part number 68P09253A56

Test Equipment

Overview

The LMF is used in conjunction with Motorola recommended test equipment, and it is a part of a "calibrated test set." To ensure consistent, reliable, and repeatable optimization test results, only recommended test equipment supported by the LMF must be used to optimize the BTS equipment. Table 1-1 outlines the supported test equipment that meets the technical criteria required for BTS optimization.

Table 1-1: CDMA LMF Test Equipment Support Table

Item	Description
Hewlett Packard, model HP 8921A	Cellular communications analyzer (includes 83203B CDMA interface option)
Agilent E4406A Analyzer with Agilent E4432B Generator	Used for both IS-95A/B and CDMA 2000 testings
Advantest R3267 Analyzer with Advantest R3562 Generator	Used for both IS-95A/B and CDMA 2000 testings
Hewlett Packard, model HP 83236A	PCS interface for PCS band
Hewlett Packard, model HP 8935	Cellular communications analyzer
Motorola CyberTest	Cellular communications analyzer
Advantest R3465 with 3561 CDMA option	Cellular communications analyzer
Gigatronix 8541C	Power meter
HP437B	Power meter

To ensure consistent, reliable, and repeatable optimization test results, test equipment meeting the following technical criteria should be used to optimize the BTS equipment. You can, of course, substitute test equipment with other test equipment models supported by the LMF *meeting the same technical specifications*.

LMF Hardware Requirements

An LMF computer platform that meets the following requirements (or better) is recommended:

- Notebook computer
- 266 MHz (32-bit CPU) Pentium processor
- 4 GB internal hard disk drive
- Color display with 1024 x 768 pixel resolution and capability to display more than 256 colors
- Memory requirements:
  - Minimum required RAM: 96 MB
  - Recommended RAM:
    - 128 MB for Windows 98 SE
    - 256 MB for Windows 2000
- CD ROM drive and 3 1/2 inch floppy drive
- 56 kbps V.90Modem
- Serial port (COM 1)
- Parallel port (LPT 1)
- PCMCIA Ethernet interface card (for example, 3COM Etherlink III) with a 10Base-T-to-coax adapter
- Windows 98SE operating system or Windows 2000 operating system

NOTE	If 800 x 600 pixel resolution is used, the LMF window must be maximized after it is displayed.

Test Equipment Guidelines

To ensure consistent, reliable, and repeatable optimization test results, test equipment meeting the following technical criteria should be used to optimize the BTS equipment. You can, of course, substitute test equipment with other test equipment models supported by the LMF *meeting the same technical specifications*.

NOTE	During manual testing, you can substitute test equipment with other test equipment models not supported by the LMF, *but those models must meet the same technical specifications*.

The customer has the responsibility of accounting for any measurement variances and/or additional losses/inaccuracies that can be introduced as a result of these substitutions. Before beginning optimization or troubleshooting, make sure that the test equipment needed is on hand and operating properly.

Test Equipment Calibration

Optimum system performance and capacity depend on regular equipment service, calibration, and characterization prior to BTS optimization. Follow the original equipment manufacturer (OEM) recommended maintenance and calibration schedules closely.

Test Cable Calibration

Equipment test cables are very important in optimization. Motorola recommends that the cable calibration be run at every BTS with the test cables attached. This method compensates for test cable insertion loss within the test equipment itself. No other allowance for test cable insertion loss needs to be made during the performance of tests.

Another method is to account for the loss by entering it into the LMF during the optimization procedure. This method requires accurate test cable characterization in a shop. The cable should be tagged with the characterization information prior to field optimization.

Equipment Warm-up

After arriving at the a site, the test equipment should be plugged in and turned on to allow warm up and stabilization to occur for as long as possible. The following pieces of test equipment must be warmed-up for *a minimum of 60 minutes* prior to using for BTS optimization or RFDS calibration procedures.

- Communications test set
- Rubidium time base
- Power meter

Test Equipment List

The following pieces of test equipment are required during the optimization procedure. Common assorted tools like screwdrivers and frame keys are not listed but are still required. Read the owner’s manual on all of the following major pieces of test equipment to understand their individual operation prior to use in optimization.

NOTE	Always refer to specific OEM test equipment documentation for detailed operating instructions.

10BaseT/10Base2 Converter

Ethernet LAN transceiver *(part of CGDSLMFCPQ1700)*

- PCMCIA Ethernet Adpater + Ethernet UTP adapter: 3COM model - Etherlink III 3C589B

Transition Engineering model E-CX-TBT-03 10BaseT/10Base2 converter

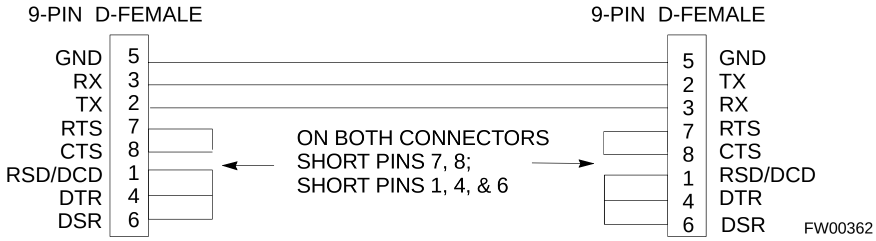
NOTE	Xircom model PE3-10B2 or equivalent can also be used to interface the LMF Ethernet connection to the frame.

RS-232 to GPIB Interface

- National Instruments GPIB-232-CT with Motorola CGDSEDN04X RS232 serial null modem cable (see Figure 1-1) or equivalent; used to interface the LMF to the test equipment.
- *Standard RS-232 cable can be used with the following modifications:*

- This solution passes only the three minimum electrical connections between the LMF and the GPIB interface. The control signals are jumpered as enabled on both ends of the RS-232 cable (9-pin D). TX and RX signals are crossed as null modem effect. Pin 5 is the ground reference.
- Short pins 7 and 8 together, and short pins 1, 4, and 6 together on each connector.

Figure 1-1: Null Modem Cable Detail



Model SLN2006A MMI Interface Kit

- Motorola Model TRN9666A null modem board. Connectors on opposite sides of the board must be used as this performs a null modem transformation between cables. This board can used for 10-pin to 8-pin, 25-pin to 25-pin and 10-pin to 10-pin conversions.
- Motorola 30-09786R01 MMI cable or equivalent ; used to interface the LMF serial port connection to GLI3, CSM and LPA debug serial ports.
- 25 pin D to 25 pin D serial cable from PC to null modem board.

Communications System Analyzer

The communication system analyzer is used during optimization and testing of the RF communications portion of BTS equipment and provides the following functions:

(1) Frequency counter
(2) RF power meter (average and code domain)
(3) RF Signal generator (capable of CDMA modulation)
(4) Spectrum analyzer
(5) CDMA code domain analyzer

The following types of communication system analyzers are currently supported by the LMF:

- HP8921A/600 Analyzer - Including 83203B CDMA Interface, manual control system card, and 83236A/B PCS Interface for 1900 MHz BTSs.
- Advantest R3465 Analyzer - Including R3561L test source unit
- Advantest R3267 Analyzer - Including R3562 test source unit
- Agilent E4406A Analyzer - including E4432 test source unit
- HP8935 Analyzer
- CyberTest Communication Analyzer

GPIB Cables

- Hewlett Packard 10833A or equivalent; 1 to 2 meters (3 to 6 feet) long used to interconnect test equipment and LMF terminal.

Power Meter

One of the following power meters is required for TX calibration and audit if an HP8921A or Advantest R3465 analyzer is used:

- Hewlett Packard Model HP HP437B with HP8481A power sensor
- Gigatronix model 8541C with model 80601A power sensor

Timing Reference Cables

- *Two* BNC-male to BNC-male RG316 cables; 3 meters (10 ft.) long, used to interconnect the HP8921A/600 or Advantest R3465 communications analyzer to the CSM front panel timing references in the BTS.

NOTE	***Two*** Huber & Suhner 16MCX/11BNC/K02252D or equivalent; right angle MCX-male to standard BNC-male RG316 cables; 3m long are required to interconnect the HP8921A/600 communications analyzer to SGLN4132A and SGLN1145A CSM board timing references.

- BNC "T" adapter with 50 ohm termination.

NOTE	This BNC "T" adapter (with 50 ohm termination) is required to connect between the HP 8921A/600 (or Advantest R3465) EVEN SECOND/SYNC IN and the BNC cable. The BNC cable leads to the 2-second clock connection on the TIB. Erroneous test results may occur if the "T" adapter with the 50 ohm termination is not connected.

Digital Multimeter

- Fluke model 8062A with Y8134 test lead kit or equivalent; used for precision DC and AC measurements, requiring 4-1/2 digits.

Directional Coupler

- Narda model 30661 30 dB (Motorola part no. 58D09732W01) coupler terminated with two Narda Model 375BN-M loads, or equivalent.

RF Attenuators

- 20 dB fixed attenuators, 20 W (Narda 768-20); used with test cable calibrations or during general troubleshooting procedures.
- Narda Model 30445 30 dB (Motorola Part No. 58D09643T01) coupler terminated with two Narda Model 375BN-M loads, or equivalent.

Miscellaneous RF Adapters, Loads, etc

- As required to interface test cables and BTS equipment and for various test set ups. Should include at least two 50 Ohm loads (type N) for calibration and one RF short, two N-type female-to-female adapters.

High-impedance Conductive Wrist Strap

- Motorola model 42-80385A59; used to prevent damage from Electrostatic Discharge (ESD) when handling or working with modules.

RF Load (at least three for trunked cabinets)

- 100 W non-radiating RF load; used (as required) to provide dummy RF loading during BTS transmit tests.

RF Network Box (and calibrated cables)

- Motorola model SGLN5531A 18:3 Passive Antenna Interface used to interface test equipment to the BTS receive and transmit antenna inputs during optimization/ATP or general troubleshooting procedures.

Optional Equipment

Frequency Counter

- Stanford Research Systems SR620 or equivalent. If direct measurement of the 3 MHz or 19.6608 MHz references is required.

Spectrum Analyzer

- Spectrum Analyzer (HP8594E with CDMA personality card) or equivalent; required for tests other than standard Receive band spectral purity and TX LPA IM reduction verification tests performed by the LMF.

Local Area Network (LAN) Tester

- Model NETcat 800 LAN troubleshooter (or equivalent); used to supplement LAN tests using the ohm meter.

Span Line (T1/E1) Verification Equipment

- As required for local application

RF Test Cable (if not Provided with Test Equipment)

- Motorola model TKN8231A; used to connect test equipment to the BTS transmitter output during optimization or during general troubleshooting procedures.

Oscilloscope

- Tektronics model 2445 or equivalent; for waveform viewing, timing, and measurements or during general troubleshooting procedure.

2-way Splitter

- Mini-Circuits model ZFSC-2-2500 or equivalent; provide the diversity receive input to the BTS

High Stability 10 MHz Rubidium Standard

- Stanford Research Systems SR625 or equivalent. Required for CSM and Low Frequency Receiver/High Stability Oscillator (LFR/HSO) frequency verification.

Abbreviations and Acronyms

Table 1-2: Abbreviations and Acronyms

Acronym	Definition
ACLC	AC Load Center
ASU	Antenna Selection Unit
AMR	Alarm Monitor Reporting
ATP	Acceptance Test Plan
BBX	Broadband Transceiver
BLO	Bay Level Offset
BTS	Base Transceiver Subsystem
CBSC	Centralized Base Station Controller
C-CCP	Combined CDMA Channel Processor
CCD	CDMA Clock Distribution
cdf	command data file
CDMA	Code Division Multiple Access
CE	Channel Element
CHI	Concentration Highway Interface
CLI	Command Line Interface
CIO	Combiner Input/Output
CMR	Cellular Manual Revision
CSM	Clock Synchronization Manager
CSU	Clock Synchronization Unit
DBPF	Dual Bandpass Filter
DBM	Debug Monitor
DLM	Download Manager
DMAC	Digital Metering and Alarm Control (also see MAP)
DRDC	Duplexer/RX Filter/Directional Coupler
DSP	Digital Signal Processor
EMPC	Expansion Multicoupler Preselector Card
FRU	Field Replaceable Unit
FSI	Frame Status Indicator
FWTIC	Fixed Wireless Terminal Interface Card
GFCI	Ground Fault Connection Interrupt
GLI 2	Group Line Interface II
GPS	Global Positioning System
GUI	Graphical User Interface
HSO	High Stability Oscillator
IFM	Integrated Frame Modem
I&Q	Interphase and Quadrature
ISB	InterShelf Bus

. . . continued on next page

Table 1-2: Abbreviations and Acronyms	
Acronym	**Definition**
LAPD	Link Access Protocol “D”
LFR	LORAN-C Frequency Receiver
LMF	Local Maintenance Facility
LORAN	LOng RAnge Navigational
LPA	Linear Power Amplifier
MAP	Meter Alarm Panel (also refered to as DMAC)
MCC	Multi-Channel CDMA
MGLI	Master Group Line Interface
MM	Mobility Manager
MMI	Man Machine Interface
MPC	Multicoupler Preselector Card
oos	Out-of-Service
OMCR	Operations Maintenance Center - Radio
PC	Personal Communication System
PDA	Personal Communication System Controller
PN	Pseudo-random Noise
QPSK	Quadrature Phase Shift Keyed
RFDS	Radio Frequency Diagnostic Subsystem
RGPS	Remote Global Positioning System
RSSI	Received Signal Strength Indicator
SCAP	Super Cell Application Protocol
TCH	Traffic Channel
TCP	Traffic Channel
TMPC	Traffic Channel
TSIC	Traffic Channel
TSI	Time Slot Interchanger

BTS Overview

The SC 4812ET BTS consists of an RF Cabinet that is an outdoor, weatherized version of the SC 4812T. The RF cabinet is powered by 27 Vdc and each cabinet has the capability to support up to 4 carriers (at 3 sector) or 2 carriers (at 6 sector).

The RF Cabinet houses the fan modules, C-CCP, LPA modules, LPA trunking backplane, Bandpass 2:1 & 4:1 Combiners, Duplexer/Receive Filter/Directional Couplers (DRDC) and a DC Power distribution assembly. The Power Cabinet (PC) provides +27 Vdc distribution and battery backup for the SC 4812ET. The Power Cabinet houses batteries, battery heaters, rectifiers, an AC Load Center (ACLC), a power distribution assembly, and two duplexed GFCI convenience outlets.

C-CCP Shelf Card/Module Device ID Numbers

All cards/modules/boards in the frames at a single site, assigned to a single BTS number, are also identified with unique Device ID numbers dependent upon the Frame ID number in which they are located. Refer to Table 1-3 and Table 1-4 for specific C-CCP Shelf Device ID numbers.

Table 1-3: C-CCP Shelf/Cage Card/Module Device ID Numbers (Top Shelf)

Frame #	Card/Module ID Number (Left to Right)																		
	Power (PS-1)	Power (PS-2)	Power (PS-3)	AMR -1	GLI3 -1	MCC						BBX						BBX -R	MPC/ EMPC -1
1	-	-	-	1	1	1	2	3	4	5	6	1	2	3	4	5	6	R1	-
101	-	-	-	101	101	101	102	103	104	105	106	101	102	103	104	105	106	R101	-
201	-	-	-	201	201	201	202	203	204	205	206	201	202	203	204	205	206	R201	-
301	-	-	-	301	301	301	302	303	304	305	306	301	302	303	304	305	306	R301	-

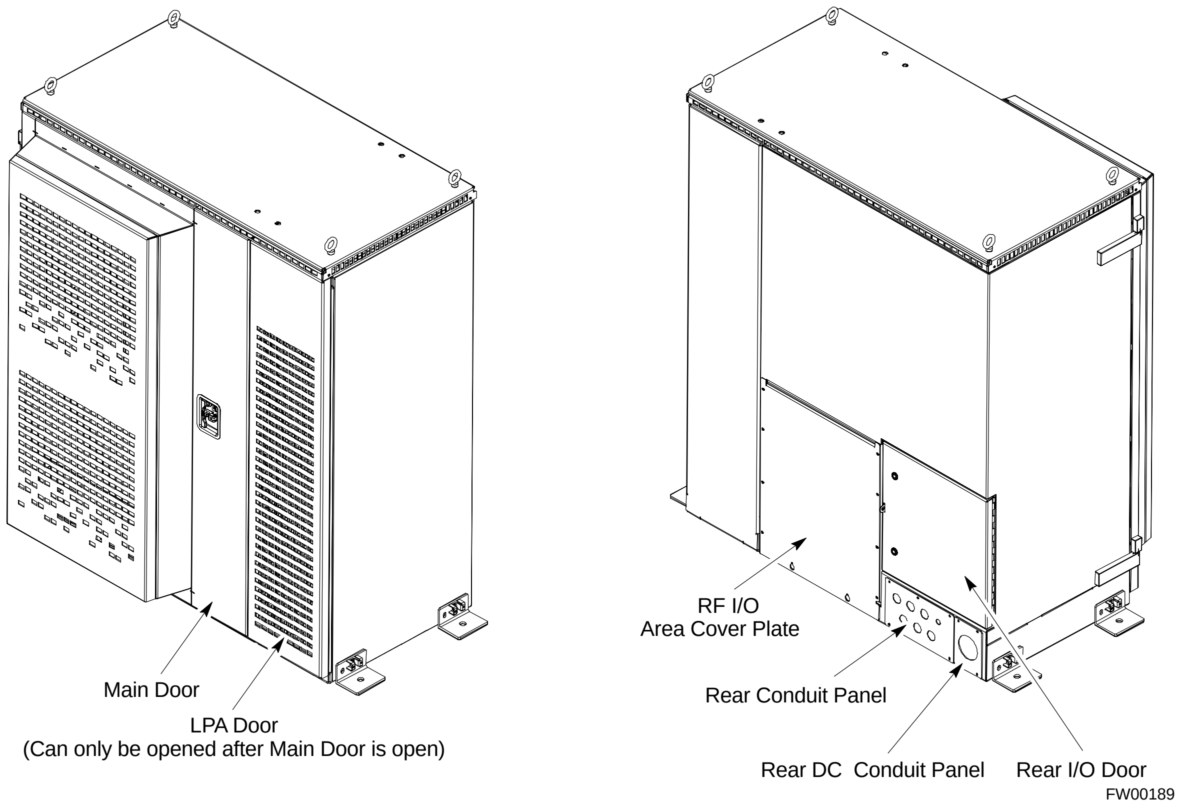
Table 1-4: C-CCP Shelf/Cage Card/Module Device ID Numbers (Bottom Shelf)

Frame #	Card/Module ID Number (Left to Right)																					
	HSO/ LFR	CSM -1	CSM -2	CCD A	CCD B		AMR -2	GLI3- 2	MCC						BBX						SW	MPC/ EMPC -2
1	-	1	2	-	-	-	2	2	7	8	9	10	11	12	7	8	9	10	11	12	-	-
101	-	101	102	-	-	-	102	102	107	108	109	110	111	112	107	108	109	110	111	112	-	-
201	-	201	202	-	-	-	202	102	207	208	209	210	211	212	207	208	209	210	211	212	-	-
301	-	301	302	-	-	-	302	102	307	308	309	310	311	312	307	308	309	310	311	312	-	-

Major Components

The major components that make up the Motorola SC 4812ET are illustrated in this section: the RF Cabinet (see Figure 1-2) and the Power Cabinet (see Figure 1-9).

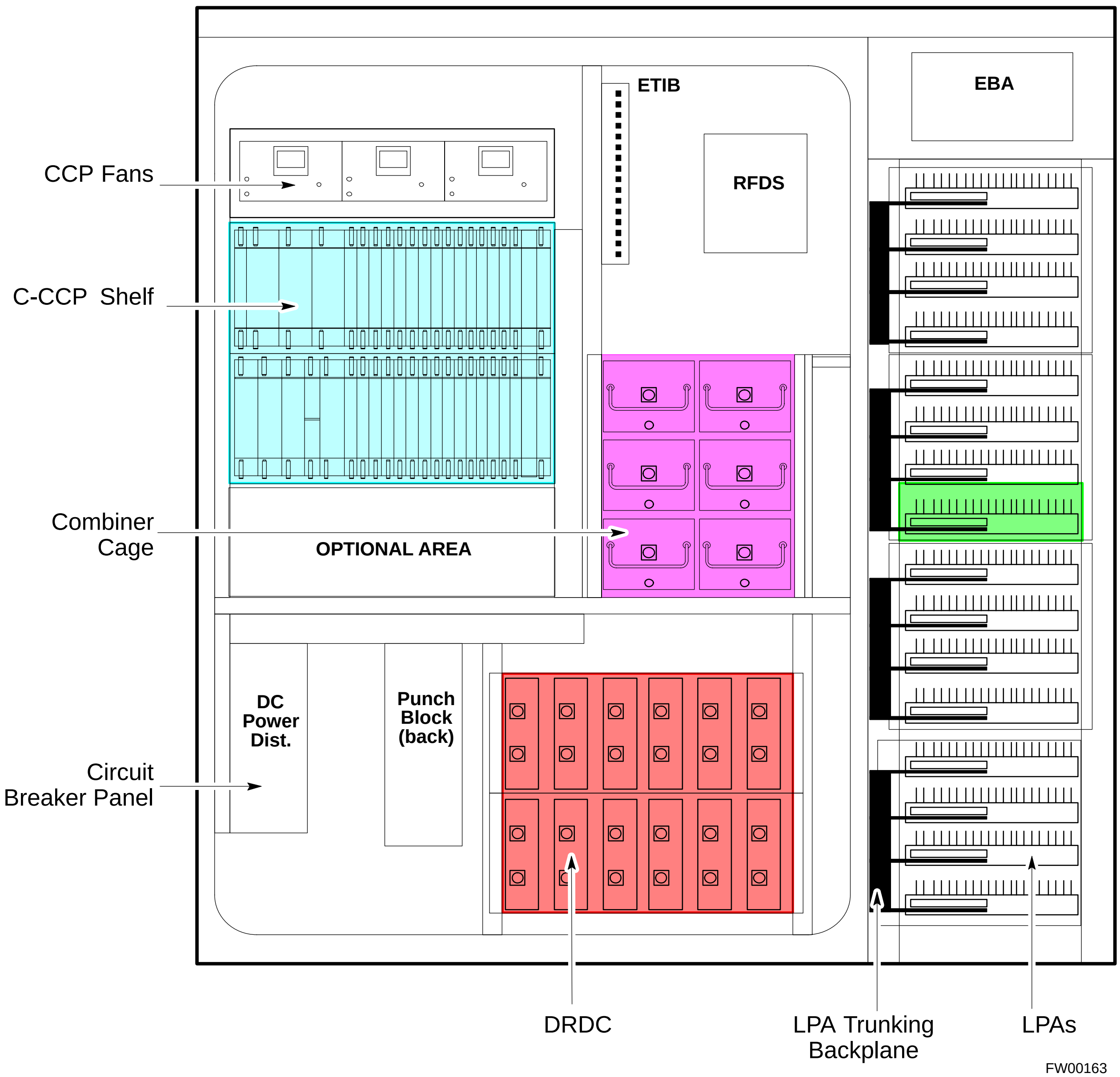
Figure 1-2: SC 4812ET RF Cabinet



RF Cabinet Internal FRUs

Figure 1-3 shows the location of the Internal Field Replaceable Units (FRUs). A brief description of each Internal FRU is found in the following paragraphs.

Figure 1-3: RF Cabinet Internal FRUs



Duplexer/RX Filter Directional Coupler

The DRDC combines, in a single module, the functions of antenna duplexing, receive band pass filtering, and surge protection (see Figure 1-7).

Combiner Cage (2:1, 4:1, or Band pass Filter)

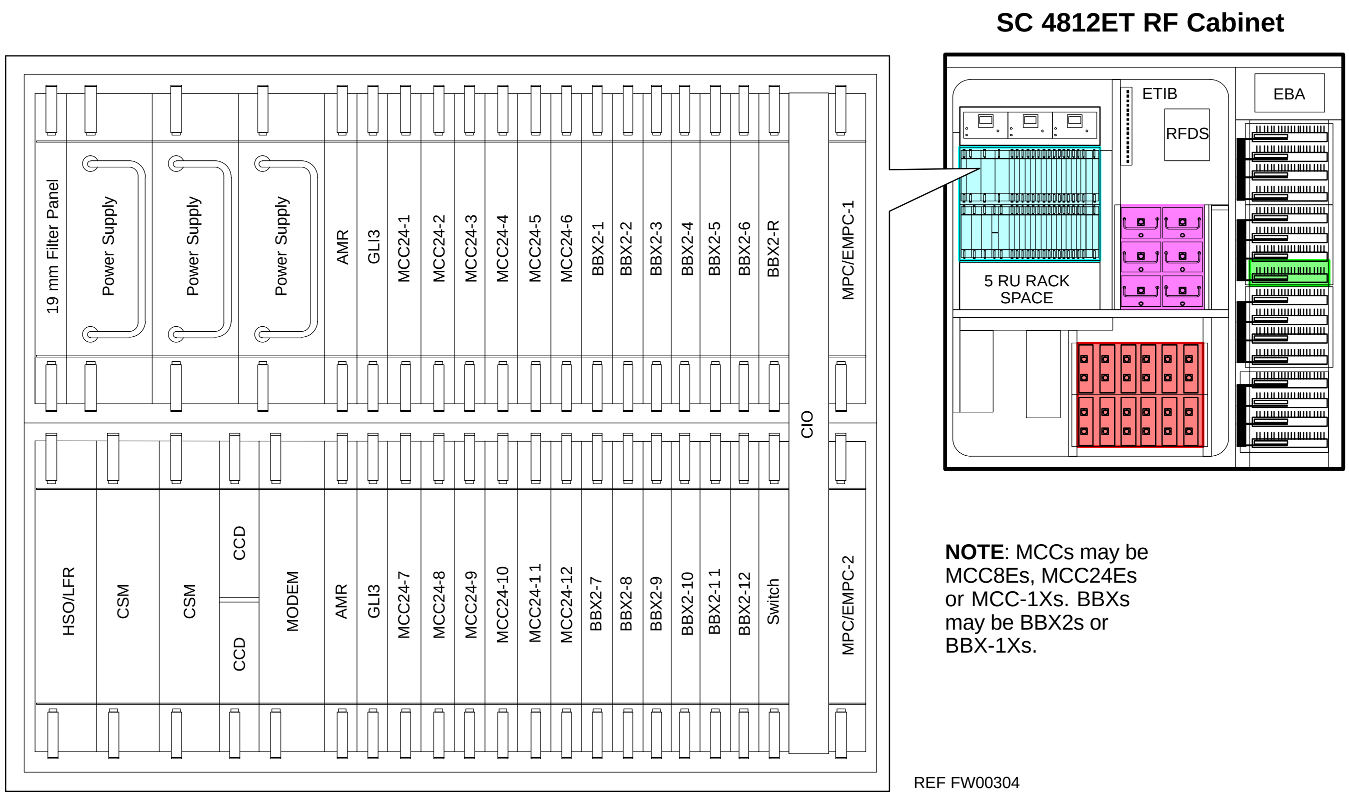
The Combiner Cage holds the transmit band pass filters, 2:1 combiners, or 4:1 combiners, depending on system configuration.

Combined CDMA Channel Processor Shelf

The C-CCP shelf contains the following (see Figure 1-4):

- High Stability Oscillator (HSO) or Low Frequency Receiver (LFR) card (1)
- Clock Synchronization Manager (CSM) cards (2)
- CDMA Clock Distribution (CCD) cards (2)
- Power Supply cards (2 minimum, 3 maximum)
- Multicoupler Preselector Cards (MPC) or Expansion Multicoupler Preselector Cards (EMPC) (2)
- Alarm Monitoring and Reporting (AMR) cards (2)
- Multi Channel CDMA (MCC8E, MCC24E or MCC-1X) cards (up to 12)
- Broadband Transceiver (BBX2 or BBX-1X) cards (up to 13)
- Combined Input/Output (CIO) card (1)
- Group Line Interface (GLI3) cards (2)
- BBX Switch card (1)
- Modem (optional)
- Filler Panels (as required)
- Fan Module (3)

Figure 1-4: SC 4812ET C-CCP Shelf



Punch Block

The Punch Block is the interface point of the RF Cabinet between the T1/E1 span lines, the Customer I/O, alarms, multi-cabinet timing (RGPS and HSO), and Pilot Beacon control (optional). (see Figure 1-6).

Span I/O Board

The Span I/O Board provides the interface for the span lines from the CSU to the C-CCP backplane (see Figure 1-6).

RF Diagnostic Subsystem

The RFDS provides the capability for remotely monitoring the status of the SC 4812ET RF Transmit and Receive paths (Figure 1-7).

Heat Exchanger

The Heat Exchanger provides cooling to the internal compartment of the RF Cabinet. The fan speed of the heat exchangers adjusts automatically with temperature. The Heat Exchanger is located in the primary front door of the RF Cabinet.

SC 4812ET Interface Board (ETIB) & LPA Control Brd (LPAC)

The ETIB is an interconnect board showing status LEDs for the RF Cabinet, as well as providing secondary surge protection. The LPAC board provides the interface for the LPA connection.

SC 4812ET Trunking Backplane

The Trunking Backplane contains a complex passive RF network that allows RF signals to share the resources of a bank of four LPAs. It also provides DC Power and digital interconnect.

Figure 1-5: SC 4812ET Intercabinet I/O Detail (Rear View)

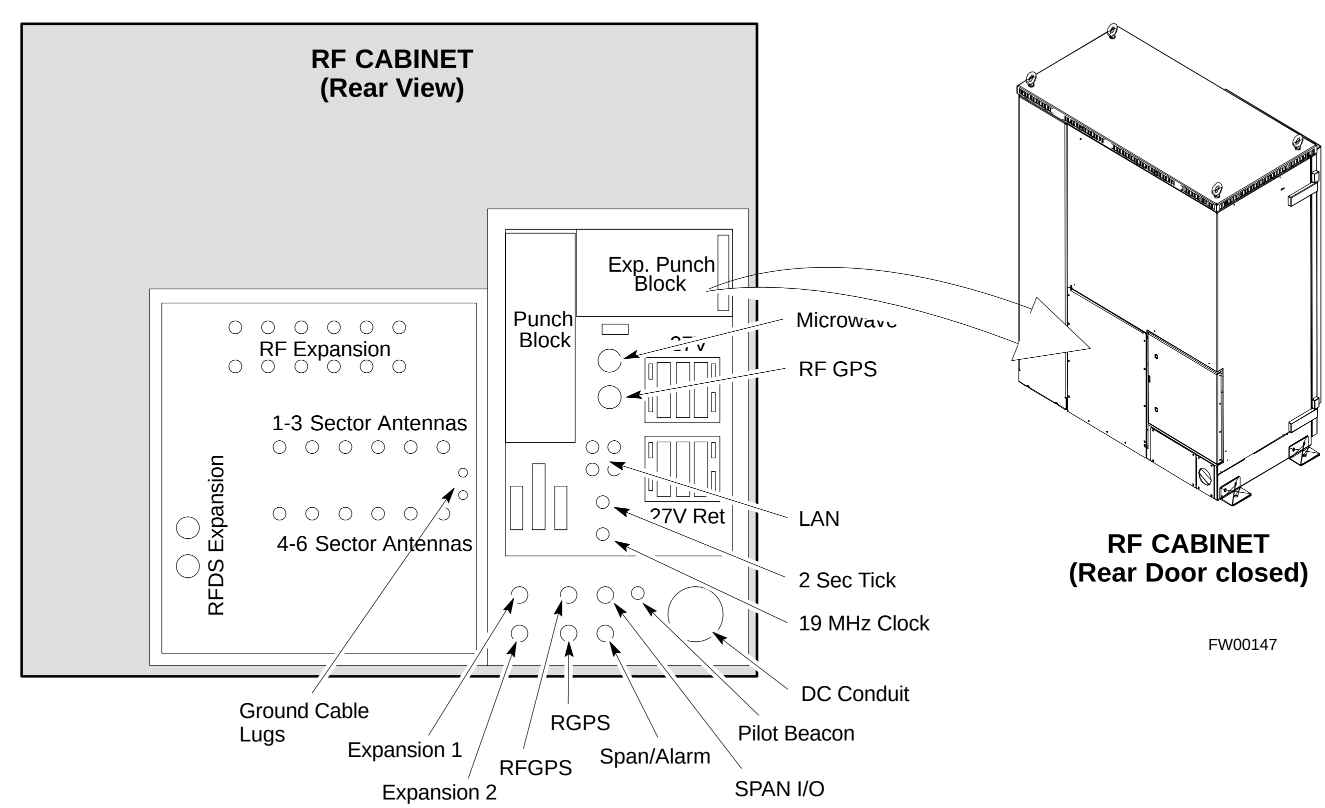


Figure 1-6: SC 4812ET I/O Plate Diagram

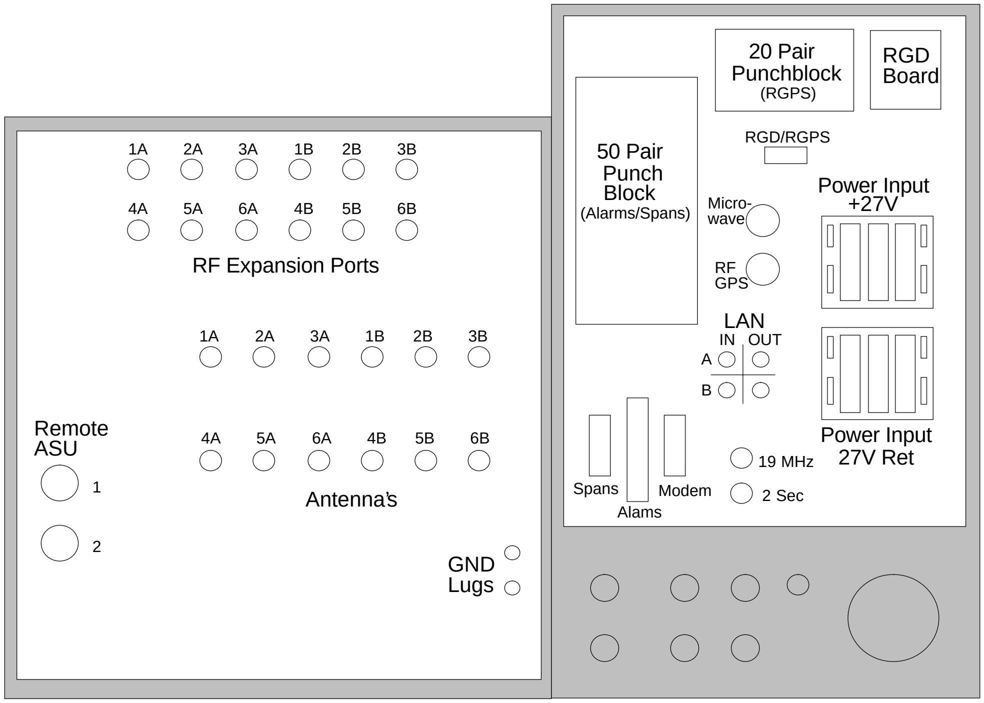
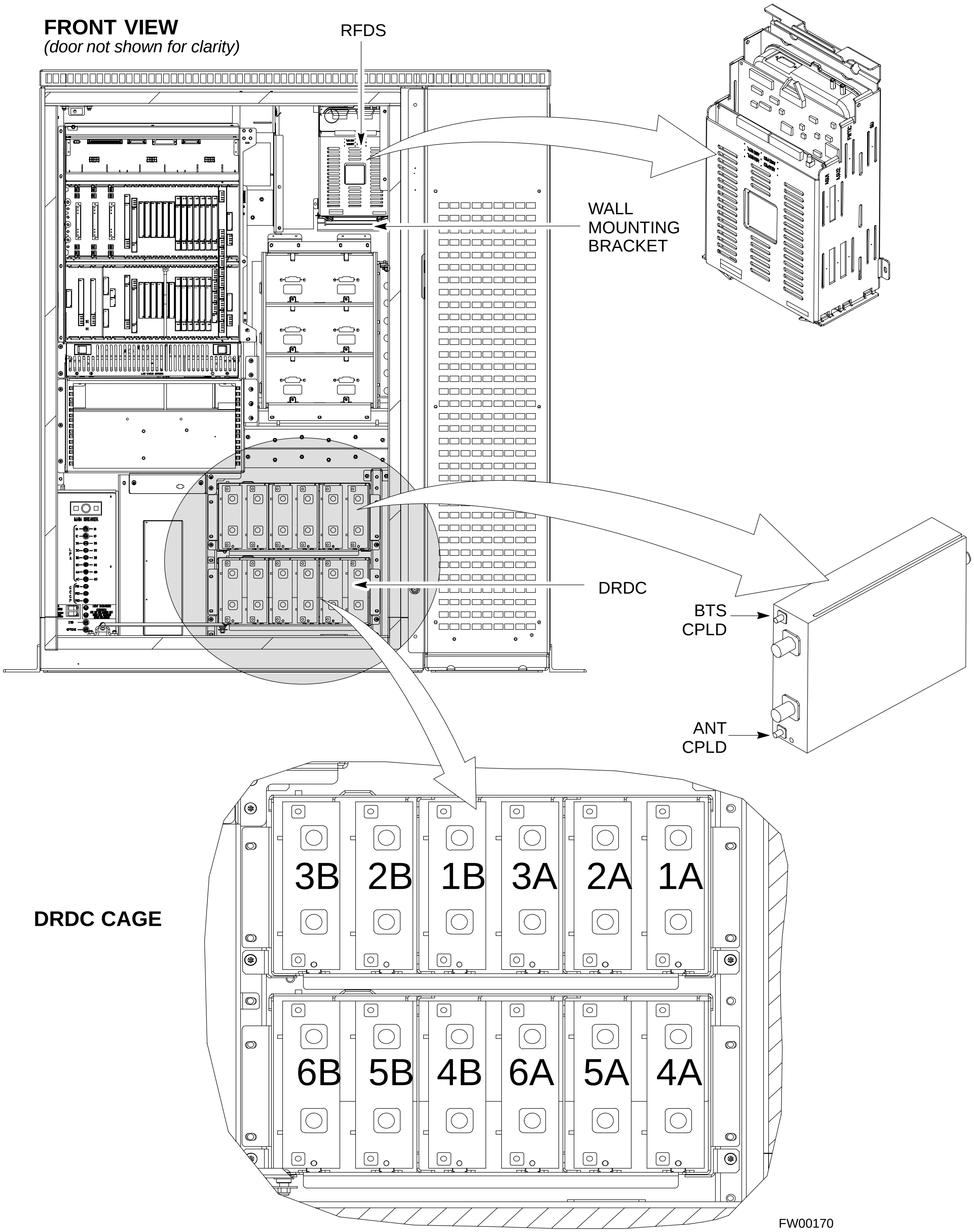


Figure 1-7: RFDS Location in an SC 4812ET RF Cabinet



Sector Configuration

There are a number of ways to configure the BTS frame. Table 1-5 outlines the basic requirements. When carrier capacity is greater than two, a 2:1 or 4:1 cavity combiner must be used. For one or two carriers, bandpass filters or cavity combiners may be used, depending on sectorization and channel sequencing.

Table 1-5: BTS Sector Configuration

Number of carriers	Number of sectors	Channel spacing	Filter requirements
1	3 or 6	N/A	Bandpass Filter, Cavity Combiner (2:1 or 4:1)
2	6	Non-adjacent	Cavity Combiner (2:1 Only)
2	6	Adjacent	Dual Band Pass Filter
2	3	Non-adjacent	Cavity Combiner (2:1 or 4:1)
2	3	Adjacent	Bandpass Filter
3,4	3	Non-adjacent	Cavity Combiner (2:1 or 4:1)
3,4	3	Adjacent	Cavity Combiner (2:1 Only)

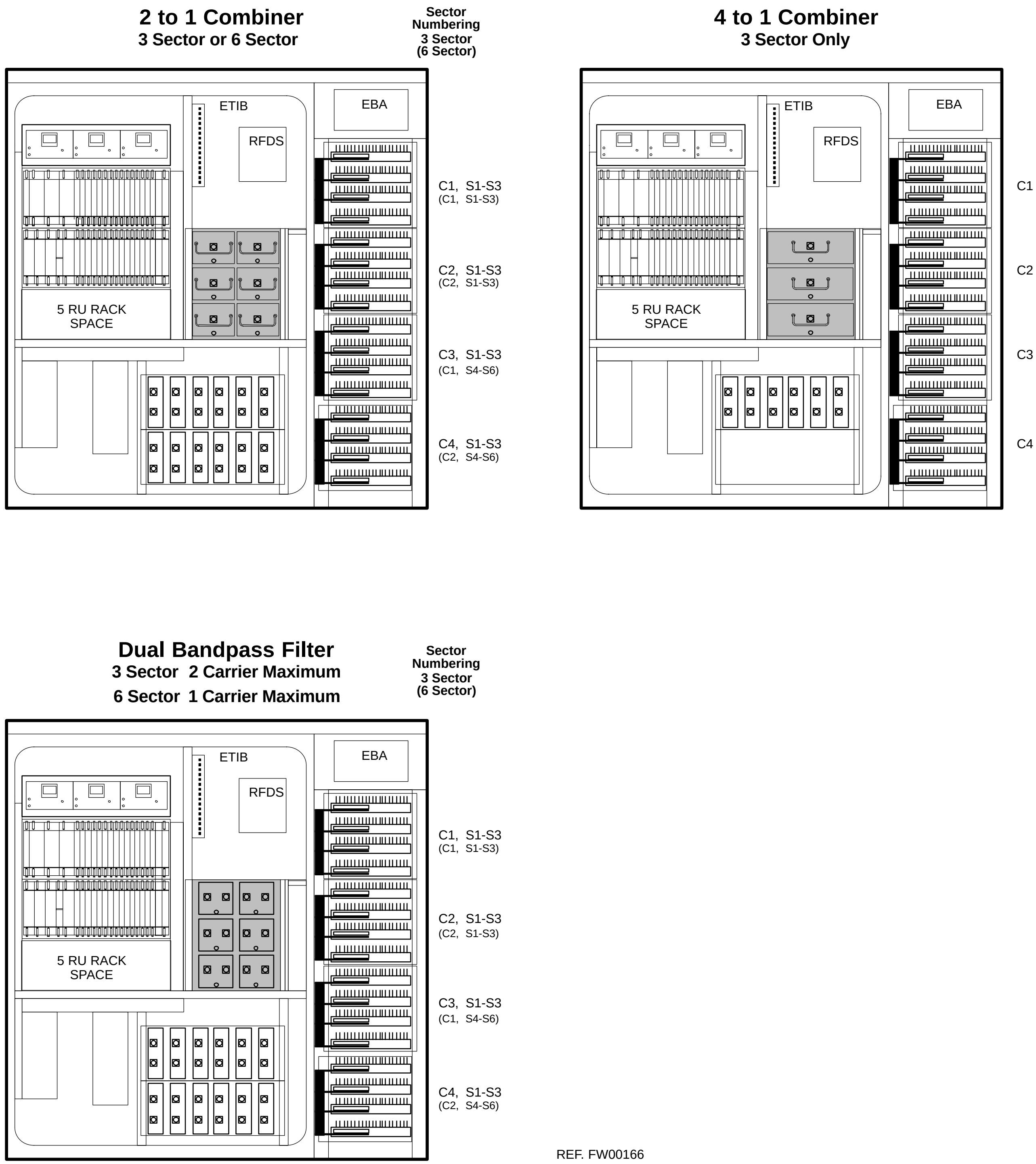
The matrix in Table 1-6 shows a correlation between the various sector configurations and BBX cards.

NOTE In Table 1-6, BBXs may be BBX2s or BBX-1Xs.

Table 1-6: Sector Configurations

Config Ref. No.	Description						
1	**3-Sector/2-ADJACENT Carriers** - The configuration below maps TX with optional 2:1 cavity combiners for 3 sectors/2 carriers for *adjacent* channels. Note that 2:1 cavity combiners are used (6 total).						
	TX1	**TX2**	**TX3**	**TX4**	**TX5**	**TX6**	**Carrier#**
	BBX-1	BBX-2	BBX-3	N/A	N/A	N/A	1
	N/A	N/A	N/A	BBX-4	BBX-5	BBX-6	2
2	**6-Sector/2-NON-ADJACENT Carriers** - The configuration below maps TX with 2:1 cavity combiners for 6 sectors/2 carriers for *non-adjacent* channels.						
	TX1	**TX2**	**TX3**	**TX4**	**TX5**	**TX6**	**Carrier#**
	BBX-1	BBX-2	BBX-3	BBX-4	BBX-5	BBX-6	1
	BBX-7	BBX-8	BBX-9	BBX-10	BBX-11	BBX-12	2
3	**3-Sector/2-NON-ADJACENT Carriers** - The configuration below maps TX with 2:1 cavity combiners for 3 sectors/2 carriers for *non-adjacent* channels.						
	TX1	**TX2**	**TX3**	**TX4**	**TX5**	**TX6**	**Carrier#**
	BBX-1	BBX-2	BBX-3	N/A	N/A	N/A	1
	BBX-7	BBX-8	BBX-9	N/A	N/A	N/A	2
4	**3-Sector/4-ADJACENT Carriers** - The configuration below maps TX with 2:1 cavity combiners for 3 sector/4 carriers for *adjacent* channels.						
	TX1	**TX2**	**TX3**	**TX4**	**TX5**	**TX6**	**Carrier#**
	BBX-1	BBX-2	BBX-3	N/A	N/A	N/A	1
	BBX-7	BBX-8	BBX-9	N/A	N/A	N/A	2
	N/A	N/A	N/A	BBX-4	BBX-5	BBX-6	3
	N/A	N/A	N/A	BBX-10	BBX-11	BBX-12	4
5	**3-Sector / 2-ADJACENT Carriers** - The configuration below maps TX with bandpass filters for 3 sectors/2 carriers for *adjacent* channels.						
	TX1	**TX2**	**TX3**	**TX4**	**TX5**	**TX6**	**Carrier#**
	BBX-1	BBX-2	BBX-3	N/A	N/A	N/A	1
	N/A	N/A	N/A	BBX-7	BBX-8	BBX-9	2
6	**3-Sector/3 or 4-NON-ADJACENT Carriers** - The configuration below maps TX with 4:1 cavity combiners for 3 sectors/3 or 4 carriers for *non-adjacent* channels.						
	TX1	**TX2**	**TX3**	**TX4**	**TX5**	**TX6**	**Carrier#**
	BBX-1	BBX-2	BBX-3	N/A	N/A	N/A	1
	BBX-7	BBX-8	BBX-9	N/A	N/A	N/A	2
	BBX-4	BBX-5	BBX-6	N/A	N/A	N/A	3
	BBX-10	BBX-11	BBX-12	N/A	N/A	N/A	4
7	**6-Sector/1-Carrier** - The configuration below maps TX with either bandpass filters or 2:1 cavity combiners for 6 sector/1 carrier.						
	TX1	**TX2**	**TX3**	**TX4**	**TX5**	**TX6**	**Carrier#**
	BBX-1	BBX-2	BBX-3	BBX-4	BBX-5	BBX-6	1

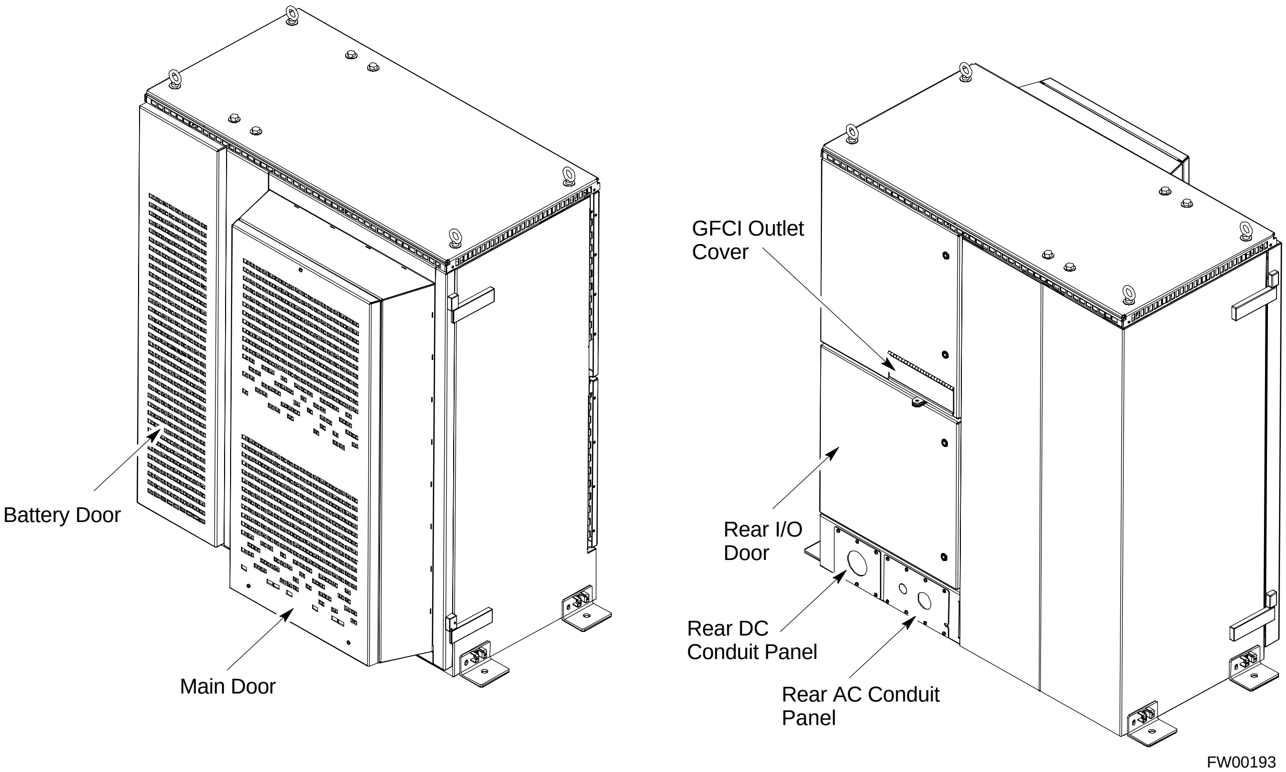
Figure 1-8: SC4812ET LPA Configuration with Combiners/Filters



Power Cabinet

Figure 1-9 illustrates the Power Cabinet design.

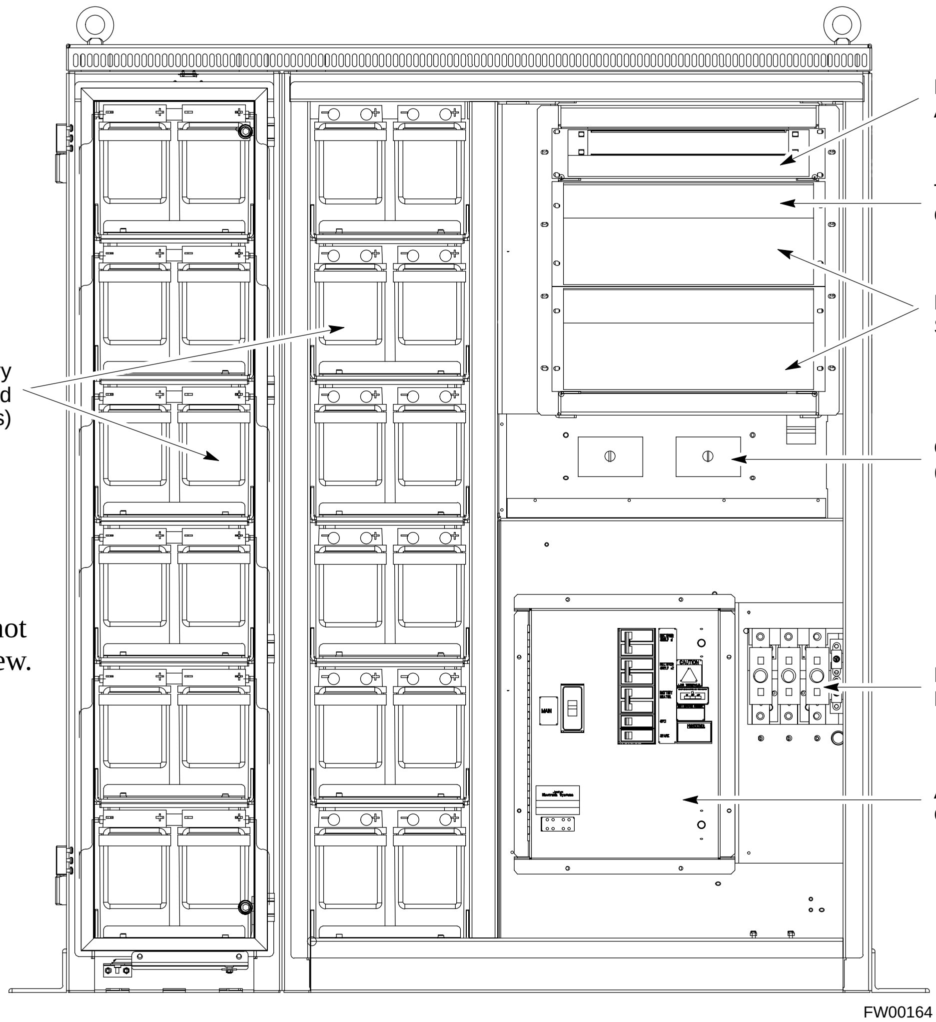
Figure 1-9: Power Cabinet



Internal FRUs

Figure 1-10 shows the location of the Internal Field Replaceable Units (FRUs). A brief description of each Internal FRU is found in the following paragraphs.

Figure 1-10: Power Cabinet with Batteries Installed (Doors Removed for Clarity)



NOTE
Punch Block is not visible in this view.

FRONT VIEW POWER CABINET

Batteries

The batteries provide a +27 Vdc backup to the RF Cabinet should AC Power be lost. The Power Cabinet can accommodate a total of 24 12-V batteries, configured in 12 strings of 2 batteries each. The time duration of backup provided depends on system configuration.

Battery Heater

The battery heaters provide heating to the batteries in the Power Cabinet. A separate heater is required for each string of batteries. The heater is a pad the batteries sit on located top of each battery shelf. The number of heaters is dependent on system configuration.

Battery Compartment Fan

The battery compartment fan provides air circulation for the two battery compartments. It is located on the inside of the battery compartment door.

Heat Exchanger

The Heat Exchanger provides cooling to the rectifier compartment of the Power Cabinet. The Heat Exchanger is located in the primary front door of the Power Cabinet.

Rectifiers

The +27 Vdc rectifiers convert the AC power supplied to the Power Cabinet to +27 Vdc to power the RF Cabinet and maintain the charge of the batteries.

AC Load Center

The ACLC is the point of entry for AC Power to the Power Cabinet. It incorporates AC power distribution and surge protection.

Punch Block

The Punch Block is the interface for the alarm signalling between the Power Cabinet and the RF Cabinet.

Notes

Chapter 2

Power Up Procedures

Prepower-up

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

Cellsite Types

Sites are configured as with a maximum of 4 carriers, 3-sectored with a maximum of 4 carriers, and 6-sectored with a maximum of 2 carriers. Each type has unique characteristics and must be optimized accordingly.

CDF

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

Site Equipage Verification

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

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

Initial Installation of Boards/Modules

Table 2-1: Initial Installation of Boards/Modules

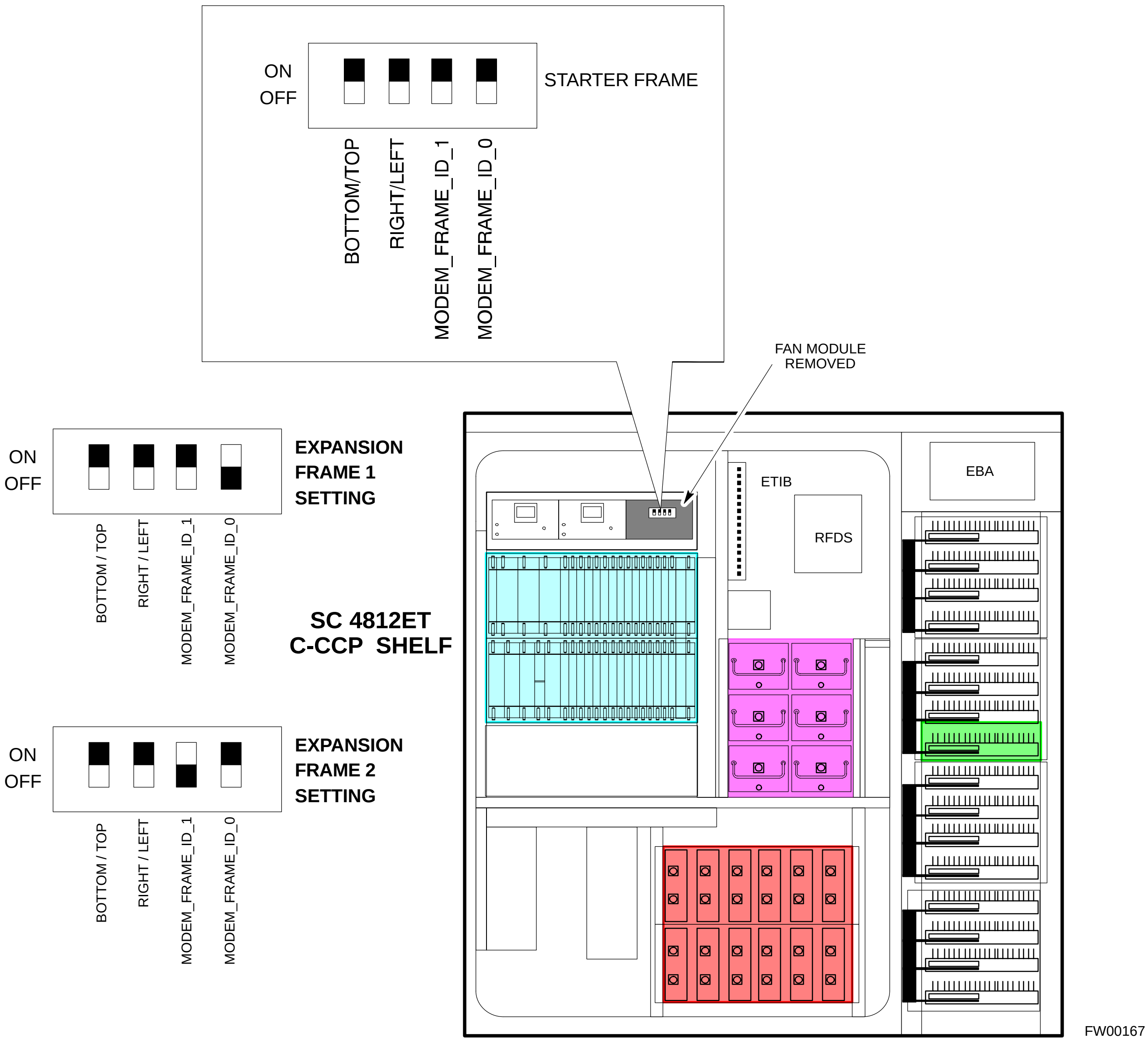
Step	Action
1	Refer to the site documentation and install all boards and modules into the appropriate shelves as required. **Verify they are NOT SEATED at this time.**
2	As the actual site hardware is installed, record the serial number of each module on a “Serial Number Checklist” in the site logbook.

Setting Frame C-CCP Shelf Configuration Switch

If the frame is a Starter BTS, the backplane switch settings behind the fan module should be set to the ON position (see Figure 2-1).

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

Figure 2-1: Backplane DIP Switch Settings



Checking for shorts

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

2

Required Tools

The following tools are used in the procedures.

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

Cabling Inspection

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

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

NOTE	For positive power applications (+27 V): • The positive power cable is red. • The negative power cable is black. (The black power cable is at ground potential.)

Initial Inspection and Setup

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

Table 2-2: Initial Inspection and Setup

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

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

AC Power Check

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

Table 2-3: AC Voltage Measurements

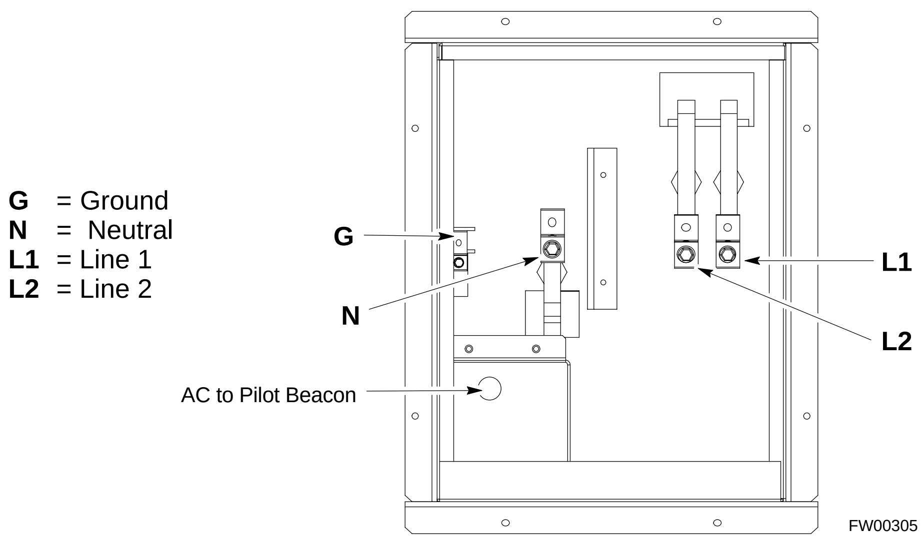
Step	Action
1	Measure the AC voltages connected to the AC load center (access the terminals from the rear of the cabinet after removing the AC load center rear panel). See Figure 2-2.
2	Measure the AC voltage from terminal L1 to neutral. This voltage should be in the range of nominally 115 to 120 Vac.

. . . continued on next page

Table 2-3: AC Voltage Measurements	
Step	**Action**
3	Measure the AC voltage from terminal L1 to ground. This voltage should be in the range of nominally 115 to 120 Vac.
4	Measure the AC voltage from terminal L2 to neutral. This voltage should be in the range of nominally 115 to 120 Vac.
5	Measure the AC voltage from terminal L2 to ground. This voltage should be in the range of nominally 115 to 120 Vac.
6	Measure L1 - L2 - should be from 208 to 240 Vac.

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

Figure 2-2: AC Load Center Wiring



AC Power Up Sequence

Applying AC Power

2

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

Table 2-4: Applying AC Power

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

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

Figure 2-3: Meter Alarm Panel

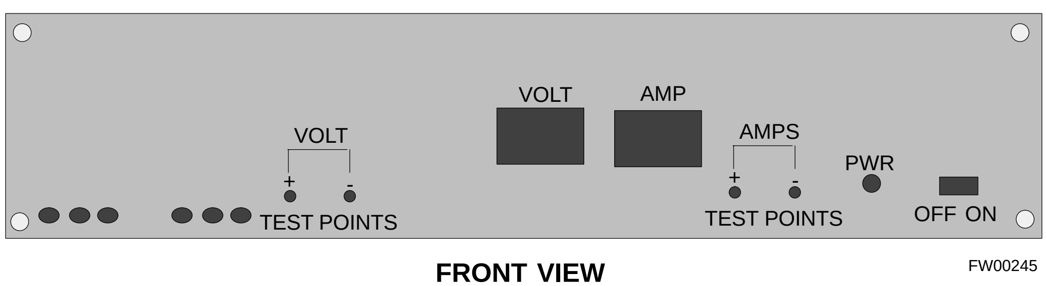
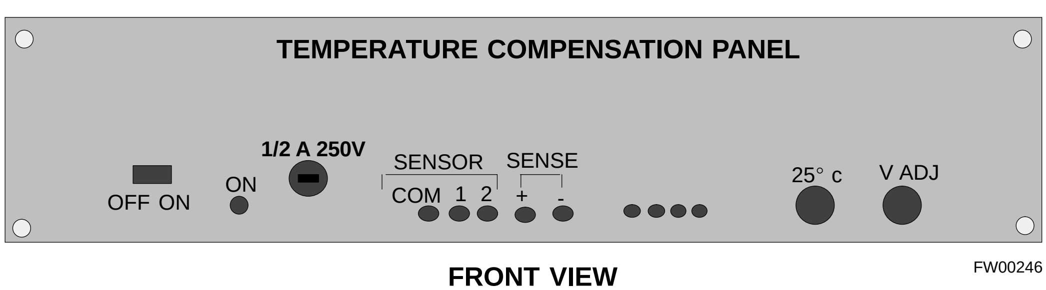


Figure 2-4: Temperature Compensation Panel



Power Cabinet Power Tests

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

Table 2-5: Power Cabinet Power Up Tests

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

DC Power Pre-test

DC Power Checks

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

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

Step	Action
1	*Physically verify* that all AC rectifiers supplying power to the RF cabinets are **OFF** or disabled (see Figure 2-5). There should be no 27 Vdc on DC feed terminals.
2	*On each RF cabinet:* • *Unseat* all circuit boards/ modules in the distribution shelf, transceiver shelf, and Single Carrier Linear Power Amplifier (SCLPA) shelves, but leave them in their associated slots. • *Unseat* all circuit boards (except CCD and CIO cards) in the C-CCP shelf and LPA shelves, but leave them in their associated slots. • Set C-CCP shelf breakers to the **OFF** position by *pulling out* power distribution breakers (labeled **C-CCP 1, 2, 3 -** located on the power distribution panel). • Set LPA breakers to the **OFF** position by *pulling out* power distribution breakers (8 breakers, labeled **1A-1B** through **4C-4D -** located on the power distribution panel).
3	Verify that the resistance from the power (+) feed terminals with respect to the ground terminal on the cabinet measures ≥ **500** Ω (see Figure 2-5). • If reading is < **500** Ω, a short may exist somewhere in the DC distribution path supplied by the breaker. Isolate the problem before proceeding. A reading > **3** MΩ could indicate an open (or missing) bleeder resistor (installed across the filter capacitors behind the breaker panel).
4	Set the 400 Amp Main Breaker and the C-CCP breakers (**C-CCP 1, 2, 3**) to the **ON** position by pushing them IN *one at a time*. Repeat step 3 after turning on each breaker. *** IMPORTANT** If, after inserting any board/module, the ohmmeter stays at **0** Ω, a short probably exists in that board/module. Replace the suspect board/module and repeat the test. If test still fails, isolate the problem before proceeding.
5	Insert and lock the DC/DC converter modules into their associated slots *one at a time*. Repeat step3 after inserting each module. • A typical response is that the ohmmeter will steadily climb in resistance as capacitors charge, finally indicating approximately **500** Ω. **! CAUTION** Verify the correct power/converter modules by observing the locking/retracting tabs appear as follows: - STPN4009 PWR CONV CDMA RCVR
6	Insert and lock all remaining circuit boards and modules into their associated slots in the C-CCP shelf. Repeat step 3 after inserting and locking each board or module. • A typical response is that the ohmmeter will steadily climb in resistance as capacitors charge, stopping at approximately **500** Ω.

. . . continued on next page

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

Step	Action
7	Set the 8 **LPA** breakers ON by pushing them IN *one at a time*. Repeat step 3 after turning on each breaker. • A typical response is that the ohmmeter will steadily climb in resistance as capacitors charge, stopping at approximately **500** Ω.
8	Seat all LPA and associated LPA fan modules into their associated slots in the shelves *one at a time*. Repeat step 3 after seating each LPA and associated LPA fan module. • A typical response is that the ohmmeter will steadily climb in resistance as capacitors charge, stopping at approximately **500** Ω.
9	Seat the Heat Exchanger, ETIB, and Options breakers one at a time. Repeat step 3.

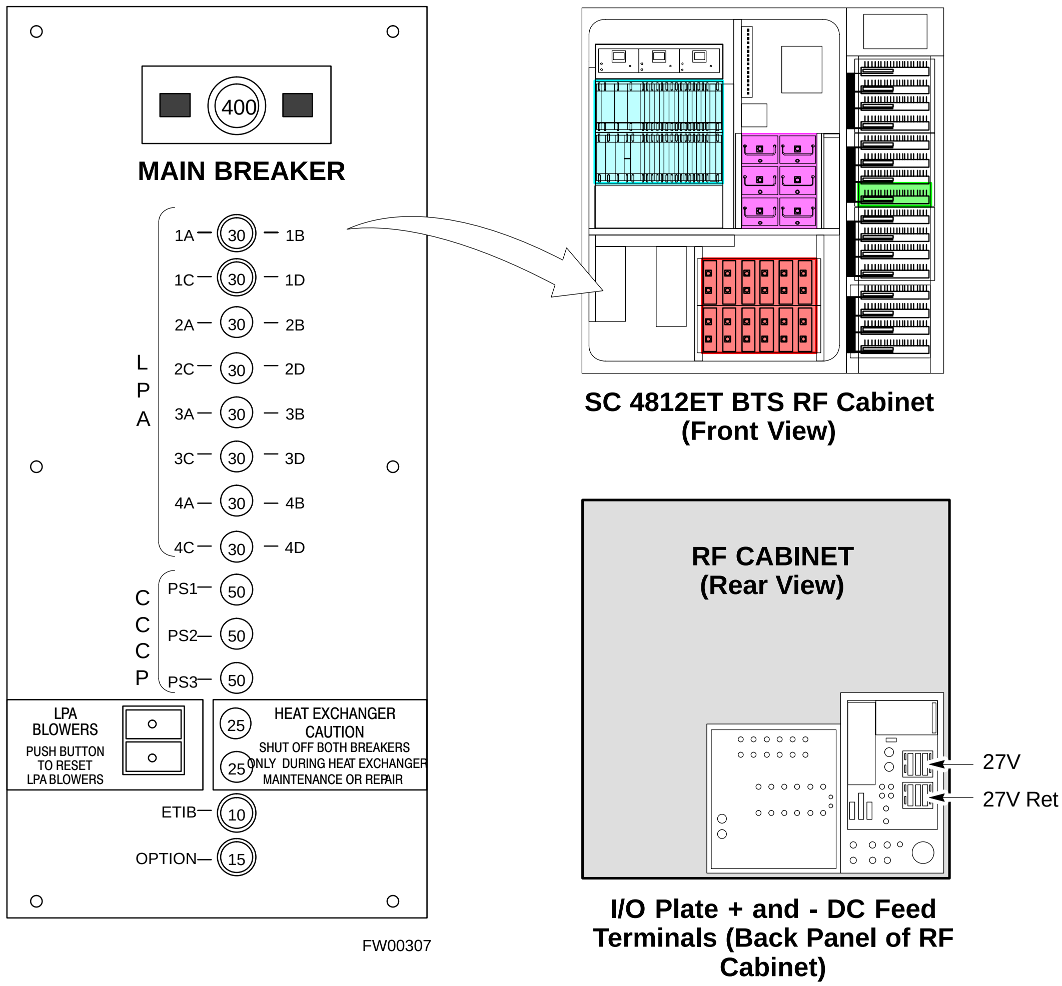
RF Cabinet Power Up

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

Table 2-7: RF Cabinet Power Up

Step	Action
1	Ensure the 400 Amp Main DC breaker and all other breakers in the RF Cabinet are OFF.
2	Proceed to the DC Power Pre-test (BTS Frame) sequence (see Table 2-6) (for initial power-up as required).
3	Ensure the power cabinet is turned on (see Table 2-5). Verify that 27 volts is applied to the terminals on the back of the RF cabinet.
4	Engage the main DC circuit breaker on the RF cabinet (see Figure 2-5).
5	*On each RF cabinet:* • Set C-CCP shelf breakers to the **ON** position by pushing them in one at a time (labeled **C-CCP 1, 2, 3 -** located on the power distribution panel). • Set LPA breakers to the **ON** position by pushing them in one at a time (8 breakers, labeled **1A-1B** through **4C-4D** - located on the power distribution panel). • Set the two heat exchanger breakers to the **ON** position by pushing them in one at a time. • Set the ETIB breaker to the **ON** position by pushing it in. • Set the OPTION breaker to the **ON** position by pushing it in.
6	Measure the voltage drop between the Power Cabinet meter test point and the 27 V buss bar inside the RF Cabinet PDA while the RF Cabinet is transmitting. **NOTE** For a 3-sector carrier system, the voltage drop should be less than 0.2 V. For a 12-sector carrier system, the voltage drop should be less than 0.3 V.
7	Using a DC current probe, measure the current in each of the six (6) DC cables that are connected between the RF and Power Cabinet. The DC current measured should be approximately the same. If there is a wide variation between one cable and the others (>20 A), check the tightness of the connections (torque settings) at each end of the cable.

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



Battery Test

Charge Test (Connected Batteries)

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

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

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

2

Discharge Test

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

Table 2-9: Battery Discharge Test

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

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

Heat Exchanger Power Up

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

Figure 2-6: Heat Exchanger Blower Assembly

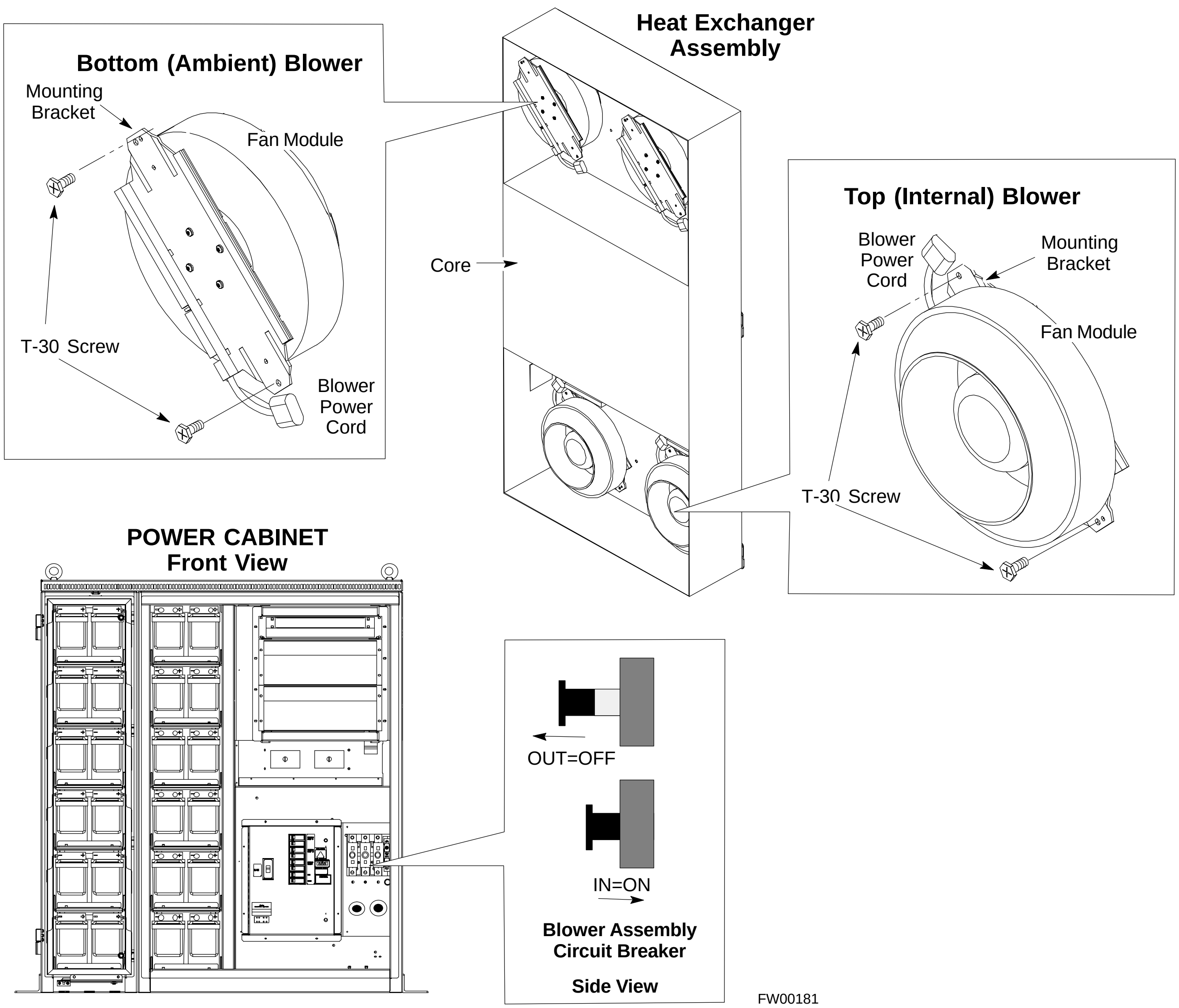


Figure 2-7: Power Cabinet Circuit Breaker Assemblies

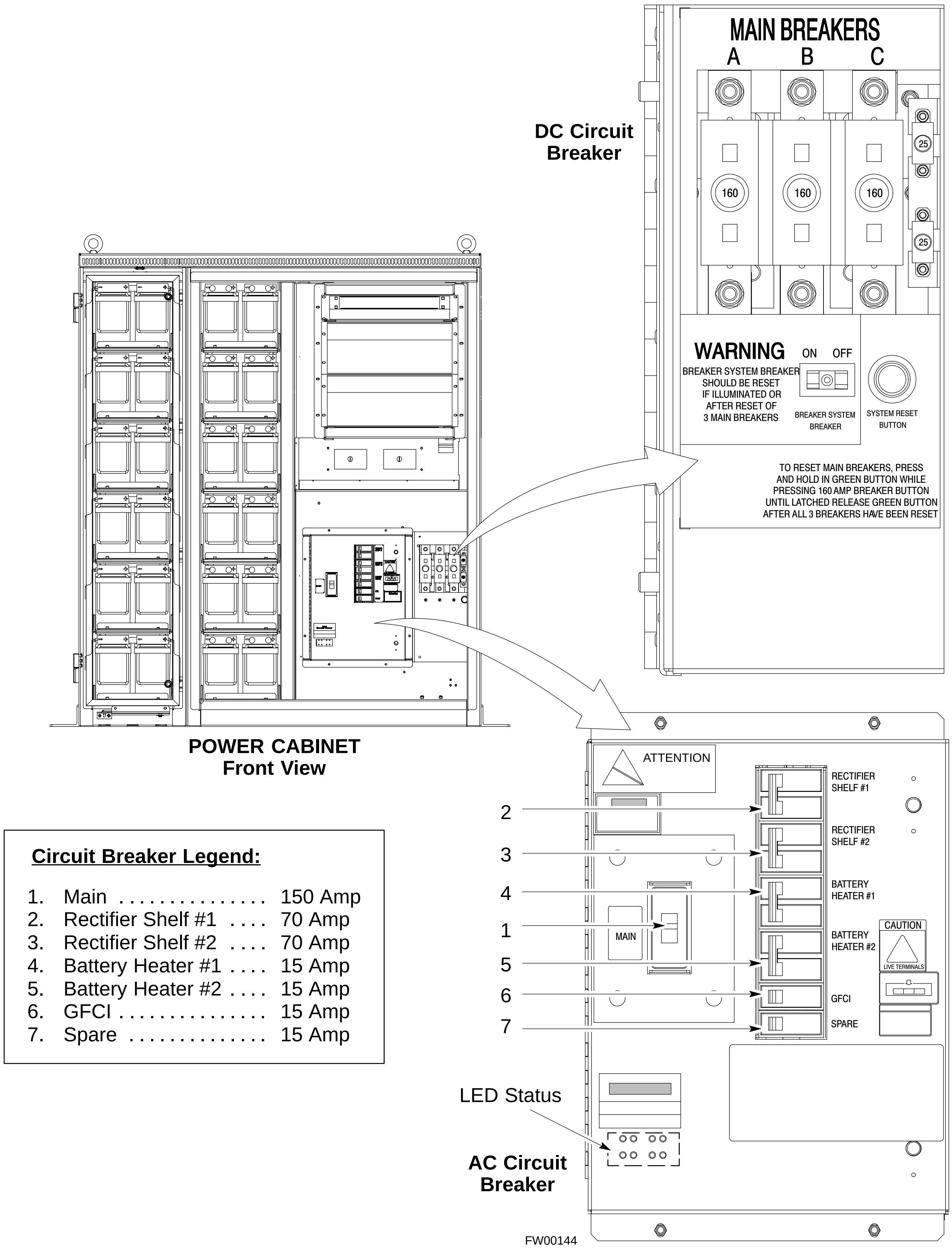


Figure 2-8: Power Cabinet AC Circuit Breakers

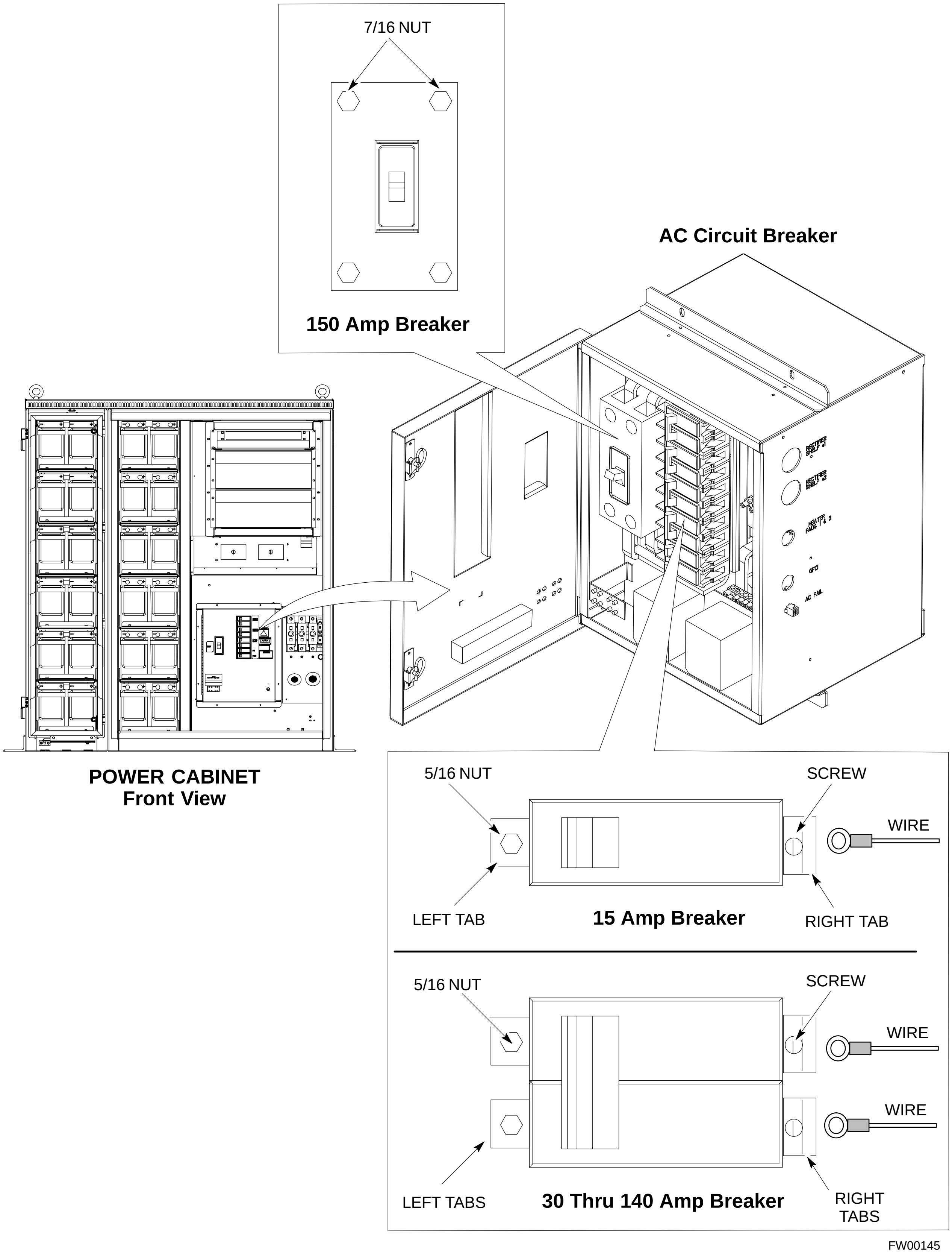
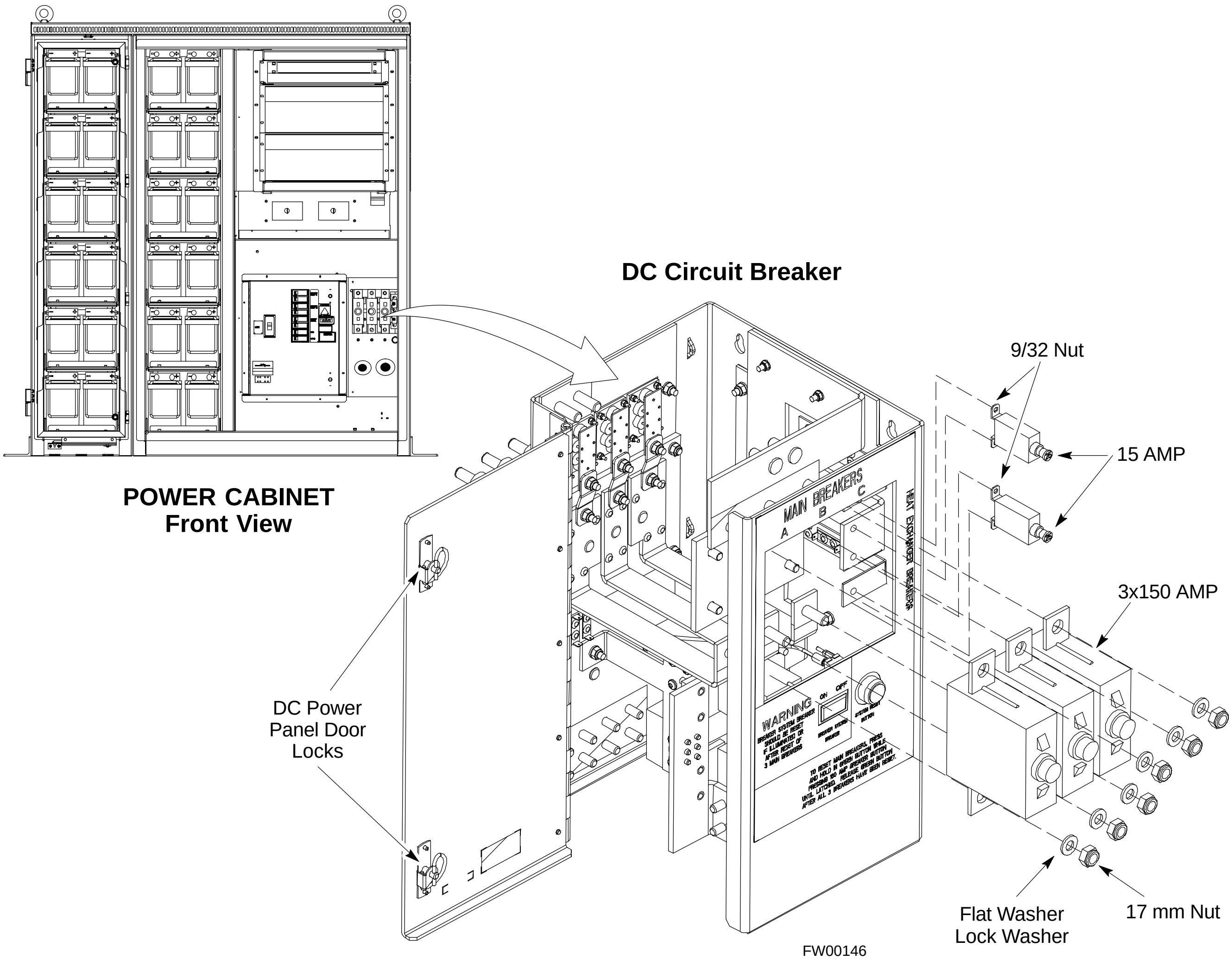


Figure 2-9: Power Cabinet DC Circuit Breakers



MOTOROLA

3

Chapter 3

Optimization/ATP

Basic Optimization

Introduction

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

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

3

Optimization Process

After a BTS is physically installed and the preliminary operations (power up) have been completed, the CDMA LMF is used to calibrate and optimize the BTS. The basic optimization process can be accomplished as follows:

- Download MGLI with code and data and then enable MGLI.

NOTE	The GLIs may be GLI2s or GLI3s

- Use the status function and verify that all of the installed devices of the following types respond with status information: CSM, BBX, GLI3, and MCC (and TSU if RFDS is installed). If a device is installed and powered up but is not responding and is colored gray in the BTS display, the device is not listed in the CDF file. The CDF file will have to be corrected before the device can be accessed by CDMA LMF.
- Download code and data to all devices of the following types:
  - CSM
  - BBX (may be BBX2 or BBX-1X)
  - GLI3 (other than GLI3-1)
  - MCC (may be MCC-8E, MCC24, or MCC-1X)
- Download the RFDS TSIC (if installed).
- Verify the operation of the GPS and HSO or LFR signals.
- Enable the following devices (in the order listed):
  - Secondary CSM (slot 2)
  - Primary CSM (slot 1)
  - All MCCs
- Connect the required test equipment for a full optimization.
- Select the test equipment.
- Calibrate the TX and RX test cables if they have not previously been calibrated using the CDMA LMF that is going to be used for the optimization/calibration. The cable calibration values can also be entered manually.
- Select all of the BBXs and all of the MCCs and use the full optimization function. The full optimization function performs TX calibration, BLO download, TX audit, all TX tests, and all RX tests for all selected devices.

- If the TX calibration fails, repeat the full optimization for any failed paths.
- If the TX calibration fails again, correct the problem that caused the failure and repeat the full optimization for the failed path.
- If the TX calibration and audit portion of the full optimization passes for a path but some of the TX or RX tests fail, correct the problem that caused the failure and run the individual tests as required until all TX and RX tests have passed for all paths.

Cell-site Types

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

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

Cell-site Data File

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

The CDF includes the following information:

- Download instructions and protocol
- Site specific equipage information
- C-CCP shelf allocation plan
  - BBX equipage (based on cell-site type) including redundancy
  - CSM equipage including redundancy
  - MCC (MCC24E, MCC8E or MCC-1X) channel element allocation plan. This plan indicates how the C-CCP shelf is configured, and how the paging, synchronization, traffic, and access channel elements (and associated gain values) are assigned among the (up to 12) MCCs in the shelf.
- CSM equipage including redundancy
- Effective Rated Power (ERP) table for all TX channels to antennas respectively. Motorola System Engineering specifies the ERP of a transmit antenna based on site geography, antenna placement, and government regulations. Working from this ERP requirement, the antenna gain, (dependent on the units of measurement specified) and antenna feed line loss can be combined to determine the required power at the top of the BTS frame. The corresponding BBX output level required to achieve that power level on any channel/sector can also be determined.

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

BTS System Software Download

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

Circuit Backhaul BTS

The information below is for Circuit-Backhaul BTS. GLI-3's configured for Circuit-backhaul use bts.cdf files.

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NOTE	Before using the LMF for optimization/ATP, the correct **bts-#.cdf** and **cbsc-#.cdf** files for the BTS must be obtained from the CBSC and put in a **bts-#** folder in the LMF. Failure to use the correct CDF files can cause wrong results.

CAUTION	**Failure to use the correct CDF files to log into a live (traffic carrying) site can shut down the site**.

Packet-Backhaul BTS

GLI-3's are configured for Packet-backhaul BTS's the file that is needed to login to the BTS is the NECF file (bts-xxx.xml) located on the OMC/R.

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

Site Equipage Verification

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

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

Isolate BTS from T1/E1 Spans

NOTE	**At active sites,** the OMC/CBSC must disable the BTS and place it out of service (OOS). **DO NOT** remove the span surge protectors until the OMC/CBSC has disabled the BTS.

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

Before connecting the LMF to the frame LAN, the OMC/CBSC must disable the BTS and place it OOS to allow the LMF to control the CDMA BTS. This prevents the CBSC from inadvertently sending control information to the CDMA BTS during LMF based tests.

Configure Channel Service Unit

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

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

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

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

Setting the Control Port

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

For more information, refer to the vendor user manual (part number 1174139) and installation manual (part number 1174462) provided with each CSU.

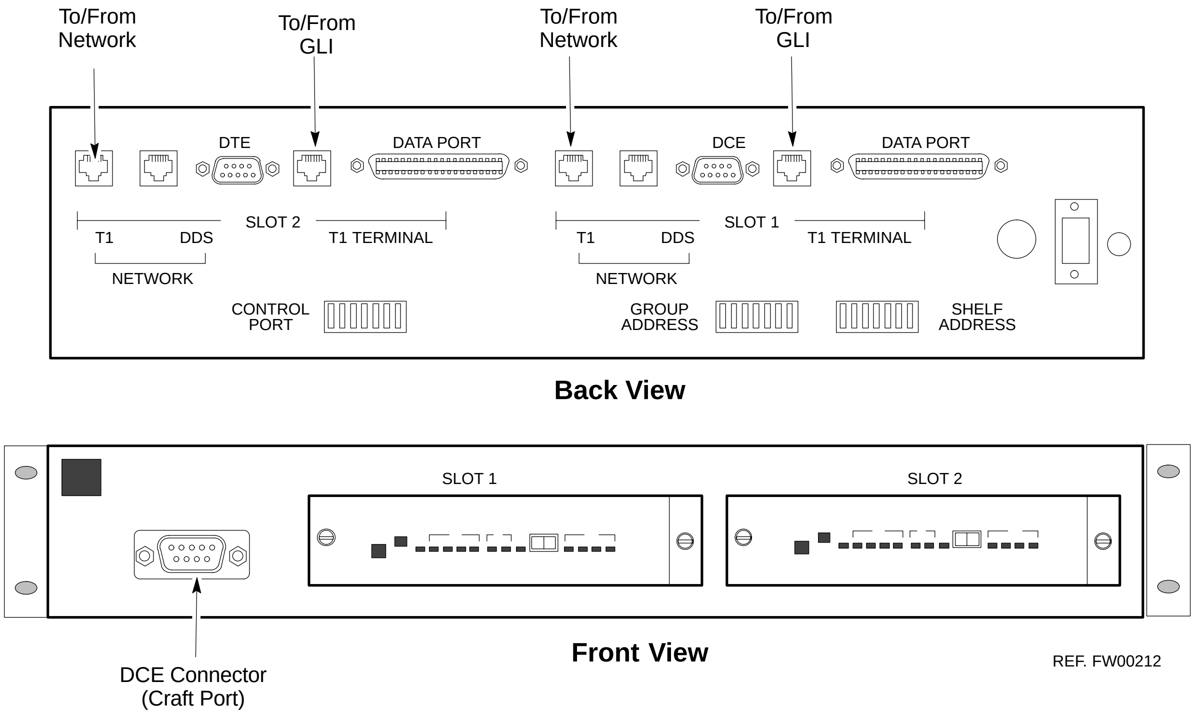
Plug one of the cables listed below into the Control Port connectors:

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

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

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

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

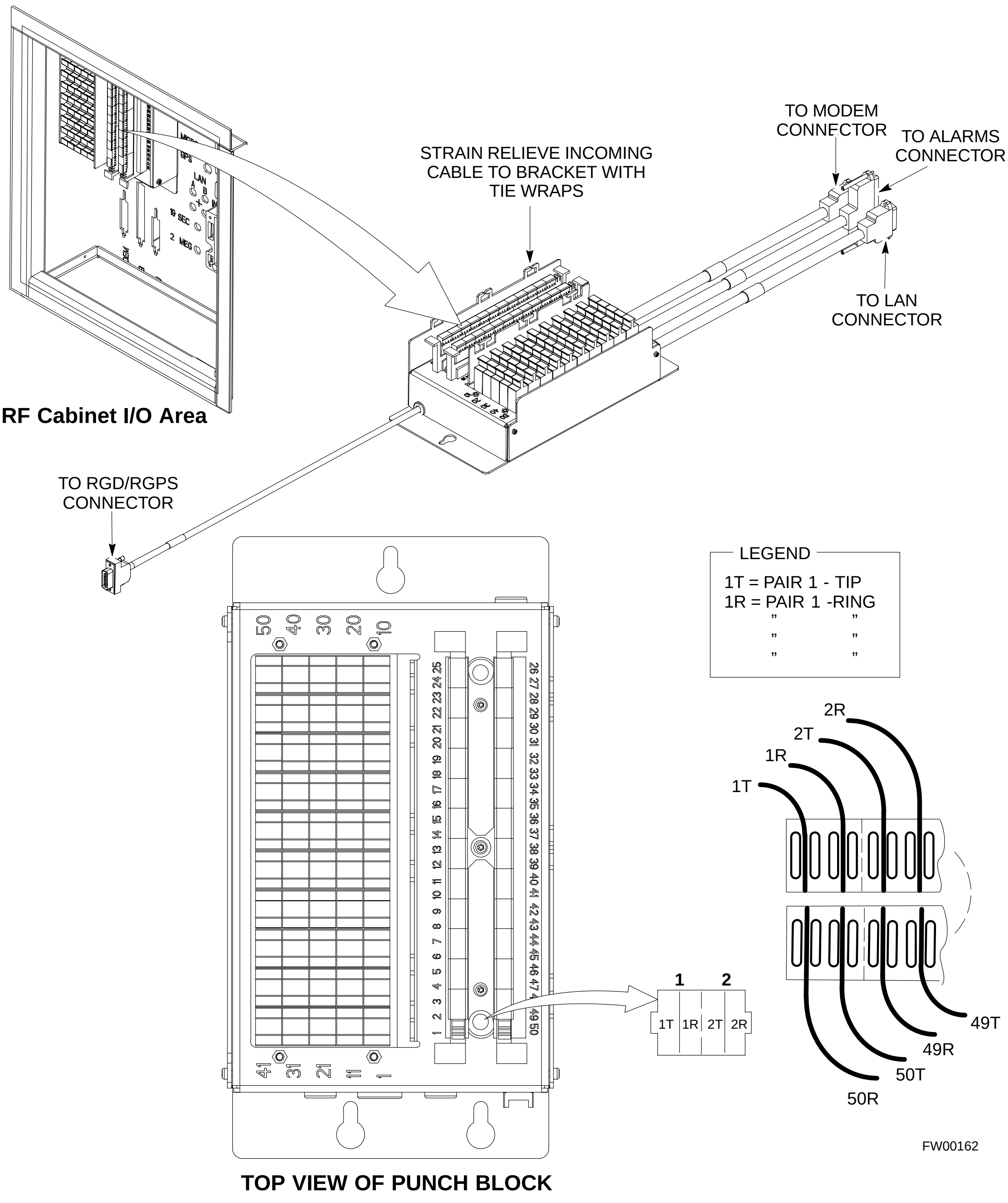


CAUTION	SC4812ET Span Line Labeling for Span B and Span C is swapped –On the SC4812ET's, the span cable internal to the base station that connects the 50 pin header on the I/O plate to the CSU has Span B and Span C (RJ-45) connectors mis-labeled. –CFE will punch down the span on the 50 pair bunchblock as per Motorola documentation and punchdown chart. When conecting the span input to the CSU re-label "Span B" cable to"Span C" cable to "Span B". Connect to CSU as per documentation **Note:** *The labeling issue on the cable from the I/O plate to the CSU Part Number 3086601H01 Rev C shall be corrected on revision "D" to address this issue. The cut over date to Rev. D will be approximately January 30, 2001.*

Alarm and Span Line Cable Pin/Signal Information

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

Figure 3-2: 50 Pair Punch Block



Alarm and Span Line Cable Pin/Signal Information

Table 3-1 lists the complete pin/signal identification for the 50-pin punch block.

Table 3-1: Pin-Out for 50-Pair Punchblock

Punchblock Cable Connector	Function	Signal Name	Punch Pin	Ext. Cable Wire Color
ALARM	Power Cabinet	Power Cab Control - NC	1T	Blue
		Power Cab Control - NO	1R	Blk/Blue
		Power Cab Control-Com	2T	Yellow
		Reserved	2R	N/C
		Rectifier Fail	3T	Blk/Yellow
		AC Fail	3R	Green
		Power Cab Exchanger Fail	4T	Blk/Grn
		Power Cab Door Alarm	4R	White
		Power Cab Major Alarm	5T	Blk/White
		Battery Over Temp	5R	Red
		Power Cab Minor Alarm	6T	Blk/Red
		Reticifier Over Temp	6R	Brown
		Power Cab Alarm Rtn	7T	Blk/Brn
	HSO/LFR Extension	LFR_HSO_GND	7R	
		EXT_1PPS_POS	8T	
		EXT_1PPS_NEG	8R	
	LFR Antenna	CAL_+	9T	
		CAB_-	9R	
		LORAN_+	10T	
		LORAN_-	10R	
	Pilot Beacon	Pilot Beacon Alarm - Minor	11T	
		Pilot Beacon Alarm - Rtn	11R	
		Pilot Beacon Alarm - Major	12T	
		Pilot Beacon Control-NO	12R	
		Pilot Beacon Control - COM	13T	
		Pilot Beacon Control - NC	13R	

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Table 3-1: Pin-Out for 50-Pair Punchblock

Punchblock Cable Connector	Function	Signal Name	Punch Pin	Ext. Cable Wire Color
ALARM	Customer Outputs	Customer Outputs 1 - NO	14T	
		Customer Outputs 1 - COM	14R	
		Customer Outputs 1 - NO	14T	
		Customer Outputs 1 - COM	14R	
		Customer Outputs 1 - NC	15T	
		Customer Outputs 2 - NO	15R	
		Customer Outputs 2 - COM	16T	
		Customer Outputs 2 - NC	16R	
		Customer Outputs 3 - NO	17T	
		Customer Outputs 3 - COM	17R	
		Customer Outputs 3 - NC	18T	
		Customer Outputs 4 - NO	18R	
		Customer Outputs 4-COM	19T	
		Customer Outputs 4 - NC	19R	
ALARM	Customer Inputs	Customer Inputs 1	20T	
		Cust_Rtn_A_1	20R	
		Customer Inputs 2	21T	
		Cust_Rtn_A_2	21R	
		Customer Inputs 3	22T	
		Cust_Rtn_A_3	22R	
		Customer Inputs 4	23T	
		Cust_Rtn_A_4	23R	
		Customer Inputs 5	24T	
		Cust_Rtn_A_5	24R	
		Customer Inputs 6	25T	
		Cust_Rtn_A_6	25R	
		Customer Inputs 7	26T	
		Cust_Rtn_A_7	26R	
		Customer Inputs 8	27T	
		Cust_Rtn_A_8	27R	
		Customer Inputs 9	28T	
		Cust_Rtn_A_9	28R	
		Customer Inputs 10	29T	
		Cust_Rtn_A_10	29R	

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Table 3-1: Pin-Out for 50-Pair Punchblock

Punchblock Cable Connector	Function	Signal Name	Punch Pin	Ext. Cable Wire Color
SPAN I/O	Span 1	RCV_TIP_A	30T	
		RCV_RING_A	30R	
		XMIT_TIP_A	31T	
		XMIT_RING_A	31R	
	Span 2	RCV_TIP_B	32T	
		RCV_RING_B	32R	
		XMIT_TIP_B	33T	
		XMIT_RING_B	33R	
	Span 3	RCV_TIP_C (Note)	34T	
		RCV_RING_C (Note)	34R	
		XMIT_TIP_C (Note)	35T	
		XMIT_RING_C(Note)	35R	
	Span 4	RCV_TIP_D (Note)	36T	
		RCV_RING_D (Note)	36R	
		XMIT_TIP_D (Note)	37T	
		XMIT_RING_D(Note)	37R	
	Span 5	RCV_TIP_E (Note)	38T	
		RCV_RING_E (Note)	38R	
		XMIT_TIP_E (Note)	39T	
		XMIT_RING_E(Note)	39R	
	Span 6	RCV_TIP_F (Note)	40T	
		RCV_RING_F (Note)	40R	
		XMIT_TIP_F (Note)	41T	
		XMIT_RING_F(Note)	41R	
		NOTE Span 3 through 6 are spares for expansion purposes		

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Table 3-1: Pin-Out for 50-Pair Punchblock

Punchblock Cable Connector	Function	Signal Name	Punch Pin	Ext. Cable Wire Color
RGD/RGPS	**For frame without RGD Expansion Punchblock** Single Frame BTS;RGPS Head Connection **OR** Multiple Frame BTS; RGD Connection at RGPS Secondary Frame	GPS_Power_A	42T	Yellow
		GPS_Power_A_Return	42R	Yellow/Black
		GPS_Power_B	43T	Blue
		GPS_Power_B_Return	43R	Blue/Black
		GPS_TXD+	44T	White
		GPS_TXD-	44R	White/Black
		GPS_RXD+	45T	Green
		GPS_RXD-	45R	Green/Black
		Signal Ground (TDR+)	46T	Red
		Signal Ground (TDR-)	46R	Red/Black
		GPS_1PPS+	47T	Brown
		GPS_1PPS-	47R	Brown/Black
RGD/RGPS	**For frame with RGD Expansion Punchblock** **OR** Multiple Frame BTS; RGPS Head Connection at RGPS Primary Frame	GPS_Power_A	42T	Yellow
		GPS_Power_A_Return	42R	Yellow/Black
		GPS_Power_B	43T	Blue
		GPS_Power_B_Return	43R	Blue/Black
		GPS_TXD+	44T	White
		GPS_TXD-	44R	White/Black
		GPS_RXD+	45T	Green
		GPS_RXD-	45R	Green/Black
		Signal Ground (TDR+)	46T	Red
		Master Frame (TDR-)	46R	Red/Black
		GPS_1PPS+	47T	Brown
		GPS_1PPS-	47R	Brown/Black
MODEM		Reserved	48T	
		Reserved	48R	
RGD/RGPS		Chassis Ground	49T	N/A
None		No Connection	49R	None
ALARM		Reserved	50T	None
		Reserved	50R	None

T1/E1 Span Isolation

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

Isolate BTS from T1/E1 Spans

NOTE	**At active sites,** the OMC/CBSC must disable the BTS and place it out of service (OOS). **DO NOT** remove the span surge protectors until the OMC/CBSC has disabled the BTS.

Table 3-2: T1/E1 Span Isolation

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

LMF Operation

Preparing the LMF

Before optimization can be performed, the LMF application software must be installed and configured on a computer platform meeting Motorola-specified requirements (see Recommended Test Equipment and Software in Chapter 1).

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

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

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

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

LMF Operating System Installation

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

Table 3-3: LMF Operating System Installation

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

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

CDMA LMF Home Directory

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

<x>:\<lmf home directory>

Where:

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

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

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

Copy CBSC CDF Files to the LMF Computer

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

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NOTE	When copying CDF files, comply with the following to prevent BTS login problems with the LMF. - The numbers used in the **bts-#.cdf** and **cbsc-#.cdf** filenames must correspond to the locally assigned numbers for each BTS and its controlling CBSC. - The generic **cbsc-1.cdf** file supplied with the LMF will work with locally numbered BTS CDF files. Using this file *will not provide a valid optimization* unless the generic file is edited to replace default parameters (e.g., channel numbers) with the operational parameters used locally.

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

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

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

. . . continued on next page

3

Table 3-4: Copying CBSC CDF Files to the LMF	
Step	**Action**
9	When all required files have been copied to the diskette, type **eject a**nd press <Enter>.
10	Remove the diskette from the CBSC drive.
11	If it is not running, start the Windows operating system on the LMF computer.
12	Insert the diskette containing the bts-#.cdf and cbsc-#.cdf files into the LMF computer.
13	Using Windows Explorer (or equivalent program), create a corresponding bts-# folder in the *<lmf home directory>* directory for each bts-#.cdf/cbsc-#.cdf file pair copied from the CBSC.
14	Use Windows Explorer (or equivalent program) to transfer the **cbsc-#.cdf** and **bts-#.cdf** files from the diskette to the corresponding ***<lmf home directory>*\cdma\bts-#** folders created in step 13.

Creating a Named HyperTerminal Connection for MMI Connection

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

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

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

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

Step	Action
	Table 3-5: Creating a Named Hyperlink Connection for MMI Connection
1	From the Windows Start menu, select: **Programs>Accessories**
2	Perform one of the following: • For *Win NT,* select **Hyperterminal a**nd then click on **HyperTerminal** or • For *Win 98,* select **Communications,** double click the **Hyperterminal** folder, and then double click on the **Hyperterm.exe** icon in the window that opens. **NOTE** • If a **Location Information Window** appears, enter the required information, then click **Close**. (This is required the first time, even if a modem is not to be used.) • If a **You need to install a modem.....** message appears, click **NO**.
3	When the **Connection Description** box opens: - Type a name for the connection being defined (e.g., MMI Session) in the **Name:** window. - Highlight any icon preferred for the named connection in the **Icon:** chooser window, and - Click **OK.**
4	**NOTE** For LMF configurations where COM1 is used by another interface such as test equipment and a physical port is available for COM2, select COM2 to prevent conflicts. From the **Connect using**: pick list in the **Connect To** box displayed, select the RS-232 port to be used for the connection (e.g., **COM1** or **COM2** - *Win NT* - or **Direct to Com 1** or **Direct to Com 2** - *Win 98*), and click **OK.**
5	In the **Port Settings** tab of the **COM# Properties** window displayed, configure the RS-232 port settings as follows: • Bits per second: 9600 • Data bits: 8 • Parity: None • Stop bits: 1 • Flow control: None
6	Click **OK**.
7	Save the defined connection by selecting: **File>Save**
8	Close the HyperTerminal window by selecting: **File>Exit**
9	Click **Yes** to disconnect when prompted.
10	Perform one of the following: • If the **Hyperterminal** folder window is still open (*Win 98*) proceed to step 12 or • From the Windows Start menu, select **Programs** > **Accessories**

. . . continued on next page

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

Folder Structure Overview

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

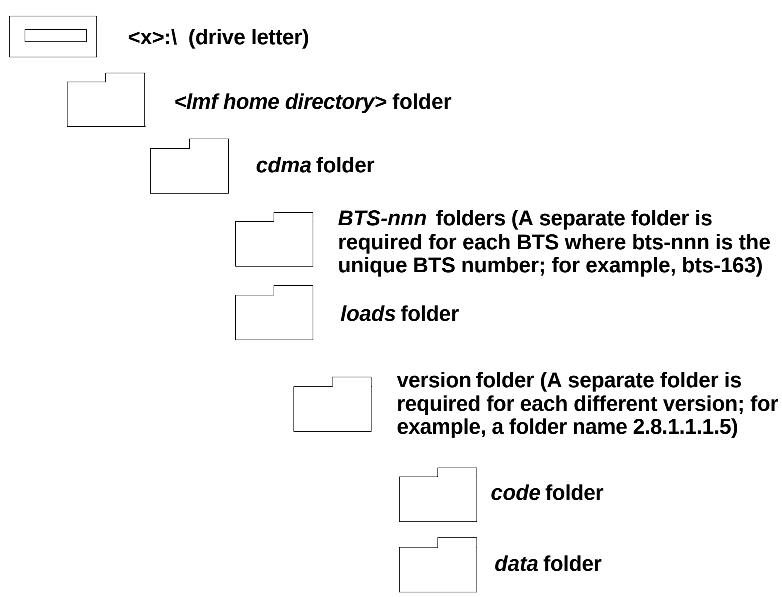
<x>:\<lmf home directory>

Where:

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

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

Figure 3-3: LMF Folder Structure



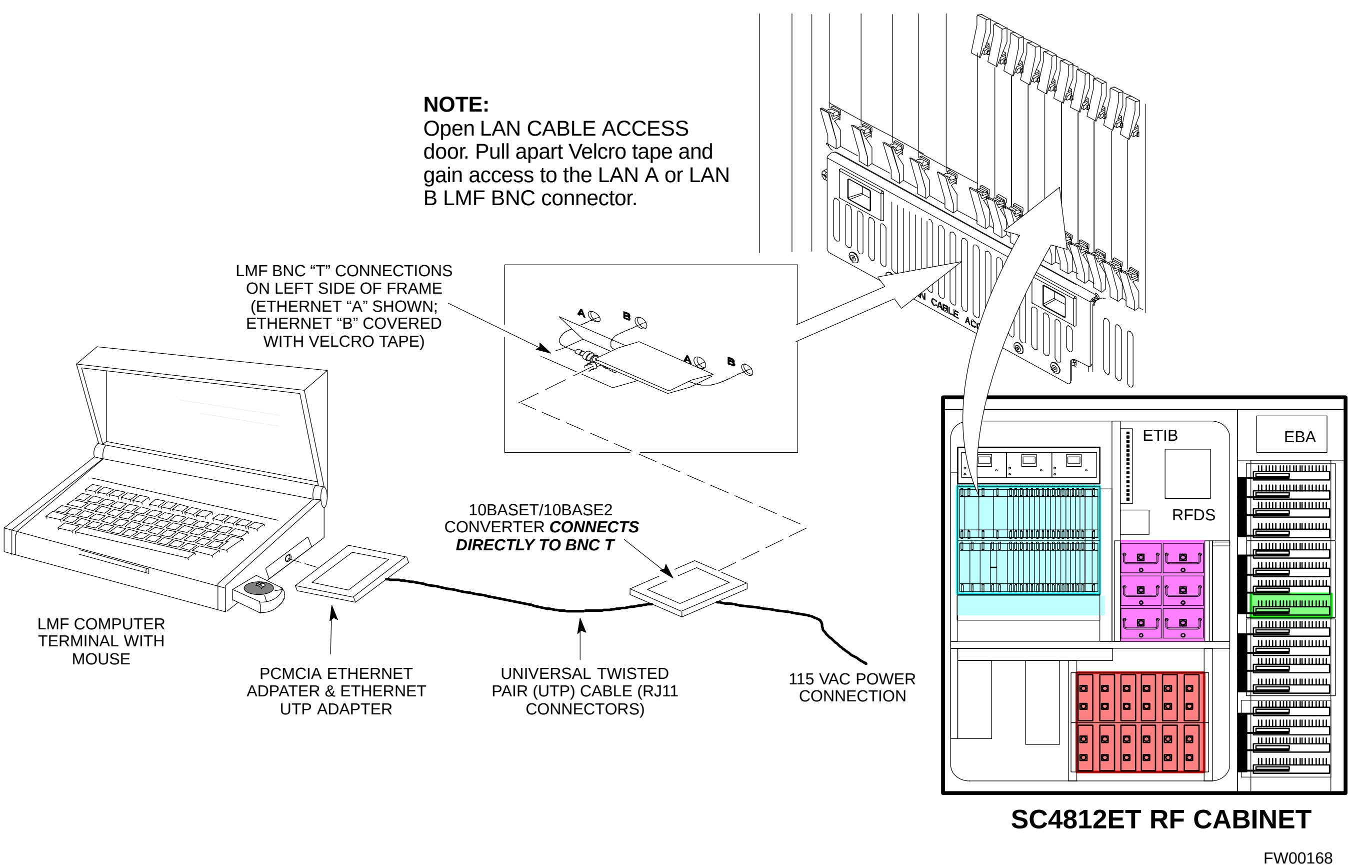
LMF to BTS Connection

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

Table 3-6: LMF to BTS Connection

Step	Action
1	To gain access to the connectors, open the LAN Cable Access door, then *pull apart the Velcro® tape covering the BNC "T" connector* and slide out the computer service tray, if desired (see Figure 3-4).
2	Connect the LMF to the LAN A BNC connector via PCMCIA Ethernet Adapter with an unshielded twisted-pair (UTP) Adapter and 10BaseT/10Base2 converter (powered by an external AC/DC transformer). If there is no login response, connect the LMF to the LAN B BNC connector. If there is still no login response, see Table 6-1, Login Failure Troubleshooting Procedure. **NOTE** - Xircom Model PE3-10B2 or equivalent can also be used to interface the LMF Ethernet connection to the frame connected to the PC parallel port, powered by an external AC/DC transformer. In this case, ***the BNC cable must not exceed 91 cm (3 ft) in length***. *** IMPORTANT** The LAN shield is isolated from chassis ground. The LAN shield (exposed portion of BNC connector) **must not touch the chassis** during optimization.

Figure 3-4: LMF Connection Detail



Pinging the Processors

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

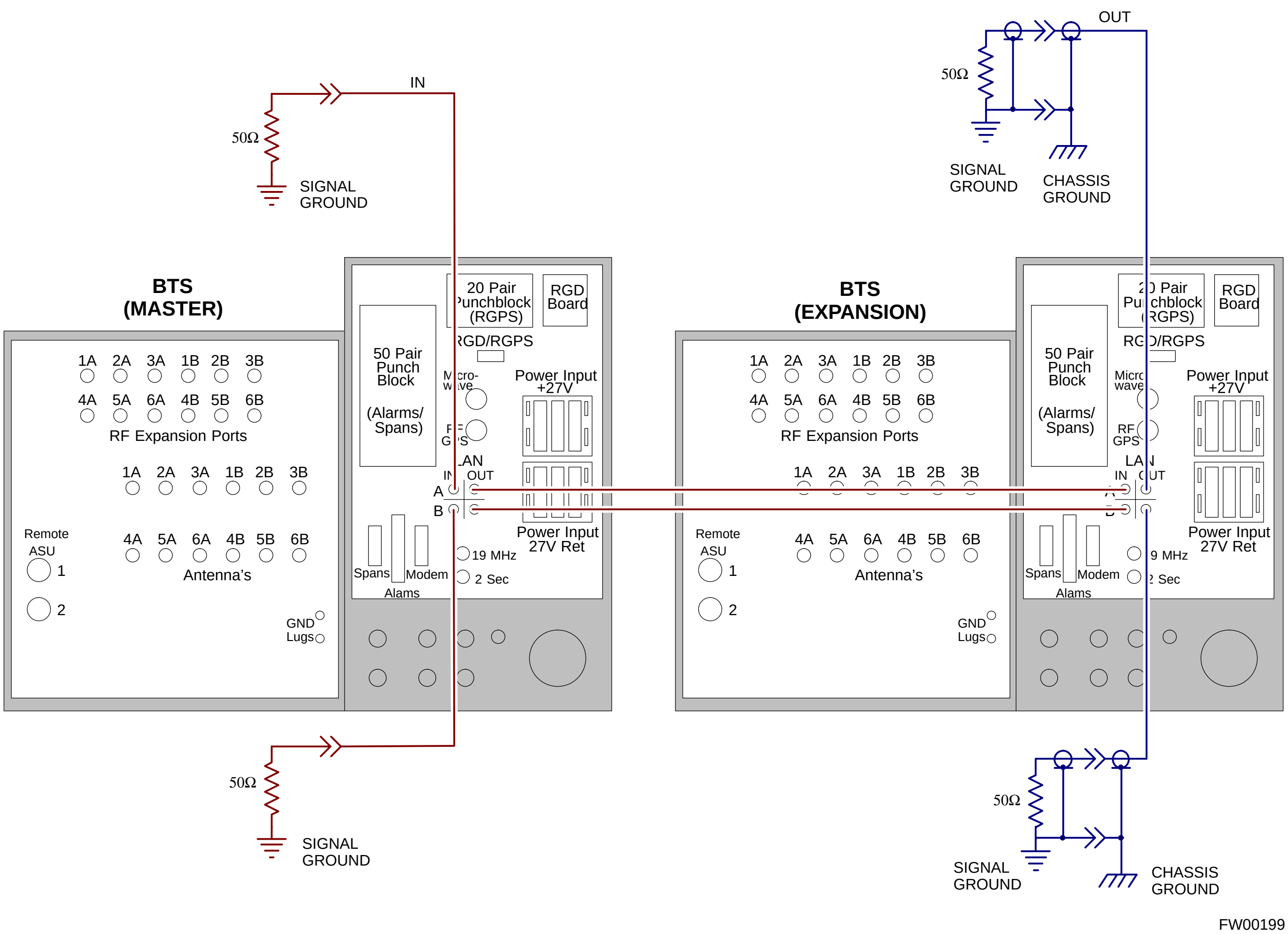
Ping is a program that sends request packets to the LAN network modules to get a response from the specified “target” module.

NOTE	*WinLMF (unreleased version 2.16.1.0.15 for example) has an option in the LOGIN menu to ping the GLI prior to login.*

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

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

Figure 3-5: BTS Ethernet LAN Interconnect Diagram



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

Table 3-7: Pinging the Processors

Step	Action
1	From the Windows desktop, click the **Start** button and select **Run.**
2	In the **Open** box, type **`ping`** **a**nd the **GLI IP address** (for example, **`ping 128.0.0.2)`**. **NOTE** 128.0.0.2 is the default IP address for the GLI3 in field BTS units.
3	Click on the **OK** button.

4	If the targeted module responds, text similar to the following is displayed:
	`Reply from 128 128.0.0.2: bytes=32 time=3ms TTL=255`
	If there is no response the following is displayed:
	`Request timed out`
	If the GLI3 fails to respond, it should be reset and re-pinged. If it still fails to respond, typical problems are shorted BNC to inter-frame cabling, open cables, crossed A and B link cables, or the GLI3 itself.

Log into and out of the BTS

Table 3-8: Logging into the BTS

Step	Action
	NOTE The LMF Mouse/Tracball must be attached if Windows and/or the GUI applications will be used.
1	Connect the LMF to the BTS as shown in .
2	Power-up the LMF. Allow the Windows operating system to come up.
3	Click the CDMA LMF desktop icon.
4	Click CDMA icon. Ths list of available BTS cell sites appears.
5	Click on the desired BTS (for example, BTS-6). If the IP Address and Port number are correct, press **Login to BTS.**
6	To keep the current IP Address for the next log in, click the **Remember Modified Address** box (a check appears in the box).
7	To use the default IP Address setting, click on **Use Defaults.**

Download Files to the LMF - Site Specific BTS Files

These procedures must be followed prior to an initial BTS optimization, or anytime a new release of the BTS operating system software is to be loaded from the LMF to the BTS.

Follow the steps outlined in Table 3-9 to create a bts directory and download files to that bts-specific directory. Perform this procedure ***only if the CDF files have not been previously loaded***.

Table 3-9: Downloading Site Specific BTS Files

Step	Action
	NOTE The types of files that can be downloaded include calibration files (.cal extension) and CDF files (.cdf extension). Files may be compressed (indicated by a .Z extension).
1	Obtain the 3.5-in. diskette(s) containing the configuration data file and calibration data.
2	Enter the following UNIX command from the `/usr/lmf` directory, to create a BTS specific directory *(if it does not already exist).* **mkdir bts-**<*bts#*>
3	Enter the following UNIX command to change to the newly created directory: **cd bts-**<*bts#*>
4	Insert the first 3.5 inch floppy diskette. Verify disk is loaded with the proper BTS files/ versions by typing the following at the `(lmf):` prompt: **seedisk <cr>**
5	To load the BTS files from the disk into the appropriate directory, enter the following at the `(lmf):` prompt: **fromdisk <cr>**
	NOTE • Copy bts-#.cdf and (if they exist) bts-#.cal files to the `/usr/lmf/bts-#` directory. (# equates to the actual BTS site number). • Unless sites use different device loads, create links to device files (as described in Table 3-10) rather than placing individual copies into each bts directory.
6	***If files are compressed***, use the `uncompress *.Z` command to unpack files.

Download Files to the LMF - Master-bts-cdma Files

These procedures must be followed prior to an initial BTS optimization, or anytime a new release of the BTS operating system software is to be loaded from the LMF to the BTS.

Follow the steps outlined in Table 3-10 to create a bts-master-cdma directory, to download files, and to create softlinks to the device load files into the appropriate `bts-` <*bts#*> subdirectory. (Always consult latest software release notes as this *is an interim procedure and is subject to change*).

Table 3-10: Downloading and linking master-bts-cdma directory files for device loads

Step	Action
	NOTE • If the current LMF code needs to be installed on the LMF PC, or if more information on file management, creating bts directories, or viewing CDF files is needed, refer to the.*LMF Users Guide.* • The types of files that can be downloaded include code (.hex or .bin extension) and data (.dds extension) files. Files may be compressed (indicated by a .Z extension).
1	Enter the following UNIX command, from the `/usr/lmf` directory, to create a device load master directory *(if it does not already exist).* **mkdir bts-master-cdma**
2	Enter the following UNIX command to change to the newly created directory: **cd bts-master-cdma**
3	Obtain the 3.5-in. diskette(s) containing the current release of the BTS operating code and/or data files. **NOTE** File naming conventions for all processor boards and applicable files for each are listed below. Rename files using the **mv** UNIX command as required: **Device** **File Name(s)** • GLI <version>`-gliboot.hex` & `gli.dds` • BBX <version>`-bbxboot.hex & bbx.dds` • BDC <version>`-bdcboot.hex` & `bdc.dds` • MCC <version>`-mccboot.hex.0501` & `mcc.dds.0501` • CSM <version>`-csmboot.hex` & `csm.dds` • TSU `tsuboot.hex`
4	Insert the first 3.5 inch floppy diskette. Verify disk is loaded with the proper BTS files/versions by typing the following at the `(lmf):` prompt: **seedisk <cr>**
5	To load the BTS files from the disk into the appropriate directory, enter the following at the `(lmf):` prompt: **fromdisk <cr>**
6	***If files are compressed***, use the `uncompress *.Z` command to unpack files. Rename files to match the naming conventions listed above if required.
7	Repeat Steps 4 and 5 for each diskette that is a part of this load.
	NOTE All older versions of files (and links to files) in the `bts-master- bts-<`*`bts#`*`>` subdirectories ***must be removed*** before beginning this procedure.

. . . continued on next page

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Table 3-10: Downloading and linking master-bts-cdma directory files for device loads

Step	Action
8	Create softlinks to the device load and data load files in the `bts-master-cdma` directory using the following UNIX commands: **ln -s /usr/lmf/bts-master-cdma/*.hex /usr/lmf/bts-**<*bts#*>**/** **ln -s /usr/lmf/bts-master-cdma/*.hex.* /usr/lmf/bts-**<*bts#*>**/** **ln -s /usr/lmf/bts-master-cdma/*.dds /usr/lmf/bts-**<*bts#*>**/** **ln -s /usr/lmf/bts-master-cdma/*.dds.* /usr/lmf/bts-**<*bts#*>**/** **NOTE** You may need to specify specific file names in the command instead of using the ***** ”wildcard” character in order to link multiple versions of files in the same subdirectory. Using *.* will link ALL files in the directory.

Create BTS Specific CDF File

Follow the steps outlined in Table 3-11 to create a BTS specific CDF file, if one cannot be obtained from the OMCR/CBSC. (*This is an interim procedure and is subject to change).*

Table 3-11: Create BTS Specific CDF File

Step	Action
	! CAUTION If you are not familiar with the UNIX vi editor, create a “dummy” CDF file, and practice making changes to it, prior to altering the “real” one.
	NOTE For more information on file management, creating bts directories, viewing/editing CDF files, refer to *LMF Users Guide*.
1	Determine the CDF file, currently loaded on the LMF, is closest to the configuration at the site. Use a generic CDF file that equips all devices, if possible. If this is an OMNI site, use an OMNI CDF file, if SECTOR, use SECTOR CDF file.
2	List the contents of the `bts-`*<bts#>* directory by entering the **ls** command at the `(lmf)` prompt followed by a `<cr>`, to verify the CDF file for the site does not already exist.
3	Enter the following command to copy an existing CDF file on the LMF hard drive to the new BTS directory. **cp /usr/lmf/bts-**`src_<bts#>`**.cdf /usr/lmf/bts-** `dest_<bts#>`**.cdf**
	NOTE The following step is for LMF software releases version 5 and 6 only.
4	Globally change the BTS ID in the new CDF file using the following UNIX commands: **vi bts-**`new_<bts#>`**.cdf** **:1,$ s/Id1 =** `old_<bts#>`**/Id1 =** `new_<bts#>` **:1,$ s/**`old_<bts#>_`**/**`new_<bts#>_` Include the underscore after the old and new bts # in the above command **:1,$ s/BTS\[**`old_<bts#>`**/BTS\[**`new_<bts#>` **:wq** **NOTE** You should now be able to log into the bts using the new CDF file. If you search for the old BTS #, it should be gone. You will have to edit the CDF file (using the vi editor) as far as BBX, MCC, etc. equipage is concerned.

Update BTS Specific CDF File Device Load Version and Site Type

Follow the steps outlined in Table 3-12 to update the existing BTS specific CDF file *NextLoad* parameter, to reflect the current device load version to be downloaded and verify the correct Site Type. (*This is an interim procedure and is subject to change).*

CAUTION	Device load version in the CDF file *must* match the current version loaded at the OMCR/CBSC.

3

Table 3-12: Update BTS Specific CDF File Device Load Version

Step	Action
	! CAUTION If you are not familiar with the UNIX vi editor, create a "dummy" CDF file, and practice making changes to it, prior to altering the "real" one.
	*** IMPORTANT** CDF files obtained from the OMCR/CBSC are modified by DELTA information being appended to the end of the CDF file. The information in the DELTA fields take precedence over information in the "core CDF file" For example: If NextLoad="1.2.3.4.5" for BBX 1 was specified in the CDF file, and there was a DELTA entry specifying NextLoad="2.3.4.5.6" appended to the CDF file for the same BBX, 2.3.4.5.6 would be the version used. There are two ways resolve this. Edit both the DELTA and "core" areas of the file to reflect the same version, or make sure the delta information is transferred to the main CDF file and delete all DELTA CDF file entries.
1	Globally change the device load version number in the new CDF file using the following UNIX commands: **vi bts-***new_<bts#>***.cdf** **:1,$ s/***x.x.x.x.x***/***y.y.y.y.y* Where: *x.x.x.x.x* and *y.y.y.y.y* represent the *old* and *new* version number, respectively. **:wq**
	NOTE You should now be able to download all devices at the BTS with the current device load version.

2	Verify the `SiteType` and `SSType` entries in the CDF file (under the BTS subheading) reflect the following information. See example of applicable fields of CDF file below.
	(*CDMA only; 1900 MHz example shown*):
	`BTS[#] = {`
	`....,`
	`SiteType=3,`
	`SSType=16`
	`...`
	`},`
	Valid SiteTypes (SC9600=1, SC9600(Mixed)=2, SC2400=3, SC2400(Mixed)=4, SC600=5)
	Valid SSTypes (CDMA800MHz=8, CDMA1900MHz=16, CDMA900MHz=32)

Update Antenna Mapping Files

Earlier release versions may require the `antenna.map` file to be updated. There are two antenna mapping files. These are `antenna.map` and `antenna.asu`.

Follow the steps outlined in Table 3-13 to check the antenna mapping file and update as needed.

<table>
<tr><th colspan="2">Table 3-13: Update Antenna Mapping Files</th></tr>
<tr><th>Step</th><th>Action</th></tr>
<tr><td></td><td>! CAUTION
If you are not familiar with the UNIX vi editor, create a “dummy” CDF file, and practice making changes to it, prior to altering the “real” one.</td></tr>
<tr><td></td><td>NOTE
For more information on file management, creating bts directories, viewing/editing CDF files, refer to the LMF Users Guide.</td></tr>
<tr><td>1</td><td>View the <code>antenna.map</code> file (see below) and verify the Xcvrs listed in the CDF file (and that are equipped in the BTS) are also listed in the <code>antenna.map</code> file (for both RX and TX tables). Make sure the <code>antenna.map</code> file has enough RX and TX antennas listed to cover the number of sectors indicated by CDF’s SiteConf parameter.

Example of Antenna Map File
<pre>
R   --- Rx --- -- Sec --   ----- Xcvrs -----
R   1:M :RX1:   1   :1,4,5,8
R   2:D :RX2:   1   :1,4,5,8
R   3:M :RX3:   2   :2,4,6,8
R   4:D :RX4:   2   :2,4,6,8
R   5:M :RX5:   3   :3,4,7,8
R   6:D :RX6:   3   :3,4,7,8

T   --- Tx --- -- Sec --   ----- Xcvrs -----
T   1:0 :TX1:   1   :1,4
T   2:0 :TX2:   2   :2,4
T   3:0 :TX3:   3   :3,4
T   4:0 :TX4:   1   :5,8
T   5:0 :TX5:   2   :6,8
T   6:0 :TX6:   3   :7,8
</pre></td></tr>
<tr><td>2</td><td>Verify all RX and TX antennas listed in the file <code>antenna.map</code> are also listed in the <code>antenna.asu</code> file.

NOTE
The antenna.asu file is required only if the BTS is equipped with RFDS. Be sure that the information in antenna files matches your actual configuration.</td></tr>
</table>

3

Operating the LMF

Basic Operation

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

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

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

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

Basic operation of the LMF GUI includes the following:

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

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

Both the GUI and the CLI use a program known as the handler. Only one handler can be running at one time. The architectural design is such that the GUI must be started before the CLI if you want the GUI and CLI to use the same handler.

When the CLI is launched after the GUI, the CLI automatically finds and uses an in-progress login session with a BTS initiated under the GUI. This allows the use of the GUI and the CLI in the same BTS login session.

If a CLI handler is already running when the GUI is launched (this happens if the CLI window is already running when the user starts the GUI, or if another copy of the GUI is already running when the user starts the GUI), a dialog window displays the following warning message:

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

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

CLI Format Conventions

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

- Verb
- Device including device identifier parameters
- Switch
- Option parameters consisting of:
  - Keywords
  - Equals sign (=) between the keyword and the parameter value
  - Parameter values

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

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

Refer to the *LMF CLI Commands (68P09251A59)* for a complete explanation of the CLI commands and their usage.

Logging into a BTS

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

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

Before attempting to log into the BTS, confirm the CDMA LMF is properly connected to the BTS (see Figure 3-4). Follow the procedure in Table 3-14 to log into a BTS.

Prerequisites

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

- The LMF is correctly installed and prepared.
- A ***bts-nnn*** folder with the correct CDF and CBSC file exists.
- The LMF is correctly installed and prepared, and the LMF computer was connected to the BTS before starting the Windows operating system and LMF software. If necessary, restart the computer after connecting it to the BTS (see Table 3-6 and Figure 3-4).

BTS Login from the GUI Environment

Follow the procedures in Table 3-14 to log into a BTS when using the GUI environment

3

Table 3-14: BTS GUI Login Procedure	
Step	**Action**

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

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

BTS Login from the CLI Environment

Follow the procedures in Table 3-15 to log into a BTS when using the GUI environment

Table 3-15: BTS CLI Login Procedure	
Step	**Action**
1	Double click the WinLMF CLI desktop icon (if the LMF CLI environment is not already running). **NOTE** If a BTS was logged into under a GUI session when the CLI environment was started, the CLI session will be logged into the same BTS, and step 2 is not required.
2	At the `/wlmf` prompt, enter the following command: **login bts-**<*bts#*> **host=**<*host*> **port=**<*port*> where: host = MGLI card IP address (defaults to address last logged into for this BTS or 128.0.0.2 if this is first login to this BTS). port = IP port of the TS (defaults to port last logged into for this BTS or 9216 if this is first login to this BTS)

Logging Out

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

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

Logging Out of a BTS from the GUI Environment

Follow the procedure in Table 3-16 to logout of a BTS when using the GUI environment.

Table 3-16: BTS GUI Logout Procedure	
Step	**Action**
1	Click on the **BTS** tab menu bar.
2	Click the **Logout** item in the pulldown menu (a **Confirm Logout** pop-up message will appear).
3	Click on **Yes** or press the **Enter** key to confirm logout. You are returned to the **Login** tab. **NOTE** If a logout was previously performed on the BTS from a CLI window running at the same time as the GUI, a **Logout Error** popup message will appear stating the system should not log out of the BTS. When this occurs, the GUI must be exited and restarted before it can be used for further operations.
4	If a **Logout Error** popup message appears stating that the system could not log out of the Base Station because the given BTS is not logged in, click **OK** and proceed to step 5.
5	Select **File > Exit** in the window menu bar, click **Yes** in the **Confirm Logout** popup, and click **OK** in the **Logout Error** popup which appears again.
6	If further work is to be done in the GUI, restart it.

3

Logging Out of a BTS from the CLI Environment

Follow the procedure in Table 3-16 to logout of a BTS when using the CLI environment.

Table 3-17: BTS CLI Logout Procedure

Step	Action

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

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

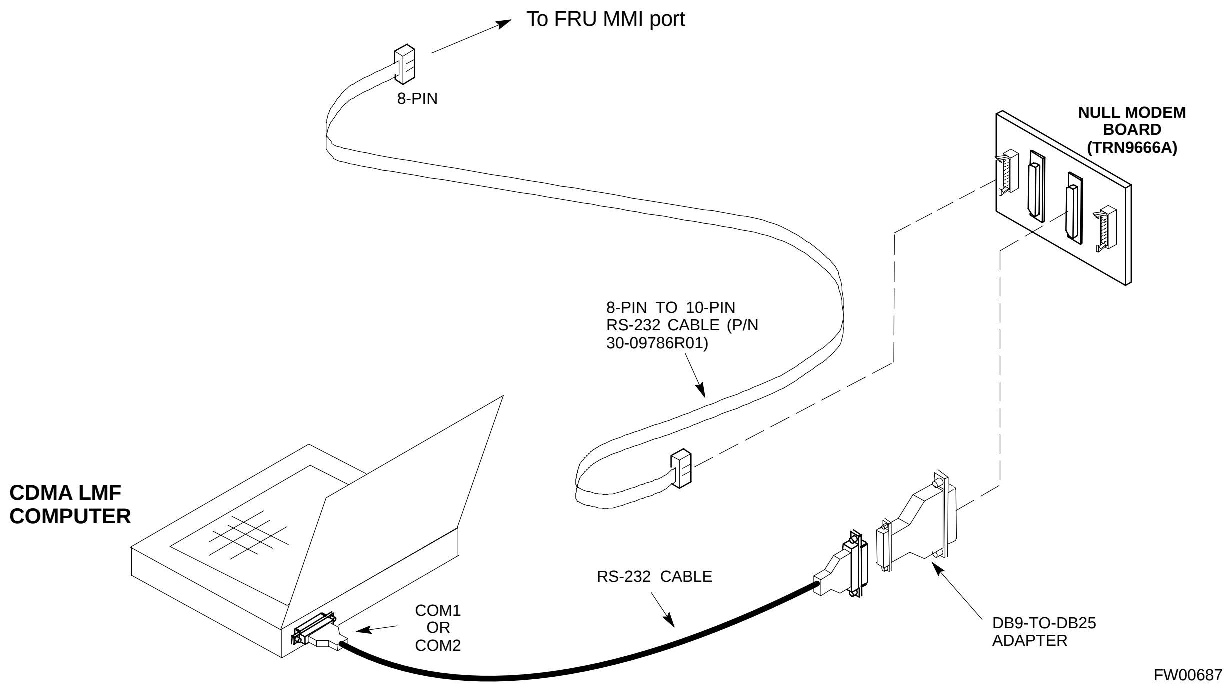
Establishing an MMI Communication Session

For those procedures that require MMI communications between the LMF and BTS FRUs, follow the procedure in Table 3-18 to initiate the communication session.

Table 3-18: Establishing MMI Communications

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

Figure 3-6: CDMA LMF Computer Common MMI Connections



BTS Download Overview

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

ROM Code

Downloading ROM code to BTS devices from the LMF is *NOT routine maintenance or a normal part of the optimization process.* It is only done in unusual situations where the resident ROM code release level in the device is not compatible with the required release level of the site operating software *and* the CBSC can not communicate with the BTS to perform the download. An example would be a BTS loaded with R16.0 software where a GLI which is factory-loaded with R9.2.x or earlier ROM code must be installed to replace a malfunctioning GLI.

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

NOTE	The ROM code file is not available for GLI3s are ROM code loaded at the factory.

ROM code can be downloaded to a device that is in any state. After the download is started, the device being downloaded will change to OOS_ROM (blue). The device will remain OOS_ROM (blue) when the download is completed. A *compatible revision-level* RAM code must then be downloaded to the device. Compatible code loads for ROM and RAM must be used for the device type to ensure proper performance. The compatible device code release levels for the BSS software release being used are listed in the Version Matrix section of the SC™ CDMA Release Notes (supplied on the tape or CD-ROM containing the BSS software).

Procedures to load ROM code are located in Appendix J.

RAM Code

Before RAM code can be downloaded from the LMF, the correct RAM code file for each device must exist on the LMF computer. RAM code can be automatically or manually selected depending on the **Device** menu item chosen and where the RAM code file for the device is stored in the LMF file structure. The RAM code file will be selected automatically if the file is in the ***<x>:\<lmf home directory>****\cdma\loads\n.n.n.n\code* folder (where *n.n.n.n* is the download code version number that matches the “NextLoad” parameter of the CDF file). The RAM code file in the code folder must have the correct hardware bin number for the device to be loaded.

RAM code can be downloaded to a device that is in any state. After the download is started, the device being loaded will change to OOS_ROM (blue). When the download is completed successfully, the device will change to OOS_RAM (yellow).

When code is downloaded to an MGLI or GLI, the LMF automatically also downloads data and then enables the MGLI. When enabled, the MGLI will change to INS_ACT (bright green). A redundant GLI will not be automatically enabled and will remain OOS_RAM (yellow). When the redundant GLI is manually commanded to enable through the LMF, it will change state to INS_SBY (olive green).

For non-GLI devices, data must be downloaded after RAM code is downloaded. To download data, the device state must be OOS_RAM (yellow).

The devices to be loaded with RAM code and data are:

- Master Group Line Interface (MGLI)
- Redundant GLI
- Clock Synchronization Module (CSM) (*Only if new revision code must be loaded*)
- Multi Channel CDMA (MCC24E, MCC8E, or MCC-1X) cards
- Broadband Transceiver (BBX2 or BBX-1X) cards
- RFDS Test Subscriber Interface Card (TSIC) or RFDS-1X RFDS PROCessor (RPROC) card, if RFDS is installed

NOTE	**IMPORTANT**: The MGLI *must* be successfully downloaded with RAM code and data, and in INS_ACT (bright green) status *before* downloading any other device. The RAM code download process for an MGLI automatically downloads data and then enables the MGLI.

Verify GLI ROM Code Loads

Devices should not be loaded with a RAM code version which is not compatible with the ROM code with which they are loaded. Before downloading RAM code and data to the processor cards, follow the procedure in Table 3-19 to verify the GLI devices are loaded with the correct ROM code for the software release used by the BSS.

Prerequisite

Identify the correct GLI ROM code load for the software release being used on the BSS by referring to the Version Matrix section of the SC™ CDMA Release Notes (supplied on the tape or CD-ROM containing the BSS software).

Table 3-19: Verify GLI ROM Code Loads

Step	Action
1	***If it has not already been done***, start a *GUI* LMF session and log into the BTS (refer to Table 3-14).
2	Select all GLI devices by clicking on them, and select **Device** > **Status** from the BTS menu bar.
3	In the status report window which opens, note the number in the **ROM Ver** column for each GLI3.
4	If the ROM code loaded in the GLIs is not the correct one for the software release being used on the BSS, log out of the BTS, disconnect the LMF computer, reconnect the span lines as described in Table 5-6, and have the CBSC download the correct ROM code version to the BTS devices.
5	When the GLIs have the correct ROM load for the software release being used, be sure the span lines are disabled as outlined in Table 3-2 and proceed to downloading RAM code and data.

Download RAM Code and Data to MGLI and GLI

Follow the steps outlined in Table 3-20 to download the RAM code and data to the MGLI and other installed GLI devices.

Prerequisites

- Prior to performing these procedures, ensure a code file exists for each of the devices to be loaded (refer to Table 3-3).
- The LMF computer is connected to the BTS (refer toTable 3-6), and is logged in using the *GUI* environment (refer to Table 3-14).

Table 3-20: Download and Enable MGLI and GLI Devices

Step	Action
1	Be sure the LMF will use the correct software release for code and data downloads by performing the following steps:
1a	- Click on **Util** in the BTS menu bar, and select **Tools** > **Update NextLoad** > **CDMA** from the pull-down menus.

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Table 3-20: Download and Enable MGLI and GLI Devices	
Step	**Action**
1b	- Click on the BTS to be loaded. -- The BTS will be highlighted.
1c	- Click the button next to the correct code version for the software release being used. -- A black dot will appear in the button circle.
1d	- Click **Save.**
1e	- Click **OK** to close each of the advisory boxes which appear.
2	Prepare to download code to the MGLI by clicking on the device.
3	Click **Device** in the BTS menu bar, and select **Download > Code/Data** in the pull-down menus. - A status report is displayed confirming change in the device(s) status.
4	Click **OK** to close the status window. - The MGLI will automatically be downloaded with data and enabled.
5	Once the MGLI is enabled, load and enable additional installed GLIs by clicking on the devices and repeating steps 3 and 4.
6	Click **OK** to close the status window for the additional GLI devices.

Download RAM Code and Data to Non-GLI Devices

Downloads to non-GLI devices can be performed individually for each device or all installed devices can be downloaded with one action. RAM code and data are downloaded to non-GLI devices in separate steps.

NOTE CSM devices are RAM code-loaded at the factory. RAM code is downloaded to CSMs *only if a newer software version needs to be loaded*.

NOTE When downloading to multiple devices, the download may fail for some of the devices (a time-out occurs). These devices can be loaded individually after completing the multiple download.

Follow the steps in Table 3-21 to download RAM code and data to non-GLI devices.

Table 3-21: Download RAM Code and Data to Non-GLI Devices	
Step	**Action**
1	Select the target CSM, MCC, and/or BBX device(s) by clicking on them.
2	Click **Device** in the BTS menu bar, and select **Download > Code/Data** in the pull-down menus. - A status report is displayed that shows the results of the download for each selected device.
3	Click **OK** to close the status report window when downloading is completed. **NOTE** After a BBX, CSM, or MCC device is successfully loaded with RAM code and has changed to the OOS_RAM state (yellow), the status LED should be rapidly flashing GREEN.

. . . continued on next page

Table 3-21: Download RAM Code and Data to Non-GLI Devices	
Step	**Action**
4	To download data, select the target CSM, MCC and/or BBX device(s).
5	Click **Device** in the BTS menu bar, and select select **Download > Data** in the pull-down menus. - A status report is displayed showing the results of the download for each selected device.
6	Click **OK** to close the status report window when downloading is completed.

System Tests

Select CSM Clock Source

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

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

Prerequisites

MGLI=INS_ACT, CSM= OOS_RAM or INS_ACT

Table 3-22: Select CSM Clock Source

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

Enable CSMs

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

The BTS may be equipped with a LORAN-C LFR, HSO, or external 10 MHz Rubidium source which the CSM can use as a secondary timing reference. The HSOX is used for expansion frames. In all cases, the CSM monitors and determines what reference to use at a given time.

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

Follow the steps outlined in Table 3-23 to enable the CSMs installed in the C-CCP shelves.

Table 3-23: Enable CSMs

Step	Action
1	Click on the target CSM. From the **Device** pull down, select **Enable**. **NOTE** If equipped with two CSMs, enable CSM-2 first A status report is displayed confirming change in the device(s) status. Click **OK** to close the status report window. **NOTE** FAIL may be shown in the status table for enable action. If Waiting For Phase Lock is shown in the Description field, the CSM changes to the Enabled state after phase lock is achieved. CSM 1 houses the GPS receiver. The enable sequence can take up to ***one hour*** (see below). *** IMPORTANT** The GPS satellite system satellites are not in a geosynchronous orbit and are maintained and operated by the United States Department of Defense (D.O.D.). The D.O.D. periodically alters satellite orbits; therefore, satellite trajectories are subject to change. A GPS receiver that is INS contains an “almanac” that is updated periodically to take these changes into account. If a GPS receiver has not been updated for a number of weeks, it may take up to an hour for the GPS receiver “almanac” to be updated. Once updated, the GPS receiver must track at least four satellites and obtain (hold) a 3-D position fix for a minimum of 45 seconds before the CSM will come in service. (In some cases, the GPS receiver needs to track only one satellite, depending on accuracy mode set during the data load).
2	**NOTE** If equipped with two CSMs, CSM-1 should be bright green (INS-ACT) and CSM-2 should be dark green (INS-STY) If more than an hour has passed, refer to CSM Verification, see Figure 3-7 and Table 3-26 to determine the cause.
	NOTE After the CSMs have been successfully enabled, observe the PWR/ALM LEDs are steady green (alternating green/red indicates the card is in an alarm state).

Enable MCCs

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

Follow the steps outlined in Table 3-24 to enable the MCCs installed in the C-CCP shelves.

NOTE	The MGLI and CSM must be downloaded and enabled, before downloading and enabling the MCC.

Table 3-24: Enable MCCs

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

Clock Synchronization Manager System Time

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

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

Each CSM2 board features an ovenized, crystal oscillator that provides 19.6608 MHz clock, even second pulse, and 3 MHz referenced to the selected synchronization source (see Table 3-26):

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

Fault management has the capability of switching between the GPS synchronization source and the LFR/HSO backup source in the event of a GPS receiver failure on CSM 1. During normal operation, the CSM 1 board selects GPS as the primary source (see Table 3-26). The source selection can also be overridden via the LMF or by the system software.

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

LFR/HSO

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

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

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

Upgrades and Expansions: LFR2/HSO2/HSOX

LFR2/HSO2 (second generation cards) both export a timing signal to the expansion frames. The associated expansion frames require an HSO-expansion (HSOX) whether the starter frame has an LFR2 or an HSO2. The HSOX accepts input from the starter frame and interfaces with the CSM cards in the expansion frame. LFR and LFR2 use the same source code in source selection (see Table 3-26). HSO, HSO2, and HSOX use the same source code in source selection (see Table 3-26).

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

CSM Frequency Verification

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

Test Equipment Setup (GPS & LFR/HSO Verification)

Follow the steps outlined in Table 3-25 to set up test equipment.

Table 3-25: Test Equipment Setup (GPS & LFR/HSO Verification)

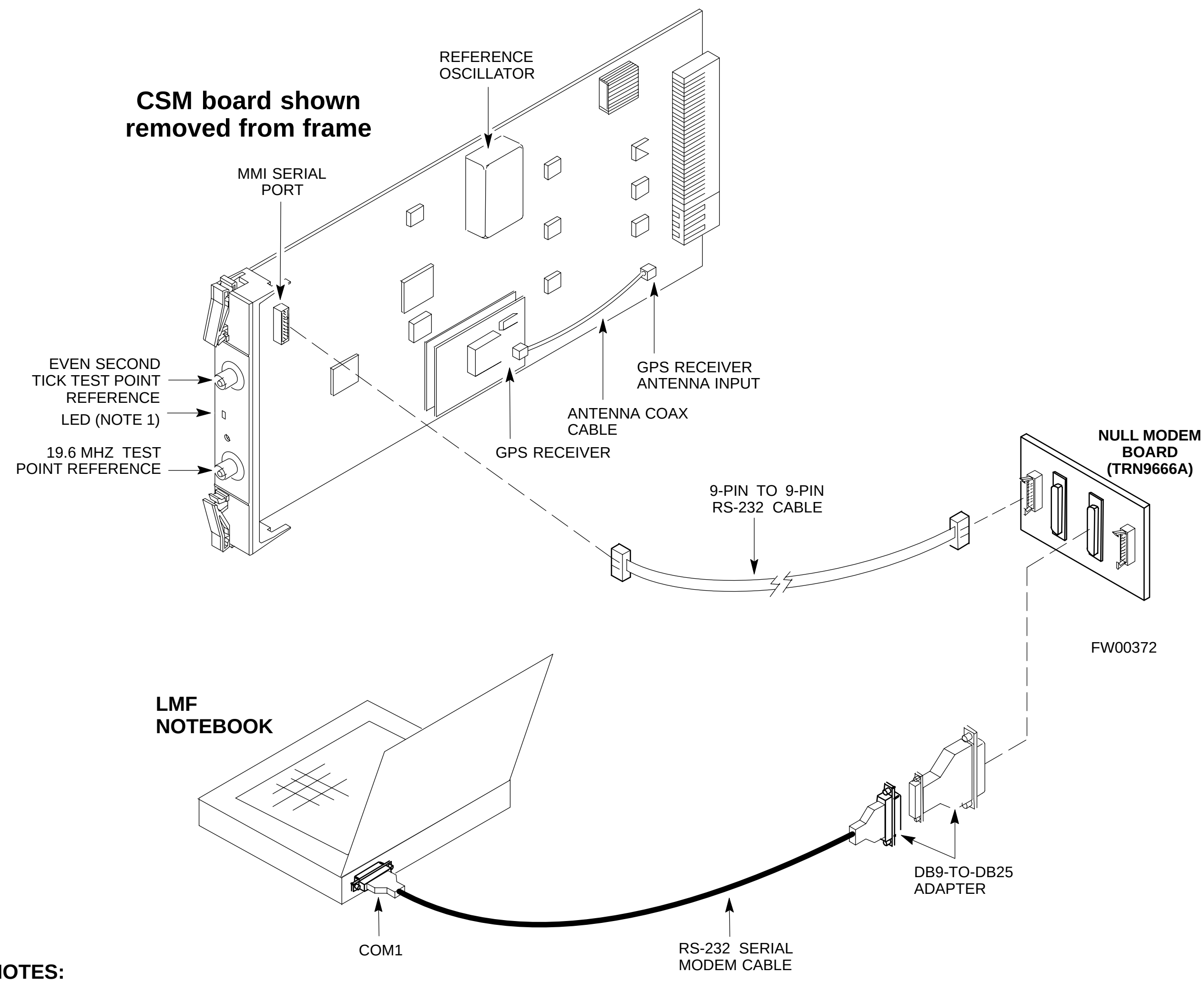
Step	Action
1a	For **local GPS** (RF-GPS): Verify a CSM board with a GPS receiver is installed in primary CSM slot 1 and that CSM-1 is INS. **NOTE** This is verified by checking the board ejectors for kit number **SGLN1145** on the board in slot 1.
1b	For **Remote GPS** (RGPS):Verify a CSM2 board is installed in primary slot 1 and that CSM-1 is INS. **NOTE** This is verified by checking the board ejectors for kit number **SGLN4132ED** or later.
2	Remove CSM-2 (if installed) and connect a serial cable from the LMF COM 1 port (via null modem board) to the MMI port on CSM-1 (see Figure 3-7).

Table 3-25: Test Equipment Setup (GPS & LFR/HSO Verification)	
Step	**Action**
3	Reinstall CSM-2.
4	Start an MMI communication session with CSM-1 by using the Windows desktop shortcut icon (see Table 3-5) **NOTE** The LMF program must be running when a Hyperterminal session is started.
5	When the terminal screen appears press the **Enter** key until the **CSM>** prompt appears.

3

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

Figure 3-7: CSM MMI Terminal Connection



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

GPS Initialization/Verification

Follow the steps outlined in Table 3-26 to connect to CSM-1 installed in the C-CCP shelf, verifying that it is functioning normally.

Table 3-26: GPS Initialization/Verification

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>

To verify that `Clock alarms (0000)`, `Dpll is locked and has a reference source`, and `GPS self test passed` messages are displayed within the report, issue the following MMI command

bstatus

- Observe the following typical response:

```
CSM Status INS:ACTIVE Slot A Clock MASTER.


Clock Alarms (0000):

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

   Time since reset 0:33:11, time since power on: 0:33:11
```

</td></tr>
<tr><td>2</td><td>

Enter the following command at the `CSM>` prompt to display the current status of the Loran and the GPS receivers.

sources

- Observe the following typical response for systems equipped with LFR:

```
N   Source Name Type      TO  Good Status   Last Phase Target Phase  Valid
---------------------------------------------------------------------------
0   LocalGPS    Primary   4   YES  Good         0           0        Yes
1   LFR CHA     Secondary 4   YES  Good     -2013177    -2013177     Yes
2   Not Used
Current reference source number: 0
```

- Observe the following typical response for systems equipped with HSO:

```
Num  Source Name  Type      TO  Good   Status  Last Phase  Target Phase Valid
------------------------------------------------------------------------------
 0   Local GPS    Primary   4   Yes    Good        3            0       Yes
 1   HSO          Backup    4   No     N/A     timed-out*   Timed-out*  No
```

***NOTE** "Timed-out" should only be displayed while the HSO is warming up. "Not-Present" or "Faulty" should not be displayed. If the HSO does not appear as one of the sources, then configure the HSO as a back-up source by entering the following command at the CSM> prompt:

ss 1 12

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

The HSO should be valid within one (1) minute, assuming the DPLL is locked and the HSO rubidium oscillator is fully warmed.

```
Num  Source Name  Type      TO  Good   Status  Last Phase  Target Phase Valid
------------------------------------------------------------------------------
 0   Local GPS    Primary   4   Yes    Good        3            0       Yes
 1   HSO          Backup    4   Yes    N/A     xxxxxxxxxx   xxxxxxxxxx  Yes
```

</td></tr>
</table>

. . . continued on next page

Table 3-26: GPS Initialization/Verification

Step	Action
3	HSO information (underlined text above, verified from left to right) is usually the #1 reference source. If this is not the case, have the *OMCR* determine the correct BTS timing source has been identified in the database by entering the **display bts csmgen** command and correct as required using the **edit csm csmgen refsrc** command.
	*** IMPORTANT** If any of the above mentioned areas fail, verify: - If LED is RED, verify that HSO had been powered up for at least 5 minutes. After oscillator temperature is stable, LED should go GREEN ***Wait for this to occur before continuing !*** - If "timed out" is displayed in the Last Phase column, suspect the HSO output buffer or oscillator is defective - Verify the HSO is FULLY SEATED and LOCKED to prevent any possible board warpage
4	Verify the following GPS information (underlined text above): - GPS information is usually the 0 reference source. - At least one Primary source must indicate "Status = good" and "Valid = yes" to bring the site up.

. . . continued on next page

Table 3-26: GPS Initialization/Verification

Step	Action

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

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

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Table 3-26: GPS Initialization/Verification

Step	Action
7	**If steps 1 through 6 pass, the GPS is good.**
	*** IMPORTANT** If any of the above mentioned areas fail, verify that: - If *Initial position accuracy* is "estimated" (typical), at least 4 satellites must be tracked and visible (1 satellite must be tracked and visible if actual lat, log, and height data for this site has been entered into CDF file). - If *Initial position accuracy* is "surveyed," position data currently in the CDF file is assumed to be accurate. GPS will not automatically survey and update its position. - The GPS antenna is not obstructed or misaligned. - GPS antenna connector center conductor measures approximately +5 Vdc with respect to the shield. - There is no more than 4.5 dB of loss between the GPS antenna OSX connector and the BTS frame GPS input. - Any lightning protection installed between GPS antenna and BTS frame is installed correctly.

8	Enter the following commands at the `CSM>` prompt to verify that the CSM is warmed up and that GPS acquisition has taken place.
	debug dpllp
	Observe the following typical response if the CSM is not warmed up (15 minutes from application of power) ***(If warmed-up proceed to step 9)***
	`CSM>DPLL Task Wait. 884 seconds left.`
	`DPLL Task Wait. 882 seconds left.`
	`DPLL Task Wait. 880 seconds left.   ...........etc.`

	NOTE The **warm** command can be issued at the MMI port used to force the CSM into warm-up, but the reference oscillator will be unstable.

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

10	Verify the following GPS information (underlined text above, from left to right): - Lower limit offset from tracked source variable is not less than -60 (equates to 3 µs limit). - Upper limit offset from tracked source variable is not more than +60 (equates to 3 µs limit). - TK SRC: 0 is selected, where SRC 0 = GPS.
11	Enter the following commands at the `CSM>` prompt to exit the debug mode display. **debug dpllp**

LORAN-C Initialization/Verification

Table 3-27: LORAN-C Initialization/Verification

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

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Table 3-27: LORAN-C Initialization/Verification

Step	Action	Note
2	Verify the following LFR information (highlighted above in **boldface** type): - Locate the “dot” that indicates the current phase locked station assignment (assigned by MM). - Verify that the station call letters are as specified in site documentation as well as M X Y Z assignment. - Verify the S/N ratio of the phase locked station is greater than 8.	

3	At the CSM> prompt, enter **sources <cr>** to display the current status of the the LORAN receiver.
	- Observe the following typical response.
	`Num Source Name Type TO Good Status Last Phase Target Phase Valid`
	`---------------------------------------------------------------------------`
	`0 Local GPS Primary 4 Yes Good -3 0 Yes`
	`1 LFR ch A Secondary 4 Yes Good -2013177 -2013177 Yes`
	`2 Not used`
	`Current reference source number: 1`	

4	LORAN LFR information (highlighted above in **boldface** type) is usually the #1 reference source (verified from left to right). *** IMPORTANT** If any of the above mentioned areas fail, verify: - The LFR antenna is not obstructed or misaligned. - The antenna pre-amplifier power and calibration twisted pair connections are intact and < 91.4 m (300 ft) in length. - A dependable connection to suitable Earth Ground is in place. - The search list and PLL station for cellsite location are correctly configured . **NOTE** LFR functionality should be verified using the “source” command (as shown in Step 3). Use the underlined responses on the LFR row to validate correct LFR operation.	
5	Close the hyperterminal window.	

Calibration and Test Equipment

Connecting Test Equipment to the BTS

The following test equipment is required to perform calibration and ATP tests:

- LMF
- Communications system analyzer model supported by the LMF
- Power meter model supported by the LMF (required when using the HP 8921A/600 and Advantest R3465 analyzers)
- Non-radiating transmit line termination load
- Directional coupler and in-line attenuator
- RF cables and adapters

Refer to Table 3-28 and Table 3-29 for an overview of connections for test equipment currently supported by the LMF. In addition, see the following figures:

- Figure 3-8 and Figure 3-9 show cable calibration test setup.
- Figure 3-10, Figure 3-11 and Figure 3-13 show the test set connections for TX calibration.
- Figure 3-13 and Figure 3-14 show test set connections for IS-95 A/B optimization/ATP tests
- Figure 3-15 through Figure 3-18 shows test set connections for IS-95 A/B/C optimization/ATP tests.
- Figure 3-19 and Figure 3-20 show typical TX and RX ATP setup with a directional coupler (shown with and without RFDS).

Test Equipment GPIB Address Settings

All test equipment is controlled by the LMF through an IEEE-488/GPIB bus. To communicate on the bus, each piece of test equipment must have a GPIB address set which the LMF will recognize. The standard address settings used by the LMF for the various types of test equipment items are as follows:

- Signal generator address: **1**
- Power meter address: **13**
- Communications system analyzer: **18**

Using the procedures included in the Setting GPIB Addresses section of Appendix D-1, verify and, if necessary, change the GPIB address of each piece of test equipment used to match the above

Supported Test Sets

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

IS-95 A/B Testing

Optimization and ATP testing for IS-95A/B sites or carriers may be performed using one of the following test equipment:

- CyberTest
- Advantest R3267 spectrum analyzer with R3562 signal generator and HP-437B or Gigatronics Power Meter
- Agilent E4406A transmitter test set with E4432B signal generator
- Agilent 8935 series E6380A communications test set (formerly HP 8935)
- Hewlett-Packard HP 8921 (with CDMA interface for 1.9 GHz PCS Interface) and HP-437B or Gigatronics Power Meter
- Spectrum Analyzer (HP8594E) - *optional*
- Rubidium Standard Timebase - *optional*

CDMA2000 1X Operation

Optimization and ATP testing for CDMA2000 1X sites or carriers may be performed using the following test equipment:

- Advantest R3267 spectrum analyzer with R3562 signal generator
- Agilent E4406A transmitter test set with E4432B signal generator
- Agilent 8935 series E6380A communications test set (formerly HP 8935) with option 200 or R2K and with E4432B signal generator for 1X FER

NOTE	E4432B signal generator for 1X FER needs to have the options UN8,1E5, and 201.

Test Equipment Preparation

See Appendix F for specific steps to prepare each type of test set and power meter to perform calibration and ATP .

Test Equipment Connection Charts

To use the following charts to identify necessary test equipment connections, locate the communications system analyzer being used in the **COMMUNICATIONS SYSTEM ANALYZER** columns, and read down the column. Where a dot appears in the column, connect one end of the test cable to that connector. Follow the horizontal line to locate the end connection(s), reading up the column to identify the appropriate equipment and/or BTS connector.

IS-95A/B-only Test Equipment Connections

Table 3-28 depicts the interconnection requirements for currently available test equipment *supporting IS-95A/B only* which meets Motorola standards and is supported by the LMF.

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Table 3-28: IS-95A/B-only Test Equipment Interconnection

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

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

Table 3-29 depicts the interconnection requirements for currently available test equipment supporting *both* CDMA 2000 1X *and* IS-95A/B which meets Motorola standards and is supported by the LMF.

Table 3-29: CDMA2000 1X/IS-95A/B Test Equipment Interconnection

	COMMUNICATIONS SYSTEM ANALYZER			ADDITIONAL TEST EQUIPMENT						
SIGNAL	Agilent 8935 (Option 200 or R2K)	Advantest R3267	Agilent E4406A	Agilent E4432 Signal Gen.	Advantest R3562 Signal Generator	Power Meter	GPIB Interface	LMF	Attenuator & Directional Coupler	BTS
EVEN SECOND SYNCHRONIZATION	EVEN SECOND SYNC IN	EXT TRIG	TRIGGER IN	PATTERN TRIG IN	EXT TRIG IN					SYNC MONITOR
	●			●						●
		●			●					●
			●	●						●
19.6608 MHZ CLOCK	EXT REF IN		EXT REF IN		MOD TIME BASE IN					FREQ MONITOR
	●									●
			●							●
					●					●
CONTROL IEEE 488 BUS	HP-IB	GP-IB	GPIB	GPIB	GP-IB	HP-IB	GPIB	SERIAL PORT		
	●			●			●	●		
		●			●	●	●	●		
			●	●		●	●	●		
10 MHZ	10 MHZ REF OUT	10 MHZ OUT	10 MHZ OUT (SWITCHED)	10 MHZ IN	SYNTHE REF IN					
	●			●						
		●			●					
			●	●						
SIGNAL SOURCE CONTROLLED SERIAL I/O		SERIAL I/O			SERIAL I/O					
		●			●					
TX TEST CABLES	RF IN/OUT	INPUT 50 Ω	RF INPUT 50 Ω						20 DB ATTEN. / BTS PORT	TX1-6
	●								● - - ●	●
		●							● - - ●	●
			●						● - - ●	●
RX TEST CABLES	DUPLEX OUT *			RF OUTPUT 50 Ω	RF OUT 50 Ω					RX1-6
	●									●
				●						●
					●					●

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

Equipment Warm-up

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

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

Automatic Cable Calibration Set-up

Figure 3-8 and Figure 3-9 show the cable calibration setup for the test sets supported by the LMF. The left side of the diagram depicts the location of the input and output connectors of each test equipment item, and the right side details the connections for each test. Table 3-33 provides a procedure for performing automatic cable calibration.

Manual Cable Calibration

If manual cable calibration is required, refer to the procedures in Appendix Figure 3-8.

Figure 3-8: Cable Calibration Test Setup - CyberTest, Agilent 8935, Advantest R3465, and HP 8921A

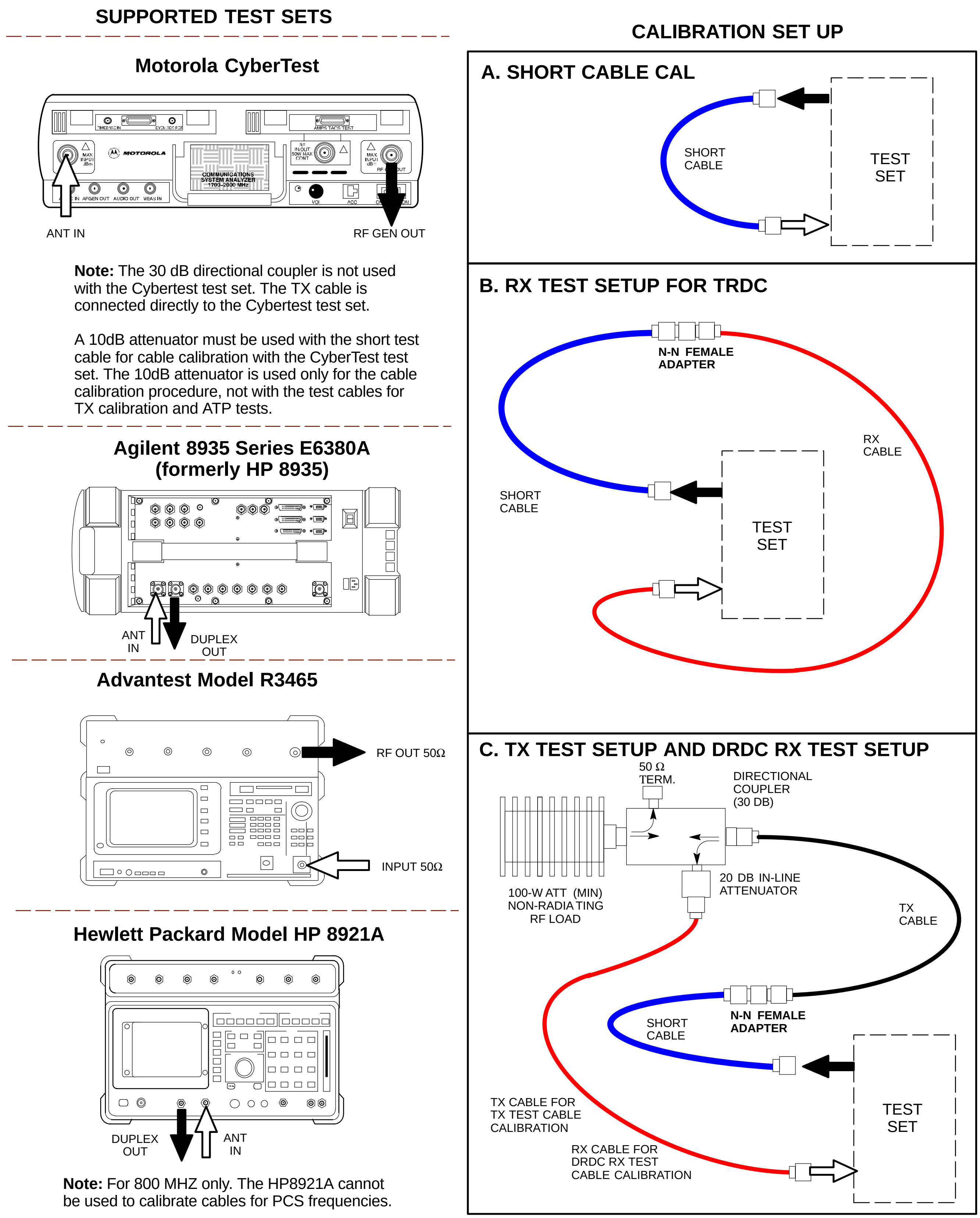
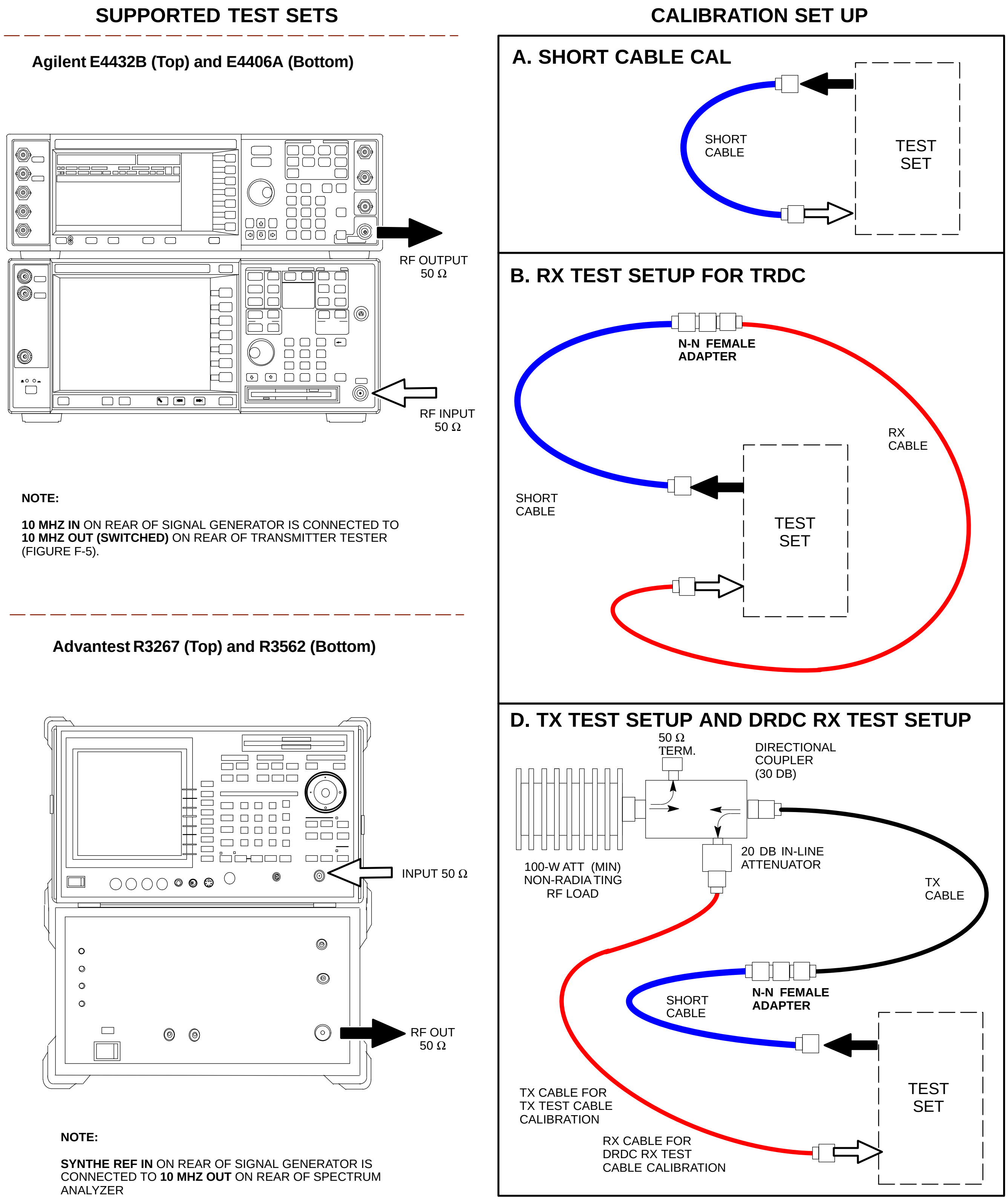


Figure 3-9: Cable Calibration Test Setup - Agilent E4406A/E4432B and Advantest R3267/R3562



Set-up for TX Calibration

Figure 3-10 and Figure 3-11 show the test set connections for TX calibration.

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Figure 3-10: TX Calibration Test Setup - CyberTest (IS-95A/B) and Agilent 8935 (IS-95A/B and CDMA2000 1X)

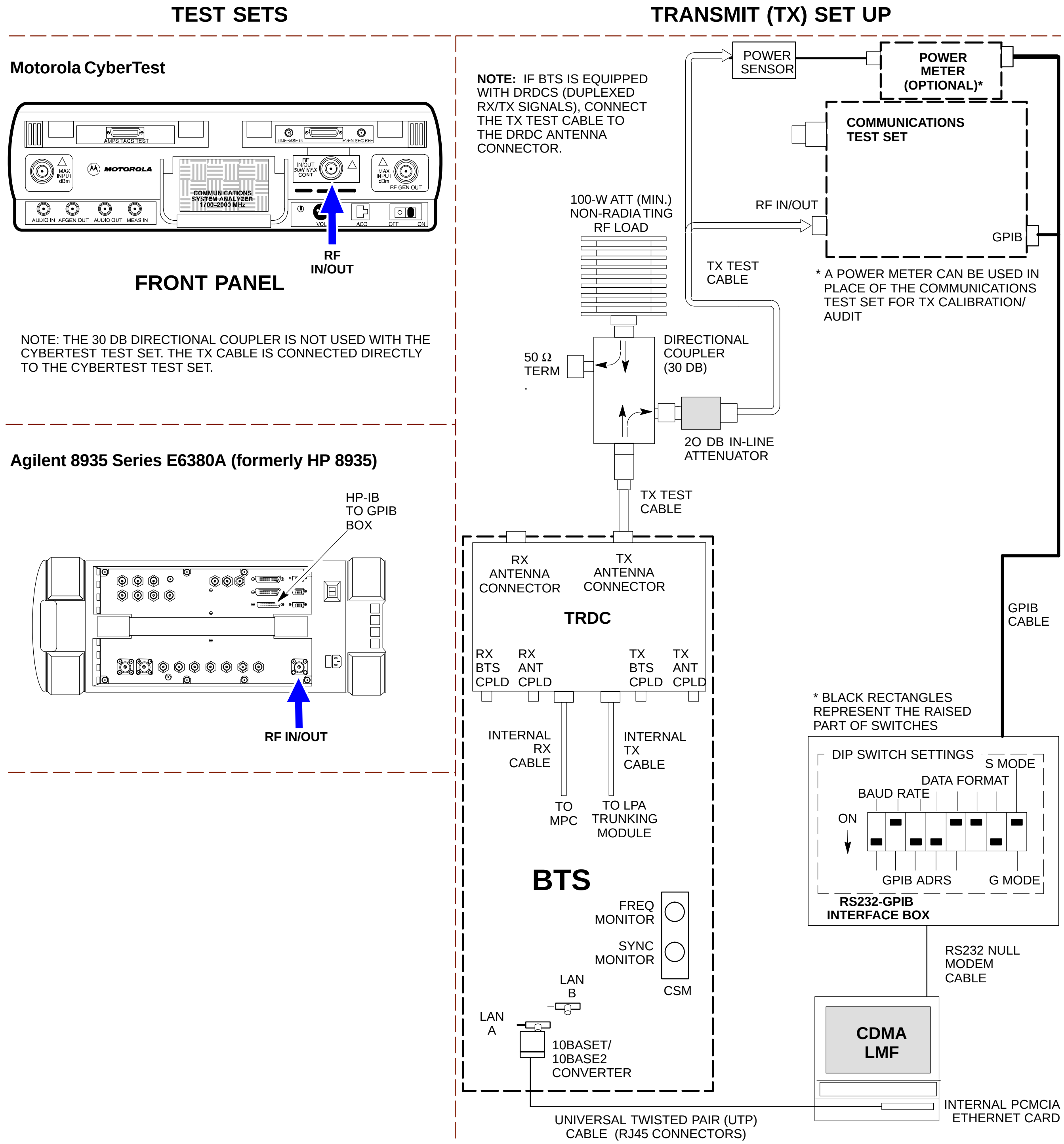


Figure 3-11: TX Calibration Test Setup - Using Power Meter

TEST SETS

NOTE: THE HP8921A AND ADVANTEST R3465 ***CANNOT*** BE USED FOR TX CALIBRATION. A POWER METER MUST BE USED.

TRANSMIT (TX) SET UP

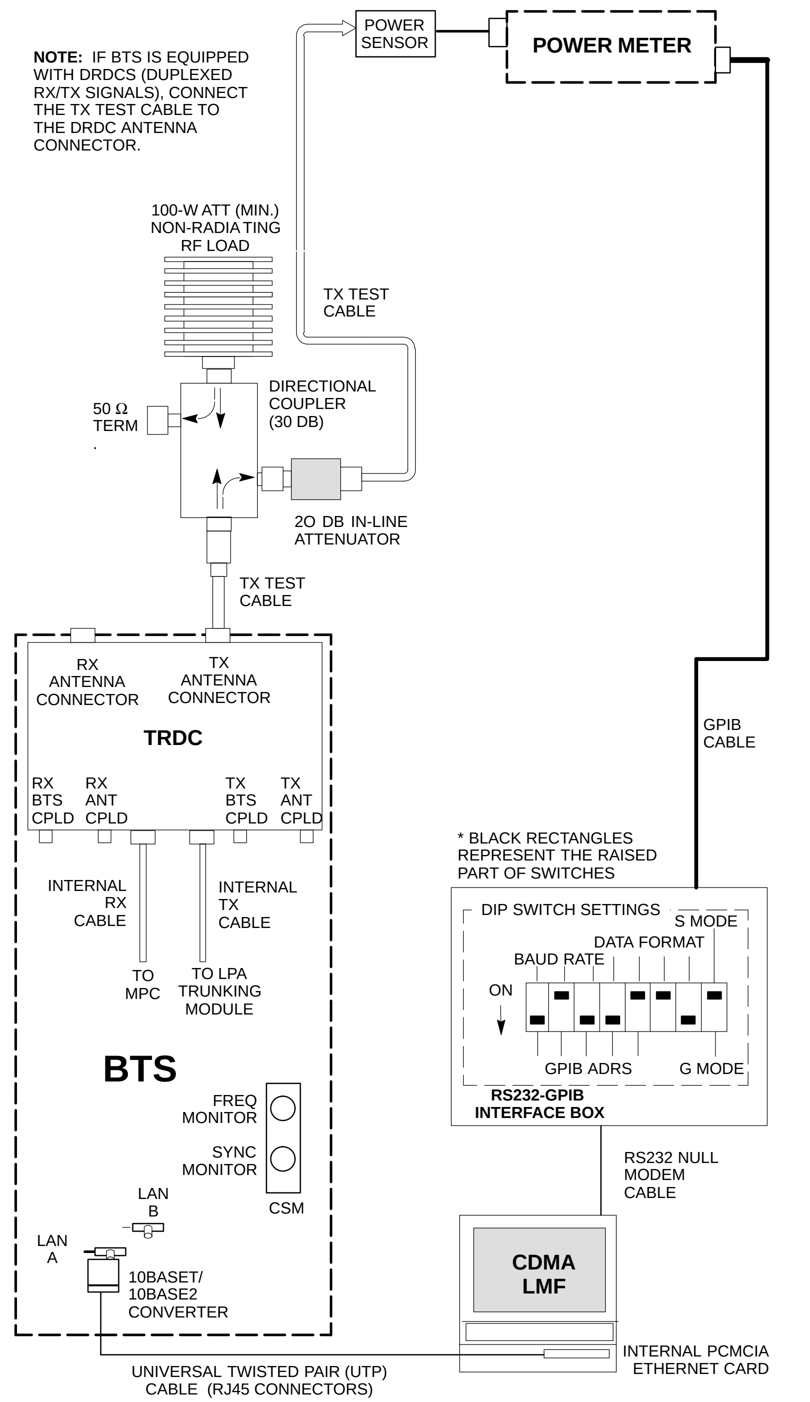
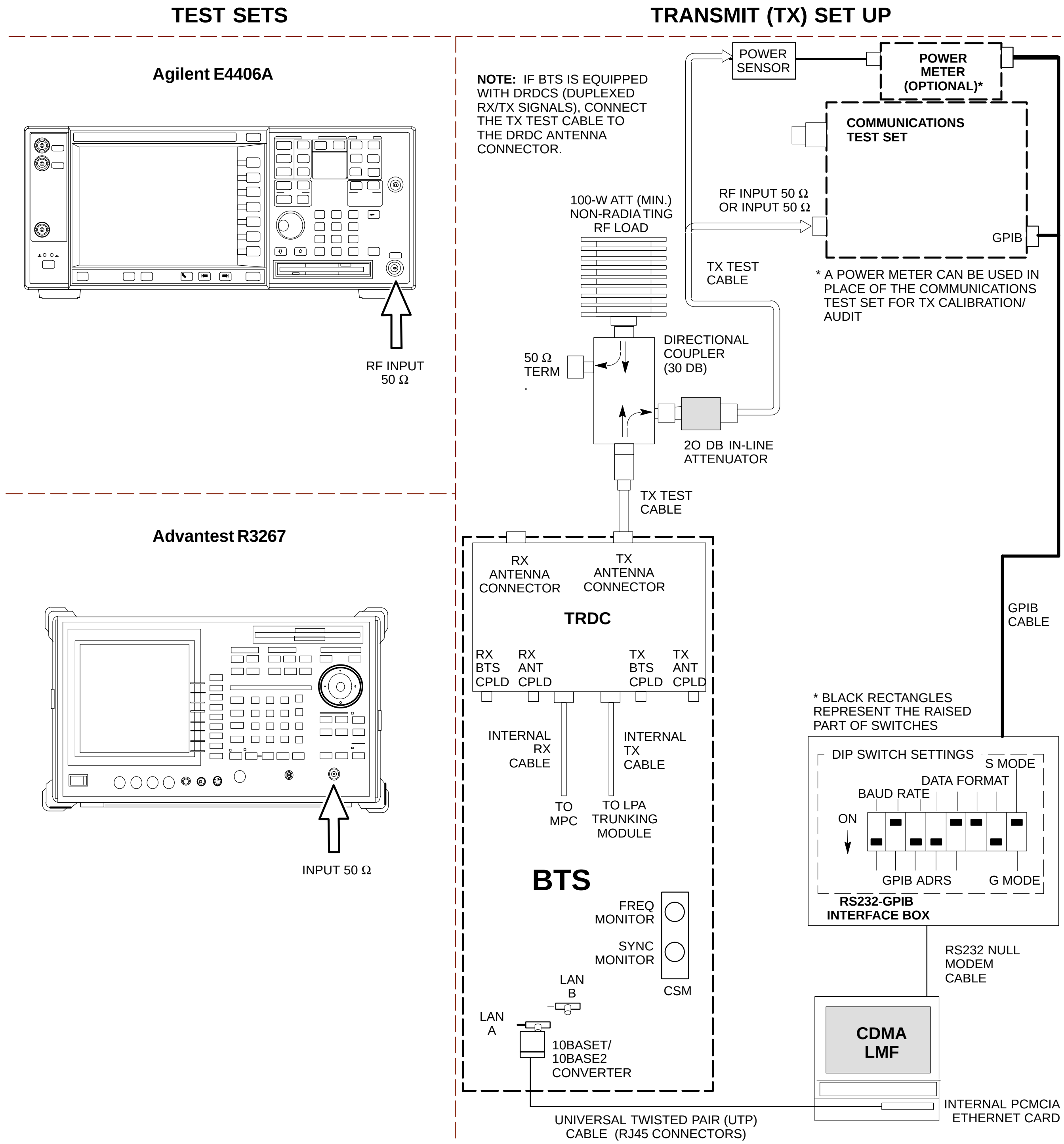


Figure 3-12: TX Calibration Test Setup - Agilent E4406A and Advantest R3567 (IS-95A/B and CDMA2000 1X)



Set-up for Optimization/ATP

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

Figure 3-13: IS-95A/B Optimization/ATP Test Set-up, TRDC Shown - CyberTest and Advantest R3465

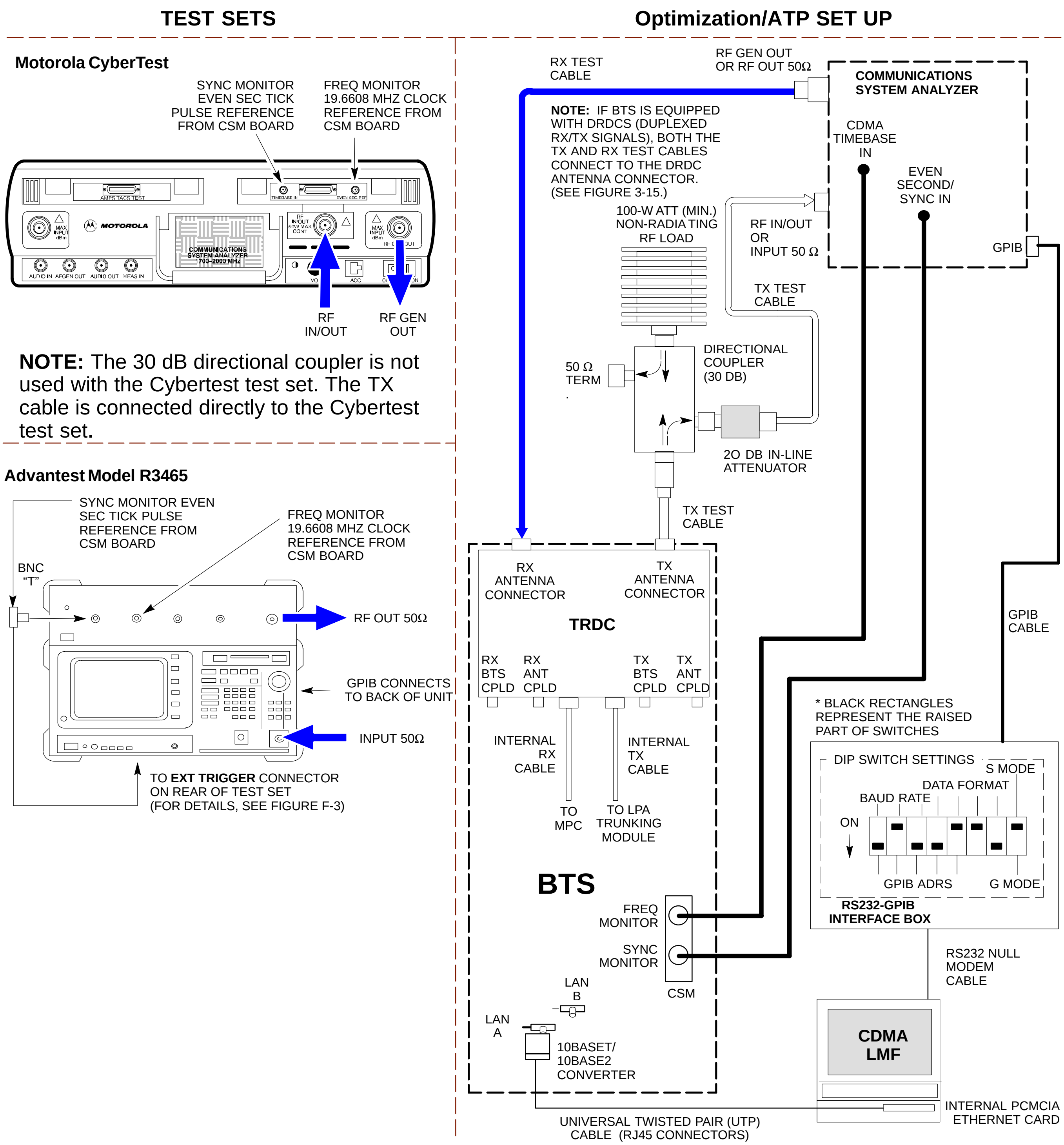


Figure 3-14: IS-95A/B Optimization/ATP Test Setup - HP 8921A

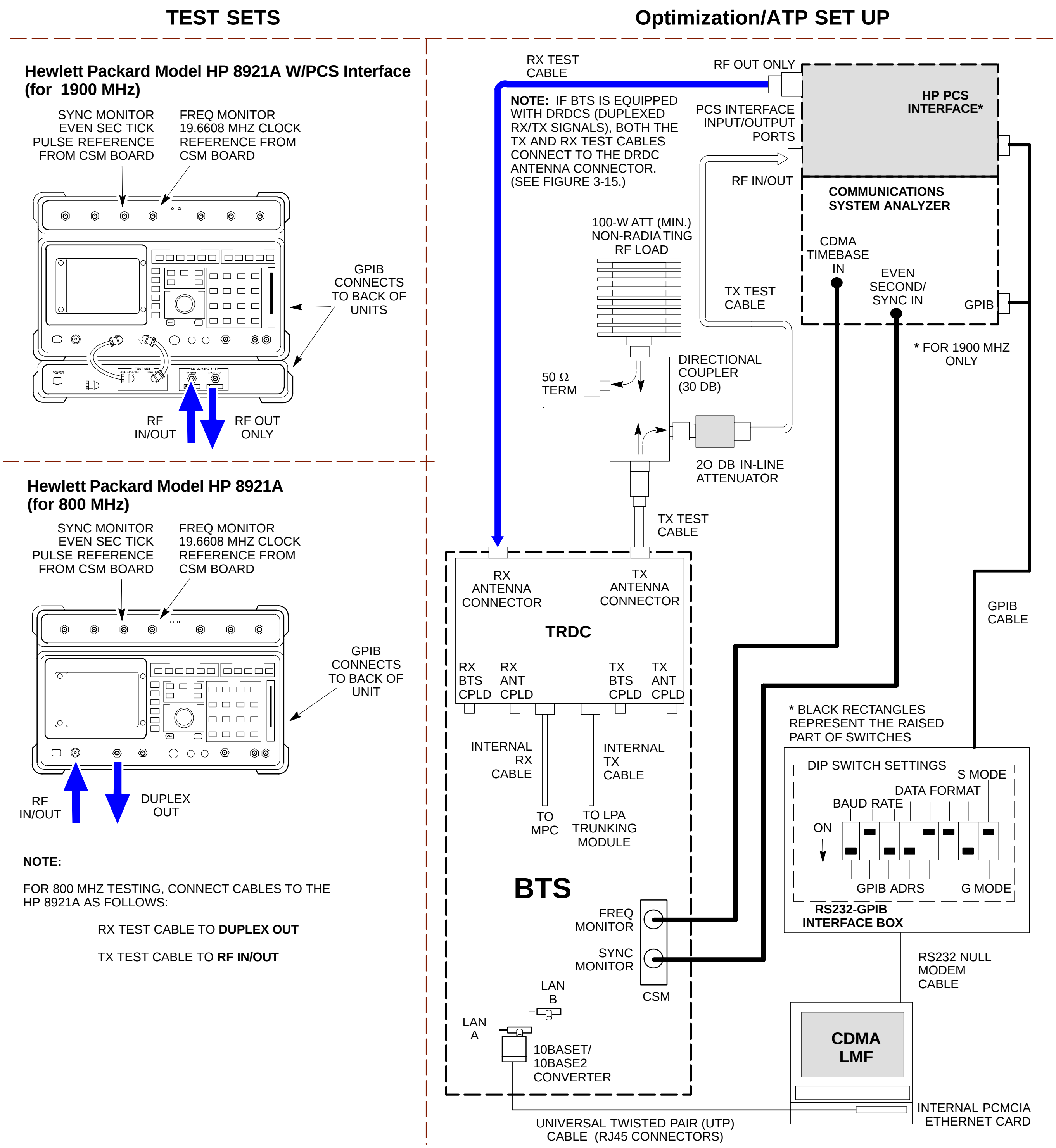


Figure 3-15: IS-95A/B and CDMA2000 1X Optimization/ATP Test Setup With DRDCs - Agilent Test Equipment

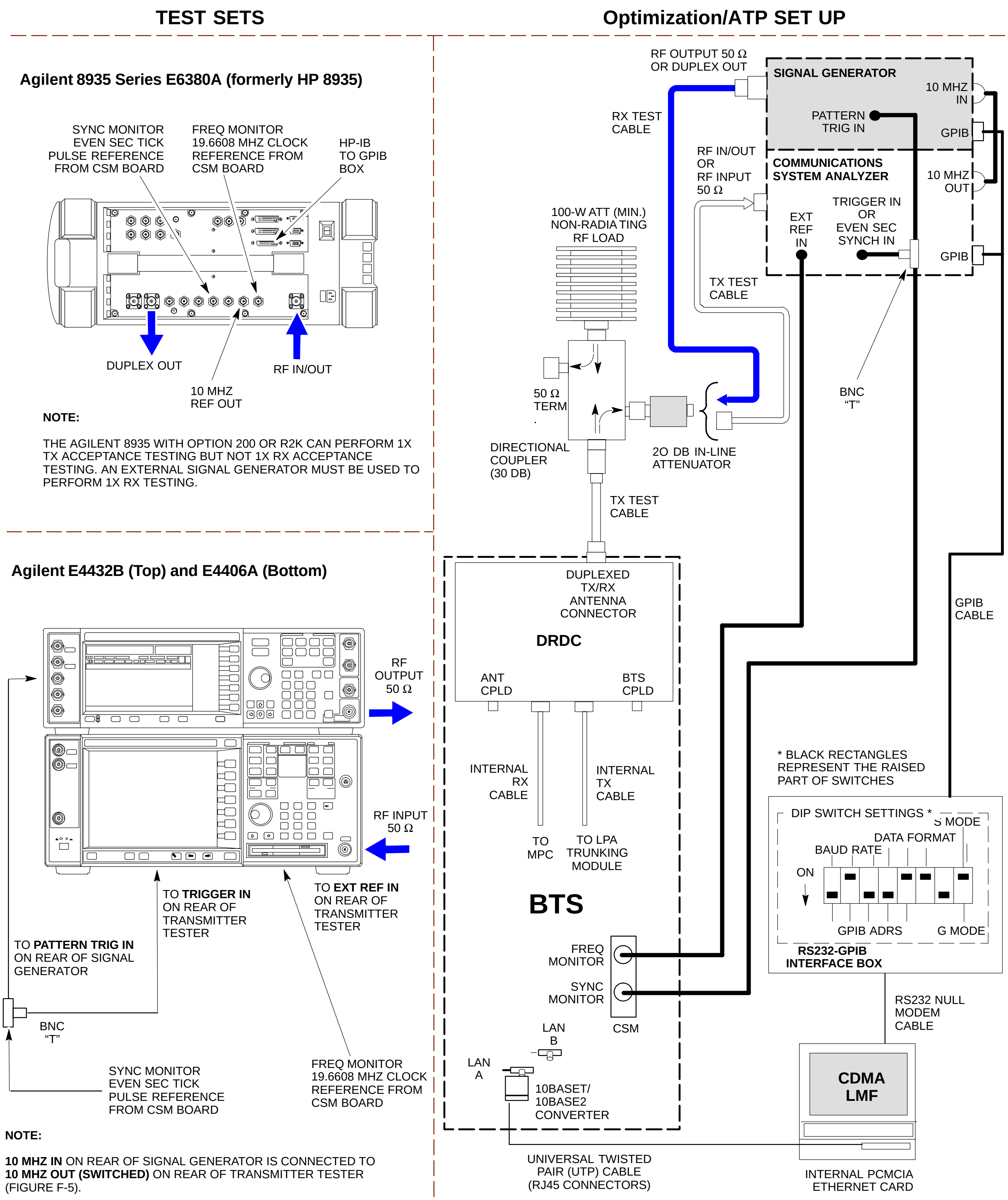


Figure 3-16: IS-95A/B and CDMA2000 1X Optimization/ATP Test Setup With DRDCs - Advantest R3267/3562 Test Equipment

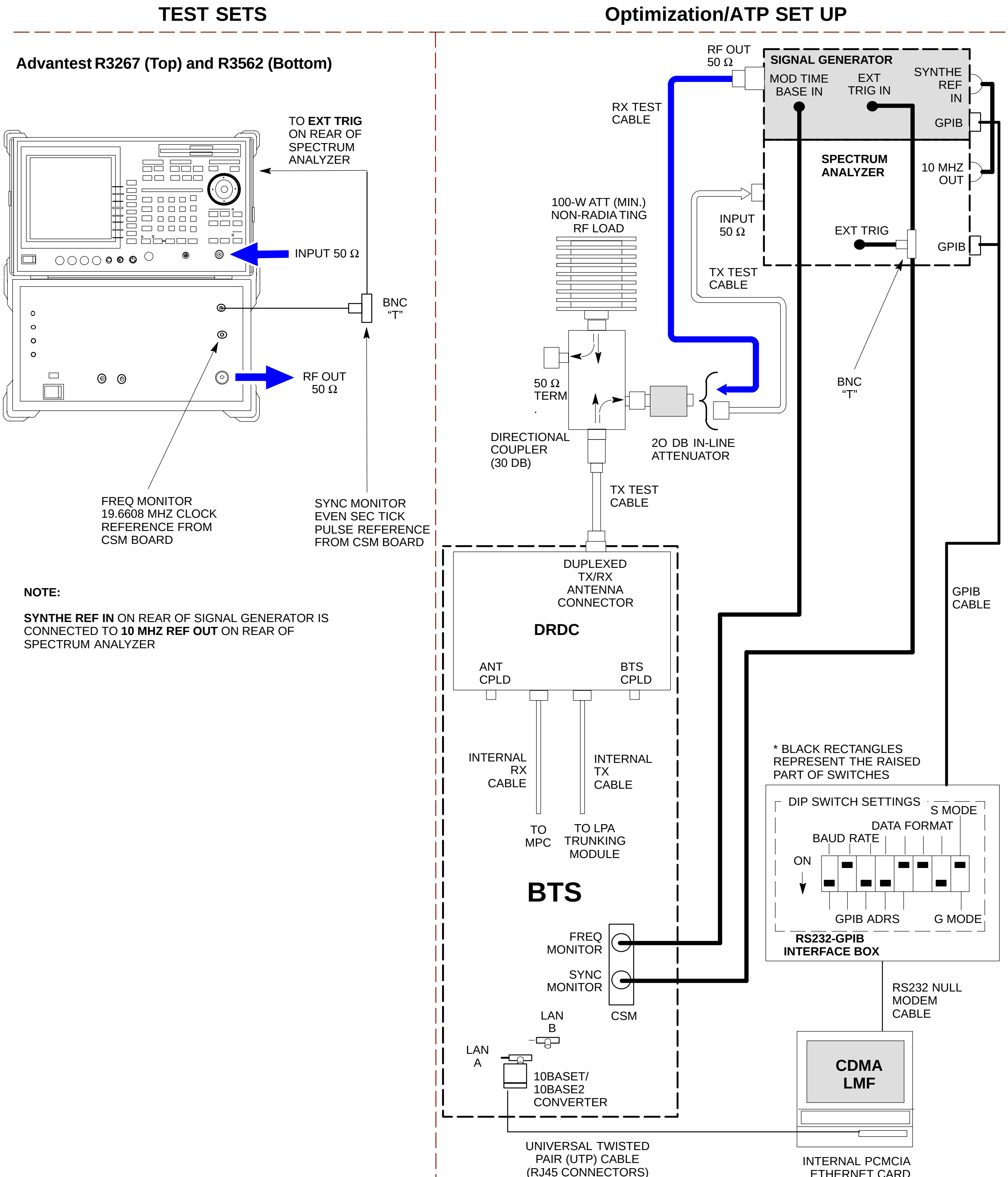


Figure 3-17: IS-95A/B and CDMA2000 1X Optimization/ATP Test Setup With TRDCs - Agilent Test Equipment

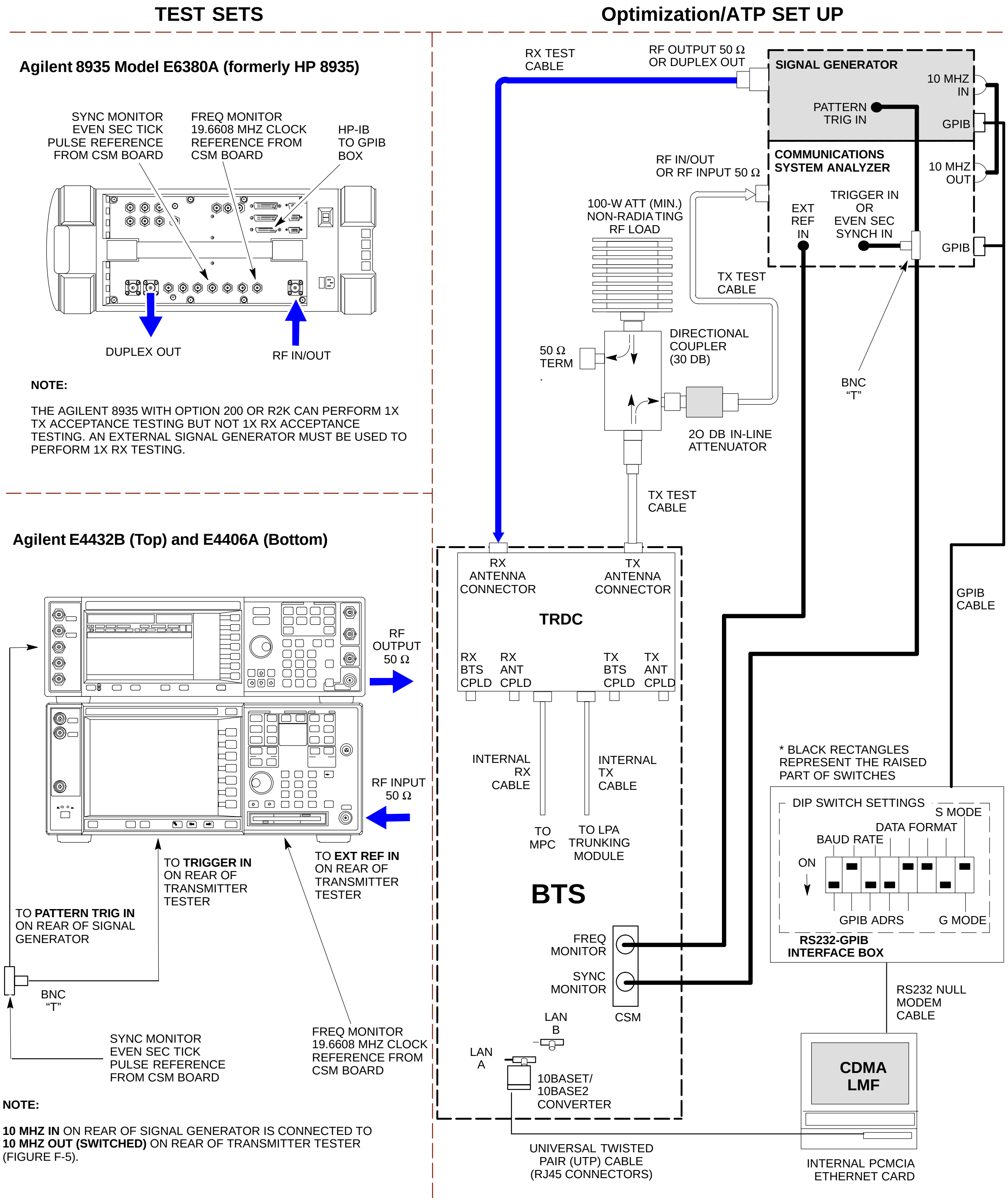
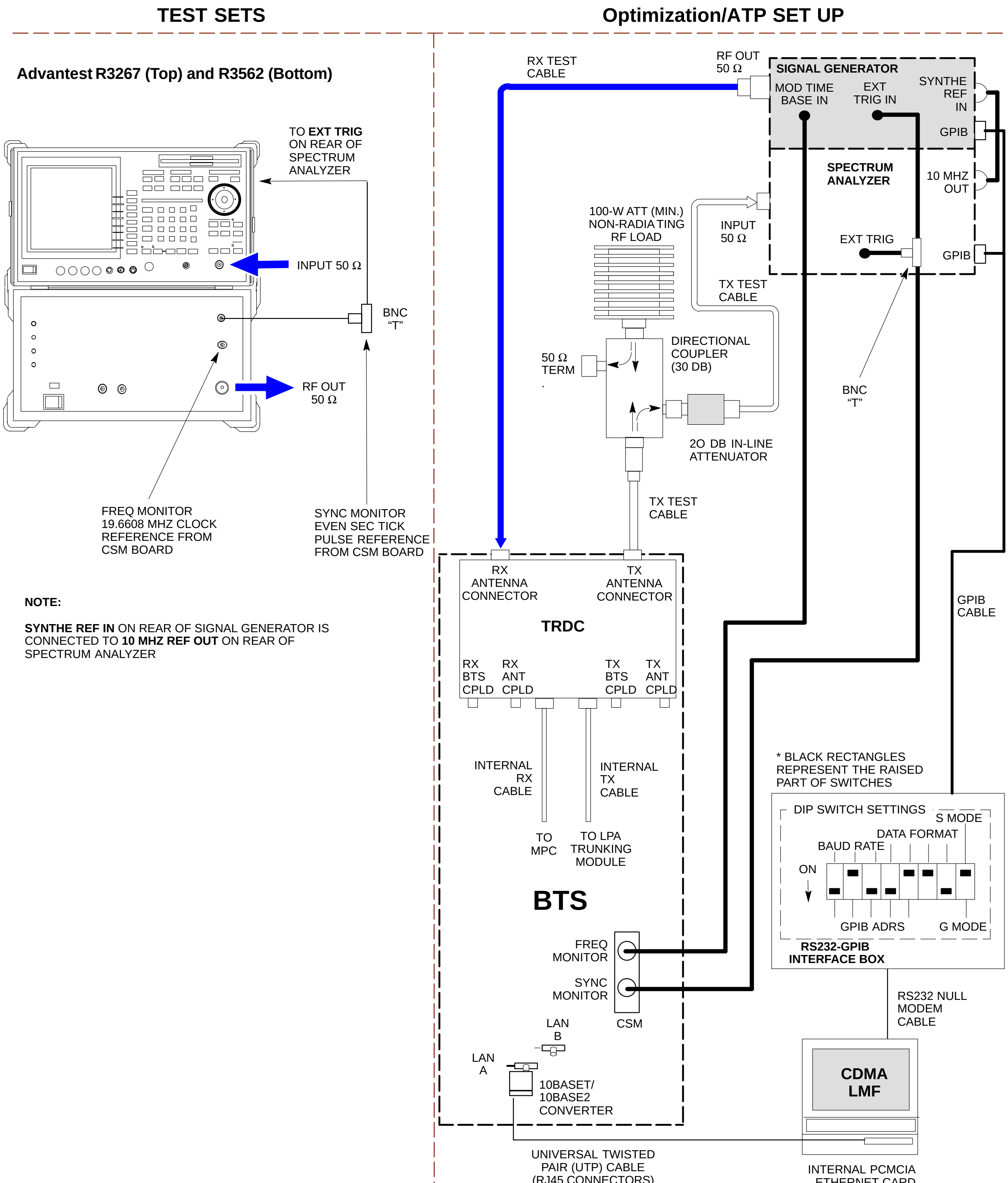


Figure 3-18: IS-95A/B and CDMA2000 1X Optimization/ATP Test Setup With TRDCs - Advantest R3267/3562 Test Equipment



TX ATP Setup

Figure 3-19 shows a typical TX ATP setup.

Figure 3-19: Typical TX ATP Setup with Directional Coupler (shown with and without RFDS)

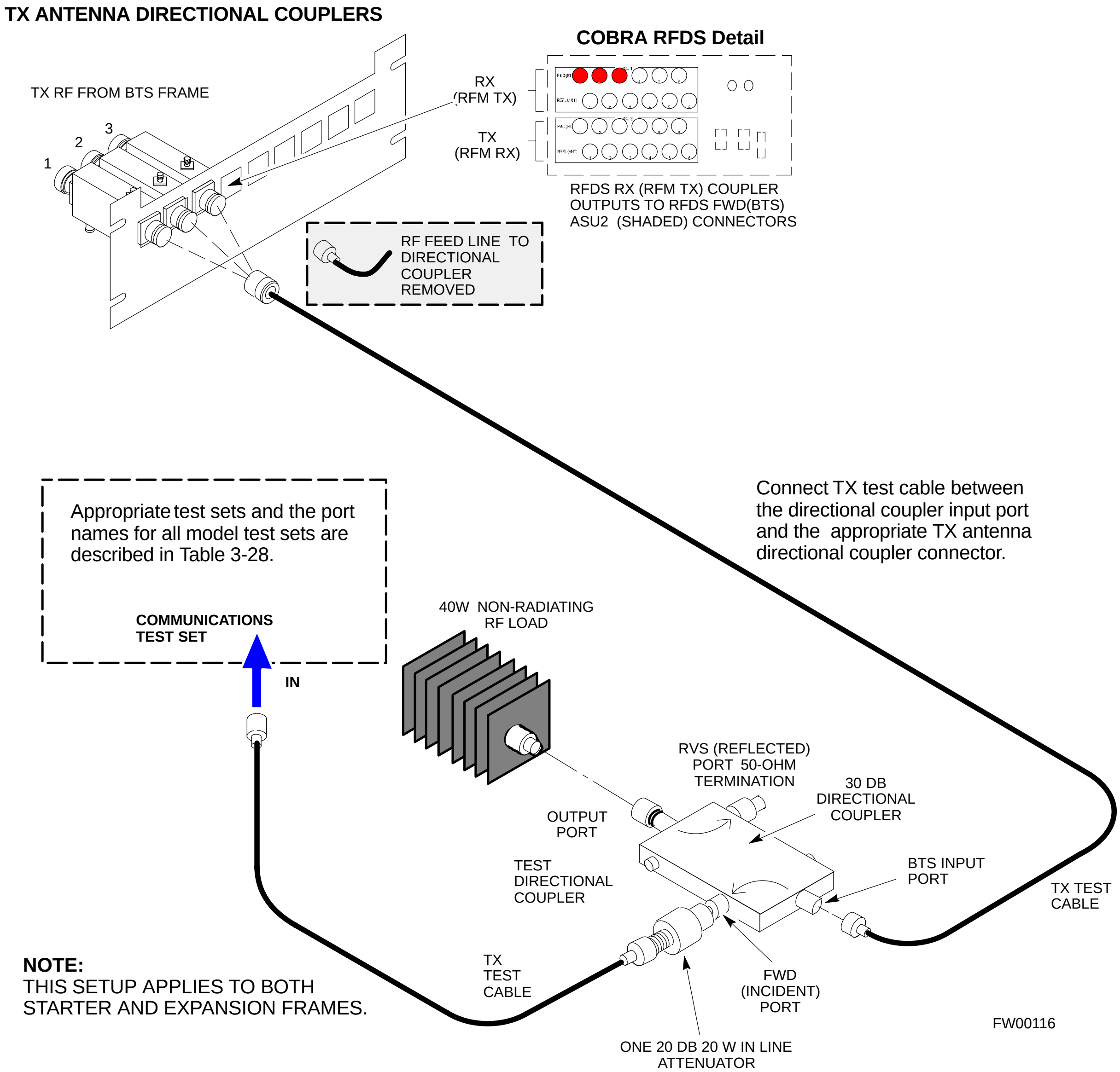


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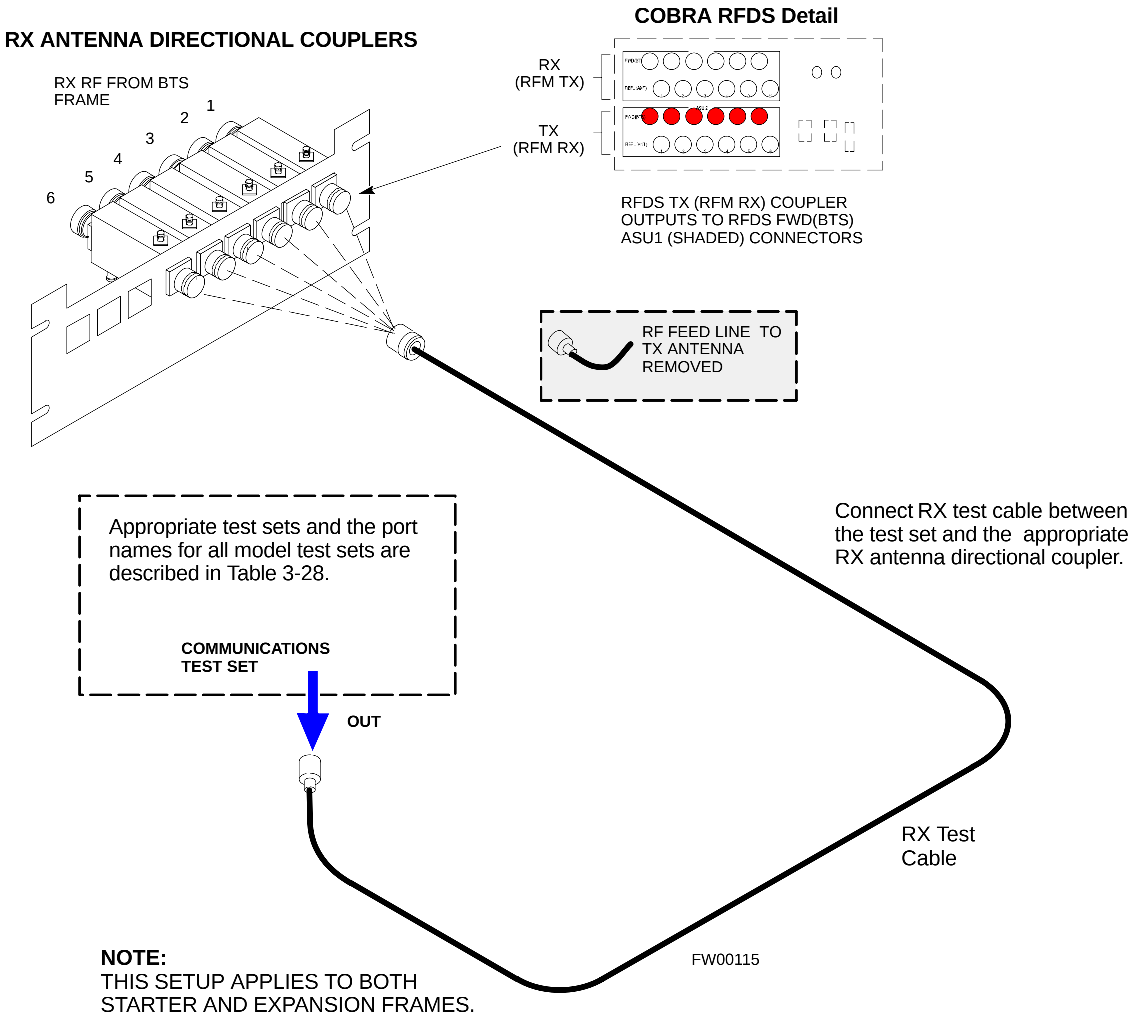
Figure 3-20: Typical RX ATP Setup with Directional Coupler (shown with or without RFDS)



Loss/Gain Offset

Background

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

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

3

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

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

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

Purpose

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

GPIB Addresses

GPIB addresses can range from 1 through 30. The LMF will accept any address in that range, but the numbers entered in the LMF Options window GPIB address box must match the addresses of the test equipment. Motorola recommends using 1 for a CDMA signal generator, 13 for a power meter, and 18 for a communications system analyzer. To verify and, if necessary, change the GPIB addresses of the test equipment, refer to the Setting GPIB Addresses section of Appendix F.

Selecting Test Equipment

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

Prerequisites

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

Ensure the following has been completed before selecting test equipment:

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

Manually Selecting Test Equipment in a Serial Connection Tab

Test equipment can be manually specified before, or after, the test equipment is connected. CDMA LMF does not check to see if the test equipment is actually detected for manual specification.

Table 3-30: Selecting Test Equipment Manually in a Serial Connection Tab

Step	Action
1	From the **Tools** menu, select **Options**. The **LMF Options** window appears.
2	Click on the **Serial Connection** tab (if not in the forefront).
3	Select the correct serial port in the **COMM Port** pick list (normally **COM1**).
4	Click on the **Manual Specification** button (if not enabled).
5	Click on the check box corresponding to the test item(s) to be used.
6	Type the GPIB address in the corresponding GPIB address box (refer to the Setting GPIB Addresses section of Appendix F for directions on verifying and/or changing test equipment GPIB addresses). Motorola-recommended addresses are: 1 = signal generator 13 = power meter 18 = communications system analyzer *** IMPORTANT** When test equipment items are manually selected by the operator, the LMF defaults to using a power meter for RF power measurements. The LMF will use a communications system analyzer for RF power measurements only if a power meter is not selected (power meter checkbox not checked).
7	Click on **Apply**. (The button will darken until the selection has been committed.)
8	Click on **Dismiss** to close the test equipment window.

Automatically Selecting Test Equipment in a Serial Connection Tab

When using the auto-detection feature to select test equipment, the CDMA LMF examines which test equipment items are actually communicating with CDMA LMF. Follow the procedure in Table 3-31 to use the auto-detect feature.

Table 3-31: Selecting Test Equipment Using Auto-Detect

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

Calibrating Test Equipment

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

Calibrate Test Equipment from the **Util** menu list is used to calibrate test equipment item *before* being used for testing. The test equipment must be selected before beginning calibration. Follow the procedure in Table 3-32 to calibrate the test equipment.

Table 3-32: Test Equipment Calibration

Step	Action
1	From the **Util** menu, select **Calibrate Test Equipment**. A **Directions** window is displayed. Follow the instructions provided.
2	Follow the direction provided.

Table 3-32: Test Equipment Calibration	
Step	**Action**
3	Click on **Continue** to close the **Directions** window. A status window is displayed.
4	Click on **OK** to close the status report window.

Calibrating Cables

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

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

Calibrating Cables with a CDMA Analyzer

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

NOTE	LMF cable calibration cannot be accomplished with an HP8921A analyzer for 1.9 MHz. A different analyzer type or the signal generator and spectrum analyzer method must be used (refer to Table 3-34 and Table 3-35). Cable calibration values must be manually entered if the signal generator and spectrum analyzer method is used. For the HP8921A, refer to Appendix F.

The test equipment must be selected before this procedure can be started. Follow the procedure in Table 3-33 to calibrate the cables.

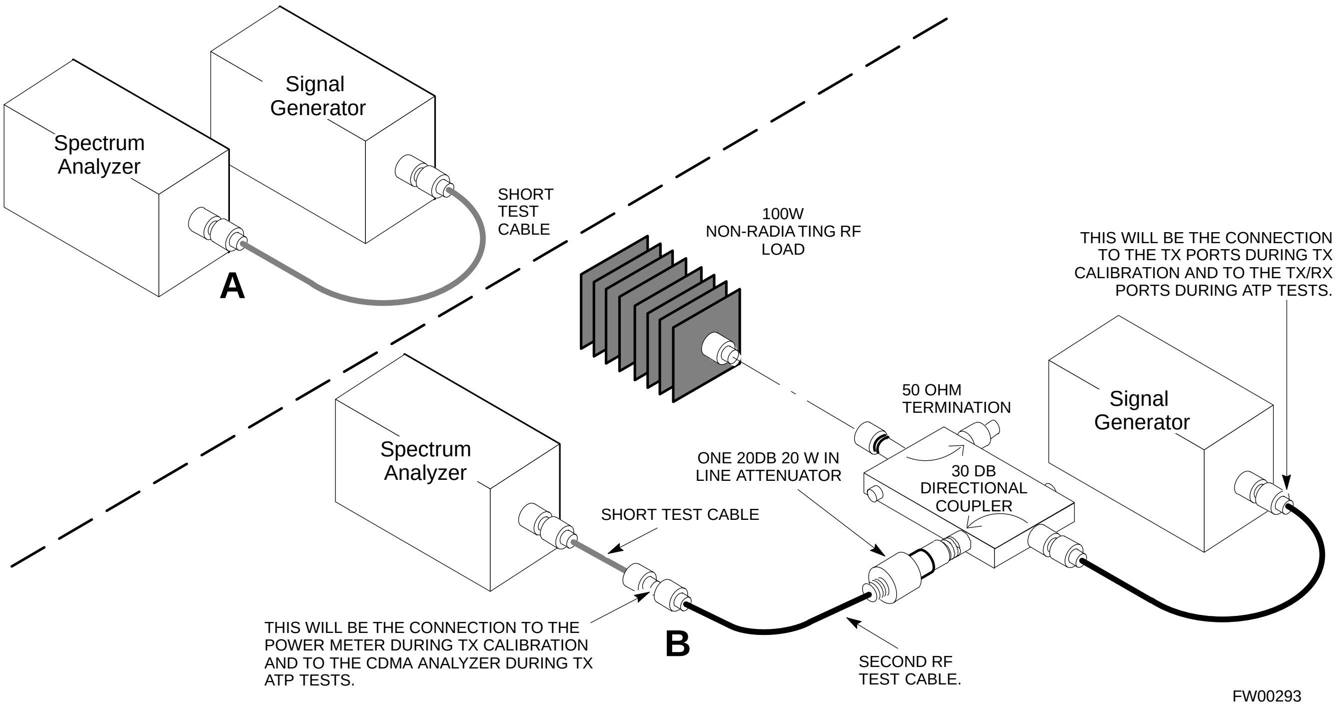
Table 3-33: Cable Calibration	
Step	**Action**
1	From the **Util** menu, select **Cable Calibration**. A **Cable Calibration** window is displayed.
2	Enter a channel number(s) in the **Channels** box. Multiple channels numbers must be separated with a comma, no space (i.e., 200,800). When two or more channels numbers are entered, the cables will be calibrated for each channel. Interpolation will be accomplished for other channels as required for TX calibration.
3	Select **TX and RX CABLE CAL**, **TX CABLE CAL** or **RX CABLE CAL** in the **Cable Calibration** picklist.
4	Click **OK**. Follow the directions displayed for each step. A status report window will be displayed with the results of the cable calibration.

Calibrating TX Cables Using a Signal Generator and Spectrum Analyzer

Follow the procedure in Table 3-34 to calibrate the TX cables using the signal generator and spectrum analyzer. Refer to Figure 3-21 for a diagram of the signal generator and spectrum analyzer.

Table 3-34: Calibrating TX Cables Using Signal Generator and Spectrum Analyzer	
Step	**Action**
1	Connect a short test cable between the spectrum analyzer and the signal generator.
2	Set signal generator to 0 dBm at the customer frequency of 869-894 MHz for 800 MHz CDMA and 1930-1990 MHz band for North American PCS.
3	Use spectrum analyzer to measure signal generator output (see Figure 3-21, “A”) and record the value.
4	Connect the spectrum analyzer’s short cable to point “B”, as shown in the lower portion of the diagram, to measure cable output at customer frequency (869-894 MHz for 800 MHz CDMA and 1930-1990 MHz for North American PCS) and record the value at point “B”.
5	Calibration factor = A - B Example: Cal = -1 dBm - (-53.5 dBm) = 52.5 dB **NOTE** The short cable is used for *calibration only.* It is *not* part of the final test setup. After calibration is completed, *do not* re-arrange any cables. Use the equipment setup, as is, to ensure test procedures use the correct calibration factor.

Figure 3-21: Calibrating Test Equipment Setup for TX Cable Calibration (Using Signal Generator and Spectrum Analyzer)



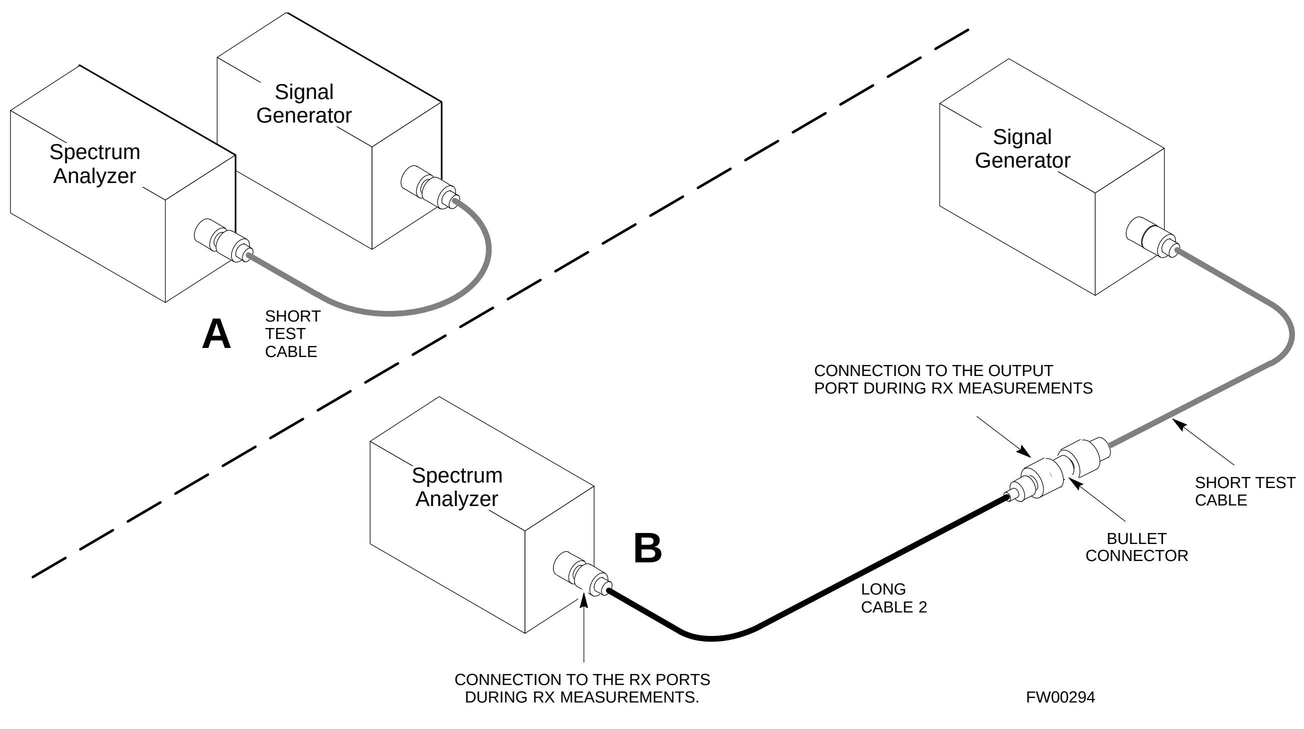
Calibrating RX Cables Using a Signal Generator and Spectrum Analyzer

Follow the procedure in Table 3-35 to calibrate the RX cables using the signal generator and spectrum analyzer. Refer to Figure 3-22, if required.

Table 3-35: Calibrating RX Cables Using a Signal Generator and Spectrum Analyzer

Step	Action
1	Connect a short test cable to the spectrum analyzer and connect the other end to the Signal Generator.
2	Set signal generator to -10 dBm at the customer's RX frequency of 824-840 MHz for 800 MHz CDMA and 1850-1910 MHz band for North American PCS.
3	Use spectrum analyzer to measure signal generator output (see Figure 3-22, "A") and record the value for "A".
4	Connect the test setup, as shown in the lower portion of the diagram, to measure the output at the customer's RX frequency in the 1850-1910 MHz band. Record the value at point ''B".
5	Calibration factor = A - B Example: Cal = -12 dBm - (-14 dBm) = 2 dB **NOTE** The short test cable is used for test equipment setup calibration *only*. It is not be part of the final test setup. After calibration is completed, *do not* re-arrange any cables. Use the equipment setup, as is, to ensure test procedures use the correct calibration factor.

Figure 3-22: Calibrating Test Equipment Setup for RX ATP Test (Using Signal Generator and Spectrum Analyzer)



Setting Cable Loss Values

Cable loss values for the TX and RX test cable configurations are normally set by accomplishing cable calibration with use of the applicable test equipment. The resulting values are stored in the cable loss files. The cable loss values can also be set/changed manually.

Prerequisites

- Logged into the BTS

Table 3-36: Setting Cable Loss Values

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

Setting Coupler Loss Value

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

Prerequisites

- Logged into the BTS

Table 3-37: Setting Coupler Loss Values

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

Adjusting for loss

Introduction

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

RF Path Bay Level Offset Calibration

Calibration identifies the accumulated gain in every transmit path (BBX slot) at the BTS site and stores that value in the CAL file. The BLOs are subsequently downloaded to each BBX.

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

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

When to Calibrate BLOs

Calibration of BLOs is required after initial BTS installation.

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

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

TX Path Calibration

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

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

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

NOTE	***At new site installations,*** to facilitate the complete test of each CCP shelf (if the shelf is not already fully populated with BBX boards), move BBX boards from shelves currently not under test and install them into the empty BBX slots of the shelf currently being tested to insure that all BBX TX paths are tested. - This procedure can be bypassed on operational sites that are due for periodic optimization. - Prior to testing, view the CDF file to verify the correct BBX slots are equipped. Edit the file as required to include BBX slots not currently equipped (per Systems Engineering documentation).

BLO Calibration Data File

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

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

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

Slot 1 contains the calibration data for the 12 BBX slots. **Slot** 20 contains the calibration data for the redundant BBX (see Table 3-39). Each BBX slot header block contains:

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

Table 3-38: BLO BTS.cal file Array Branch Assignments

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

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

Table 3-39: BTS.cal File Array (Per Sector)

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

- Refer to the hard copy of the file. As you can see, 10 calibration points per sector are supported for each branch. Two entries are required for each calibration point.
- The first value (all odd entries) refer to the CDMA channel (frequency) the BLO is measured at. The second value (all even entries) is the power set level. The valid range for PwrLvlAdj is from 2500 to 27500 (2500 corresponds to -125 dBm and 27500 corresponds to +125 dBm).
- The 20 calibration entries for each slot/branch combination must be stored in order of increasing frequency. If less than 10 points (frequencies) are calibrated, the largest frequency that is calibrated is repeated to fill out the 10 points.

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

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

Test Equipment Setup: RF Path Calibration

Follow the steps in Table 3-40 to set up test equipment.

Table 3-40: Test Equipment Setup (RF Path Calibration)

Step	Action
	NOTE Verify the GPIB is properly connected and turned on.
	! CAUTION To prevent damage to the test equipment, all transmit (TX) test connections must be via the 30 dB directional coupler for 800 MHz or via a 30 dB coupler with a 20 dB in-line attenuator for 1900 MHz.
1	Connect the LMF computer terminal to the BTS LAN A connector on the BTS (if you have not already done so). Refer to the procedure in Table 3-6. • If required, calibrate the test equipment per the procedure in Table 3-32. • Connect the test equipment as shown in Figure 3-16, Figure 3-17 and Figure 3-18.

Transmit (TX) Path Calibration

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

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

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

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

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

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

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

Test Pattern Drop-down Pick List

Pilot is shown as the default setting in this pick list box. The full range of available selections and their descriptions are as follows:

Standard - performs calibration or audit using pilot, paging, synch, and six traffic channels with IS-97-specified gain. This pattern setting should be used for all non-in-service calibrations and audits. Using this pattern setting requires the selection of both a BBX and at least one MCC.

Pilot (default) - performs calibration using only the pilot channel. This pattern setting should be used for in-service calibrations, and requires selection of only a BBX.

CDFPilot -This pattern setting is for advanced users. It performs calibration or audit using the CDF value for pilot gain and IS-97 gain values for all the other channels included in the Standard pattern setting (paging, synch, and six traffic). Using this pattern setting requires the selection of both a BBX and at least one MCC.

CDF - This pattern setting is for advanced users who need to use CDF gain settings for all channels included in the Standard pattern setting (pilot, paging, synch, and six traffic). Using this pattern setting requires the selection of both a BBX and at least one MCC.

Verify BLO

In both the TX Calibration and All Cal/Audit dialog boxes, a Verify BLO checkbox is provided and checked by default. After the actual TX calibration is completed during either the TX Calibration or All Cal/Audit process, the BLO derived from the calibration is compared to a standard, acceptable BLO tolerance for the BTS. In some installations, additional items may be installed in the transmit path. The additional change in gain from these items could cause BLO verification failure and, therefore, failure of the entire calibration. In these cases, either the Verify BLO checkbox should be unchecked or the additional path losses should be added into each applicable sector using the **Util>Edit>TX Coupler Loss** function.

3

Single-Sided BLO

Normally valid values are some value plus-or-minus some offset. If single-sided BLO" is selected, the result will only be considered a success if it's in the lower half of the range. If it was normally success from 37-47 (which is 42± 5), single-sided BLO" would make it a success only if the result was from 37-42.

Prerequisites

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

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

Connect the test equipment as shown in Figure 3-10 and Figure 3-11 and follow the procedure in Table 3-41 to perform the TX calibration test.

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

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

Table 3-41: BTS TX Path Calibration

✓	Step	Action
	1	Select the BBX(s) to be calibrated. **NOTE** If **STANDARD, CDF** or **CDFPILOT** is selected for **TEST PATTERN**, then at least one MCC must be also selected.
	2	From the **Tests** menu, select **TX>TX Calibration**.
	3	Select the appropriate carrier(s) displayed in the **Channels/Carrier** pick list. (Press and hold the **<Shift>** or **<Ctrl>** key to select multiple items.)
	4	Type the appropriate channel number in the **Carrier n Channels** box.
	5	Select **Verify BLO** (default) or **Single-sided BLO**. **NOTE** **Single-sided BLO** is only used when checking non-redundant transceivers.
	6	From the **Test Pattern** pick list, select a test pattern.

Table 3-41: BTS TX Path Calibration		
✓	Step	Action
		NOTE • Selecting **PILOT** (default) performs tests using a pilot signal only. • Selecting **STANDARD** performs tests using pilot, synch, paging and six traffic channels. This requires an MCC to be selected. • Selecting **CDFPilot** performs tests using the CDF value for pilot gain and IS-97 gain values for all the other channels included in the Standard pattern setting (paging, synch, and six traffic). Using this pattern setting requires the selection of both a BBX and at least one MCC. • Selecting **CDF** performs tests using pilot, synch, paging and six traffic channels, however, the gain for the channel elements is specified in the CDF file.
	7	Click on **OK**.
	8	Follow the cable connection directions as they are displayed. A status report window displays the test results.
	9	Click on **Save Results** or **Dismiss** to close the status report window.

Exception Handling

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

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

Download BLO Procedure

After a successful TX path calibration, download the BLO calibration file data to the BBXs. BLO data is extracted from the CAL file for the BTS and downloaded to the selected BBX devices.

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

Prerequisites

Ensure the following prerequisites have been met before proceeding.

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

Follow the steps in Table 3-42 to download the BLO data to the BBXs.

Table 3-42: Download BLO

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

Calibration Audit Introduction

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

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

Transmit (TX) Path Audit

Perform the calibration audit of the TX paths of all equipped BBX slots, per the steps in Table 3-43.

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

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

TX Audit Test

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

Prerequisites

Before running this test, the following should be done:

- CSM-1,GLI3s, BBXs have correct code load.
- Primary CSM and MGLI3 are INS.
- All BBXs are OOS_RAM.

- Test equipment and test cables are calibrated and connected for TX BLO calibration.
- LMF is logged into the BTS.

Follow the procedure in Table 3-43 to perform the BTS TX Path Audit test.

Table 3-43: BTS TX Path Audit

✓	Step	Action
	1	Select the BBX(s) to be audited. **NOTE** If **STANDARD** or **CDF** is selected for **Test Pattern**, then at least one MCC must be also selected.
	2	From the **Tests** menu, select **TX>TX Audit**.
	3	Select the appropriate carrier(s) displayed in the **Channels/Carrier** pick list. Press and hold the **<Shift>** or **<Ctrl>** key to select multiple items.
	4	Type the appropriate channel number in the **Carrier n Channels** box.
	5	Select **Verify BLO** (default) or **Single-sided BLO**. **NOTE** **Single-sided BLO** is only used when checking non-redundant transceivers.
	6	From the **Test Pattern** pick list, select a test pattern. **NOTE** • Selecting **PILOT** (default) performs tests using a pilot signal only. • Selecting **STANDARD** performs tests using pilot, synch, paging and six traffic channels. This requires an MCC to be selected. • Selecting **CDFPILOT** performs tests using the CDF value for pilot gain and IS-97 gain values for all the other channels included in the Standard pattern setting (paging, synch, and six traffic). Using this pattern setting requires the selection of both a BBX and at least one MCC. • Selecting **CDF** performs tests using pilot, synch, paging and six traffic channels, however, the gain for the channel elements is specified in the CDF file.
	7	Click on **OK**.
	8	Follow the cable connection directions as they are displayed. A status report window displays the test results.
	9	Click on **Save Results** or **Dismiss** to close the status report window.

3

Exception Handling

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

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

All Cal/Audit Test

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

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

Prerequisites

Before running this test, the following should be done:

- CSM-1, GLI3s, BBXs have correct code and data load.
- Primary CSM and MGLI3 are INS.
- All BBXs are OOS_RAM.
- Test equipment and test cables are calibrated and connected for TX BLO calibration.
- LMF is logged into the BTS.

Follow the procedures in Table 3-44 to perform the All Cal/Audit test.

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

Table 3-44: All Cal/Audit Test		
✓	**Step**	**Action**
	1	Select the BBX(s) to be tested. **NOTE** If **STANDARD**, **CDF** or **CDFPILOT** is selected for TEST PATTERN, then at least one MCC must be also selected.
	2	From the **Tests** menu, select **All Cal/Audit.**
	3	Select the appropriate carrier(s) displayed in the **Channels/Carrier** pick list. Press and hold the **<Shift>** or **<Ctrl>** key to select multiple items.
	4	Type the appropriate channel number in the **Carrier n Channels** box.
	5	Select **Verify BLO** or **Single-sided BLO**. **NOTE** **Single-sided BLO** is only used when checking non-redundant transceivers.
	6	From the **Test Pattern** pick list, select a test pattern. **NOTE** • Selecting **Pilot** (default) performs tests using a pilot signal only. • Selecting **Standard** performs tests using pilot, synch, paging and 6 traffic channels. This requires an MCC to be selected. • Selecting **CDFPilot** performs tests using the CDF value for pilot gain and IS-97 gain values for all the other channels included in the Standard pattern setting (paging, synch, and six traffic). Using this pattern setting requires the selection of both a BBX and at least one MCC. • Selecting **CDF** performs tests using pilot, synch, paging and 6 traffic channels, however, the gain for the channel elements is specified in the CDF file.
	7	Click on **OK**.
	8	Follow the cable connection directions as they are displayed. A status report window displays the test results.
	9	Click on **Save Results** or **Dismiss** to close the status report window.

Create CAL File

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

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

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

Prerequisites

Before running this test, the following should be done:

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

Table 3-45: Create CAL File

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

RFDS Description

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

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

For complete information regarding the RFDS, refer to the CDMA, and the.*LMF Help function on-line documentation*.

RFDS Parameters

The **bts-#.cdf** file includes RFDS parameter settings that must match the installed RFDS equipment. The paragraphs below describe the editable parameters and their defaults. Table 3-46 explains how to edit the parameter settings.

- **RfdsEquip -** valid inputs are 0 through 2.
  0 = (default) RFDS is not equipped
  1 = Non-Cobra/Patzer box RFDS
  2 = Cobra RFDS
- **TsuEquip -** valid inputs are 0 or 1
  0 = (default) TSU not equipped
  1 = TSU is equipped in the system
- **MC1....4 -** valid inputs are 0 or 1
  0 = (default) Not equipped
  1 = Multicouplers equipped in RFDS system
  (SC9600 internal RFDS only)

- **Asu1/2Equip** - valid inputs are 0 or 1
  0 = (default) Not equipped
  1 = Equipped
- **TestOrigDN** - valid inputs are ’’’ (default) or a numerical string up to 15 characters. (This is the phone number the RFDS dials when originating a call. A dummy number needs to be set up by the switch, and is to be used in this field.)

NOTE	Any text editor may be used to open the **bts-#.cdf** file to verify, view, or modify data. Because the **bts-#.cdf** file is generated on a Unix system, a more sophisticated editor, such as *MicroSoft* WordPad, will display file content in a more easily-read format than many simple text editors.

Checking and Setting RFDS Parameters

Follow the procedure in Table 3-46 to review and/or edit RFDS parameters.

Table 3-46: RFDS Parameter Settings

Step	Action

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

2	Save changes and/or quit the editor.
3	Log into the BTS using an LMF *GUI* session(refer to Table 3-14).
4	If *no* changes were made to the **bts-#.cdf** file fields listed in step 1, proceed to Step 7. If changes *were* made, continue with Step 5.
5	*** IMPORTANT** To make certain the complete data download is accepted, the MGLI should be OOS_RAM (yellow) when RFDS parameter settings are downloaded. When changes are made to RFDS parameters in the **bts-#.cdf** file, data must be downloaded to the MGLI by performing the following:

. . . continued on next page

3

Table 3-46: RFDS Parameter Settings

Step	Action
5a	- To be sure it does not take control when the MGLI is disabled, *manually* disable the redundant GLI card by unseating it from the backplane connectors and sliding it partially out of the shelf slot.
5b	- Click on the MGLI.
5c	- Click on **Device** in the BTS menu bar, and select **Disable** from the pull-down menu. -- A status report window is displayed showing status of the operation.
5d	- When the operation is complete, click **OK** to close the status report window.
5e	- Click on the MGLI (now OOS_RAM (yellow)).
5f	- Click on **Device** in the BTS menu bar, and select **Download** > **Data** from the pull-down menus *(selected devices do not change color when data is downloaded)*. -- A status report window is displayed showing status of the download.
5g	- Click **OK** to close the status report window.
5h	- Click on the MGLI.
5i	- Click on **Device** in the BTS menu bar, and select **Enable** from the pull-down menu. -- A status report window is displayed showing status of the operation.
5j	- When the operation is complete, click **OK** to close the status report window.
	! CAUTION When the MGLI changes to INS_ACT, data will automatically be downloaded to the RFDS. During this process, the RFDS LED will slowly begin flashing red and green for approximately 2-3 minutes. **DO NOT** attempt to perform any functions with the RFDS until the LED remains steady green.
5k	- Re-seat the redundant GLI card into the backplane connectors and lock it in place with the ejector tabs.
5l	- Once the redundant GLI initializes, download data to it by selecting the card and, in the BTS menu bar, clicking **Device** and selecting **Download** > **Data** from the pull-down menus.
6	Any MCCs which were INS_ACT when the MGLI was disabled must be disabled, re-enabled, and downloaded with code as follows:
6a	- Select the devices to be reset by clicking on them or using **Select** from the BTS menu bar and clicking on **MCCs** in the pull-down menu.
6b	- In the BTS menu bar, click on **Device** and select **Disable** from the pull-down menu. -- A status window report window is displayed showing status of the operation.
6c	- Click **OK** to close the status report window.
6d	- Download data to the MCCs by following the procedure in Table 3-21.
6e	- When data download is complete, enable the MCCs by following the procedure in Table 3-24.
7	Click on the RFDS tab.
8	Status the RFDS TSU by performing the following:
8a	- Click on the SUA to select it.

. . . continued on next page

Table 3-46: RFDS Parameter Settings	
Step	**Action**
8b	- Click on **TSU** in the BTS menu bar, and select **Status TSU** from the pull-down menu. -- A status report is displayed showing the software version number for the TSIC and SUA.
8c	- Click **OK** to close the status report window. *** IMPORTANT** If the LMF displays an error message, check the following: • Ensure AMR cable is correctly connected from the BTS to the RFDS. • Verify RFDS has power. • Verify RFDS status LED is green. • Verify entries in RFDS fields of the **bts-#.cdf** file are correct (refer to step 1). • Status the MGLI and ensure it is communicating (by Ethernet) with the LMF, and is in the proper state (INS_ACT (bright green)).

3

RFDS TSU NAM Programming

The Number Assignment Module (NAM) information needs to be programmed into the TSU before it can receive and process test calls, or be used for any type of RFDS test. The RFDS TSU NAM must be programmed with the appropriate system parameters and phone number during hardware installation. The TSU phone and TSU MSI must be recorded for each BTS used for OMC-R RFDS software configuration.

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

Explanation of Parameters Used When Programming the TSU NAM

Table 3-47 defines the parameters used when editing the tsu.nam file.

Table 3-47: Definition of Parameters	
Access Overload Code Slot Index System ID Network ID	These parameters are obtained from the switch.
Primary Channel A Primary Channel B Secondary Channel A Secondary Channel B	These parameters are the channels which are to be used in operation of the system.
Lock Code Security Code Service Level Station Class Mark	Do ***NOT*** change.

Table 3-47: Definition of Parameters	
IMSI MCC IMSI 11 12	These fields are obtained at the OMC using the following command: **OMC000>disp bts-# imsi** If the fields are blank, replace the IMSI fields in the NAM file to 0, otherwise use the values displayed by the OMC.
MIN Phone Number	These fields are the phone number assigned to the mobile. The ESN and MIN must be entered into the switch as well. **NOTE** This field is different from the TODN field in the **bts-#.cdf** file. The MIN is the phone number of the RFDS subscriber, and the TODN is the number the subscriber calls.

Valid NAM Ranges

Table 3-48 provides the valid NAM field ranges. If any of the fields are missing or out-of-range, the RFDS will error out.

Table 3-48: Valid NAM Field Ranges

NAM Field Name	Valid Range	
	Minimum	Maximum
Access Overload Code	0	15
Slot Index	0	7
System ID	0	32767
Network ID	0	32767
Primary Channel A	25	1175
Primary Channel B	25	1175
Secondary Channel A	25	1175
Secondary Channel B	25	1175
Lock Code	0	999
Security Code	0	999999
Service Level	N/A	N/A
Station Class Mark	0	255
IMSI 11 12	0	99
IMSI MCC	0	999
MIN Phone Number	N/A	N/A

Set Antenna Map Data

The antenna map data must be entered manually if an RFDS is installed. Antenna map data does not need to be entered if an RFDS is not installed. The antenna map data is only used for RFDS tests and is required if an RFDS is installed.

Prerequisite

- LMF is logged into the BTS

Follow the procedure in Table 3-49 to set antenna map data for the RFDS.

Table 3-49: Set Antenna Map Data

Step	Action
1	Click on **Util** in the BTS menu bar, and select **Edit > Antenna Map...** from the pull-down menus. - A *tabbed* data entry pop-up window will appear.
2	In the data entry pop-up window, click on the **TX Antenna Map** or **RX Antenna Map** tab to select the antenna map to be edited.
3	Locate the carrier and sector number for which data is to be entered or edited, and click in the column where entry or editing is needed.
4	Enter/edit **Antenna #** and **Antenna Label** column data as needed for each carrier. **NOTE** Refer to the **CDMA Help > Utility Menu > Edit-Antenna Map...** section of *LMF Help function on-line documentation* for antenna map examples.
5	*For each tab with changes,* click on the **Save** button to save displayed values.
6	Click on the **Dismiss** button to close the window. **NOTE** • Values entered or changed after the **Save** button was used will be lost when the window is dismissed. • Entered values will be used by the LMF as soon as they are saved. It is not necessary to log out and log back into the LMF for changes to take effect.

3

Set RFDS Configuration Data

If an RFDS is installed, the RFDS configuration data must be manually entered.

Prerequisite

- LMF is logged into the BTS

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

Follow the procedure in Table 3-50 to set RFDS configuration data.

Table 3-50: Set RFDS Configuration Data

Step	Action
1	Click on **Util** in the BTS menu bar, and select **Edit > RFDS Configuration...** from the pull-down menus. - A *tabbed* data entry pop-up window will appear.
2	In the data entry pop-up window, click on the **TX RFDS Configuration** or **RX RFDS Configuration** tab, as required.
3	To add a new antenna number, perform the following:
3a	- Click on the **Add Row** button.
3b	- Click in the **Antenna #**, **Cal Antenna**, **Scap Antenna**, or **Populate [Y/N]** columns, as required.

. . . continued on next page

Table 3-50: Set RFDS Configuration Data

Step	Action
3c	- Enter the desired data.
4	To edit existing values click in the data box to be changed and change the value. **NOTE** Refer to the **CDMA Help > Utility Menu > Edit-RFDS Configuration...** section of *LMF Help function on-line documentation* for RFDS configuration data examples.
5	To delete a row, click on the row and then click on the **Delete Row** button.
6	*For each tab with changes*, click on the **Save** button to save displayed values.
7	Click on the **Dismiss** button to close the window. **NOTE** • Values entered or changed after the **Save** button was used will be lost when the window is dismissed. • Entered values will be used by the LMF as soon as they are saved. It is not necessary to log out and log back into the LMF for changes to take effect.

RFDS Calibration

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

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

RX Path Calibration - For an RX antenna path calibration the RFDS is keyed at a pre-determined power level and the power input level is measured by the BTS BBX. A CDMA signal at the same power level measured by the BTS BBX is then injected at the RX antenna directional coupler by the communications system analyzer. The difference (offset) between the RFDS-keyed power level and power level measured at the BTS BBX is the RFDS RX calibration offset value.

RFDS calibration and the CAL file - The TX and RX RFDS calibration offset values are written to the CAL file in the slot[385] Block.

TSIC channel frequency - For each RFDS TSIC, the channel frequency is determined at the lower third and upper third of the appropriate band using the frequencies listed in Table 3-51.

Table 3-51: RFDS TSIC Calibration Channel Frequencies	
System	**Channel Calibration Points**
800 MHz (A and B)	341 and 682
1.9 GHz	408 and 791

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

RFDS Calibration Procedure

Prerequisites

- Test equipment has been selected.
- Test equipment and test cables have been calibrated.
- TX calibration has been performed and BLO data has been downloaded to the BBXs.
- Test equipment and test cables are connected for TX calibration.
- Antenna map data has been entered for the site.
- BBXs are INS_TEST.

Follow the procedure in Table 3-52 to perform RFDS calibration.

Table 3-52: RFDS Calibration	
Step	**Action**
1	In the LMF, select the **FRAME** tab.
2	*If it is not selected (no black dot showing)*, click on the **B** button in the BTS menu bar to select it.
3	Select the BBX(s) assigned to the carrier(s) and sector(s) which will be used in RFDS calibration (refer to Table 1-5 for BBX carrier and sector assignments).
4	Click on **RFDS** in the BTS menu bar, and select **RFDS Calibration...** from the pull-down menu. - An **RFDS Calibration** set-up window will be displayed.
5	In the **Tests to Perform** box, select **TX Calibration** or **RX Calibration**, as required
6	Enter the appropriate channel number(s) (refer to Table 3-51) in the **Channel Field** box. • To enter more than one channel number, use the following methods: - Separate *non*-sequential channel numbers with a comma and *no spaces*; for example: 247,585,742. - Enter a range of sequential channels by typing the first and last channel numbers in the range separated by a dash and *no spaces*; for example: 385-395.
7	If the frame is equipped with TX combiners, click in the **Has Combiners** checkbox.
8	Select the appropriate carrier(s) and sector(s) from the **Carriers** pick list (hold down the **Shift** or **Ctrl** key while clicking on pick list items to select multiple carrier(s)-sector(s)).
9	Select the appropriate **RX branch** (**Both**, **Main**, or **Div**ersity) in the drop-down list.
10	In the **Rate Set** box, select the appropriate transfer rate (**1**=9600, **2**=14400) from the drop-down list.
11	Click on the **OK** button. - A status report window is displayed, followed by a **Directions** pop-up window.
12	Follow the cable connection directions as they are displayed.
13	When the test is completed, test results are displayed in the status report window.
14	Click on the **OK** button to close the status report window.
15	Click on the **Frame** tab.
16	Select the MGLI by clicking on it.
17	Download the CAL file, now updated with the RFDS offset data, to the MGLI by clicking on **Device** on the BTS menu bar, and selecting **Download** > **Data** from the pull-down menus. **NOTE** The MGLI will automatically transfer the RFDS offset data from the CAL file to the RFDS.

Program TSU NAM

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

Prerequisites

- MGLI is INS_ACT (bright green).
- SUA is powered up and has a code load.

Follow the procedure in Table 3-53 to program the TSU NAM.

Table 3-53: Program NAM Procedure

Step	Action
1	In the LMF, select the RFDS tab.
2	Select the SUA by clicking on it.
3	Click on **TSU** in the BTS menu bar, and select **Program TSU NAM** from the pull-down menu. - A NAM programming window will appear.
4	Enter the appropriate information in the boxes (see Table 3-47 and Table 3-48) .
5	Click on the **OK** button to display the status report.
6	Click on the **OK** button to close the status report window.

Alarms

The alarms testing should be performed at a convenient point in the optimization/ATP process, since the LMF is necessary to ensure that the RF cabinet is receiving the appropriate alarms from the power cabinet.

The SC 4812ET is capable of concurrently monitoring 10 customer defined input signals and four customer defined outputs, which interface to the 50-pin punchblock. All alarms are defaulted to "Not Equipped" during ATP testing. Testing of these inputs is achieved by triggering the alarms and monitoring the LMF for state-transition messages from the active MGLI3.

All customer alarms are routed through the 50 pair punchblock located in the I/O compartment at the back of the frame. Testing is best accomplished by using a specialized connector that interfaces to the 50-pair punchblock. This connector is wired so that customer return 1 (2 for the B side) is connected to every input, CDI 0 through CDI 17.

Alarm Reporting Display

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

The following buttons are included:

- The **Options** button allows for a severity level (**Warning, Minor**, **Major, Critical, and Unknown**) selection. The default is all levels. To change the level of alarms reported click on the **Options** button and highlight the desired alarm level(s). To select multiple levels press the Ctrl key (for individual selections) or Shift key (for a range of selections) while clicking on the desired levels.
- The **Pause** button can be used to pause/stop the display of alarms. When the **Pause** button is clicked the name of the button changes to **Continue**. When the **Continue** button is click the display of alarms will continue. Alarms that occur between the time the **Pause** button is clicked and the **Continue** button is clicked will not be displayed.
- The **Clear** button can be used to clear the Alarm Monitor display. New alarms that occur after the **Clear** button is clicked will be displayed.
- The **Dismiss** button is used to dismiss/close the Alarm Monitor display.

Heat Exchanger Alarm Test

Table 3-54 gives instructions on testing the Heat Exchanger alarm.

Table 3-54: Heat Exchanger Alarm	
Step	**Action**
1	Turn circuit breaker “B” of the Heat Exchanger circuit breakers OFF. This will generate a Heat Exchanger alarm, ensure that the LMF reports the correct alarm condition in the RF Cabinet.
2	Alarm condition will be reported as **BTS Relay #25 -** “Heat Exchanger Alarm” makes contact.
3	Turn the circuit breaker “B” ON. Ensure that the alarm condition is now removed. **NOTE** The Heat Exchanger will go through the Start Up sequence.

Door Alarm

Table 3-55 gives instructions on testing the door alarms.

NOTE	When conducting this test connect the LMF via the LAN port on the back of the frame thru the Rear I/O Door.

Table 3-55: Door Alarm	
Step	**Action**
1	Close all doors on the power cabinet. Ensure that no alarms are reported on the LMF.
2	Individually open and then close each power supply cabinet door. Ensure that the LMF reports an alarm when each door is opened.
3	Alarm condition will be reported as **BTS Relay #27** “Door Alarm” makes contact.

AC Fail Alarm

Table 3-56 gives instructions on testing the AC Fail Alarm.

Table 3-56: AC Fail Alarm	
Step	**Action**
1	**NOTE** The batteries should have a stable charge before performing this test. Turn the Main AC breaker on the power cabinet OFF. The LMF should report an alarm on an AC Fail (Rectifier Fail, Minor Alarm & Major Alarm) condition.
2	Alarm condition will be reported as **BTS Relay #23, BTS # 21, BTS # 24 and BTS Relay # 29 “AC Fail Alarm”** makes contact respectively.
3	Turn the Main AC breaker on the power cabinet ON. The AC Fail alarm should clear.

Minor Alarm

Table 3-57 gives instructions on testing minor alarm.

Table 3-57: Minor Alarm	
Step	**Action**
1	Turn the Temperature Compensation Panel (TCP) power switch OFF. This will generate a minor alarm. Verify that the minor alarm LED (amber) is illuminated on the Meter Alarm Panel and the LMF reports this minor alarm.
2	Alarm condition will be reported as **BTS Relay #24** “Minor Alarm” makes contact.
3	Turn the TCP power switch ON. The alarm condition should clear.

Rectifier Alarms

The following series of tests are for single rectifier modules in a multiple rectifier system. The systems include a three rectifier and a six rectifier system.

Single Rectifier Failure (Three Rectifier System)

Table 3-58 gives instructions on testing single rectifier failure or minor alarm in a **three rectifier system**.

Table 3-58: Single Rectifier Fail or Minor Alarm	
Step	**Action**
1	Remove a single rectifier module and place it into the unused rectifier shelf #2.
2	Turn the AC breaker OFF, for this 2nd shelf.
3	Verify that a rectifier fail alarm is generated. The single rectifier module will lite two RED fail LED (DC and Power), and the Meter Alarm Panel and LMF will also indicate a minor alarm and rectifier fail status. The RECTIFIER FAIL LED will lite.
4	Check that the LMF reports both of these alarm conditions. **NOTE** Alarm conditions reported as **BTS #24 and BTS #21**, contacts respectively.
5	Turn the AC breaker for the 2nd shelf ON and verify that Rectifier Fail and minor alarm conditions clear on the Meter Alarm Panel and LMF.

Multiple Rectifier Failure

Table 3-59 gives instructions on testing multiple rectifier failure or major alarm in a **three rectifier system**.

Table 3-59: Multiple Rectifier Failure or Major Alarm	
Step	**Action**
1	With the rectifier module still in the unused shelf position fromTable 3-58 test procedures, turn the AC breaker for the 1st shelf OFF.
2	Verify that a rectifier alarm is generated. Each of the two rectifier modules will lite two RED fail LED (DC and Power), and the Meter Alarm Panel and LMF will indicate a major alarm (Rectifier Fail and Major Alarm). The RECTIFIER FAIL LED will lite.

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Table 3-59: Multiple Rectifier Failure or Major Alarm	
Step	**Action**
3	Verify that the LMF reports both alarm conditions. (**BTS #29, BTS #21, and BTS #24**)
4	Turn the AC breaker for the 1st shelf ON. Verify that all alarms have cleared.
5	Return the rectifier module to its original location. This completes the alarm test on the power cabinet.

3

Single Rectifier Failure (Six Rectifier System)

Table 3-60 gives instructions on testing single rectifier failure or minor alarm in a **six rectifier system**.

Table 3-60: Single Rectifier Fail or Minor Alarm	
Step	**Action**
1	Remove two(2) rectifier modules from shelf #2.
2	Turn the AC breaker OFF, for shelf #2.
3	Verify that a rectifier fail alarm is generated. The single rectifier module will lite two RED fail LED (DC and Power), and the Meter Alarm Panel and LMF will also indicate a minor alarm and rectifier fail status. The RECTIFIER FAIL LED will lite.
4	Check that the LMF reports both of these alarm conditions. (**BTS #24 and BTS #21**)
5	Turn the AC breaker for this shelf ON and verify that Rectifier Fail and Minor Alarm conditions have cleared.

Multiple Rectifier Failure (Six Rectifier System)

Table 3-61 gives instructions on testing multiple rectifier failure or major alarm in a **six rectifier system**.

Table 3-61: Multiple Rectifier Failure or Major Alarm	
Step	**Action**
1	Replace one rectifier module previously removed and turn the AC breaker for this shelf, OFF.
2	Verify that a rectifier alarm is generated. Each of the two rectifier modules will lite a RED fail LED, and the Meter Alarm Panel will indicate a major alarm (Rectifier Fail, Major and Minor Alarm).The RECTIFIER FAIL LED will lite.
3	Verify that the LMF reports both alarm conditions. (**BTS #29**)
4	Turn the AC breaker for this shelf ON. Verify that all alarms have cleared.
5	Return all rectifier module to their original location. This completes the rectifier alarm tests on the power cabinet.

Battery Over Temperature Alarm (Optional)

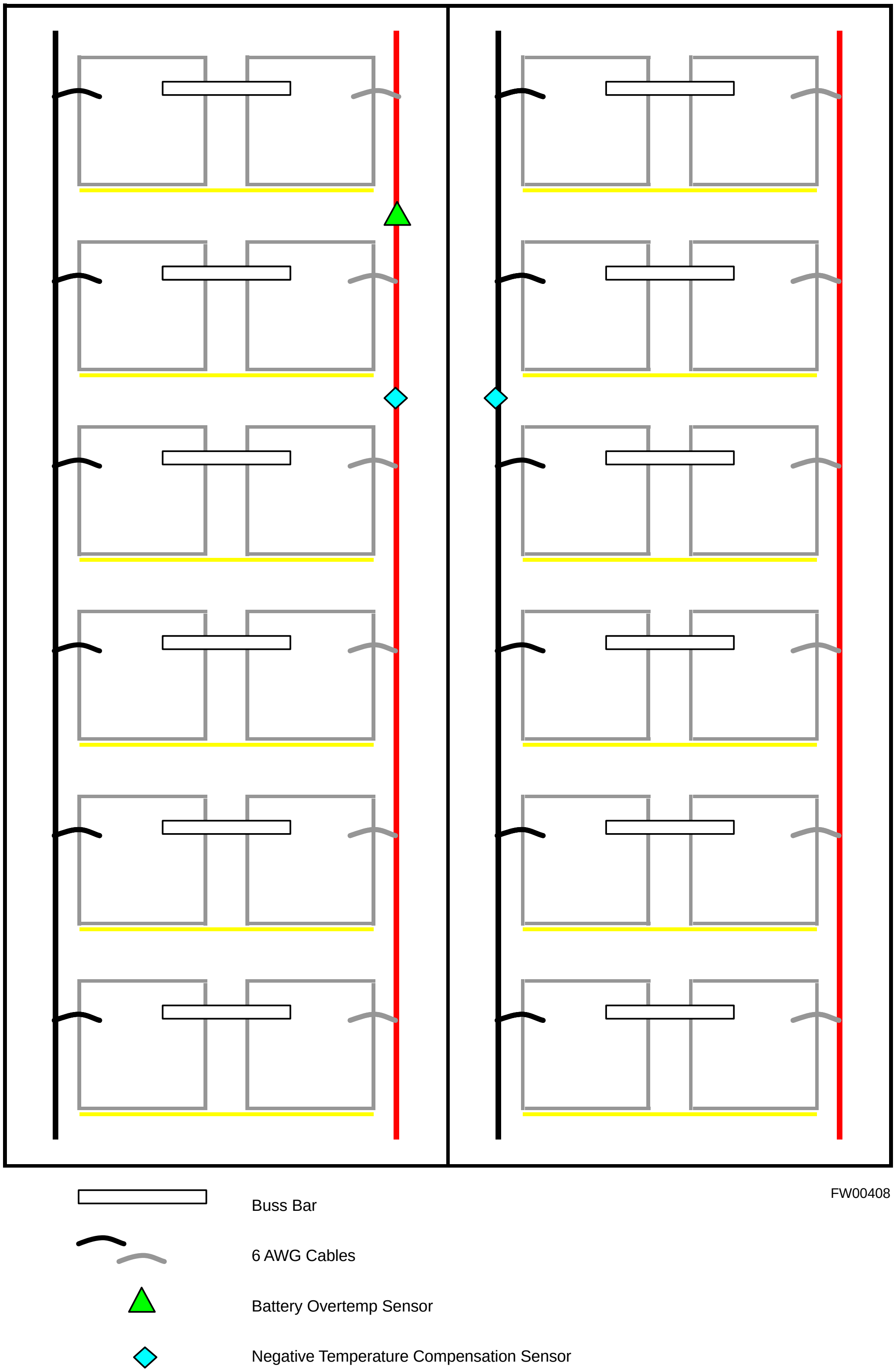
CAUTION	Use special care to avoid damaging insulation on cables, or damaging battery cases when using a power heat gun.

Table 3-62 gives instructions on testing the battery over temperature alarm system.

Table 3-62: Battery Over Temperature Alarm

Step	Action
1	Use a low powered heat gun and gently heat the battery over temperature sensor (see location in Figure 3-23). Do Not hold the hot air gun closer than 7.6 cm (3 in.) to the sensor. This will avoid burning the cable insulation.
2	When the sensor is heated to approximately 50° C, a battery Over Temperature alarm is generated. **NOTE** An audible click will sound as K1 contact engage and K2 contacts disengage.
3	Visually inspect the K1 and K2 relays to verify state changes. The LMF should be displaying correct alarms. (**BTS #22**)
4	Verify that the CHARGE DISABLE LED (amber) on the Meter Alarm Panel and the BATTERY MAIN LED (green) are both illuminated.
5	Switch the hot air gun to cool. Cool the sensor until the K1 and K2 contact return to normal position (K1 open and K2 closed). Use the LMF verify that all alarms have cleared.

Figure 3-23: Battery Over-temperature Sensor



3

Rectifier Over Temperature Alarm

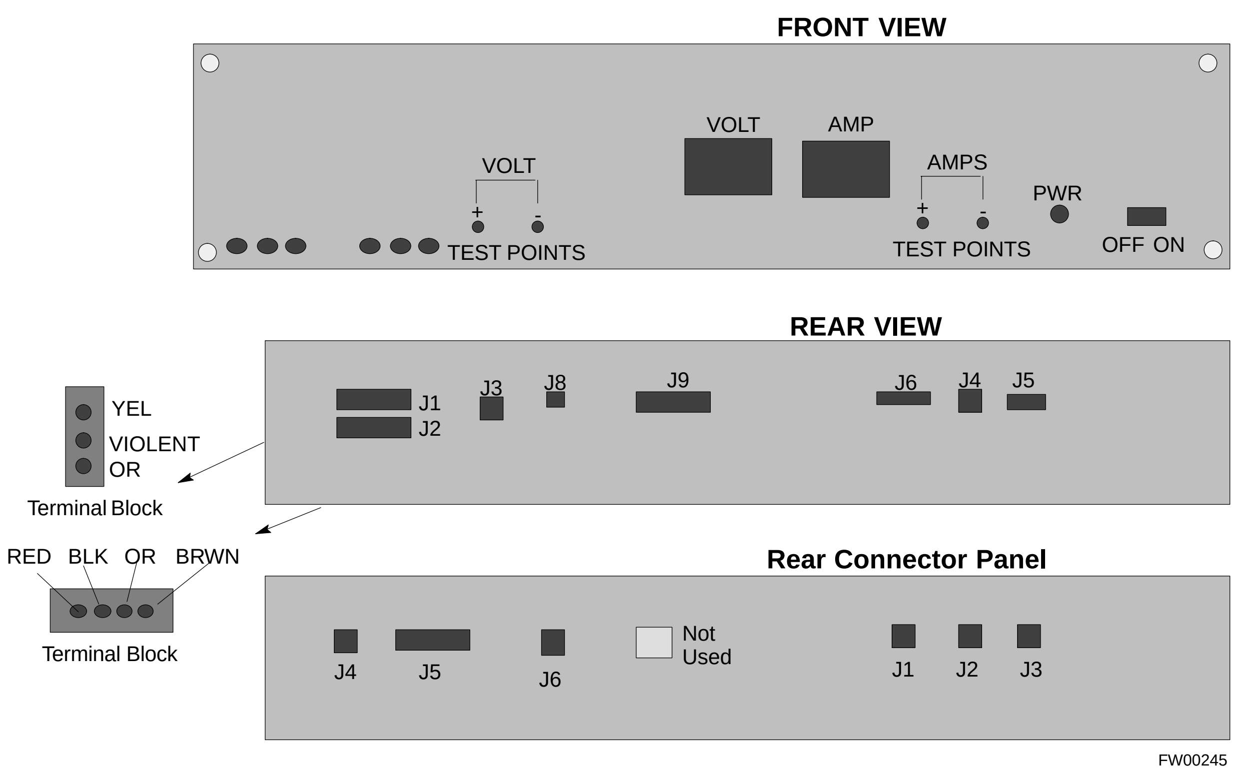
NOTE	This is connector J8 on the rear of the Meter Alarm Panel itself, this is not connector J8 on the connector bulkhead at the rear of the cabinet.

Table 3-63 gives instructions on testing the battery over temperature alarm system.

Table 3-63: Rectifier Over Temperature Alarm

Step	Action
1	Remove the J8 link on the rear of the Meter Alarm Panel (see Figure 3-24 for J8 location). **NOTE** This is the J8 on the rear of the Meter Alarm Panel itself, this is not connector J8 on the connector bulkhead at the rear of the cabinet.
2	Verify that RECTIFIER OVERTEMP LED (red) is lite. Contacts on K1 and K2 change states (K1 now closed and K2 open).
3	Verify that the LMF has reported an alarm condition. (**BTS #26**)
4	Reinstall J8 connector and verify that all alarm conditions have cleared. K1 and K2 should now be in their normal states (K1 open and K2 closed).
5	This completes the system tests of the SC 4812ET power cabinet.

Figure 3-24: Location of Connector J8 on the Meter Alarm Panel



Before Leaving the site

Table 3-64 gives instructions on what to check before leaving the site.

Table 3-64: Check Before Leaving the Site

Step	Action
1	Verify that ALL battery circuit breakers (for occupied shelves) are CLOSED (pushed in).
2	Verify that the Heat Exchanger is running.
3	Verify that the Meter Alarm Panel and TCP modules are switched ON.
4	Verify that the Battery Test Switch on the Meter Alarm Panel is in the OFF position.
5	Verify that no alarm conditions are being reported (with all doors closed).

Notes

MOTOROLA

Chapter 4

4

Automated Test Procedures (ATP)

ATP Tests

Introduction

The Automated Acceptance Test Procedure (ATP) allows Motorola Cellular Field Engineers (CFEs) to run automated acceptance tests on all equipped BTS subsystem devices using the Local Maintenance Facility (LMF) and supported test equipment per the current Cell Site Data File (CDF) assignment.

The results of these tests (at the option of the operator) are written to a file that can be printed. All tests are controlled via the LMF platform using the GPIB interface, therefore, only recommended test equipment supported by the LMF can be used.

This chapter describes the tests run from the GUI environment, which is the recommended method. The GUI provides the advantages of simplifying the LMF user interface, reducing the potential for miskeying commmands and associated parameters, and speeding up the execution of complex operations involving multiple command strings. If you feel the command line interface (CLI) will provide additional insight into the progress of ATPs and problems that could possibly be encountered, refer to *LMF CLI Commands.*

NOTE	Before using the LMF, use an editor to view the ”CAVEATS” section in the ”readme.txt” file in the c:\wlmf folder for any applicable information. The ATP test is to be performed on out-of-service sectors *only.* DO NOT substitute test equipment with other models not supported by the LMF.

Reduced ATP

NOTE	Equipment has been factory-tested for FCC compliance. If license-governing bodies require documentation supporting 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 Cellular Field Engineer (CFE) must perform these procedures (minimal 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 section (Table B-1) 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.

NOTE	Refer to Chapter 3 for detailed information on test set connections for calibrating equipment, cables and other test set components, if required.

Customer requirements determine which ATP tests are to be performed and the field engineer selects the appropriate ATP tests to run.

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

- **All TX:** TX tests verify the performance of the BTS transmit line up. These include the GLI3, MCC, BBX, and CIO cards, the LPAs and passive components including splitters, combiners, bandpass filter, and RF cables.
- **All RX:** RX tests verify the performance of the BTS receiver line up. These includes the MPC (for starter frames), EMPC (for expansion frames), CIO, BBX, MCC, and GLI3 cards and the passive components including RX filter (starter frame only), and RF cables.
- **All TX/RX:** Executes all the TX and RX tests.
- **Full Optimization:** Executes the TX calibration, download BLO, and TX audit before running all of the TX and RX tests.

4

ATP Test Prerequisites

Before attempting to run *any* ATP tests, ensure the following:

- BTS has been optimized and calibrated (see Chapter 3).
- LMF is logged into the BTS.
- CSMs, GLI3s, BBXs, MCCs and TSU (if the RFDS is installed)have correct code load and data load
- Primary CSM and GLI3 are INS_ACT
- MCCs are INS_ACT.
- BBXs are OOS-RAM.
- BBXs are calibrated and BLOs are downloaded.
- Test cables are calibrated.
- Test equipment is selected.
- Test equipment is connected for ATP tests.
- Test equipment has been warmed up 60 minutes and calibrated.
- GPIB is on.

WARNING	Before the FER is run, be sure that all LPAs are turned OFF (circuit breakers pulled) or that all transmitter ports are properly terminated. All transmit ports must be properly terminated for all ATP tests. Failure to observe these warnings may result in bodily injury or equipment damage.

TX/RX OUT Connections

NOTE	Table:note. Note 10pt Helvetica Many of the acceptance test procedures require taking measurements at the **TX OUT** (BTS/RFDS) connector. At sites with RFDS, all measurements are through the RFDS directional coupler **TX OUT** connector.

ATP Test Procedure

There are three different ATP testing options that can be performed to completely test a BTS. Depending on your requirements, one of the following ATP testing options should be run. Table 4-1 provides the procedure to execute an ATP test. To completely test a BTS, run the ATP tests according to one of the following ATP testing options.

4

ATP Testing Option 1

- **All TX/RX** test

ATP Testing Option 2

- **All TX** test
- **All RX** test

ATP Testing Option 3

- **TX Mask** test
- **Rho** test
- **Pilot Time Offset** test
- **Code Domain Power** test
- **FER** test

NOTE	The Full Optimization test can be run if you want the TX path calibrated before all the TX and RX tests are run.

NOTE	If manual testing has been performed with the HP analyzer, remove the manual control/system memory card from the card slot and set the **IO CONFIG** to the **Talk & Listen** mode before starting the automated testing.

CDMA 2000 Testing

Software release 2.16.x supports two new pieces of test equipment. These are the Agilent E4406A with E4432B, as well as the Advantest R3267 with R3562. The E4406A/E4432B pair, or the R3267/R3562 pair, should be connected together using a GPIB cable. This test equipment is capable of performing tests in both IS95 mode as well as cdma2000 mode if the required options are installed:

The HP 8935 with option 200 or R2k for 1X TX and with Agilent E4432B Signal Generator for 1X FER (see note for options).

NOTE	E4432B Signal Generator” for 1X FER. The options are: UN8-Real Time I/Q Baseband Generator 1E5-High Stability Timebase 201-Real Time CDMA2000

Individual Acceptance Tests

The following individual ATP tests can be used to verify the results of specific tests:

Spectral Purity TX Mask

This test verifies that the transmitted CDMA carrier waveform, generated on each sector, meets the transmit spectral mask specification with respect to the assigned CDF file values.

Waveform Quality (rho)

This test verifies that the transmitted Pilot channel element digital waveform quality (rho) exceeds the minimum specified value in ANSI-J_STD-019. "*Rho*" represents the correlation between actual and perfect CDMA modulation spectrum. A rho value of 1.0000 represents 100% (or perfect correlation).

Pilot Time Offset

The Pilot Time Offset is the difference between the CDMA analyzer measurement interval (based on the BTS system time reference) and the incoming block of transmitted data from the BTS (Pilot only, Pilot Gain = 262, PN Offset = 0).

Code Domain Power

This test verifies 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** .

Frame Error Rate

The Frame Error Rate (FER) test verifies RX operation of the entire CDMA Reverse Link using all equipped MCCs assigned to all respective sector/antennas. The test verifies the BTS sensitivity on all traffic channel elements currently configured on all equipped MCCs at an RF input level of -119 dBm (or -116 dBm if using TMPC). Follow the procedure in Table 4-1 to perform any ATP test.

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

ATP Test Procedure

Table 4-1 describes the step-by-step procedures to run any APT Test.

Table 4-1: ATP Test Procedure

Step	Action
1	Select the device(s) to be tested.
2	From the **Tests** menu, select the desired test.
3	Select the appropriate carrier(s) (carrier - bts# - sector# - carrier#) displayed in the **Channels/Carrier** pick list. To select multiple items, hold down the **<Shift>** or **<Ctrl>** key while making the selections.
4	Type the appropriate channel number in the **Carrier n Channels** box. The default channel number displayed is determined by the **CdmaChans[n]** number in the **cbsc-n.cdf** file for the BTS.
5	If applicable, select Verify BLO (default) or Single-sided BLO. **NOTE** Single-sided BLO is only used when checking non-redundant transceivers.
6	For RX select the appropriate RX branch (Both, Main, or Diversity) in the drop-down list.
7	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 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: Pilot (default), CDF, CDFPilot or Standard.
9	Click **OK**. The status report window and a **Directions** pop-up are displayed.
10	Follow the cable connection directions as they are displayed.
11	Click **Save Results** or **Dismiss** to close the status report window. If **Dismiss** is used the test results will not be saved in the test report file.

Background: Tx Mask Test

This test verifies the spectral purity of each BBX2 carrier keyed up at a specific frequency, *per the current CDF file assignment*. All tests are performed using the external calibrated test set, controlled by the same command. All measurements are through the appropriate **TX OUT** (BTS/RFDS) connector.

The Pilot Gain is set to 541 for each antenna and all channel elements from the MCCs are forward-link disabled. The BBX2 is keyed up, using both bbxlvl and bay level offsets, to generate a CDMA carrier (with pilot channel element only). BBX2 power output is set to obtain +40 dBm as measured at the **TX OUT** connector (on either the BTS or RFDS directional coupler).

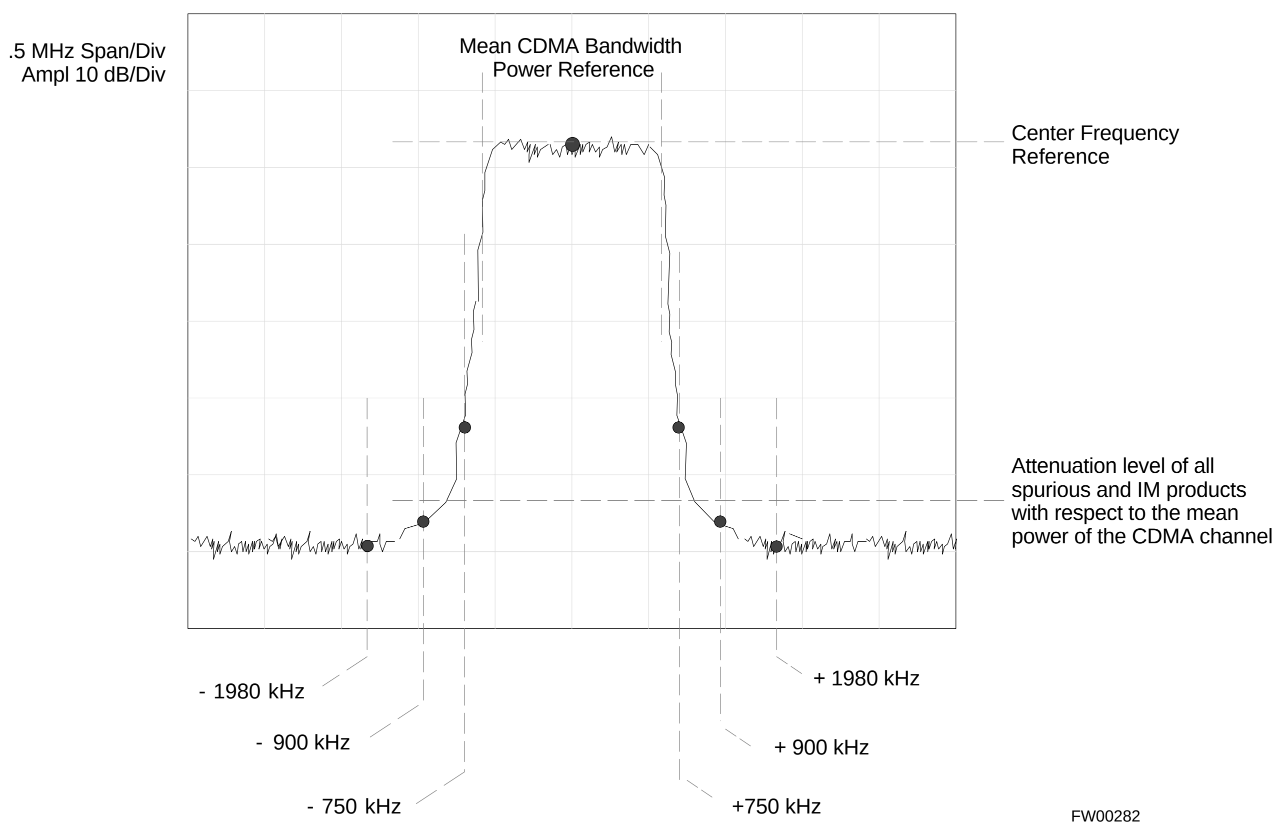
NOTE	TX output power is set to +40 dBm by setting BTS power level to +33.5 dBm to compensate for 6.5 dB increase from pilot gain set to 541.

The calibrated communications test set measures and returns the attenuation level of all spurious and IM products in a 30 kHz resolution bandwidth with respect to the mean power of the CDMA channel, measured in a 1.23 MHz bandwidth, in dB, verifying that results meet system tolerances at the following test points:

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

The BBX2 then de-keys, and, if selected, the MCC is re-configured to assign the applicable redundant BBX2 to the current TX antenna path under test. The test is then repeated.

Figure 4-1: TX Mask Verification Spectrum Analyzer Display



Background: Rho Test

This test verifies the transmitted Pilot channel element digital waveform quality of each BBX2 carrier keyed up at a specific frequency *per the current CDF file assignment*. All tests are performed using the external calibrated test set controlled by the same command. All measurements are via the appropriate **TX OUT** (BTS/RFDS) connector.

The Pilot Gain is set to 262 for each antenna, and all channel elements from the MCCs will be forward link disabled. The BBX2 is keyed up using both bbxlvl and bay level offsets, to generate a CDMA carrier (with pilot channel element only, Walsh code 0). BBX2 power output is set to 40 dBm as measured at the **TX OUT** connector (on either the BTS or RFDS directional coupler).

The calibrated communications test set measures and returns the Pilot channel element digital waveform quality (rho) in dB, verifying that result meets system tolerances. Waveform quality (rho) should be

≥ 0.912 (-0.4 dB).

The BBX2 then de-keys and the applicable redundant BBX2 is assigned to the current TX antenna path under test. The test is then repeated.

The LMF Tests menu list item, **Rho,** performs the waveform quality test for a XCVR(s). All measurements are made through the appropriate TX output connector using the calibrated TX cable setup.

Background: Pilot Offset Acceptance Test

This test verifies the transmitted Pilot channel element Pilot Time Offset of each BBX2 carrier keyed up at a specific frequency *per the current CDF file assignment*. All tests are performed using the external calibrated test set controlled by the same command. All measurements will be via the appropriate **TX OUT** (BTS/RFDS) connector.

The Pilot Gain is set to 262 for each antenna and all TCH elements from the MCCs are forward link disabled. The BBX is keyed up using both bbxlvl and bay level offsets to generate a CDMA carrier (with pilot channel element only, Walsh code 0). BBX power output is set to 40 dBm as measured at the **TX OUT** connector (on either the BTS or RFDS directional coupler).

The calibrated communications test set measures and returns the Pilot Time Offset in uS, verifying results meet system tolerances. Pilot Time Offset should be within ≤ **3 μs** of the target PT Offset (0 μS).

The BBX2 then de-keys, and the applicable redundant BBX2 is assigned to the current TX antenna path under test. The test is then repeated.

Background: Code Domain Power Test

This test verifies the Code Domain Power/Noise of each BBX2 carrier keyed up at a specific frequency *per the current CDF file assignment*. All tests are performed using the external calibrated test set controlled by the same command. All measurements are via the appropriate **TX OUT** (BTS/RFDS) connector.

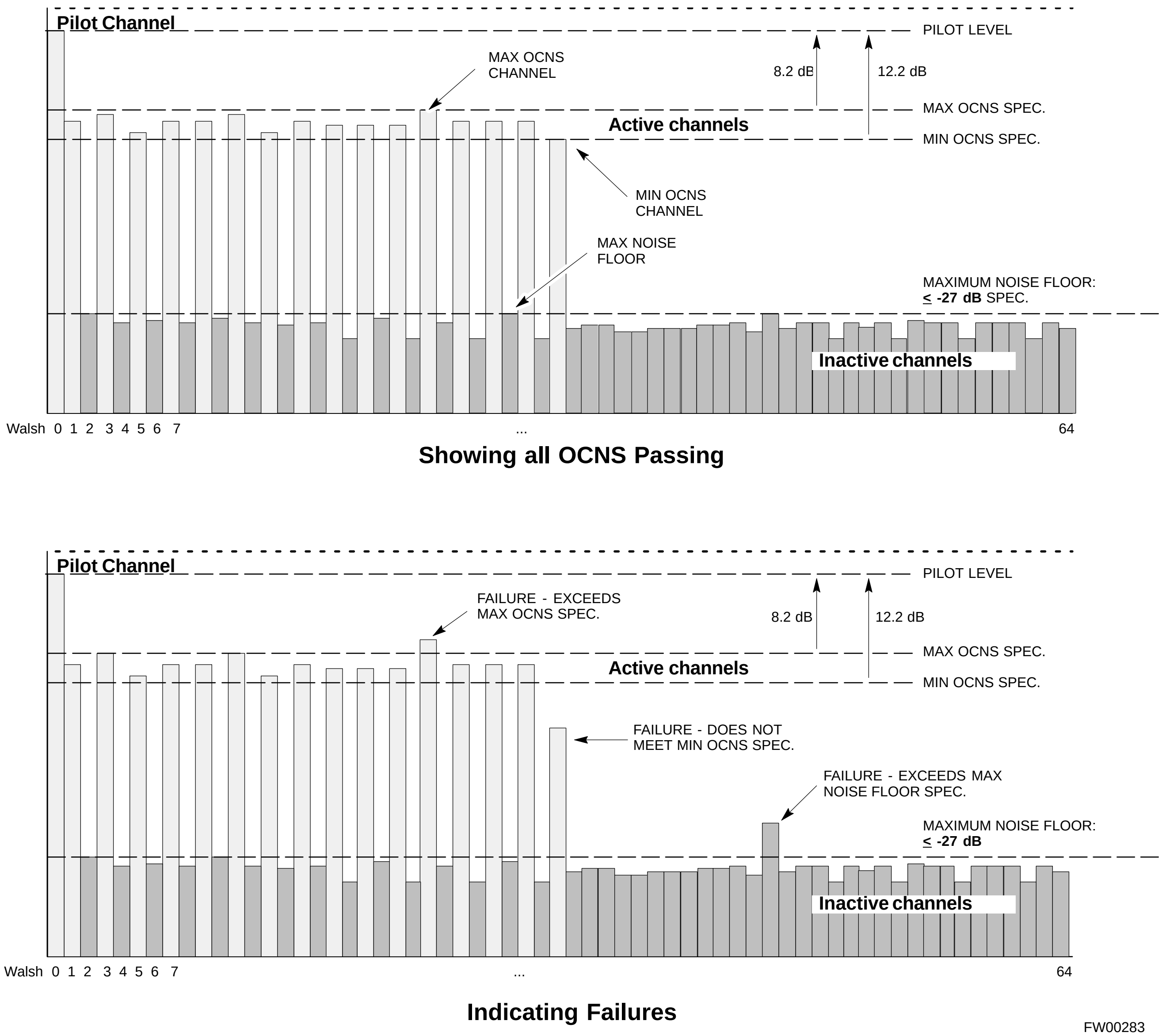
For each sector/antenna under test, the Pilot Gain is set to 262 and all MCC channel elements under test are configured to generate Orthogonal Channel Noise Source (OCNS) on different odd Walsh codes, and are assigned a full-rate gain of 81. The maximum number of MCC/CEs to be tested at any one time is 32 (32 odd Walsh codes). If more than 32 CEs exist, then multiple sets of measurements are made, so all channel elements are verified on all sectors.

BBX2 power output is set to 40 dBm as measured at the **TX OUT** connector (on either the BTS or RFDS directional coupler).

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

The BBX2 then de-keys and, the applicable redundant BBX2 is assigned to the current TX antenna path under test. The test is then repeated. Upon completion of the test, OCNS is disabled on the specified MCC/CE.

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



Background: FER Test

This test verifies the BTS FER on *all* traffic channel elements currently configured on *all* equipped MCCs (full rate at 1% FER) at an RF input level of -119 dBm [or -116 dBm if using Tower Top Amplifier (TMPC)]. All tests are performed using the external calibrated test set as the signal source controlled by the same command. All measurements will be via the LMF.

The pilot gain is set to 262 for each TX antenna and all channel elements from the MCCs are forward-link disabled. The BBX2 is keyed up using only bbxlvl level offsets, to generate a CDMA carrier (with pilot channel element only). BBX2 power output is set to -20 dBm as measured at the **TX OUT** connector (on either the BTS or RFDS directional coupler). The BBX2 must be keyed in order to enable the RX receive circuitry.

The LMF prompts the MCC/CE under test to measure all zero longcode and provide the FER report on the selected active MCC on the reverse link for both the main and diversity RX antenna paths, verifying the results meet the following specification: FER returned less than **1%** and total frames measured is **1500**.

All MCC/CEs selected are tested on the specified RX antenna path. The BBX then de-keys and, the applicable redundant BBX2 is assigned to the current RX antenna paths under test. The test is then repeated.

Background

Each time an ATP test is run, an ATP report is updated to include the results of the most recent ATP tests if the **Save Results** button is used to close the status report window. The ATP report *will not* be updated if the status reports window is closed with use of the **Dismiss** button.

ATP Report

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

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

Follow the procedure in the Table 4-2 to view and create a printable file for the ATP report of a BTS.

Table 4-2: Generate an ATP Report

Step	Action
1	Click on the **Login** tab if it is not in the forefront.
2	Select the desired BTS from the **Available Base Stations** pick list.
3	Click on the **Report** button.
4	Sort the report if desired by clicking on a column heading.
5	Click on the **Dismiss** button if you do not want to create a printable file copy.
6	To create a printable file, select the desired file type in the picklist and then click on the **Save** button.

Notes

Chapter 5

Prepare to Leave the Site

5

Initializing Active Service

External Test Equipment Removal

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

Table 5-1: External Test Equipment Removal

Step	Action
1	Disconnect all external test equipment from all TX and RX connectors at the rear of the frame.
2	Reconnect and visually inspect all TX and RX antenna feed lines at the rear of the frame.

CAUTION	Verify all sector antenna feed lines are connected to the correct ports on the frame. Crossed antenna cables will cause system degradation of call processing.

Reset All Devices

5

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

Updating BTS CAL LMF Files in the CBSC

Updated CAL file information is moved from the LMF Windows environment back to the CBSC which resides in a Unix environment. The procedures that follow detail how to move files from the Windows environment to the CBSC.

Copying CAL files from LMF to a Disk

Follow the procedures in Table 5-2 to copy CAL files from a LMF computer to a 3.5 diskette.

Table 5-2: Copy Files from LMF to a Diskette

Step	Action
1	Insert a disk into your Windows A drive.
	NOTE If your disk has not been formatted, format it using Windows. The disk must be DOS formatted before copying any files. Consult your Windows/DOS documentation or online helps on how to format diskettes.
2	Click on the **Start** button and launch the **Windows Explorer** program from your **Programs** menu list.
3	Click on your **C:** drive.
4	Double Click on the **wlmf** folder.
5	Double Click on the **CDMA** folder.

Table 5-2: Copy Files from LMF to a Diskette	
Step	**Action**
6	Click on the **bts-#** folder for the calibration file you want to copy.
7	Drag the **BTS-#.cal** file to the 3-1/2 floppy (A:) icon on the top left of the screen and release the mouse button.
8	Continue step 6 and 7 until you have copied each file desired and close the Windows Explorer program by selecting **Close** from the **File** menu option.

Copying CAL files from diskette to the CBSC

Follow the procedure in Table 5-3 to copy CAL files from a diskette to the CBSC.

Table 5-3: Copy CAL Files From Diskette to the CBSC	
Step	**Action**
1	Log into the CBSC workstation.
2	Place your diskette containing CAL file(s) in the CBSC workstation diskette drive.
3	Enter **eject -q** and press the **Enter** key.
4	Enter **mount** and press the **Enter** key. Verify that **floppy/no_name** is displayed.
	NOTE If the **eject** command has been previously entered, **floppy/no_name** will be appended with a number. Use the explicit floppy/no_name reference displayed.
5	Enter **cd /floppy/no_name** and press the **Enter** key.
6	Enter **ls -lia** and press the **Enter** key. Verify that the **bts-#.cal** file is on the disk.
7	Enter **cd** and press the **Enter** key.
8	Enter **pwd** and press the **Enter** key. Verify that you are in your home directory (/home/<name>).
9	Enter **dos2unix /floppy/no_name/bts-#.cal bts-#.cal** and **press** the Enter key (where # is the BTS number).
10	Enter **ls -l *.cal** and press the **Enter** key. Verify that the CAL file was successfully copied.
11	Enter **eject** and press the **Enter** key.
12	Remove the floppy disk from the workstation.

5

BTS Site Span Configuration Verification

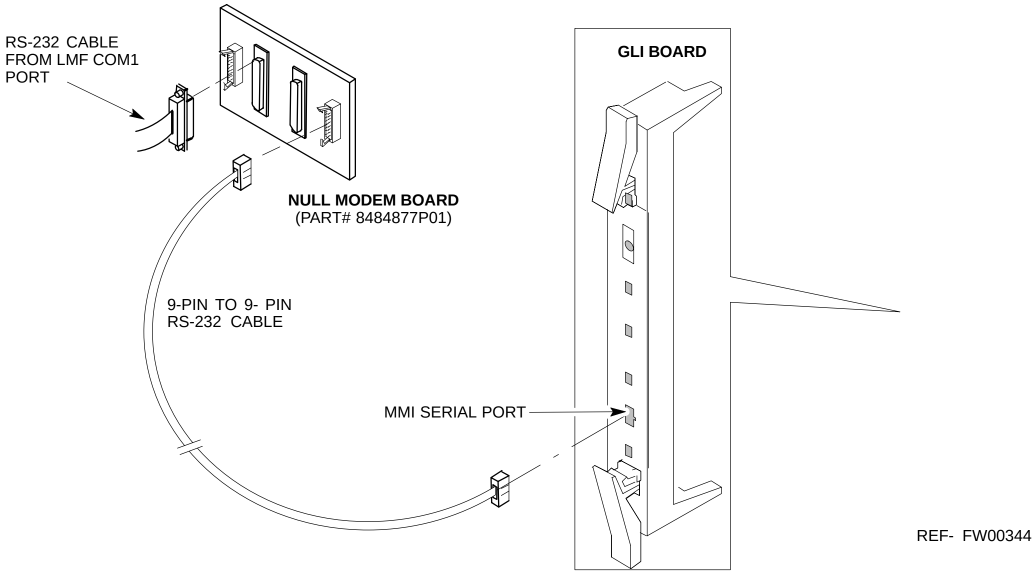
Perform the procedure in Table 5-4 to verify the current Span Framing Format and Line Build Out (LBO) parameters. *ALL* MGLI3/SGLI3 boards in all C-CCP shelves that terminate a T1/E1 span should be verified.

Table 5-4: BTS Span Parameter Configuration	
Step	**Action**
1	Connect a serial cable from the LMF COM1 port (via null modem board) to the front panel of the MGLI3 MMI port (see Figure 5-1).
2	Start an MMI communication session with CSM-1 by using the Windows desktop shortcut icon. **NOTE** The LMF program must not be running when a Hyperterminal session is started if COM1 is being used for the MMI session.

3	Enter the following MMI command to display the current MGLI3/SGLI3 framing format and line code configuration (in bold type):
	span view <cr>
	Observe a display similar to the options shown below:
	`COMMAND ACCEPTED:  span view`
	
	`The parameter in NVM is set to T1_2.`
	
	`The frame format in flash is set to use T1_2.`
	`Equalization:`
	`  Span A - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
	`  Span B - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
	`  Span C - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
	`  Span D - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
	`  Span E - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
	`  Span F - Default (0-131 feet for T1/J1, 120 Ohm for E1)`
	
	`Linkspeed: Default (56K for T1 D4 AMI, 64K otherwise)`
	`Currently, the link is running at the default rate`
	`The actual rate is 0`
	
	NOTE
	Defaults for span equalization are 0-40 m for T1/J1 spans and 120 Ohm for E1.
	Default linkspeed is 56K for T1 D4 AMI spans and 64K for all other types.
	There is no need to change from defaults unless the OMC-R/CBSC span configuration requires it.
	If the current MGLI3/SGLI3 framing format and line code configuration does not display the correct choice, proceed to Table 5-5.

4	Repeat steps 1 through 3 for all remaining GLIs.
5	Exit the GLI MMI session and HyperTerminal connection by selecting **File** from the connection window menu bar, and then **Exit** from the dropdown menu.

Figure 5-1: MGLI3/SGLI3 MMI Port Connection



Set BTS Site Span Configuration

Perform the procedure in Table 5-5 to configure the Span Framing Format and Line Build Out (LBO) parameters. *ALL* MGLI3/SGLI3 boards in all C-CCP shelves that terminate a T1/E1 span must be configured.

NOTE	Perform the following procedure *ONLY* if span configurations loaded in the MGLI3/GLI3s do not match those in the OMCR/CBSC data base, *AND ONLY* when the exact configuration data is available. Loading incorrect span configuration data will render the site inoperable.

Table 5-5: Set BTS Span Parameter Configuration

Step	Action
1	If not already done, connect a serial cable from the LMF COM1 port (via null modem board) to the front panel of the MGLI3 MMI port (see Figure 5-1).
2	Start an MMI communication session with CSM-1 by using the Windows desktop shortcut icon (see Table 3-5 on page 3-17). **NOTE** The LMF program must not be running when a Hyperterminal session is started if COM1 is being used for the MMI session.

. . . continued on next page

Table 5-5: Set BTS Span Parameter Configuration

Step	Action

3	*If required only*, enter the following MMI command for each span line to set the BTS span parameters to match that of the physical spans *a* - *f* run to the site:
	span_config *<option#1> <option#2> <option#3> <option#4> <option#5>*
	option#1 = the span to change (**a** - **f**)
	option#2 = the span type (**0** - **8**):
	0 - E1_1 (HDB3, CCS, CRC-4)
	1 - E1_2 (HDB3, CCS)
	2 - E1_3 (HDB3, CAS, CRC-4, TS16)
	3 - E1_4 (HDB3, CAS, TS16)
	4 - T1_1 (AMI, DS1 AT&T D4, without ZCS, 3 to 1 packing, Group 0 unusable)
	5 - T1_2 (B8ZS, DS1 AT&T ESF, 4 to 1 packing, 64K link)
	6 - J1_1 (B8ZS, J1 AT&T ESF, Japan CRC6, 4 to 1 packing)
	7 - J1_2 (B8ZS, J1 AT&T ESF, US CRC6, 4 to 1 packing)
	8 - T1_3 (AMI, DS1 AT&T D4, with ZCS, 3 to 1 packing, Group 0 unusable)
	option#3 = the link speed (**56** or **64**) Kbps
	option#4 = the span equalization (**0** - **7**):
	0 - T1_6 (T1,J1:long haul)
	1 - T1_4 (T1,J1:393-524 feet)
	2 - T1_4 (T1,J1:131-262 feet)
	3 - E1_75 (E1:75 Ohm)
	4 - T1_4 (T1,J1:0-131 feet)
	5 - T1_4 (T1,J1:524-655 feet)
	6 - T1_4 (T1,J1:262-393 feet)
	7 - E1_120 (E1:120 Ohm)
	option#5 = the slot that has LAPD channel (**0** - **31**)
	Example for setting span configuration to E1_2, 64 Kbps, E1_120-Ohm, LAPD channel 1:
	`span_config a 1 64 7 1`
	.
	.
	`span_config f 1 64 7 1`
	Example for setting span configuration to T1_2, 64 Kbps, T1_4 (0-131 feet), LAPD channel 0:
	`span_config a 5 64 4 0`
	.
	.
	`span_config f 5 64 4 0`
	*** IMPORTANT**
	Make sure that spans *a* - *f* are set to the same span type and link speed. The equalization may be different for each individual span.
	After executing the **span_config** command, the affected MGLI3/SGLI3 board MUST be reset and re-loaded for changes to take effect.
	Although defaults are shown, always consult site specific documentation for span type and rate used at the site.

4	Press the RESET button on the GLI3 for changes to take effect.

. . . continued on next page

Table 5-5: Set BTS Span Parameter Configuration	
Step	**Action**
5	This completes the site specific BTS Span setup for this GLI. Move the MMI cable to the next SGLI3 and repeat steps 1 and 4 for *ALL* MGLI3/SGLI3 boards.
6	Terminate the Hyperterm session and disconnect the LMF from the MGLI/SGLI.

Re-connect BTS T1 Spans and Integrated Frame Modem

Before leaving the site, connect any T1 span TELCO connectors which were removed to allow the LMF to control the BTS. Refer to Table 5-6.

Table 5-6: T1/E1 Span/IFM Connections	
Step	**Action**
1	Connect the surge protectors on the 50-pin punch block for the spans.
2	Ensure that the CSU is powered **ON**.
3	Verify the span status.

LMF Removal

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

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

Table 5-7: Terminate the LMF Session and Remove the LMF	
Step	**Action**
1	From the CDMA window select **File>Exi**t.
2	From the Windows Task Bar click **Start>Shutdown**. Click **Yes** when the Shut Down Windows message appears.
3	Disconnect the LMF terminal Ethernet connector from the BTS cabinet.
4	Disconnect the LMF serial port, the RS-232 to GPIB interface box, and the GPIB cables as required for equipment transport.

Reestablish OMC-R Control/ Verifying T1/E1

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

5

MOTOROLA

Chapter 6

Troubleshooting

6

Troubleshooting

Overview

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

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

Cannot Log into Cell-Site

Follow the procedure in Table 6-1 to troubleshoot any Login Failure problem during normal operation.

Table 6-1: Login Failure Troubleshooting Procedure

✓	Step	Action
	1	If MGLI3 LED is solid RED, it implies a hardware failure. Reset MGLI3 by re-seating it. If this persists, install RGLI3 card in MGLI3 slot and retry. A Red LED may also indicate no Ethernet termination at top of frame.
	2	Verify that T1 is disconnected at the Channel Signaling Unit (CSU). If T1 is still connected, verify the CBSC has disabled the BTS.
	3	Try *'ping'*ing the MGLI3.
	4	Verify the LMF is connected to the **Primary** LMF port (LAN A) in front of the BTS.
	5	Verify the LMF was configured properly.
	6	Verify the BTS-LMF cable is RG-58 (flexible black cable of less than 2.5 feet length).
	7	Verify the Ethernet ports are terminated properly.
	8	Verify a T-adapter is not used on LMF side port if connected to the BTS front LMF primary port.
	9	Try connecting to the I/O panel (back of frame). Use Tri-Ax to BNC adapter at the LMF port for this connection.
	10	Re-boot the CDMA LMF and retry.
	11	Re-seat the MGLI3 and retry.
	12	Verify IP addresses are configured properly.

Cannot Communicate to Power Meter

Follow the procedure in Table 6-2 to troubleshoot a power meter communication failure.

Table 6-2: Troubleshooting a Power Meter Communication Failure

✓	Step	Action
	1	Verify Power Meter is connected to LMF with GPIB adapter.
	2	Verify cable setup as specified in Chapter 3.
	3	Verify the GP-IB address of the Power Meter is set to *13*. Refer to Test Equipment setup section of Chapter 3 for details.
	4	Verify that Com1 port is not used by another application.
	5	Verify that the communications analyzer is in Talk&Listen, not Control mode.

Cannot Communicate to Communications Analyzer

Follow the procedure in Table 6-3 to troubleshoot a communication analyzer failure.

Table 6-3: Troubleshooting a Communications Analyzer Communication Failure

✓	Step	Action
	1	Verify analyzer is connected to LMF with GPIB adapter.
	2	Verify cable setup.
	3	Verify the GPIB address is set to 18.
	4	Verify the GPIB adapter DIP switch settings are correct. Refer to Test Equipment setup section for details.
	5	Verify the GPIB adapter is not locked up. Under normal conditions, only 2 green LEDs must be ‘ON’ (Power and Ready). If any other LED is continuously ‘ON’, then power-cycle the GPIB Box and retry.
	6	If a Hyperterm window is open for MMI, close it.
	7	Verify the LMF GPIB address is set to 18
	8	Verify the analyzer is in Talk and Listen not Control mode.

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Code Download Failure

Follow the procedure in Table 6-4 to troubleshoot any code download failure.

Table 6-4: Troubleshooting Code Download Failure

✓	Step	Action
	1	Verify T1 is disconnected from the BTS at CSU.
	2	Verify LMF can communicate with the BTS device using the Status function.

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Table 6-4: Troubleshooting Code Download Failure		
✓	Step	Action
	3	Communication to MGLI3 must first be established before trying to talk to any other BTS device. MGLI3 must be INS_ACT state (green).
	4	Verify the card is physically present in the cage and powered-up.
	5	If card LED is solid RED, it implies hardware failure. Reset card by re-seating it. If this persists, replace card from another slot & retry. **NOTE** The card can only be replaced by a card of the same type.
	6	Re-seat card and try again.
	7	If BBX reports a failure message and is OOS_RAM, the code load was OK. Status it.
	8	If the download portion completes and the reset portion fails, reset the device by selecting the device and reset.

Cannot Download DATA to Any Device (Card)

Follow the procedure in Table 6-5 to troubleshoot any data download failure.

Table 6-5: 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 Chapter 3, “Download the BTS” for more information.

Cannot ENABLE Device

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

The three states that devices can be displayed:

- Enabled (green, INS)
- Disabled (yellow, OOS_RAM)
- Reset (blue, OOS_ROM)

Follow the procedure in Table 6-6 to troubleshoot device enable failure.

Table 6-6: 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 file has correct latitude and longitude data for cell site location and GPS sync.

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Table 6-6: Troubleshooting Device Enable (INS) Failure		
✓	**Step**	**Action**
	3	Ensure primary CSM is in INS_ACT state. **NOTE** MCCs will not go INS without the CSM being INS.
	4	Verify 19.6608 MHz CSM clock; MCCs will not go INS otherwise.
	5	The BBX should not be enabled for ATP tests.
	6	If MCCs give "invalid or no system time," verify the CSM is enabled.

LPA Errors

Follow the procedure in Table 6-7 to troubleshoot any LPA errors.

Table 6-7: LPA Errors		
✓	**Step**	**Action**
	1	If LPAs continue to give alarms, even after cycling power at the circuit breakers, then connect an MMI cable to the LPA and set up a Hyperterminal connection. Enter **ALARMS** in the Hyperterminal window. The resulting LMF display may provide an indication of the problem. (Call Field Support for further assistance.)

Bay Level Offset Calibration Failure

Follow the procedure in Table 6-8 to troubleshoot a BLO calibration failure.

Table 6-8: Troubleshooting BLO Calibration Failure		
✓	**Step**	**Action**
	1	Verify the Power Meter is configured correctly (see the test equipment setup section) and connection is made to the proper TX port.
	2	Verify the parameters in the bts-#.cdf file are set correctly for the following bands: For 1900 MHz: BandClass=1; FreqBand=16 For 800 MHz: BandClass=0; FreqBand=8
	3	Verify that no LPA in the sector is in alarm state (flashing red LED). Reset the LPA by pulling the circuit breaker, and after 5 seconds, pushing back in.
	4	Re-calibrate the Power Meter and verify it is calibrated correctly with cal factors from sensor head.
	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	Verify sensor head is functioning properly by checking it with the 1 mW (0 dBm) Power Ref signal.

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Table 6-8: Troubleshooting BLO Calibration Failure		
✓	**Step**	**Action**
	7	If communication between the LMF and Power Meter is operational, the Meter display will show "*RES :*"
	8	Verify the combiner frequency is the same as the test freq/chan.

Calibration Audit Failure

Follow the procedure in Table 6-9 to troubleshoot a calibration audit failure.

Table 6-9: Troubleshooting Calibration Audit Failure		
✓	**Step**	**Action**
	1	Verify Power Meter is configured correctly (refer to the test equipment setup section of chapter 3).
	2	Re-calibrate the Power Meter and verify it is calibrated correctly with cal factors from sensor head.
	3	Verify that no LPA is in alarm state (rapidly flashing red LED). Reset the LPA by pulling the circuit breaker, and, after 5 seconds, pushing back in.
	4	Verify that no sensor head is functioning properly by checking it with the 1 mW (0 dBm) Power Ref signal.
	5	After calibration, the BLO data must be re-loaded to the BBX2s before auditing. Click on the BBX(s) and select **Device>Download BLO** Re-try the audit.
	6	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 GP-IB Box and retry.

Forward link problem

If the BTS passes the reduced ATP tests but has a forward link problem during normal operation follow the procedure in Table 6-10 to troubleshoot.

Table 6-10: Troubleshooting Forward Link Failure (BTS Passed Reduced ATP)		
✓	**Step**	**Action**
	1	Perform these additional TX tests to troubleshoot a forward link problem: - TX mask - TX rho - TX code domain

Cannot Perform Txmask Measurement

Follow the procedure in Table 6-11 to troubleshoot a TX Mask Measurement failure.

Table 6-11: Troubleshooting TX Mask Measurement Failure

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

Cannot Perform Rho or Pilot Time Offset Measurement

Follow the procedure in Table 6-12 to troubleshoot a rhoand pilot time offset measurement failure.

Table 6-12: 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 MGLI3 data and repeat the test.
	4	If performing manual measurement, verify analyzer setup.
	5	Verify that no LPA in the sector is in alarm state (flashing red LED). Reset the LPA by pulling the circuit breaker, and, after 5 seconds, pushing back in.
	6	If Rho value is unstable and varies considerably (e.g. .95,.92,.93), this may indicate that the GPS is still phasing (i.e. trying to reach and maintain 0 freq. error). Go to the freq. bar in the upper right corner of the Rho meter and select Hz. Press <Shift-avg> and enter 10, to obtain an average Rho value. This is an indication the GPS has not stabilized before going *INS* and may need to be re-initialized.

Cannot Perform Code Domain Power and Noise Floor Measurement

Follow the procedure in Table 6-13 to troubleshoot code domain and noise floor measurement failure.

Table 6-13: Troubleshooting Code Domain Power and Noise Floor Measurement Failure

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

Cannot Perform Carrier Measurement

Follow the procedure in Table 6-14 to troubleshoot carrier measurement failure.

Table 6-14: Troubleshooting Carrier Measurement Failure

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

Multi-FER Test Failure

Follow the procedure in Table 6-15 to troubleshoot multi-FER failure.

Table 6-15: Troubleshooting Multi-FER Failure

✓	Step	Action
	1	Verify test equipment set up is correct for a FER test.
	2	Verify test equipment is locked to 19.6608 and even second clocks. 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 (one 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 directions messages.

Problem Description

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

Intermittent 19.6608 MHz Reference Clock/GPS Receiver Operation

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

No GPS Reference Source

Check the CSM boards for proper hardware configuration. 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 (R-GPS) - 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.

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 source configuration performed in the field by software download. CSM kit SGLN1145 and SGLN4132 must have proper reference sources configured (as shown below) to function correctly.

CSM Kit No.	Hardware Configuration	CSM Slot No.	Reference Source Configuration
SGLN1145	With GPS Receiver	1	Primary = Local GPS Backup = Either LFR or HSO
SGLN4132ED or later	Without GPS Receiver	2	Primary = Remote GPS Backup = Either LFR or HSO

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 GSM system time/GPS and LFR/HSO verification section in Chapter 3. At least 1 satellite should be visible and tracked for the “surveyed” mode and 4 satellites should be visible and tracked for the “estimated” mode. Also, verify correct base site position data used in “surveyed” mode.

C-CCP Backplane

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

Connector Functionality

The following connector overview describes the major types of backplane connectors along with the functionality of each. This will allow the Cellular Field Engineer (CFE) to:

- Determine which connector(s) is associated with a specific problem type.
- Allow the isolation of problems to a specific cable or connector.

Primary “A” and Redundant “B” ISB (Inter Shelf Bus) connectors

The 40 pin ISB connectors provide an interface bus from the master GLI3 to all other GLI3s in the modem frame. Its basic function is to provide clock synchronization from the master GLI3 to all other GLI3s in the frame.

The ISB is also provides the following functions:

- Groom span line when a single span is used for multiple cages.
- Provide MMI connection to/from the master GLI3 to cell site modem.
- Provide interface between GLI3s and the AMR (for reporting BTS alarms).

Span Line Connector

The span line input is an 8 pin RJ-45 connector that provides a primary and secondary (if used) span line interface to each GLI3 in the C-CCP shelf. The span line is used for MM/EMX switch control of the Master GLI3 and also all the BBX traffic.

Power Input (Return A, B, and C connectors)

Provides a +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 C-CCP backplane. These include a VCC/Ground input connector, a Harting style multiple pin interface, and a +15 V/Analog Ground output connector. The Transceiver Power Module converts 27/48 Volts to a regulated +15, +6.5, +5.0 Volts to be used by the C-CCP shelf cards.

GLI3 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 GLI3s in the C-CCP backplane.

GLI3 Ethernet "A" and "B" Connections

These BNC connectors are located on the C-CCP backplane and routed to the GLI3 board. This interface provides all the control and data communications between the master GLI3 and the other GLI3, between gateways, and for the LMF on the LAN.

BBX2 Connector

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

CIO Connectors

- RX RF antenna path signal inputs are routed through RX Tri-Filters (on the I/O plate), and via coaxial cables to the two MPC modules - the six "A" (main) signals go to one MPC; the six "B" (diversity) to the other. The MPC outputs the low-noise-amplified signals via the C-CCP backplane to the CIO where the signals are split and sent to the appropriate BBX.
- A digital bus then routes the baseband signal through the BBX, to the backplane, then on to the MCC slots.
- Digital TX antenna path signals originate at the MCC24s. Each output is routed from the MCC slot via the backplane appropriate BBX.
- TX RF path signal originates from the BBX, through the backplane to the CIO, through the CIO, and via multi-conductor coaxial cabling to the LPAs in the LPA shelf.

C-CCP Backplane Troubleshooting Procedure

The following table provides a standard procedure for troubleshooting problems that appear to be related to a defective C-CCP backplane. The table is broken down into possible problems and steps which should be taken in an attempt to find the root cause.

NOTE	It is important to note that all steps be followed before replacing ANY C-CCP backplane.

Digital Control Problems

No GLI3 Control via LMF (all GLI3s)

Follow the procedure in Table 6-16 for problems with GLI3 control.

Table 6-16: No GLI3 Control via LMF (all GLI3s)

Step	Action
1	Check the ethernet for proper connection, damage, shorts, or opens.
2	Verify C-CCP backplane Shelf ID DIP switch is set correctly.
3	Visually check the master GLI3 connector (both board and backplane) for damage.
4	Replace the master GLI3 with a known good GLI3.

No GLI3 Control through Span Line Connection (All GLI3s)

Follow the procedure in Table 6-17 for problems with GLI3 control.

Table 6-17: No GLI3 Control through Span Line Connection (Both GLI3s)

Step	Action
1	Verify C-CCP backplane Shelf ID DIP switch is set correctly.
2	Verify that the BTS and GLI3s are correctly configured in the OMCR/CBSC data base.
3	Visually check the master GLI3 connector (both board and backplane) for damage.
4	Replace the master GLI3 with a known good GLI3.
5	Check the span line inputs from the top of the frame to the master GLI3 for proper connection and damage.

MGLI3 Control Good - No Control over Co-located GLI3

Follow the procedure in Table 6-18 for problems with GLI3 control.

Table 6-18: MGLI3 Control Good - No Control over Co-located GLI3

Step	Action
1	Verify that the BTS and GLI3s are correctly configured in the OMCR CBSC data base.
2	Check the ethernet for proper connection, damage, shorts, or opens.
3	Visually check all GLI3 connectors (both board and backplane) for damage.
4	Replace the remaining GLI3 with a known good GLI3.

No AMR Control (MGLI3 good)

Follow the procedure in Table 6-19 for problems with AMR control.

Table 6-19: MGLI3 Control Good - No Control over AMR

Step	Action
1	Visually check the master GLI3 connector (both board and backplane) for damage.
2	Replace the master GLI3 with a known good GLI3.
3	Replace the AMR with a known good AMR.

No BBX Control in the Shelf

Follow the procedure in Table 6-20 for problems with co-located GLI3.

Table 6-20: MGLI3 Control Good - No Control over Co-located GLI3s

Step	Action
1	Visually check all GLI3 connectors (both board and backplane) for damage.
2	Replace the remaining GLI3 with a known good GLI3.
3	Visually check BBX connectors (both board and backplane) for damage.
4	Replace the BBX with a known good BBX.

No (or Missing) Span Line Traffic

Follow the procedure in Table 6-21 for problems with span line traffic.

Table 6-21: BBX Control Good - No (or Missing) Span Line Traffic	
Step	**Action**
1	Visually check all GLI3 connectors (both board and backplane) for damage.
2	Replace the remaining GLI3 with a known good GLI3.
3	Visually check all span line distribution (both connectors and cables) for damage.
4	If the problem seems to be limited to 1 BBX, replace the BBX with a known good BBX.

No (or Missing) MCC24 Channel Elements

Follow the procedure in Table 6-22 for problems with channel elements.

Table 6-22: 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 Power Supply Module

Follow the procedure in Table 6-23 for problems with DC input voltage.

Table 6-23: No DC Input Voltage to Power Supply Module

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

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No DC Voltage (+5, +6.5, or +15 Volts) to a Specific GLI3, BBX2, or Switchboard

Follow the procedure in Table 6-24 for problems with DC input voltage.

Table 6-24: No DC Input Voltage to any C-CCP Shelf Module

Step	Action
1	Verify steps outlined in Table 6-23 have been performed.
2	Inspect the defective board/module (both board and backplane) connector for damage.
3	Replace suspect board/module with known good board/module.

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Follow the procedure in Table 6-25 for problems with DC input voltage.

Table 6-25: No DC Input Voltage to any C-CCP Shelf Module	
Step	**Action**
1	Inspect all Harting Cable connectors and back-plane connectors for damage in all the affected board slots.
2	Perform steps outlined in the RF path troubleshooting flowchart in this manual.

RFDS

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

Follow the procedure in Table 6-26 for problems with RFDS.

Table 6-26: RFDS Fault Isolation - All tests fail	
Step	**Action**
1	Check the 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 *BTS Site Installation* manual.
5	Verify RGLI and TSU have been downloaded.
6	Check to see that all RFDS boards show green on the front panel indicators. Visually check (both board and backplane) for damage.
7	Replace any boards that do not show green with known good boards one at a time in the following order. Re-test after each is replaced. - RFDS ASU board. - RFDS Transceiver board.

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. Refer to Table 6-27 for fault isolation procedures.

Table 6-27: RFDS Fault Isolation - All RX and TX paths fail

Step	Action
1	Visually check the master RF converter board (both board and backplane) for damage.
2	Replace the RF converter board with a known good RF converter board.
3	Visually check RXCVR TSU (both board and backplane) for damage.
4	Replace the TSU with a known good TSU.

All tests fail on a single antenna

If all path failures are on one antenna port, forward and/or reflected, follow the procedures in Table 6-28 checks.

Table 6-28: RFDS Fault Isolation - All tests fail on single antenna path

Step	Action
1	Visually inspect the site interface cabinet internal cabling to the suspect directional coupler antenna port.
2	Verify the forward and reflected ports connect to the correct RFDS antenna select unit positions on the RFDS backplane. Refer to the installation manual for details.
3	Visually check ASU connectors (both board and backplane) for damage.
4	Replace the ASU with a known good ASU.
5	Replace the RF cables between the affected directional coupler and RFDS. **NOTE** Externally route the cable to bypass suspect segment.

Module Status Indicators

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

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

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

LED Status Combs All Modules (except GLI3, CSM, BBX2, MCC8/24E)

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

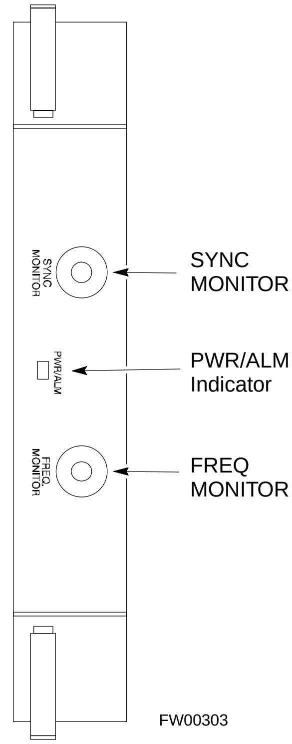
PWR/ALM LED

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

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



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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 TTL active high signal with a pulse width of 153 nanoseconds.

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

GLI3 LED Status Combinations

The GLI3 module has indicators, controls and connectors as described below and shown in Figure 6-2.

The indicators and controls consist of:

- Four LEDs
- One pushbutton

ACTIVE LED

Solid GREEN - GLI3 is active. This means that the GLI3 has shelf control and is providing control of the digital interfaces.

Off - GLI3 is not active (i.e., Standby). The mate GLI3 should be active.

MASTER LED

- Solid GREEN - GLI3 is Master (sometimes referred to as MGLI3).
- Off - GLI3 is non-master (i.e., Slave).

ALARM LED

- Solid RED - GLI3 is in a fault condition or in reset.
- While in reset transition, STATUS LED is OFF while GLI3 is performing ROM boot (about 12 seconds for normal boot).
- While in reset transition, STATUS LED is ON while GLI3 is performing RAM boot (about 4 seconds for normal boot).
- Off - No Alarm.

STATUS LED

- Flashing GREEN- GLI3 is in service (INS), in a stable operating condition.
- On - GLI3 is in OOS RAM state operating downloaded code.
- Off - GLI3 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.

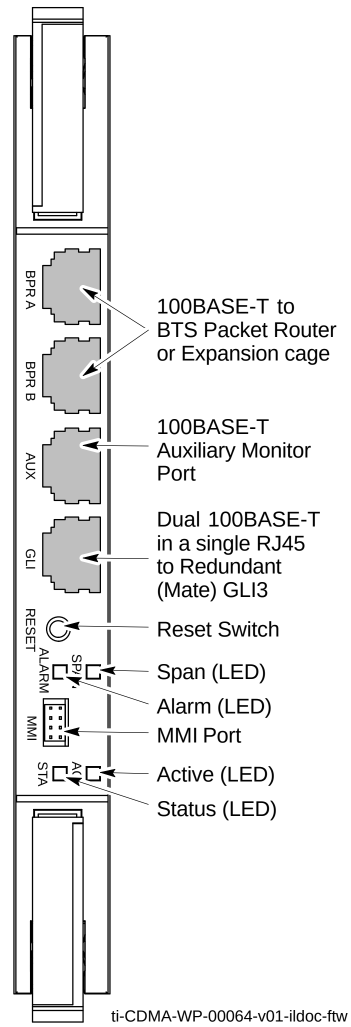
GLI3 Pushbuttons and Connectors

RESET Pushbutton - Depressing the RESET pushbutton causes a partial reset of the CPU and a reset of all board devices. GLI3 will be placed in the OOS_ROM state

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

Figure 6-2: GLI3 Front Panel Operating Indicators

LED	OPERATING STATUS
BPR A	Connects to either a BPR or expansion cage and is wired as an ethernet hub.
BPR B	Connects to either a BPR or expansion cage and is wired as an ethernet hub.
AUX	Wired as an ethernet hub for direct connection to a personal computer with a standard ethernet cable. It allows connection of ethernet "sniffer" when the ethernet switch is properly configured for port monitoring.
GLI	Supports the cross-coupled ethernet circuits to the mate GLI using a standard ethernet straight cable.
RESET	Pressing and releasing the switch resets all functions on the GLI3.
ALARM	OFF - operating normally ON - briefly during power-up when the Alarm LED turns OFF SLOW GREEN - when the GLI3 is INS (in-service)
Span	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
MMI	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.
STATUS	OFF - operating normally ON - briefly during power-up when the Alarm LED turns OFF SLOW GREEN - when the GLI3 is INS (in-service)
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 BBX module has its own alarm (fault) detection circuitry that controls the state of the PWR/ALM LED.

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

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

MCC LED Status Combinations

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

The LED indicators and their states are as follows:

PWR/ALM LED

- RED - fault on module

ACTIVE LED

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

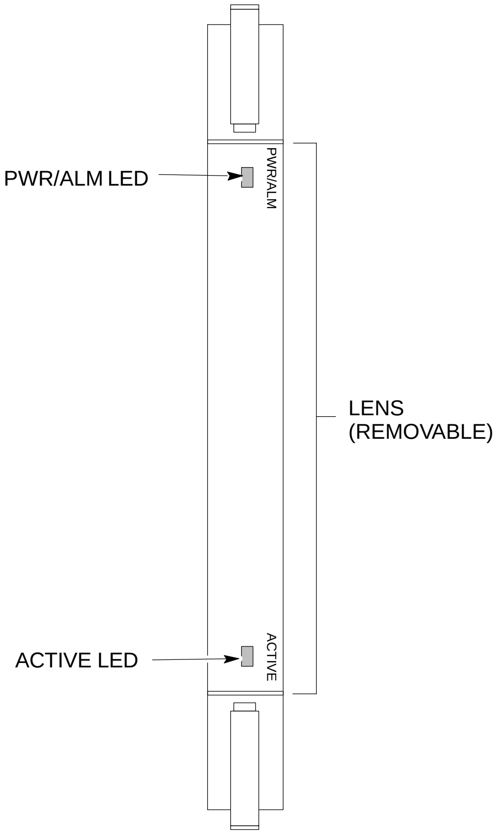
PWR/ALM and ACTIVE LEDs

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

MMI Connectors

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

Figure 6-3: MCC24/8E Front Panel LEDs and LED Indicators



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

FW00224

LPA Shelf LED Status Combinations

6

LPA Module LED

Each LPA module contains a bi-color LED just above the MMI connector on the ETIB module. Interpret this LED as follows:

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

Span Problems (No Control Link)

Follow the procedure in Table 6-29 when troubleshooting a control link failure.

Table 6-29: Troubleshooting Control Link Failure

✓	Step	Action
	1	Verify the span settings using the `span view` command on the active master GLI3 MMI port. If these are set correctly, verify the edlc parameters using the `show` command. Any alarms conditions indicate that the span is not operating correctly. - Try looping back the span line from the DSX panel back to the mobility manager (MM) and verify that the looped signal is good. - Listen for control tone on appropriate timeslot from base site and MM.

6

Notes

MOTOROLA

Appendix A

System Data

Site Operation Verification

Verification of Test Equipment Used

Table A-1: Verification of Test Equipment Used

Manufacturer	Model	Serial Number

Comments:____

____

Site Checklist

Table A-2: Site Checklist

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

Preliminary Operations

Table A-3: Preliminary Operations

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

Comments:____

General Optimization Checklist

Table A3b: Pre-power Checklist

OK	Parameter	Specification	Comments
❑	LEDs	illuminated	
❑	Frame fans	operational	
	LMF to BTS Connection		
❑	Preparing the LMF	per procedure	
❑	Log into the LMF PC	per procedure	
❑	Create site specific BTS directory	per procedure	
❑	Download device loads	per procedure	
❑	Ping LAN A	per procedure	
❑	Ping LAN B	per procedure	
❑	Download/Enable MGLI3s	per procedure	
❑	Download/Enable GLI3s	per procedure	
❑	Set Site Span Configuration	per procedure	
❑	Download CSMs	per procedure	
❑	Enable CSMs	per procedure	
❑	Enable CSMs	per procedure	
❑	Download/Enable MCCs*	per procedure	
❑	Download BBXs*	per procedure	
❑	Download TSU (in RFDS)	per procedure	
	Program TSU NAM		
❑	Test Set Calibration	per procedure	

*MCCs may be MCC8Es, MCC24s or MCC-1Xs. BBXs may be BBXs or BBX-1Xs

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					
		4:1 & 2:1 3-Sector	2:1 6-Sector	Dual BP 3-Sector	Dual BP 6-Sector		
❑	1A	C1	C1	C1	C1	No Alarms	
❑	1B	C1	C1	C1	C1	No Alarms	
❑	1C	C1	C1	C1	C1	No Alarms	
❑	1D	C1	C1	C1	C1	No Alarms	
❑	2A	C2	C2	C2		No Alarms	
❑	2B	C2	C2	C2		No Alarms	
❑	2C	C2	C2	C2		No Alarms	
❑	2D	C2	C2	C2		No Alarms	
❑	3A	C3	C1		C1	No Alarms	
❑	3B	C3	C1		C1	No Alarms	
❑	3C	C3	C1		C1	No Alarms	
❑	3D	C3	C1		C1	No Alarms	
❑	4A	C4	C2			No Alarms	
❑	4B	C4	C2			No Alarms	
❑	4C	C4	C2			No Alarms	
❑	4D	C4	C2			No Alarms	

Comments:____

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

1-Carrier
2-Carrier Non-adjacent Channels
4-Carrier Non-adjacent Channels

Table A-7: TX BLO Calibration (3-Sector: 1-Carrier, 2-Carrier and 4-Carrier Non-adjacent Channels)

OK	Parameter	Specification	Comments
❑	Calibrate carrier 1	TX Bay Level Offset = 37 dB (±4 dB) prior to calibration	BBX-1, ANT-1 = ____dB BBX-r, ANT-1 = ____dB
❑			BBX-2, ANT-2 = ____dB BBX-r, ANT-2 = ____dB
❑			BBX-3, ANT-3 = ____dB BBX-r, ANT-3 = ____dB
❑	Calibrate carrier 2	TX Bay Level Offset = 37 dB (±4 dB) prior to calibration	BBX-7, ANT-1 = ____dB BBX-r, ANT-1 = ____dB
❑			BBX-8, ANT-2 = ____dB BBX-r, ANT-2 = ____dB
❑			BBX-9, ANT-3 = ____dB BBX-r, ANT-3 = ____dB
❑	Calibrate carrier 3	TX Bay Level Offset = 37 dB (±4 dB) prior to calibration	BBX-4, ANT-1 = ____dB BBX-r, ANT-1 = ____dB
❑			BBX-5, ANT-2 = ____dB BBX-r, ANT-2 = ____dB
❑			BBX-6, ANT-3 = ____dB BBX-r, ANT-3 = ____dB
❑	Calibrate carrier 4	TX Bay Level Offset = 37 dB (±4 dB) prior to calibration	BBX-10, ANT-1 = ___dB BBX-r, ANT-1 = ____dB
❑			BBX-11, ANT-2 = ___dB BBX-r, ANT-2 = ____dB
❑			BBX-12, ANT-3 = ___dB BBX-r, ANT-3 = ____dB
❑	Calibration Audit carrier 1	0 dB (±0.5 dB) for gain set resolution post calibration	BBX-1, ANT-1 = ____dB BBX-r, ANT-1 = ____dB
❑			BBX-2, ANT-2 = ____dB BBX-r, ANT-2 = ____dB
❑			BBX-3, ANT-3 = ____dB BBX-r, ANT-3 = ____dB

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

Comments:____

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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	BBX-1, ANT-1 = ____dB BBX-r, ANT-1 = ____dB
❑			BBX-2, ANT-2 = ____dB BBX-r, ANT-2 = ____dB
❑			BBX-3, ANT-3 = ____dB BBX-r, ANT-3 = ____dB

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Table A-8: TX Bay Level Offset Calibration (3-Sector: 2-Carrier Adjacent Channels)			
OK	Parameter	Specification	Comments
❑	Calibrate carrier 2	TX Bay Level Offset = 42 dB (typical), 38 dB (minimum) prior to calibration	BBX-7, ANT-4 = ____dB BBX-r, ANT-4 = ____dB
❑			BBX-8, ANT-5 = ____dB BBX-r, ANT-5 = ____dB
❑			BBX-9, ANT-6 = ____dB BBX-r, ANT-6 = ____dB
❑	Calibration Audit carrier 1	0 dB (±0.5 dB) for gain set resolution post calibration	BBX-1, ANT-1 = ____dB BBX-r, ANT-1 = ____dB
❑			BBX-2, ANT-2 = ____dB BBX-r, ANT-2 = ____dB
❑			BBX-3, ANT-3 = ____dB BBX-r, ANT-3 = ____dB
❑	Calibration Audit carrier 2	0 dB (±0.5 dB) for gain set resolution post calibration	BBX-7, ANT-4 = ____dB BBX-r, ANT-4 = ____dB
❑			BBX-8, ANT-5 = ____dB BBX-r, ANT-5 = ____dB
❑			BBX-9, ANT-6 = ____dB BBX-r, ANT-6 = ____dB

Comments:____

____

3-Carrier Adjacent Channels
4-Carrier Adjacent Channels

Table A-9: TX Bay Level Offset Calibration (3-Sector: 3 or 4-Carrier Adjacent Channels)			
OK	Parameter	Specification	Comments
❑	Calibrate carrier 1	TX Bay Level Offset = 37 dB before calibration	BBX-1, ANT-1 = ____dB BBX-r, ANT-1 = ____dB
❑			BBX-2, ANT-2 = ____dB BBX-r, ANT-2 = ____dB
❑			BBX-3, ANT-3 = ____dB BBX-r, ANT-3 = ____dB

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Table A-9: TX Bay Level Offset Calibration (3-Sector: 3 or 4-Carrier Adjacent Channels)			
OK	**Parameter**	**Specification**	**Comments**
❑	Calibrate carrier 2	TX Bay Level Offset =37 dB before calibration	BBX-7, ANT-1 = ____dB BBX-r, ANT-1 = ____dB
❑			BBX-8, ANT-2 = ____dB BBX-r, ANT-2 = ____dB
❑			BBX-9, ANT-3 = ____dB BBX-r, ANT-3 = ____dB
❑	Calibrate carrier 3	TX Bay Level Offset = 37 dB before calibration	BBX-4, ANT-4 = ____dB BBX-r, ANT-4 = ____dB
❑			BBX-5, ANT-5 = ____dB BBX-r, ANT-5 = ____dB
❑			BBX-6, ANT-6 = ____dB BBX-r, ANT-6 = ____dB
❑	Calibrate carrier 4	TX Bay Level Offset = 37 dB before calibration	BBX-10, ANT-4 = ___dB BBX-3, ANT-4 = ____dB
❑			BBX-11, ANT-5 = ___dB BBX-r, ANT-5 = ____dB
❑			BBX-12, ANT-6 = ___dB BBX-r, ANT-6 = ____dB
❑	Calibration Audit carrier 1	0 dB (±0.5 dB) for gain set resolution post calibration	BBX-1, ANT-1 = ____dB BBX-r, ANT-1 = ____dB
❑			BBX-2, ANT-2 = ____dB BBX-r, ANT-2 = ____dB
❑			BBX-3, ANT-3 = ____dB BBX-r, ANT-3 = ____dB
❑	Calibration Audit carrier 2	0 dB (±0.5 dB) for gain set resolution post calibration	BBX-7, ANT-1 = ____dB BBX-r, ANT-1 = ____dB
❑			BBX-8, ANT-2 = ____dB BBX-r, ANT-2 = ____dB
❑			BBX-9, ANT-3 = ____dB BBX-r, ANT-3 = ____dB

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

Comments:____

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

1-Carrier
2-Carrier Non-adjacent Channels

Table A-10: TX BLO Calibration (6-Sector: 1-Carrier, 2-Carrier Non-adjacent Channels)

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

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

Comments:____

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TX Antenna VSWR

Table A-11: TX Antenna VSWR			
OK	Parameter	Specification	Data
❑	VSWR - Antenna 1	< (1.5 : 1)	
❑	VSWR - Antenna 2	< (1.5 : 1)	
❑	VSWR - Antenna 3	< (1.5 : 1)	
❑	VSWR - Antenna 4	< (1.5 : 1)	
❑	VSWR - Antenna 5	< (1.5 : 1)	
❑	VSWR - Antenna 6	< (1.5 : 1)	

Comments:____

____

RX Antenna VSWR

Table A-12: RX Antenna VSWR			
OK	Parameter	Specification	Data
❑	VSWR - Antenna 1	< (1.5 : 1)	
❑	VSWR - Antenna 2	< (1.5 : 1)	
❑	VSWR - Antenna 3	< (1.5 : 1)	
❑	VSWR - Antenna 4	< (1.5 : 1)	
❑	VSWR - Antenna 5	< (1.5 : 1)	
❑	VSWR - Antenna 6	< (1.5 : 1)	

Comments:____

Alarm Verification

Table A-13: CDI Alarm Input Verification

OK	Parameter	Specification	Data
❑	Verify CDI alarm input operation per Table 3-1.	BTS Relay #XX - Contact Alarm Sets/Clears	

Comments:____

C-CCP Shelf

Site I/O A & B	______
C-CCP Shelf	______
CSM-1	______
CSM-2	______
HSO	______
CCD-1	______
CCD-2	______
AMR-1	______
AMR-2	______
MPC-1	______
MPC-2	______
Fans 1-3	______
GLI3-1	______
GLI3-2	______
BBX-1	______
BBX-2	______
BBX-3	______
BBX-4	______
BBX-5	______
BBX-6	______
BBX-7	______
BBX-8	______
BBX-9	______
BBX-10	______
BBX-11	______
BBX-12	______
BBX-r	______
MCC-1	______
MCC-2	______
MCC-3	______
MCC-4	______
MCC-5	______
MCC-6	______
MCC-7	______
MCC-8	______
MCC-9	______
MCC-10	______
CIO	______
SWITCH	______
PS-1	______
PS-2	______
PS-3	______

LPAs

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

B

Appendix B

ATP Matrix Table

Re-optimization

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.

Various passive BTS components (such as the DRDCs, filter; etc.) 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.

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

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

Table B-1: SC 4812ET 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 w/RGPS	RGD/20-pair Punchblock w/RGD	CCD Card	GLI3	ETIB or Associated Cables	LPAC Cable	LPA or LPA Trunking Module	LPA Bandpass Filter or Combiner	Swithch Card	RFDS cables	RFDS
Table 3-20/ Table 3-21/	Download Code/Data						•	•	•	•						•							•
Table 3-23	Enable CSMs						•			•			•	•			9						
Table 3-26	GPS &HSO Initialization / Verification						•			•	•	•	•	•	•		9						
Table 3-27	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 3-52	RFDS Path Calibration and Offset Data Download	6	5	4	5	1	1	6								*			3	4		6	6
Table 4-1	Spectral Purity TX Mask	4					1	4								*			*	*	*		
Table 4-1	Waveform Quality (rho)	4				*	1	4		*					*	*	1		*	*			
Table 4-1	Pilot Time Offset	4				*	1	4		*					*	*			*	*			
Table 4-1	Code Domain Power / Noise Floor	4						1	4	8	8	8			8	*			*	*			
Table 4-1	FER Test	5	5		5	2	2	5	8	8	8				8	*					7		
Table 3-54/ Table 3-63	Alarm Tests																•						

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Table B-1: SC 4812ET 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 w/RGPS	RGD/20-pair Punchblock w/RGD	CCD Card	GLI3	ETIB or Associated Cables	LPAC Cable	LPA or LPA Trunking Module	LPA Bandpass Filter or Combiner	Swithch Card	RFDS cables	RFDS

OPTIMIZATION AND TEST LEGEND:

● Required

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

****** Replace power supply modules one at a time so that power to the C-CCP shelf is not interrupted. If power to the shelf is lost, all cards in the shelf must be downloaded again.

1. Perform on all carrier and sector TX paths to the C-CCP cage.
2. Perform on all carrier and sector RX paths to the C-CCP cage.
3. Perform on all primary and redundant TX paths of the affected carrier.
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

BBX Gain Set Point

Usage & Background

C

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 at the top of the BTS in dBm) is shown in the table. The table assumes that the BBX Bay Level Offset (BLO) values have been calculated.

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

Table 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

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Appendix D

D

CDMA Operating Frequency Programming

Channel Frequencies

Introduction

Programming of each of the BTS BBX synthesizers is performed by the BTS GLIs via the CHI bus. This programming data determines the transmit and receive transceiver operating frequencies (channels) for each BBX2.

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).

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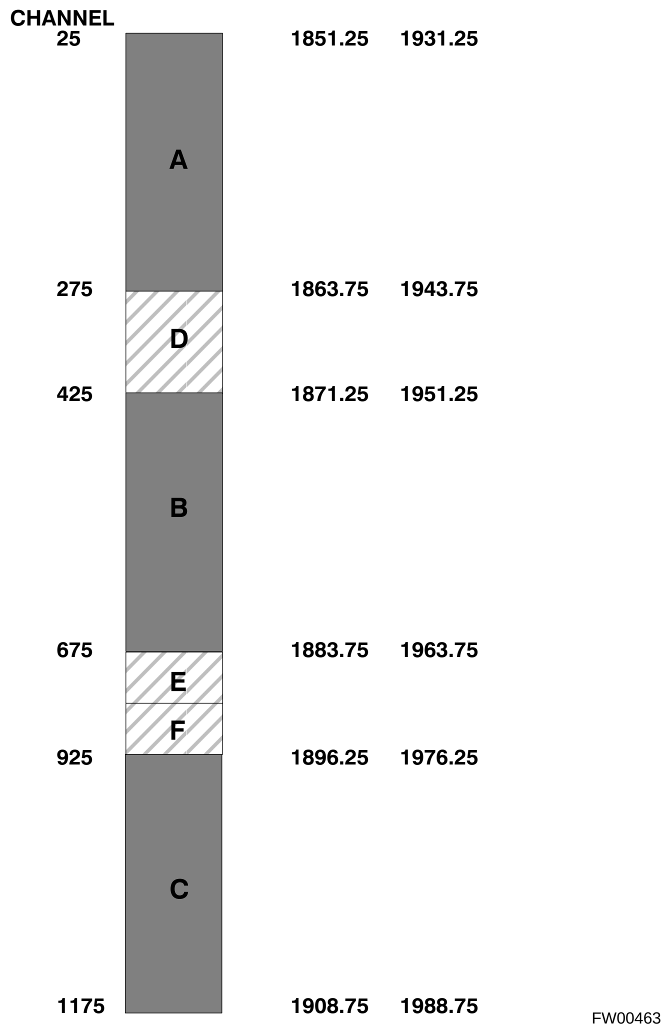
Figure D-1: North America PCS Frequency Spectrum (CDMA Allocation)



Calculating 1900 MHz Center Frequencies

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

- TX = 1930 + 0.05 * Channel#
  Example: Channel 262
  TX = 1930 + 0.05*262 = 1943.10 MHz
- RX = TX - 80
  Example: Channel 262
  RX = 1943.10 - 50 = 1863.10 MHz

Actual frequencies used depend on customer CDMA system frequency plan.

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

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

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

Channel Number Decimal	Hex	Transmit Frequency (MHz) Center Frequency	Receive Frequency (MHz) Center Frequency
25	0019	1931.25	1851.25
50	0032	1932.50	1852.50
75	004B	1933.75	1853.75
100	0064	1935.00	1855.00
125	007D	1936.25	1856.25
150	0096	1937.50	1857.50
175	00AF	1938.75	1858.75
200	00C8	1940.00	1860.00
225	00E1	1941.25	1861.25
250	00FA	1942.50	1862.50
275	0113	1943.75	1863.75
300	012C	1945.00	1865.00
325	0145	1946.25	1866.25
350	015E	1947.50	1867.50
375	0177	1948.75	1868.75
400	0190	1950.00	1870.00
425	01A9	1951.25	1871.25
450	01C2	1952.50	1872.50
475	01DB	1953.75	1873.75
500	01F4	1955.00	1875.00
525	020D	1956.25	1876.25
550	0226	1957.50	1877.50
575	023F	1958.75	1878.75
600	0258	1960.00	1880.00
625	0271	1961.25	1881.25
650	028A	1962.50	1882.50

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

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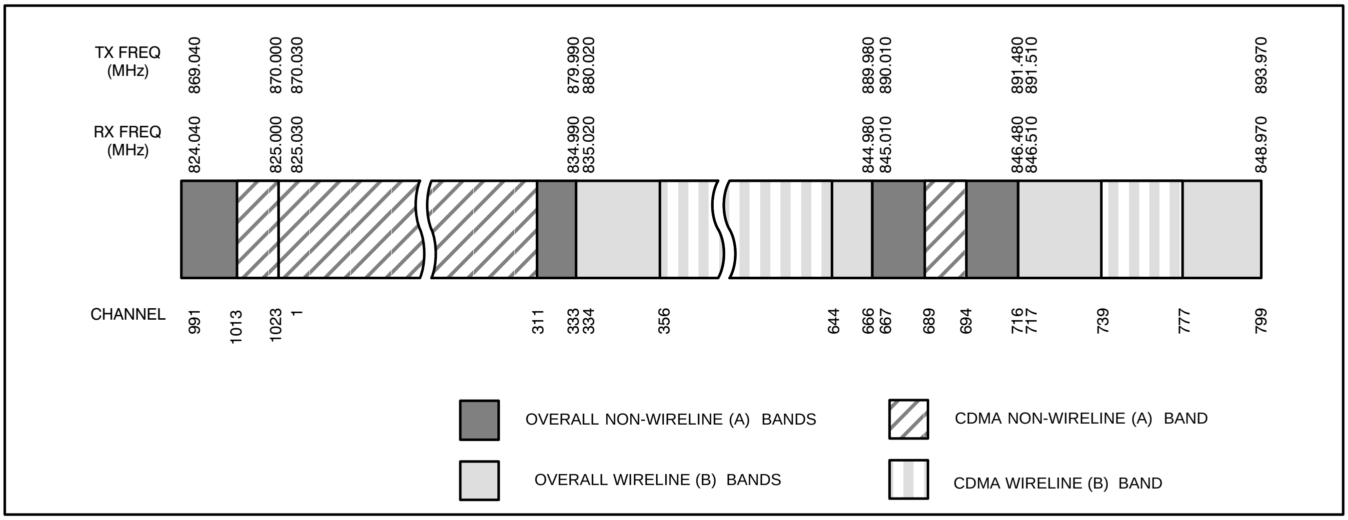
800 MHz CDMA Channels

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

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



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Calculating 800 MHz Center Frequencies

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

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

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

Channel Number Decimal	Hex	Transmit Frequency (MHz) Center Frequency	Receive Frequency (MHz) Center Frequency
1	0001	870.0300	825.0300
25	0019	870.7500	825.7500
50	0032	871.5000	826.5000
75	004B	872.2500	827.2500
100	0064	873.0000	828.0000
125	007D	873.7500	828.7500
150	0096	874.5000	829.5000
175	00AF	875.2500	830.2500
200	00C8	876.0000	831.0000
225	00E1	876.7500	831.7500
250	00FA	877.5000	832.5000
275	0113	878.2500	833.2500
300	012C	879.0000	834.0000
325	0145	879.7500	834.7500
350	015E	880.5000	835.5000
375	0177	881.2500	836.2500
400	0190	882.0000	837.0000
425	01A9	882.7500	837.7500
450	01C2	883.5000	838.5000
475	01DB	884.2500	839.2500
500	01F4	885.0000	840.0000
525	020D	885.7500	840.7500
550	0226	886.5000	841.5000

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Table D-2: 800 MHz TX and RX Frequency vs. Channel			
Channel Number Decimal	Hex	Transmit Frequency (MHz) Center Frequency	Receive Frequency (MHz) Center Frequency
575	023F	887.2500	842.2500
600	0258	888.0000	843.0000
625	0271	888.7500	843.7500
650	028A	889.5000	844.5000
675	02A3	890.2500	845.2500
700	02BC	891.0000	846.0000
725	02D5	891.7500	846.7500
750	02EE	892.5000	847.5000
775	0307	893.2500	848.2500
NOTE Channel numbers 778 through 1012 are not used.			
1013	03F5	869.7000	824.7000
1023	03FF	870.0000	825.0000

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Appendix E

PN Offset

E

PN Offset

Background

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

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

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

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

Usage

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

Observe the following guidelines:

- If the `FineTxAdj` value in the cdf file is 101 (65 HEX), the FineTxAdj has not been set. The I and Q values from the 0 table MUST be used.

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

- If the `FineTxAdj` value in the cdf file is 197 (C5 HEX), FineTxAdj has been set for the *13 chip table*.

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

- If you are using a Qualcomm mobile, use the I and Q values from the 13 chip delay table.
- If you are using a mobile that does not have the 1 chip offset problem, (any mobile meeting the IS-97 specification), use the 14 chip delay table.

NOTE	If the wrong I and Q values are used with the wrong `FineTxAdj` parameter, system timing problems will occur. This will cause the energy transmitted to be "smeared" over several Walsh codes (instead of the single Walsh code that it was assigned to), causing erratic operation. Evidence of smearing is usually identified by Walsh channels not at correct levels or present when not selected in the Code Domain Power Test.

Table E-1: PnMaskI and PnMaskQ Values for PilotPn

Pilot PN	14-Chip Delay I (Dec.)	14-Chip Delay Q (Dec.)	14-Chip Delay I (Hex.)	14-Chip Delay Q (Hex.)	13-Chip Delay I (Dec.)	13-Chip Delay Q (Dec.)	13-Chip Delay I (Hex.)	13-Chip Delay Q (Hex.)	0-Chip Delay I (Dec.)	0-Chip Delay Q (Dec.)	0-Chip Delay I (Hex.)	0-Chip Delay Q (Hex.)
0	17523	23459	4473	5BA3	29673	25581	73E9	63ED	4096	4096	1000	1000
1	32292	32589	7E24	7F4D	16146	29082	3F12	719A	9167	1571	23CF	0623
2	4700	17398	125C	43F6	2350	8699	092E	21FB	22417	7484	5791	1D3C
3	14406	26333	3846	66DD	7203	32082	1C23	7D52	966	6319	03C6	18AF
4	14899	4011	3A33	0FAB	19657	18921	4CC9	49E9	14189	2447	376D	098F
5	17025	2256	4281	08D0	28816	1128	7090	0468	29150	24441	71DE	5F79
6	14745	18651	3999	48DB	19740	27217	4D1C	6A51	18245	27351	4745	6AD7
7	2783	1094	0ADF	0446	21695	547	54BF	0223	1716	23613	06B4	5C3D
8	5832	21202	16C8	52D2	2916	10601	0B64	2969	11915	29008	2E8B	7150
9	12407	13841	3077	3611	18923	21812	49EB	5534	20981	5643	51F5	160B
10	31295	31767	7A3F	7C17	27855	28727	6CCF	7037	24694	28085	6076	6DB5
11	7581	18890	1D9D	49CA	24350	9445	5F1E	24E5	11865	18200	2E59	4718
12	18523	30999	485B	7917	30205	29367	75FD	72B7	6385	21138	18F1	5292
13	29920	22420	74E0	5794	14960	11210	3A70	2BCA	27896	21937	6CF8	55B1
14	25184	20168	6260	4EC8	12592	10084	3130	2764	25240	25222	6298	6286
15	26282	12354	66AA	3042	13141	6177	3355	1821	30877	109	789D	006D
16	30623	11187	779F	2BB3	27167	23525	6A1F	5BE5	30618	6028	779A	178C
17	15540	11834	3CB4	2E3A	7770	5917	1E5A	171D	26373	22034	6705	5612
18	23026	10395	59F2	289B	11513	23153	2CF9	5A71	314	15069	013A	3ADD
19	20019	28035	4E33	6D83	30409	30973	76C9	78FD	17518	4671	446E	123F
20	4050	27399	0FD2	6B07	2025	31679	07E9	7BBF	21927	30434	55A7	76E2
21	1557	22087	0615	5647	21210	25887	52DA	651F	2245	11615	08C5	2D5F
22	30262	2077	7636	081D	15131	18994	3B1B	4A32	18105	19838	46B9	4D7E
23	18000	13758	4650	35BE	9000	6879	2328	1ADF	8792	14713	2258	3979
24	20056	11778	4E58	2E02	10028	5889	272C	1701	21440	241	53C0	00F1
25	12143	3543	2F6F	0DD7	18023	18647	4667	48D7	15493	24083	3C85	5E13
26	17437	7184	441D	1C10	29662	3592	73DE	0E08	26677	7621	6835	1DC5
27	17438	2362	441E	093A	8719	1181	220F	049D	11299	19144	2C23	4AC8
28	5102	25840	13EE	64F0	2551	12920	09F7	3278	12081	1047	2F31	0417
29	9302	12177	2456	2F91	4651	23028	122B	59F4	23833	26152	5D19	6628
30	17154	10402	4302	28A2	8577	5201	2181	1451	20281	22402	4F39	5782
31	5198	1917	144E	077D	2599	19842	0A27	4D82	10676	21255	29B4	5307
32	4606	17708	11FE	452C	2303	8854	08FF	2296	16981	30179	4255	75E3
33	24804	10630	60E4	2986	12402	5315	3072	14C3	31964	7408	7CDC	1CF0
34	17180	6812	431C	1A9C	8590	3406	218E	0D4E	26913	115	6921	0073
35	10507	14350	290B	380E	17749	7175	4555	1C07	14080	1591	3700	0637
36	10157	10999	27AD	2AF7	16902	23367	4206	5B47	23842	1006	5D22	03EE
37	23850	25003	5D2A	61AB	11925	32489	2E95	7EE9	27197	32263	6A3D	7E07
38	31425	2652	7AC1	0A5C	27824	1326	6CB0	052E	22933	1332	5995	0534
39	4075	19898	0FEB	4DBA	22053	9949	5625	26DD	30220	12636	760C	315C
40	10030	2010	272E	07DA	5015	1005	1397	03ED	12443	4099	309B	1003
41	16984	25936	4258	6550	8492	12968	212C	32A8	19854	386	4D8E	0182
42	14225	28531	3791	6F73	18968	31109	4A18	7985	14842	29231	39FA	722F
43	26519	11952	6797	2EB0	25115	5976	621B	1758	15006	25711	3A9E	646F
44	27775	31947	6C7F	7CCB	26607	28761	67EF	7059	702	10913	02BE	2AA1
45	30100	25589	7594	63F5	15050	32710	3ACA	7FC6	21373	8132	537D	1FC4
46	7922	11345	1EF2	2C51	3961	22548	0F79	5814	23874	20844	5D42	516C
47	14199	28198	3777	6E26	19051	14099	4A6B	3713	3468	13150	0D8C	335E
48	17637	13947	44E5	367B	29602	21761	73A2	5501	31323	18184	7A5B	4708
49	23081	8462	5A29	210E	31940	4231	7CC4	1087	29266	19066	7252	4A7A
50	5099	9595	13EB	257B	22565	23681	5825	5C81	16554	29963	40AA	750B

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Table E-1: PnMaskI and PnMaskQ Values for PilotPn

Pilot PN	14-Chip Delay I (Dec.)	14-Chip Delay Q (Dec.)	14-Chip Delay I (Hex.)	14-Chip Delay Q (Hex.)	13-Chip Delay I (Dec.)	13-Chip Delay Q (Dec.)	13-Chip Delay I (Hex.)	13-Chip Delay Q (Hex.)	0-Chip Delay I (Dec.)	0-Chip Delay Q (Dec.)	0-Chip Delay I (Hex.)	0-Chip Delay Q (Hex.)
51	32743	4670	7FE7	123E	28195	2335	6E23	091F	22575	6605	582F	19CD
52	7114	14672	1BCA	3950	3557	7336	0DE5	1CA8	31456	29417	7AE0	72E9
53	7699	29415	1E13	72E7	24281	30543	5ED9	774F	8148	22993	1FD4	59D1
54	19339	20610	4B8B	5082	29717	10305	7415	2841	19043	27657	4A63	6C09
55	28212	6479	6E34	194F	14106	17051	371A	429B	25438	5468	635E	155C
56	29587	10957	7393	2ACD	26649	23386	6819	5B5A	10938	8821	2ABA	2275
57	19715	18426	4D03	47FA	30545	9213	7751	23FD	2311	20773	0907	5125
58	14901	22726	3A35	58C6	19658	11363	4CCA	2C63	7392	4920	1CE0	1338
59	20160	5247	4EC0	147F	10080	17411	2760	4403	30714	5756	77FA	167C
60	22249	29953	56E9	7501	31396	29884	7AA4	74BC	180	28088	00B4	6DB8
61	26582	5796	67D6	16A4	13291	2898	33EB	0B52	8948	740	22F4	02E4
62	7153	16829	1BF1	41BD	23592	28386	5C28	6EE2	16432	23397	4030	5B65
63	15127	4528	3B17	11B0	19547	2264	4C5B	08D8	9622	19492	2596	4C24
64	15274	5415	3BAA	1527	7637	17583	1DD5	44AF	7524	26451	1D64	6753
65	23149	10294	5A6D	2836	31974	5147	7CE6	141B	1443	30666	05A3	77CA
66	16340	17046	3FD4	4296	8170	8523	1FEA	214B	1810	15088	0712	3AF0
67	27052	7846	69AC	1EA6	13526	3923	34D6	0F53	6941	26131	1B1D	6613
68	13519	10762	34CF	2A0A	19383	5381	4BB7	1505	3238	15969	0CA6	3E61
69	10620	13814	297C	35F6	5310	6907	14BE	1AFB	8141	24101	1FCD	5E25
70	15978	16854	3E6A	41D6	7989	8427	1F35	20EB	10408	12762	28A8	31DA
71	27966	795	6D3E	031B	13983	20401	369F	4FB1	18826	19997	498A	4E1D
72	12479	9774	30BF	262E	18831	4887	498F	1317	22705	22971	58B1	59BB
73	1536	24291	0600	5EE3	768	24909	0300	614D	3879	12560	0F27	3110
74	3199	3172	0C7F	0C64	22511	1586	57EF	0632	21359	31213	536F	79ED
75	4549	2229	11C5	08B5	22834	19046	5932	4A66	30853	18780	7885	495C
76	17888	21283	45E0	5323	8944	26541	22F0	67AD	18078	16353	469E	3FE1
77	13117	16905	333D	4209	18510	28472	484E	6F38	15910	12055	3E26	2F17
78	7506	7062	1D52	1B96	3753	3531	0EA9	0DCB	20989	30396	51FD	76BC
79	27626	7532	6BEA	1D6C	13813	3766	35F5	0EB6	28810	24388	708A	5F44
80	31109	25575	7985	63E7	27922	32719	6D12	7FCF	30759	1555	7827	0613
81	29755	14244	743B	37A4	27597	7122	6BCD	1BD2	18899	13316	49D3	3404
82	26711	28053	6857	6D95	26107	30966	65FB	78F6	7739	31073	1E3B	7961
83	20397	30408	4FAD	76C8	30214	15204	7606	3B64	6279	6187	1887	182B
84	18608	5094	48B0	13E6	9304	2547	2458	09F3	9968	21644	26F0	548C
85	7391	16222	1CDF	3F5E	24511	8111	5FBF	1FAF	8571	9289	217B	2449
86	23168	7159	5A80	1BF7	11584	17351	2D40	43C7	4143	4624	102F	1210
87	23466	174	5BAA	00AE	11733	87	2DD5	0057	19637	467	4CB5	01D3
88	15932	25530	3E3C	63BA	7966	12765	1F1E	31DD	11867	18133	2E5B	46D5
89	25798	2320	64C6	0910	12899	1160	3263	0488	7374	1532	1CCE	05FC
90	28134	23113	6DE6	5A49	14067	25368	36F3	6318	10423	1457	28B7	05B1
91	28024	23985	6D78	5DB1	14012	24804	36BC	60E4	9984	9197	2700	23ED
92	6335	2604	18BF	0A2C	23951	1302	5D8F	0516	7445	13451	1D15	348B
93	21508	1826	5404	0722	10754	913	2A02	0391	4133	25785	1025	64B9
94	26338	30853	66E2	7885	13169	29310	3371	727E	22646	4087	5876	0FF7
95	17186	15699	4322	3D53	8593	20629	2191	5095	15466	31190	3C6A	79D6
96	22462	2589	57BE	0A1D	11231	19250	2BDF	4B32	2164	8383	0874	20BF
97	3908	25000	0F44	61A8	1954	12500	07A2	30D4	16380	12995	3FFC	32C3
98	25390	18163	632E	46F3	12695	27973	3197	6D45	15008	27438	3AA0	6B2E
99	27891	12555	6CF3	310B	26537	22201	67A9	56B9	31755	9297	7C0B	2451
100	9620	8670	2594	21DE	4810	4335	12CA	10EF	31636	1676	7B94	068C

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Table E-1: PnMaskI and PnMaskQ Values for PilotPn

Pilot PN	14-Chip Delay I (Dec.)	14-Chip Delay Q (Dec.)	14-Chip Delay I (Hex.)	14-Chip Delay Q (Hex.)	13-Chip Delay I (Dec.)	13-Chip Delay Q (Dec.)	13-Chip Delay I (Hex.)	13-Chip Delay Q (Hex.)	0-Chip Delay I (Dec.)	0-Chip Delay Q (Dec.)	0-Chip Delay I (Hex.)	0-Chip Delay Q (Hex.)
101	6491	1290	195B	050A	23933	645	5D7D	0285	25414	12596	6346	3134
102	16876	4407	41EC	1137	8438	18087	20F6	46A7	7102	19975	1BBE	4E07
103	17034	1163	428A	048B	8517	19577	2145	4C79	20516	20026	5024	4E3A
104	32405	12215	7E95	2FB7	28314	23015	6E9A	59E7	19495	8958	4C27	22FE
105	27417	7253	6B19	1C55	25692	16406	645C	4016	17182	19143	431E	4AC7
106	8382	8978	20BE	2312	4191	4489	105F	1189	11572	17142	2D34	42F6
107	5624	25547	15F8	63CB	2812	32729	0AFC	7FD9	25570	19670	63E2	4CD6
108	1424	3130	0590	0C3A	712	1565	02C8	061D	6322	30191	18B2	75EF
109	13034	31406	32EA	7AAE	6517	15703	1975	3D57	8009	5822	1F49	16BE
110	15682	6222	3D42	184E	7841	3111	1EA1	0C27	26708	22076	6854	563C
111	27101	20340	69DD	4F74	25918	10170	653E	27BA	6237	606	185D	025E
112	8521	25094	2149	6206	16756	12547	4174	3103	32520	9741	7F08	260D
113	30232	23380	7618	5B54	15116	11690	3B0C	2DAA	31627	9116	7B8B	239C
114	6429	10926	191D	2AAE	23902	5463	5D5E	1557	3532	12705	0DCC	31A1
115	27116	22821	69EC	5925	13558	25262	34F6	62AE	24090	17502	5E1A	445E
116	4238	31634	108E	7B92	2119	15817	0847	3DC9	20262	18952	4F26	4A08
117	5128	4403	1408	1133	2564	18085	0A04	46A5	18238	15502	473E	3C8E
118	14846	689	39FE	02B1	7423	20324	1CFF	4F64	2033	17819	07F1	459B
119	13024	27045	32E0	69A5	6512	31470	1970	7AEE	25566	4370	63DE	1112
120	10625	27557	2981	6BA5	17680	31726	4510	7BEE	25144	31955	6238	7CD3
121	31724	16307	7BEC	3FB3	15862	20965	3DF6	51E5	29679	30569	73EF	7769
122	13811	22338	35F3	5742	19241	11169	4B29	2BA1	5064	7350	13C8	1CB6
123	24915	27550	6153	6B9E	24953	13775	6179	35CF	27623	26356	6BE7	66F4
124	1213	22096	04BD	5650	21390	11048	538E	2B28	13000	32189	32C8	7DBD
125	2290	23136	08F2	5A60	1145	11568	0479	2D30	31373	1601	7A8D	0641
126	31551	12199	7B3F	2FA7	27727	23023	6C4F	59EF	13096	19537	3328	4C51
127	12088	1213	2F38	04BD	6044	19554	179C	4C62	26395	25667	671B	6443
128	7722	936	1E2A	03A8	3861	468	0F15	01D4	15487	4415	3C7F	113F
129	27312	6272	6AB0	1880	13656	3136	3558	0C40	29245	2303	723D	08FF
130	23130	32446	5A5A	7EBE	11565	16223	2D2D	3F5F	26729	16362	6869	3FEA
131	594	13555	0252	34F3	297	21573	0129	5445	12568	28620	3118	6FCC
132	25804	8789	64CC	2255	12902	24342	3266	5F16	24665	6736	6059	1A50
133	31013	24821	7925	60F5	27970	32326	6D42	7E46	8923	2777	22DB	0AD9
134	32585	21068	7F49	524C	28276	10534	6E74	2926	19634	24331	4CB2	5F0B
135	3077	31891	0C05	7C93	22482	28789	57D2	7075	29141	9042	71D5	2352
136	17231	5321	434F	14C9	28791	17496	7077	4458	73	107	0049	006B
137	31554	551	7B42	0227	15777	20271	3DA1	4F2F	26482	4779	6772	12AB
138	8764	12115	223C	2F53	4382	22933	111E	5995	6397	13065	18FD	3309
139	15375	4902	3C0F	1326	20439	2451	4FD7	0993	29818	30421	747A	76D5
140	13428	1991	3474	07C7	6714	19935	1A3A	4DDF	8153	20210	1FD9	4EF2
141	17658	14404	44FA	3844	8829	7202	227D	1C22	302	5651	012E	1613
142	13475	17982	34A3	463E	19329	8991	4B81	231F	28136	31017	6DE8	7929
143	22095	19566	564F	4C6E	31479	9783	7AF7	2637	29125	30719	71C5	77FF
144	24805	2970	60E5	0B9A	24994	1485	61A2	05CD	8625	23104	21B1	5A40
145	4307	23055	10D3	5A0F	22969	25403	59B9	633B	26671	7799	682F	1E77
146	23292	15158	5AFC	3B36	11646	7579	2D7E	1D9B	6424	17865	1918	45C9
147	1377	29094	0561	71A6	21344	14547	5360	38D3	12893	26951	325D	6947
148	28654	653	6FEE	028D	14327	20346	37F7	4F7A	18502	25073	4846	61F1
149	6350	19155	18CE	4AD3	3175	27477	0C67	6B55	7765	32381	1E55	7E7D
150	16770	23588	4182	5C24	8385	11794	20C1	2E12	25483	16581	638B	40C5

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Table E-1: PnMaskI and PnMaskQ Values for PilotPn

Pilot PN	14-Chip Delay I (Dec.)	14-Chip Delay Q (Dec.)	14-Chip Delay I (Hex.)	14-Chip Delay Q (Hex.)	13-Chip Delay I (Dec.)	13-Chip Delay Q (Dec.)	13-Chip Delay I (Hex.)	13-Chip Delay Q (Hex.)	0-Chip Delay I (Dec.)	0-Chip Delay Q (Dec.)	0-Chip Delay I (Hex.)	0-Chip Delay Q (Hex.)
151	14726	10878	3986	2A7E	7363	5439	1CC3	153F	15408	32087	3C30	7D57
152	25685	31060	6455	7954	25594	15530	63FA	3CAA	6414	97	190E	0061
153	21356	30875	536C	789B	10678	29297	29B6	7271	8164	7618	1FE4	1DC2
154	12149	11496	2F75	2CE8	18026	5748	466A	1674	10347	93	286B	005D
155	28966	24545	7126	5FE1	14483	25036	3893	61CC	29369	16052	72B9	3EB4
156	22898	9586	5972	2572	11449	4793	2CB9	12B9	10389	14300	2895	37DC
157	1713	20984	06B1	51F8	21128	10492	5288	28FC	24783	11129	60CF	2B79
158	30010	30389	753A	76B5	15005	30054	3A9D	7566	18400	6602	47E0	19CA
159	2365	7298	093D	1C82	21838	3649	554E	0E41	22135	14460	5677	387C
160	27179	18934	6A2B	49F6	25797	9467	64C5	24FB	4625	25458	1211	6372
161	29740	23137	742C	5A61	14870	25356	3A16	630C	22346	15869	574A	3DFD
162	5665	24597	1621	6015	23232	32310	5AC0	7E36	2545	27047	09F1	69A7
163	23671	23301	5C77	5B05	32747	25534	7FEB	63BE	7786	26808	1E6A	68B8
164	1680	7764	0690	1E54	840	3882	0348	0F2A	20209	7354	4EF1	1CBA
165	25861	14518	6505	38B6	25426	7259	6352	1C5B	26414	27834	672E	6CBA
166	25712	21634	6470	5482	12856	10817	3238	2A41	1478	11250	05C6	2BF2
167	19245	11546	4B2D	2D1A	29766	5773	7446	168D	15122	552	3B12	0228
168	26887	26454	6907	6756	25939	13227	6553	33AB	24603	27058	601B	69B2
169	30897	15938	78B1	3E42	28040	7969	6D88	1F21	677	14808	02A5	39D8
170	11496	9050	2CE8	235A	5748	4525	1674	11AD	13705	9642	3589	25AA
171	1278	3103	04FE	0C1F	639	18483	027F	4833	13273	32253	33D9	7DFD
172	31555	758	7B43	02F6	27761	379	6C71	017B	14879	26081	3A1F	65E1
173	29171	16528	71F3	4090	26921	8264	6929	2048	6643	21184	19F3	52C0
174	20472	20375	4FF8	4F97	10236	27127	27FC	69F7	23138	11748	5A62	2DE4
175	5816	10208	16B8	27E0	2908	5104	0B5C	13F0	28838	32676	70A6	7FA4
176	30270	17698	763E	4522	15135	8849	3B1F	2291	9045	2425	2355	0979
177	22188	8405	56AC	20D5	11094	24150	2B56	5E56	10792	19455	2A28	4BFF
178	6182	28634	1826	6FDA	3091	14317	0C13	37ED	25666	19889	6442	4DB1
179	32333	1951	7E4D	079F	28406	19955	6EF6	4DF3	11546	18177	2D1A	4701
180	14046	20344	36DE	4F78	7023	10172	1B6F	27BC	15535	2492	3CAF	09BC
181	15873	26696	3E01	6848	20176	13348	4ED0	3424	16134	15086	3F06	3AEE
182	19843	3355	4D83	0D1B	30481	18609	7711	48B1	8360	30632	20A8	77A8
183	29367	11975	72B7	2EC7	26763	22879	688B	595F	14401	27549	3841	6B9D
184	13352	31942	3428	7CC6	6676	15971	1A14	3E63	26045	6911	65BD	1AFF
185	22977	9737	59C1	2609	32048	23864	7D30	5D38	24070	9937	5E06	26D1
186	31691	9638	7BCB	25A6	27701	4819	6C35	12D3	30300	2467	765C	09A3
187	10637	30643	298D	77B3	17686	30181	4516	75E5	13602	25831	3522	64E7
188	25454	13230	636E	33AE	12727	6615	31B7	19D7	32679	32236	7FA7	7DEC
189	18610	22185	48B2	56A9	9305	25960	2459	6568	16267	12987	3F8B	32BB
190	6368	2055	18E0	0807	3184	19007	0C70	4A3F	9063	11714	2367	2DC2
191	7887	8767	1ECF	223F	24247	24355	5EB7	5F23	19487	19283	4C1F	4B53
192	7730	15852	1E32	3DEC	3865	7926	0F19	1EF6	12778	11542	31EA	2D16
193	23476	16125	5BB4	3EFD	11738	20802	2DDA	5142	27309	27928	6AAD	6D18
194	889	6074	0379	17BA	20588	3037	506C	0BDD	12527	26637	30EF	680D
195	21141	31245	5295	7A0D	30874	29498	789A	733A	953	10035	03B9	2733
196	20520	15880	5028	3E08	10260	7940	2814	1F04	15958	10748	3E56	29FC
197	21669	20371	54A5	4F93	31618	27125	7B82	69F5	6068	24429	17B4	5F6D
198	15967	8666	3E5F	21DA	20223	4333	4EFF	10ED	23577	29701	5C19	7405
199	21639	816	5487	0330	31635	408	7B93	0198	32156	14997	7D9C	3A95
200	31120	22309	7990	5725	15560	26030	3CC8	65AE	32709	32235	7FC5	7DEB

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Table E-1: PnMaskI and PnMaskQ Values for PilotPn

Pilot PN	14-Chip Delay I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)	13-Chip Delay I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)	0-Chip Delay I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
201	3698	29563	0E72	737B	1849	30593	0739	7781	23557	30766	5C05	782E
202	16322	13078	3FC2	3316	8161	6539	1FE1	198B	17638	5985	44E6	1761
203	17429	10460	4415	28DC	29658	5230	73DA	146E	3545	6823	0DD9	1AA7
204	21730	17590	54E2	44B6	10865	8795	2A71	225B	9299	20973	2453	51ED
205	17808	20277	4590	4F35	8904	27046	22C8	69A6	6323	10197	18B3	27D5
206	30068	19988	7574	4E14	15034	9994	3ABA	270A	19590	9618	4C86	2592
207	12737	6781	31C1	1A7D	18736	17154	4930	4302	7075	22705	1BA3	58B1
208	28241	32501	6E51	7EF5	26360	28998	66F8	7146	14993	5234	3A91	1472
209	20371	6024	4F93	1788	30233	3012	7619	0BC4	19916	12541	4DCC	30FD
210	13829	20520	3605	5028	19154	10260	4AD2	2814	6532	8019	1984	1F53
211	13366	31951	3436	7CCF	6683	28763	1A1B	705B	17317	22568	43A5	5828
212	25732	26063	6484	65CF	12866	31963	3242	7CDB	16562	5221	40B2	1465
213	19864	27203	4D98	6A43	9932	31517	26CC	7B1D	26923	25216	692B	6280
214	5187	6614	1443	19D6	23537	3307	5BF1	0CEB	9155	1354	23C3	054A
215	23219	10970	5AB3	2ADA	31881	5485	7C89	156D	20243	29335	4F13	7297
216	28242	5511	6E52	1587	14121	17663	3729	44FF	32391	6682	7E87	1A1A
217	6243	17119	1863	42DF	24033	28499	5DE1	6F53	20190	26128	4EDE	6610
218	445	16064	01BD	3EC0	20750	8032	510E	1F60	27564	29390	6BAC	72CE
219	21346	31614	5362	7B7E	10673	15807	29B1	3DBF	20869	8852	5185	2294
220	13256	4660	33C8	1234	6628	2330	19E4	091A	9791	6110	263F	17DE
221	18472	13881	4828	3639	9236	21792	2414	5520	714	11847	02CA	2E47
222	25945	16819	6559	41B3	25468	28389	637C	6EE5	7498	10239	1D4A	27FF
223	31051	6371	794B	18E3	28021	16973	6D75	424D	23278	6955	5AEE	1B2B
224	1093	24673	0445	6061	21490	32268	53F2	7E0C	8358	10897	20A6	2A91
225	5829	6055	16C5	17A7	23218	17903	5AB2	45EF	9468	14076	24FC	36FC
226	31546	10009	7B3A	2719	15773	23984	3D9D	5DB0	23731	12450	5CB3	30A2
227	29833	5957	7489	1745	27540	17822	6B94	459E	25133	8954	622D	22FA
228	18146	11597	46E2	2D4D	9073	22682	2371	589A	2470	19709	09A6	4CFD
229	24813	22155	60ED	568B	24998	25977	61A6	6579	17501	1252	445D	04E4
230	47	15050	002F	3ACA	20935	7525	51C7	1D65	24671	15142	605F	3B26
231	3202	16450	0C82	4042	1601	8225	0641	2021	11930	26958	2E9A	694E
232	21571	27899	5443	6CFB	31729	30785	7BF1	7841	9154	8759	23C2	2237
233	7469	2016	1D2D	07E0	24390	1008	5F46	03F0	7388	12696	1CDC	3198
234	25297	17153	62D1	4301	24760	28604	60B8	6FBC	3440	11936	0D70	2EA0
235	8175	15849	1FEF	3DE9	24103	20680	5E27	50C8	27666	25635	6C12	6423
236	28519	30581	6F67	7775	26211	30086	6663	7586	22888	17231	5968	434F
237	4991	3600	137F	0E10	22639	1800	586F	0708	13194	22298	338A	571A
238	7907	4097	1EE3	1001	24225	17980	5EA1	463C	26710	7330	6856	1CA2
239	17728	671	4540	029F	8864	20339	22A0	4F73	7266	30758	1C62	7826
240	14415	20774	384F	5126	19959	10387	4DF7	2893	15175	6933	3B47	1B15
241	30976	24471	7900	5F97	15488	25079	3C80	61F7	15891	2810	3E13	0AFA
242	26376	27341	6708	6ACD	13188	31578	3384	7B5A	26692	8820	6844	2274
243	19063	19388	4A77	4BBC	29931	9694	74EB	25DE	14757	7831	39A5	1E97
244	19160	25278	4AD8	62BE	9580	12639	256C	315F	28757	19584	7055	4C80
245	3800	9505	0ED8	2521	1900	23724	076C	5CAC	31342	2944	7A6E	0B80
246	8307	26143	2073	661F	16873	32051	41E9	7D33	19435	19854	4BEB	4D8E
247	12918	13359	3276	342F	6459	21547	193B	542B	2437	10456	0985	28D8
248	19642	2154	4CBA	086A	9821	1077	265D	0435	20573	17036	505D	428C
249	24873	13747	6129	35B3	24900	21733	6144	54E5	18781	2343	495D	0927
250	22071	27646	5637	6BFE	31435	13823	7ACB	35FF	18948	14820	4A04	39E4

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Table E-1: PnMaskI and PnMaskQ Values for PilotPn

Pilot PN	14-Chip Delay I (Dec.)	14-Chip Delay Q (Dec.)	14-Chip Delay I (Hex.)	14-Chip Delay Q (Hex.)	13-Chip Delay I (Dec.)	13-Chip Delay Q (Dec.)	13-Chip Delay I (Hex.)	13-Chip Delay Q (Hex.)	0-Chip Delay I (Dec.)	0-Chip Delay Q (Dec.)	0-Chip Delay I (Hex.)	0-Chip Delay Q (Hex.)
251	13904	1056	3650	0420	6952	528	1B28	0210	23393	1756	5B61	06DC
252	27198	1413	6A3E	0585	13599	19710	351F	4CFE	5619	19068	15F3	4A7C
253	3685	3311	0E65	0CEF	22242	18507	56E2	484B	17052	28716	429C	702C
254	16820	4951	41B4	1357	8410	18327	20DA	4797	21292	31958	532C	7CD6
255	22479	749	57CF	02ED	31287	20298	7A37	4F4A	2868	16097	0B34	3EE1
256	6850	6307	1AC2	18A3	3425	17005	0D61	426D	19538	1308	4C52	051C
257	15434	961	3C4A	03C1	7717	20444	1E25	4FDC	24294	3320	5EE6	0CF8
258	19332	2358	4B84	0936	9666	1179	25C2	049B	22895	16682	596F	412A
259	8518	28350	2146	6EBE	4259	14175	10A3	375F	27652	6388	6C04	18F4
260	14698	31198	396A	79DE	7349	15599	1CB5	3CEF	29905	12828	74D1	321C
261	21476	11467	53E4	2CCB	10738	22617	29F2	5859	21415	3518	53A7	0DBE
262	30475	8862	770B	229E	27221	4431	6A55	114F	1210	3494	04BA	0DA6
263	23984	6327	5DB0	18B7	11992	16999	2ED8	4267	22396	6458	577C	193A
264	1912	7443	0778	1D13	956	16565	03BC	40B5	26552	10717	67B8	29DD
265	26735	28574	686F	6F9E	26087	14287	65E7	37CF	24829	8463	60FD	210F
266	15705	25093	3D59	6205	20348	32574	4F7C	7F3E	8663	27337	21D7	6AC9
267	3881	6139	0F29	17FB	22084	17857	5644	45C1	991	19846	03DF	4D86
268	20434	22047	4FD2	561F	10217	25907	27E9	6533	21926	9388	55A6	24AC
269	16779	32545	418B	7F21	28949	29100	7115	71AC	23306	21201	5B0A	52D1
270	31413	7112	7AB5	1BC8	27786	3556	6C8A	0DE4	13646	31422	354E	7ABE
271	16860	28535	41DC	6F77	8430	31111	20EE	7987	148	166	0094	00A6
272	8322	10378	2082	288A	4161	5189	1041	1445	24836	28622	6104	6FCE
273	28530	15065	6F72	3AD9	14265	21328	37B9	5350	24202	6477	5E8A	194D
274	26934	5125	6936	1405	13467	17470	349B	443E	9820	10704	265C	29D0
275	18806	12528	4976	30F0	9403	6264	24BB	1878	12939	25843	328B	64F3
276	20216	23215	4EF8	5AAF	10108	25451	277C	636B	2364	25406	093C	633E
277	9245	20959	241D	51DF	17374	26323	43DE	66D3	14820	21523	39E4	5413
278	8271	3568	204F	0DF0	16887	1784	41F7	06F8	2011	8569	07DB	2179
279	18684	26453	48FC	6755	9342	32150	247E	7D96	13549	9590	34ED	2576
280	8220	29421	201C	72ED	4110	30538	100E	774A	28339	22466	6EB3	57C2
281	6837	24555	1AB5	5FEB	23690	25033	5C8A	61C9	25759	12455	649F	30A7
282	9613	10779	258D	2A1B	17174	23345	4316	5B31	11116	27506	2B6C	6B72
283	31632	25260	7B90	62AC	15816	12630	3DC8	3156	31448	21847	7AD8	5557
284	27448	16084	6B38	3ED4	13724	8042	359C	1F6A	27936	28392	6D20	6EE8
285	12417	26028	3081	65AC	18832	13014	4990	32D6	3578	1969	0DFA	07B1
286	30901	29852	78B5	749C	28042	14926	6D8A	3A4E	12371	30715	3053	77FB
287	9366	14978	2496	3A82	4683	7489	124B	1D41	12721	23674	31B1	5C7A
288	12225	12182	2FC1	2F96	17968	6091	4630	17CB	10264	22629	2818	5865
289	21458	25143	53D2	6237	10729	32551	29E9	7F27	25344	12857	6300	3239
290	6466	15838	1942	3DDE	3233	7919	0CA1	1EEF	13246	30182	33BE	75E6
291	8999	5336	2327	14D8	16451	2668	4043	0A6C	544	21880	0220	5578
292	26718	21885	685E	557D	13359	25730	342F	6482	9914	6617	26BA	19D9
293	3230	20561	0C9E	5051	1615	26132	064F	6614	4601	27707	11F9	6C3B
294	27961	30097	6D39	7591	26444	29940	674C	74F4	16234	16249	3F6A	3F79
295	28465	21877	6F31	5575	26184	25734	6648	6486	24475	24754	5F9B	60B2
296	6791	23589	1A87	5C25	23699	24622	5C93	602E	26318	31609	66CE	7B79
297	17338	26060	43BA	65CC	8669	13030	21DD	32E6	6224	22689	1850	58A1
298	11832	9964	2E38	26EC	5916	4982	171C	1376	13381	3226	3445	0C9A
299	11407	25959	2C8F	6567	18327	31887	4797	7C8F	30013	4167	753D	1047
300	15553	3294	3CC1	0CDE	20400	1647	4FB0	066F	22195	25624	56B3	6418

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Table E-1: PnMaskI and PnMaskQ Values for PilotPn

Pilot PN	14-Chip Delay				13-Chip Delay				0-Chip Delay			
	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)	I (Dec.)	Q (Dec.)	I (Hex.)	Q (Hex.)
301	17418	30173	440A	75DD	8709	29906	2205	74D2	30380	10924	76AC	2AAC
302	14952	15515	3A68	3C9B	7476	20593	1D34	5071	15337	23096	3BE9	5A38
303	52	5371	0034	14FB	26	17473	001A	4441	10716	22683	29DC	589B
304	27254	10242	6A76	2802	13627	5121	353B	1401	13592	10955	3518	2ACB
305	15064	28052	3AD8	6D94	7532	14026	1D6C	36CA	2412	17117	096C	42DD
306	10942	14714	2ABE	397A	5471	7357	155F	1CBD	15453	15837	3C5D	3DDD
307	377	19550	0179	4C5E	20844	9775	516C	262F	13810	22647	35F2	5877
308	14303	8866	37DF	22A2	19007	4433	4A3F	1151	12956	10700	329C	29CC
309	24427	15297	5F6B	3BC1	32357	21468	7E65	53DC	30538	30293	774A	7655
310	26629	10898	6805	2A92	26066	5449	65D2	1549	10814	5579	2A3E	15CB
311	20011	31315	4E2B	7A53	30405	29461	76C5	7315	18939	11057	49FB	2B31
312	16086	19475	3ED6	4C13	8043	26677	1F6B	6835	19767	30238	4D37	761E
313	24374	1278	5F36	04FE	12187	639	2F9B	027F	20547	14000	5043	36B0
314	9969	11431	26F1	2CA7	17064	22639	42A8	586F	29720	22860	7418	594C
315	29364	31392	72B4	7AA0	14682	15696	395A	3D50	31831	27172	7C57	6A24
316	25560	4381	63D8	111D	12780	18098	31EC	46B2	26287	307	66AF	0133
317	28281	14898	6E79	3A32	26348	7449	66EC	1D19	11310	20380	2C2E	4F9C
318	7327	23959	1C9F	5D97	24479	24823	5F9F	60F7	25724	26427	647C	673B
319	32449	16091	7EC1	3EDB	28336	20817	6EB0	5151	21423	10702	53AF	29CE
320	26334	9037	66DE	234D	13167	24474	336F	5F9A	5190	30024	1446	7548
321	14760	24162	39A8	5E62	7380	12081	1CD4	2F31	258	14018	0102	36C2
322	15128	6383	3B18	18EF	7564	16971	1D8C	424B	13978	4297	369A	10C9
323	29912	27183	74D8	6A2F	14956	31531	3A6C	7B2B	4670	13938	123E	3672
324	4244	16872	1094	41E8	2122	8436	084A	20F4	23496	25288	5BC8	62C8
325	8499	9072	2133	2370	16713	4536	4149	11B8	23986	27294	5DB2	6A9E
326	9362	12966	2492	32A6	4681	6483	1249	1953	839	31835	0347	7C5B
327	10175	28886	27BF	70D6	16911	14443	420F	386B	11296	8228	2C20	2024
328	30957	25118	78ED	621E	28070	12559	6DA6	310F	30913	12745	78C1	31C9
329	12755	20424	31D3	4FC8	18745	10212	4939	27E4	27297	6746	6AA1	1A5A
330	19350	6729	4B96	1A49	9675	17176	25CB	4318	10349	1456	286D	05B0
331	1153	20983	0481	51F7	21392	26311	5390	66C7	32504	27743	7EF8	6C5F
332	29304	12372	7278	3054	14652	6186	393C	182A	18405	27443	47E5	6B33
333	6041	13948	1799	367C	23068	6974	5A1C	1B3E	3526	31045	0DC6	7945
334	21668	27547	54A4	6B9B	10834	31729	2A52	7BF1	19161	12225	4AD9	2FC1
335	28048	8152	6D90	1FD8	14024	4076	36C8	0FEC	23831	21482	5D17	53EA
336	10096	17354	2770	43CA	5048	8677	13B8	21E5	21380	14678	5384	3956
337	23388	17835	5B5C	45AB	11694	27881	2DAE	6CE9	4282	30656	10BA	77C0
338	15542	14378	3CB6	382A	7771	7189	1E5B	1C15	32382	13721	7E7E	3599
339	24013	7453	5DCD	1D1D	32566	16562	7F36	40B2	806	21831	0326	5547
340	2684	26317	0A7C	66CD	1342	32090	053E	7D5A	6238	30208	185E	7600
341	19018	5955	4A4A	1743	9509	17821	2525	459D	10488	9995	28F8	270B
342	25501	10346	639D	286A	24606	5173	601E	1435	19507	3248	4C33	0CB0
343	4489	13200	1189	3390	22804	6600	5914	19C8	27288	12030	6A98	2EFE
344	31011	30402	7923	76C2	27969	15201	6D41	3B61	2390	5688	0956	1638
345	29448	7311	7308	1C8F	14724	16507	3984	407B	19094	2082	4A96	0822
346	25461	3082	6375	0C0A	24682	1541	606A	0605	13860	23143	3624	5A67
347	11846	21398	2E46	5396	5923	10699	1723	29CB	9225	25906	2409	6532
348	30331	31104	767B	7980	27373	15552	6AED	3CC0	2505	15902	09C9	3E1E
349	10588	24272	295C	5ED0	5294	12136	14AE	2F68	27806	21084	6C9E	525C
350	32154	27123	7D9A	69F3	16077	31429	3ECD	7AC5	2408	25723	0968	647B

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E

Table E-1: PnMaskI and PnMaskQ Values for PilotPn

Pilot PN	14-Chip Delay I (Dec.)	14-Chip Delay Q (Dec.)	14-Chip Delay I (Hex.)	14-Chip Delay Q (Hex.)	13-Chip Delay I (Dec.)	13-Chip Delay Q (Dec.)	13-Chip Delay I (Hex.)	13-Chip Delay Q (Hex.)	0-Chip Delay I (Dec.)	0-Chip Delay Q (Dec.)	0-Chip Delay I (Hex.)	0-Chip Delay Q (Hex.)
351	29572	5578	7384	15CA	14786	2789	39C2	0AE5	13347	13427	3423	3473
352	13173	25731	3375	6483	18538	31869	486A	7C7D	7885	31084	1ECD	796C
353	10735	10662	29EF	29A6	17703	5331	4527	14D3	6669	24023	1A0D	5DD7
354	224	11084	00E0	2B4C	112	5542	0070	15A6	8187	23931	1FFB	5D7B
355	12083	31098	2F33	797A	17993	15549	4649	3CBD	18145	15836	46E1	3DDC
356	22822	16408	5926	4018	11411	8204	2C93	200C	14109	6085	371D	17C5
357	2934	6362	0B76	18DA	1467	3181	05BB	0C6D	14231	30324	3797	7674
358	27692	2719	6C2C	0A9F	13846	19315	3616	4B73	27606	27561	6BD6	6BA9
359	10205	14732	27DD	398C	16958	7366	423E	1CC6	783	13821	030F	35FD
360	7011	22744	1B63	58D8	23649	11372	5C61	2C6C	6301	269	189D	010D
361	22098	1476	5652	05C4	11049	738	2B29	02E2	5067	28663	13CB	6FF7
362	2640	8445	0A50	20FD	1320	24130	0528	5E42	15383	29619	3C17	73B3
363	4408	21118	1138	527E	2204	10559	089C	293F	1392	2043	0570	07FB
364	102	22198	0066	56B6	51	11099	0033	2B5B	7641	6962	1DD9	1B32
365	27632	22030	6BF0	560E	13816	11015	35F8	2B07	25700	29119	6464	71BF
366	19646	10363	4CBE	287B	9823	23041	265F	5A01	25259	22947	62AB	59A3
367	26967	25802	6957	64CA	25979	12901	657B	3265	19813	9612	4D65	258C
368	32008	2496	7D08	09C0	16004	1248	3E84	04E0	20933	18698	51C5	490A
369	7873	31288	1EC1	7A38	24240	15644	5EB0	3D1C	638	16782	027E	418E
370	655	24248	028F	5EB8	20631	12124	5097	2F5C	16318	29735	3FBE	7427
371	25274	14327	62BA	37F7	12637	21959	315D	55C7	6878	2136	1ADE	0858
372	16210	23154	3F52	5A72	8105	11577	1FA9	2D39	1328	8086	0530	1F96
373	11631	13394	2D6F	3452	18279	6697	4767	1A29	14744	10553	3998	2939
374	8535	1806	2157	070E	16763	903	417B	0387	22800	11900	5910	2E7C
375	19293	17179	4B5D	431B	29822	28593	747E	6FB1	25919	19996	653F	4E1C
376	12110	10856	2F4E	2A68	6055	5428	17A7	1534	4795	5641	12BB	1609
377	21538	25755	5422	649B	10769	31857	2A11	7C71	18683	28328	48FB	6EA8
378	10579	15674	2953	3D3A	17785	7837	4579	1E9D	32658	25617	7F92	6411
379	13032	7083	32E8	1BAB	6516	17385	1974	43E9	1586	26986	0632	696A
380	14717	29096	397D	71A8	19822	14548	4D6E	38D4	27208	5597	6A48	15DD
381	11666	3038	2D92	0BDE	5833	1519	16C9	05EF	17517	14078	446D	36FE
382	25809	16277	64D1	3F95	25528	20982	63B8	51F6	599	13247	0257	33BF
383	5008	25525	1390	63B5	2504	32742	09C8	7FE6	16253	499	3F7D	01F3
384	32418	20465	7EA2	4FF1	16209	27076	3F51	69C4	8685	30469	21ED	7705
385	22175	28855	569F	70B7	31391	30311	7A9F	7667	29972	17544	7514	4488
386	11742	32732	2DDE	7FDC	5871	16366	16EF	3FEE	22128	28510	5670	6F5E
387	22546	20373	5812	4F95	11273	27126	2C09	69F6	19871	23196	4D9F	5A9C
388	21413	9469	53A5	24FD	30722	23618	7802	5C42	19405	13384	4BCD	3448
389	133	26155	0085	662B	20882	32041	5192	7D29	17972	4239	4634	108F
390	4915	6957	1333	1B2D	22601	17322	5849	43AA	8599	20725	2197	50F5
391	8736	12214	2220	2FB6	4368	6107	1110	17DB	10142	6466	279E	1942
392	1397	21479	0575	53E7	21354	26575	536A	67CF	26834	28465	68D2	6F31
393	18024	31914	4668	7CAA	9012	15957	2334	3E55	23710	19981	5C9E	4E0D
394	15532	32311	3CAC	7E37	7766	28967	1E56	7127	27280	16723	6A90	4153
395	26870	11276	68F6	2C0C	13435	5638	347B	1606	6570	4522	19AA	11AA
396	5904	20626	1710	5092	2952	10313	0B88	2849	7400	678	1CE8	02A6
397	24341	423	5F15	01A7	32346	20207	7E5A	4EEF	26374	15320	6706	3BD8
398	13041	2679	32F1	0A77	18600	19207	48A8	4B07	22218	29116	56CA	71BC
399	23478	15537	5BB6	3CB1	11739	20580	2DDB	5064	29654	5388	73D6	150C
400	1862	10818	0746	2A42	931	5409	03A3	1521	13043	22845	32F3	593D

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E

Table E-1: PnMaskI and PnMaskQ Values for PilotPn

Pilot PN	14-Chip Delay I (Dec.)	14-Chip Delay Q (Dec.)	14-Chip Delay I (Hex.)	14-Chip Delay Q (Hex.)	13-Chip Delay I (Dec.)	13-Chip Delay Q (Dec.)	13-Chip Delay I (Hex.)	13-Chip Delay Q (Hex.)	0-Chip Delay I (Dec.)	0-Chip Delay Q (Dec.)	0-Chip Delay I (Hex.)	0-Chip Delay Q (Hex.)
401	5850	23074	16DA	5A22	2925	11537	0B6D	2D11	24457	28430	5F89	6F0E
402	5552	20250	15B0	4F1A	2776	10125	0AD8	278D	17161	8660	4309	21D4
403	12589	14629	312D	3925	18758	21166	4946	52AE	21314	2659	5342	0A63
404	23008	29175	59E0	71F7	11504	30407	2CF0	76C7	28728	8803	7038	2263
405	27636	13943	6BF4	3677	13818	21767	35FA	5507	22162	19690	5692	4CEA
406	17600	11072	44C0	2B40	8800	5536	2260	15A0	26259	22169	6693	5699
407	17000	29492	4268	7334	8500	14746	2134	399A	22180	8511	56A4	213F
408	21913	5719	5599	1657	31516	17687	7B1C	4517	2266	17393	08DA	43F1
409	30320	7347	7670	1CB3	15160	16485	3B38	4065	10291	11336	2833	2C48
410	28240	12156	6E50	2F7C	14120	6078	3728	17BE	26620	13576	67FC	3508
411	7260	25623	1C5C	6417	3630	31799	0E2E	7C37	19650	22820	4CC2	5924
412	17906	27725	45F2	6C4D	8953	30746	22F9	781A	14236	13344	379C	3420
413	5882	28870	16FA	70C6	2941	14435	0B7D	3863	11482	20107	2CDA	4E8B
414	22080	31478	5640	7AF6	11040	15739	2B20	3D7B	25289	8013	62C9	1F4D
415	12183	28530	2F97	6F72	17947	14265	461B	37B9	12011	18835	2EEB	4993
416	23082	24834	5A2A	6102	11541	12417	2D15	3081	13892	16793	3644	4199
417	17435	9075	441B	2373	29661	24453	73DD	5F85	17336	9818	43B8	265A
418	18527	32265	485F	7E09	30207	28984	75FF	7138	10759	4673	2A07	1241
419	31902	3175	7C9E	0C67	15951	18447	3E4F	480F	26816	13609	68C0	3529
420	18783	17434	495F	441A	30079	8717	757F	220D	31065	10054	7959	2746
421	20027	12178	4E3B	2F92	30413	6089	76CD	17C9	8578	10988	2182	2AEC
422	7982	25613	1F2E	640D	3991	31802	0F97	7C3A	24023	14744	5DD7	3998
423	20587	31692	506B	7BCC	31205	15846	79E5	3DE6	16199	17930	3F47	460A
424	10004	25384	2714	6328	5002	12692	138A	3194	22310	25452	5726	636C
425	13459	18908	3493	49DC	19353	9454	4B99	24EE	30402	11334	76C2	2C46
426	13383	25816	3447	64D8	19443	12908	4BF3	326C	16613	15451	40E5	3C5B
427	28930	4661	7102	1235	14465	18214	3881	4726	13084	11362	331C	2C62
428	4860	31115	12FC	798B	2430	29433	097E	72F9	3437	2993	0D6D	0BB1
429	13108	7691	3334	1E0B	6554	16697	199A	4139	1703	11012	06A7	2B04
430	24161	1311	5E61	051F	32480	19635	7EE0	4CB3	22659	5806	5883	16AE
431	20067	16471	4E63	4057	30433	28183	76E1	6E17	26896	20180	6910	4ED4
432	2667	15771	0A6B	3D9B	21733	20721	54E5	50F1	1735	8932	06C7	22E4
433	13372	16112	343C	3EF0	6686	8056	1A1E	1F78	16178	23878	3F32	5D46
434	28743	21062	7047	5246	27123	10531	69F3	2923	19166	20760	4ADE	5118
435	24489	29690	5FA9	73FA	32260	14845	7E04	39FD	665	32764	0299	7FFC
436	249	10141	00F9	279D	20908	24050	51AC	5DF2	20227	32325	4F03	7E45
437	19960	19014	4DF8	4A46	9980	9507	26FC	2523	24447	25993	5F7F	6589
438	29682	22141	73F2	567D	14841	25858	39F9	6502	16771	3268	4183	0CC4
439	31101	11852	797D	2E4C	28014	5926	6D6E	1726	27209	25180	6A49	625C
440	27148	26404	6A0C	6724	13574	13202	3506	3392	6050	12149	17A2	2F75
441	26706	30663	6852	77C7	13353	30175	3429	75DF	29088	10193	71A0	27D1
442	5148	32524	141C	7F0C	2574	16262	0A0E	3F86	7601	9128	1DB1	23A8
443	4216	28644	1078	6FE4	2108	14322	083C	37F2	4905	7843	1329	1EA3
444	5762	10228	1682	27F4	2881	5114	0B41	13FA	5915	25474	171B	6382
445	245	23536	00F5	5BF0	20906	11768	51AA	2DF8	6169	11356	1819	2C5C
446	21882	18045	557A	467D	10941	27906	2ABD	6D02	21303	11226	5337	2BDA
447	3763	25441	0EB3	6361	22153	32652	5689	7F8C	28096	16268	6DC0	3F8C
448	206	27066	00CE	69BA	103	13533	0067	34DD	8905	14491	22C9	389B
449	28798	13740	707E	35AC	14399	6870	383F	1AD6	26997	8366	6975	20AE
450	32402	13815	7E92	35F7	16201	21703	3F49	54C7	15047	26009	3AC7	6599

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E

Table E-1: PnMaskI and PnMaskQ Values for PilotPn

Pilot PN	14-Chip Delay I (Dec.)	14-Chip Delay Q (Dec.)	14-Chip Delay I (Hex.)	14-Chip Delay Q (Hex.)	13-Chip Delay I (Dec.)	13-Chip Delay Q (Dec.)	13-Chip Delay I (Hex.)	13-Chip Delay Q (Hex.)	0-Chip Delay I (Dec.)	0-Chip Delay Q (Dec.)	0-Chip Delay I (Hex.)	0-Chip Delay Q (Hex.)
451	13463	3684	3497	0E64	19355	1842	4B9B	0732	17460	5164	4434	142C
452	15417	23715	3C39	5CA3	20428	24685	4FCC	606D	17629	17126	44DD	42E6
453	23101	15314	5A3D	3BD2	31950	7657	7CCE	1DE9	10461	21566	28DD	543E
454	14957	32469	3A6D	7ED5	19686	29014	4CE6	7156	21618	21845	5472	5555
455	23429	9816	5B85	2658	31762	4908	7C12	132C	11498	28149	2CEA	6DF5
456	12990	4444	32BE	115C	6495	2222	195F	08AE	193	9400	00C1	24B8
457	12421	5664	3085	1620	18834	2832	4992	0B10	16140	19459	3F0C	4C03
458	28875	7358	70CB	1CBE	27061	3679	69B5	0E5F	13419	7190	346B	1C16
459	4009	27264	0FA9	6A80	22020	13632	5604	3540	10864	3101	2A70	0C1D
460	1872	28128	0750	6DE0	936	14064	03A8	36F0	28935	491	7107	01EB
461	15203	30168	3B63	75D8	19553	15084	4C61	3AEC	18765	25497	494D	6399
462	30109	29971	759D	7513	27422	29877	6B1E	74B5	27644	29807	6BFC	746F
463	24001	3409	5DC1	0D51	32560	18580	7F30	4894	21564	26508	543C	678C
464	4862	16910	12FE	420E	2431	8455	097F	2107	5142	4442	1416	115A
465	14091	20739	370B	5103	19029	26301	4A55	66BD	1211	4871	04BB	1307
466	6702	10191	1A2E	27CF	3351	24027	0D17	5DDB	1203	31141	04B3	79A5
467	3067	12819	0BFB	3213	21549	22325	542D	5735	5199	9864	144F	2688
468	28643	19295	6FE3	4B5F	26145	27539	6621	6B93	16945	12589	4231	312D
469	21379	10072	5383	2758	30737	5036	7811	13AC	4883	5417	1313	1529
470	20276	15191	4F34	3B57	10138	21399	279A	5397	25040	8549	61D0	2165
471	25337	27748	62F9	6C64	24748	13874	60AC	3632	7119	14288	1BCF	37D0
472	19683	720	4CE3	02D0	30625	360	77A1	0168	17826	8503	45A2	2137
473	10147	29799	27A3	7467	16897	29711	4201	740F	4931	20357	1343	4F85
474	16791	27640	4197	6BF8	28955	13820	711B	35FC	25705	15381	6469	3C15
475	17359	263	43CF	0107	28727	20159	7037	4EBF	10726	18065	29E6	4691
476	13248	24734	33C0	609E	6624	12367	19E0	304F	17363	24678	43D3	6066
477	22740	16615	58D4	40E7	11370	28239	2C6A	6E4F	2746	23858	0ABA	5D32
478	13095	20378	3327	4F9A	18499	10189	4843	27CD	10952	7610	2AC8	1DBA
479	10345	25116	2869	621C	17892	12558	45E4	310E	19313	18097	4B71	46B1
480	30342	19669	7686	4CD5	15171	26710	3B43	6856	29756	20918	743C	51B6
481	27866	14656	6CDA	3940	13933	7328	366D	1CA0	14297	7238	37D9	1C46
482	9559	27151	2557	6A0F	17275	31547	437B	7B3B	21290	30549	532A	7755
483	8808	28728	2268	7038	4404	14364	1134	381C	1909	16320	0775	3FC0
484	12744	25092	31C8	6204	6372	12546	18E4	3102	8994	20853	2322	5175
485	11618	22601	2D62	5849	5809	25112	16B1	6218	13295	26736	33EF	6870
486	27162	2471	6A1A	09A7	13581	19183	350D	4AEF	21590	10327	5456	2857
487	17899	25309	45EB	62DD	29477	32594	7325	7F52	26468	24404	6764	5F54
488	29745	15358	7431	3BFE	27592	7679	6BC8	1DFF	13636	7931	3544	1EFB
489	31892	17739	7C94	454B	15946	27801	3E4A	6C99	5207	5310	1457	14BE
490	23964	12643	5D9C	3163	11982	22157	2ECE	568D	29493	554	7335	022A
491	23562	32730	5C0A	7FDA	11781	16365	2E05	3FED	18992	27311	4A30	6AAF
492	2964	19122	0B94	4AB2	1482	9561	05CA	2559	12567	6865	3117	1AD1
493	18208	16870	4720	41E6	9104	8435	2390	20F3	12075	7762	2F2B	1E52
494	15028	10787	3AB4	2A23	7514	23341	1D5A	5B2D	26658	15761	6822	3D91
495	21901	18400	558D	47E0	31510	9200	7B16	23F0	21077	12697	5255	3199
496	24566	20295	5FF6	4F47	12283	27039	2FFB	699F	15595	24850	3CEB	6112
497	18994	1937	4A32	0791	9497	19956	2519	4DF4	4921	15259	1339	3B9B
498	13608	17963	3528	462B	6804	27945	1A94	6D29	14051	24243	36E3	5EB3
499	27492	7438	6B64	1D0E	13746	3719	35B2	0E87	5956	30508	1744	772C
500	11706	12938	2DBA	328A	5853	6469	16DD	1945	21202	13982	52D2	369E

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E

Table E-1: PnMaskI and PnMaskQ Values for PilotPn

Pilot PN	14-Chip Delay I (Dec.)	14-Chip Delay Q (Dec.)	14-Chip Delay I (Hex.)	14-Chip Delay Q (Hex.)	13-Chip Delay I (Dec.)	13-Chip Delay Q (Dec.)	13-Chip Delay I (Hex.)	13-Chip Delay Q (Hex.)	0-Chip Delay I (Dec.)	0-Chip Delay Q (Dec.)	0-Chip Delay I (Hex.)	0-Chip Delay Q (Hex.)
501	14301	19272	37DD	4B48	19006	9636	4A3E	25A4	11239	25039	2BE7	61CF
502	23380	29989	5B54	7525	11690	29870	2DAA	74AE	30038	24086	7556	5E16
503	11338	8526	2C4A	214E	5669	4263	1625	10A7	30222	21581	760E	544D
504	2995	18139	0BB3	46DB	21513	27985	5409	6D51	13476	21346	34A4	5362
505	23390	3247	5B5E	0CAF	11695	18539	2DAF	486B	2497	28187	09C1	6E1B
506	14473	28919	3889	70F7	19860	30279	4D94	7647	31842	23231	7C62	5ABF
507	6530	7292	1982	1C7C	3265	3646	0CC1	0E3E	24342	18743	5F16	4937
508	20452	20740	4FE4	5104	10226	10370	27F2	2882	25857	11594	6501	2D4A
509	12226	27994	2FC2	6D5A	6113	13997	17E1	36AD	27662	7198	6C0E	1C1E
510	1058	2224	0422	08B0	529	1112	0211	0458	24594	105	6012	0069
511	12026	6827	2EFA	1AAB	6013	17257	177D	4369	16790	4534	4196	11B6

E

Notes

E

Appendix F

Test Preparation

F

Test Equipment Setup

Purpose

This appendix provides information on setting up the HP8921 with PCS interface, the HP8935 and the Advantest R3465. The Cybertest test set doesn't require any setup.

HP8921A Test Equipment Connections

Table F-1 depicts the rear panels of the HP 8921A test equipment as configured to perform automatic tests. All test equipment is controlled by the LMF via an IEEE-488/GPIB bus. The LMF expects each piece of test equipment to have a factory-set GPIB address (refer to Table F-4). If there is a communications problem between the LMF and any piece of test equipment, you should verify that the GPIB addresses have been set correctly and that the GPIB cables are firmly connected to the test equipment.

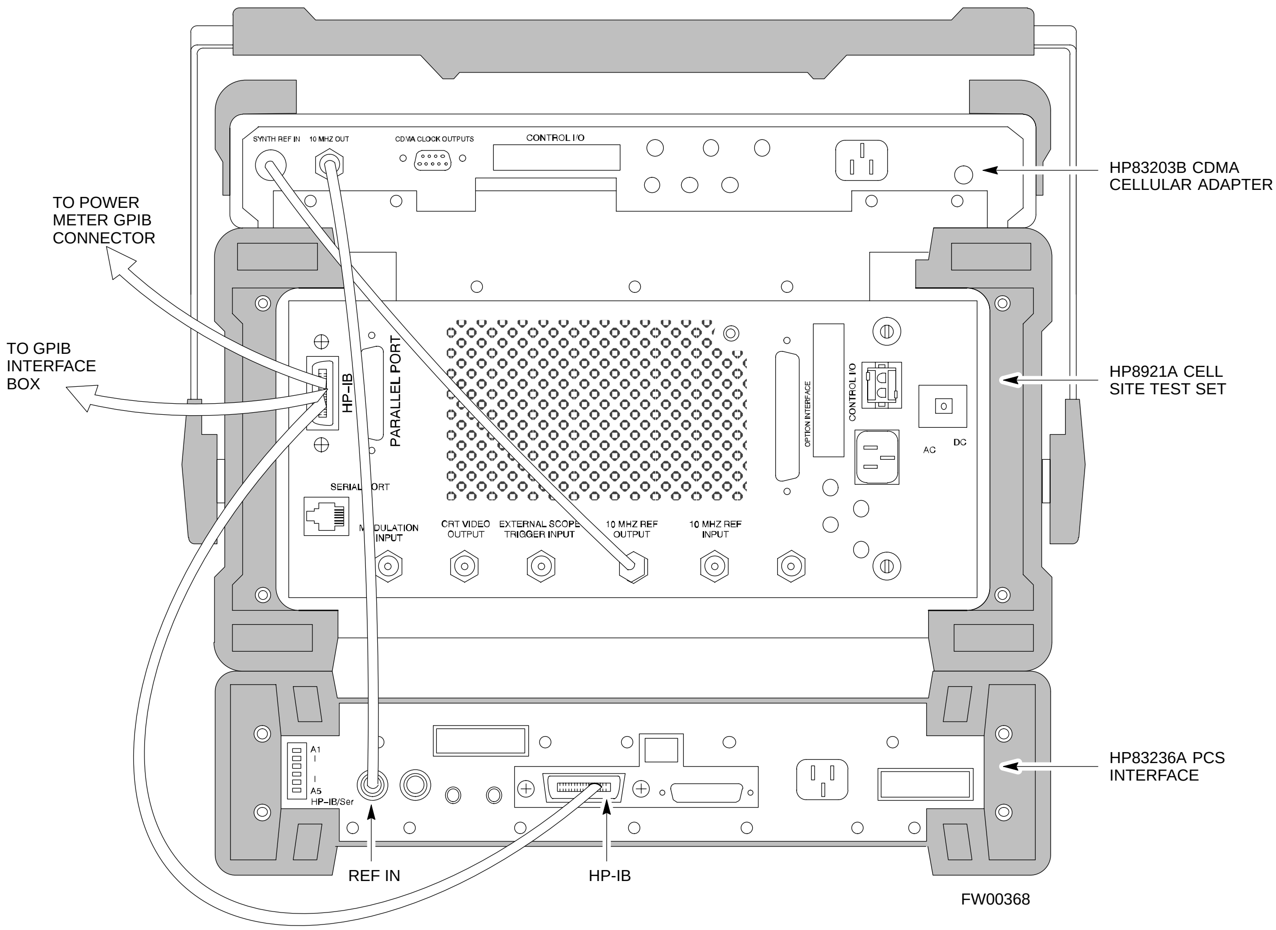
Figure F-1 shows the connections when **not using** an external 10 MHz Rubidium reference.

Table F-1: HP8921A/600 Communications Test Set Rear Panel Connections Without Rubidium

From Test Set:	To Interface:		Connector Type
8921A	83203B CDMA	83236A PCS	
CW RF OUT	CW RF IN		SMC-female - SMC-female
114.3 MHZ IF OUT	114.3 MHZ IF IN		SMC-female - SMC-female
IQ RF IN	IQ RF OUT		SMC-female - SMC-female
DET OUT	AUX DSP IN		SMC-female - SMC-female
CONTROL I/O	CONTROL I/O		45-pin custom BUS
10 MHZ OUT	SYNTH REF IN		BNC-male - BNC-male
HPIB INTERFACE		HPIB INTERFACE	HPIB cable
	10 MHZ OUT	REF IN	BNC-male - BNC-male

F

Figure F-1: HP8921A/600 Cables Connection for 10 MHz Signal and GPIB without Rubidium



REAR PANEL
COMMUNICATIONS TEST SET

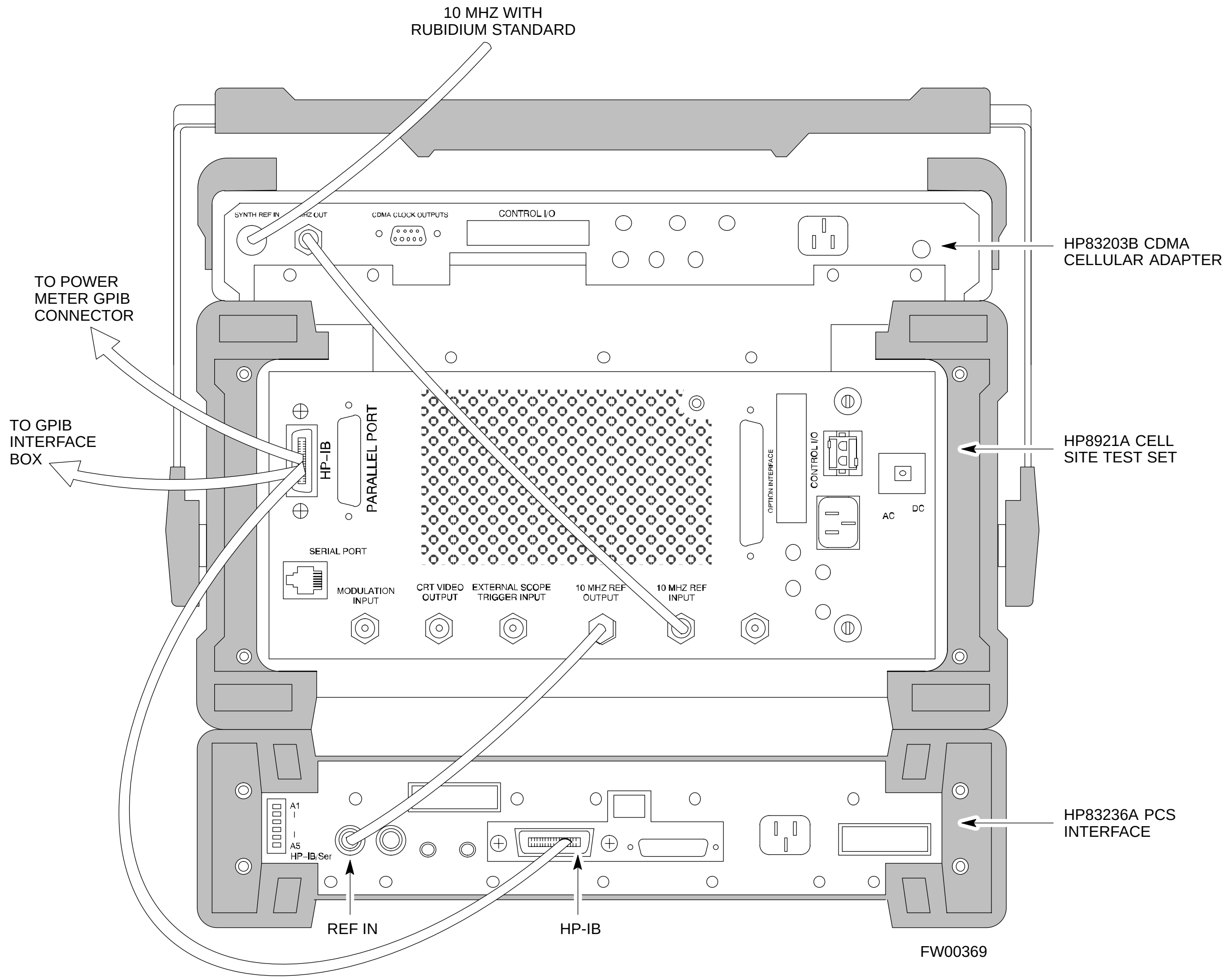
F

Figure F-2 shows the connections **when using** an external 10 MHz Rubidium reference.

Table F-2: HP8921A/600 Communications Test Set Rear Panel Connections With Rubidium

From Test Set:	To Interface:		Connector Type
8921A	**83203B CDMA**	**83236A PCS**	
CW RF OUT	CW RF IN		SMC-female - SMC-female
114.3 MHZ IF OUT	114.3 MHZ IF IN		SMC-female - SMC-female
IQ RF IN	IQ RF OUT		SMC-female - SMC-female
DET OUT	AUX DSP IN		SMC-female - SMC-female
CONTROL I/O	CONTROL I/O		45-pin custom BUS
10 MHZ OUT		REF IN	BNC-male - BNC-male
HPIB INTERFACE		HPIB INTERFACE	HPIB cable
10 MHZ INPUT	10 MHZ OUT		BNC-male - BNC-male

Figure F-2: HP8921A Cables Connection for 10 MHz Signal and GPIB with Rubidium



REAR PANEL
COMMUNICATIONS TEST SET

F

HP8921A System Connectivity Test

Follow the steps in Table F-3 to verify that the connections between the PCS Interface and the HP8921A are correct and cables are intact. The software also performs basic functionality checks of each instrument.

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

Table F-3: System Connectivity

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

F

Setting HP8921A and HP83236A/B GPIB Address

Follow the steps in Table F-4 to set the HP8921A GPIB address.

Table F-4: Setting HP8921A GPIB Address

Step	Action
1	If you have not already done so, turn the HP8921A power on.
2	Verify that the GPIB addresses are set correctly. • HP8921A HP-IB Adrs = 18, accessed by pushing **LOCAL** and selecting **More** and **I/O Configure** on the HP8921A/600. (Consult test equipment OEM documentation for additional info as required). • HP83236A (or B) PCS Interface GPIB address=19. Set dip switches as follows: - A1=1, A2=1, A3=0, A4=0, A5=1, HP-IB/Ser = 1

Pretest Setup for HP8921A

Before the HP8921A CDMA analyzer is used for LMF controlled testing it must be set up correctly for automatic testing.

Table F-5: Pretest Setup for HP8921A

Step	Action
1	Unplug the memory card if it is plugged in.
2	Press the **CURSOR CONTROL** knob.
3	Position the cursor at **IO CONFIG** (under **To Screen** and **More**) and select it.
4	Select Mode and set for **Talk&Lstn**.

Pretest Setup for HP8935

Before the HP8935 CDMA analyzer is used for LMF controlled testing it must be set up correctly for automatic testing.

Table F-6: Pretest Setup for HP8935

Step	Action
1	Unplug the memory card if it is plugged in.
2	Press the **Shift** button and then press the **I/O Config** button.
3	Press the **Push to Select** knob.
4	Position the cursor at **IO CONFIG** and select it.
5	Select **Mode** and set for **Talk&Lstn**.

Advantest R3465 Connection

The following diagram depicts the rear panels of the Advantest test equipment as configured to perform automatic tests. All test equipment is controlled by the LMF via an IEEE-488/GPIB bus. The LMF expects each piece of test equipment to have a factory-set GPIB address (refer to Table F-7). If there is a communications problem between the LMF and any piece of test equipment, you should verify that the GPIB addresses have been set correctly and that the GPIB cables are firmly connected to the test equipment.

Figure F-3 shows the connections when **not using** an external 10 MHz Rubidium reference.

Figure F-3: Cable Connections for Test Set without 10 MHz Rubidium Standard

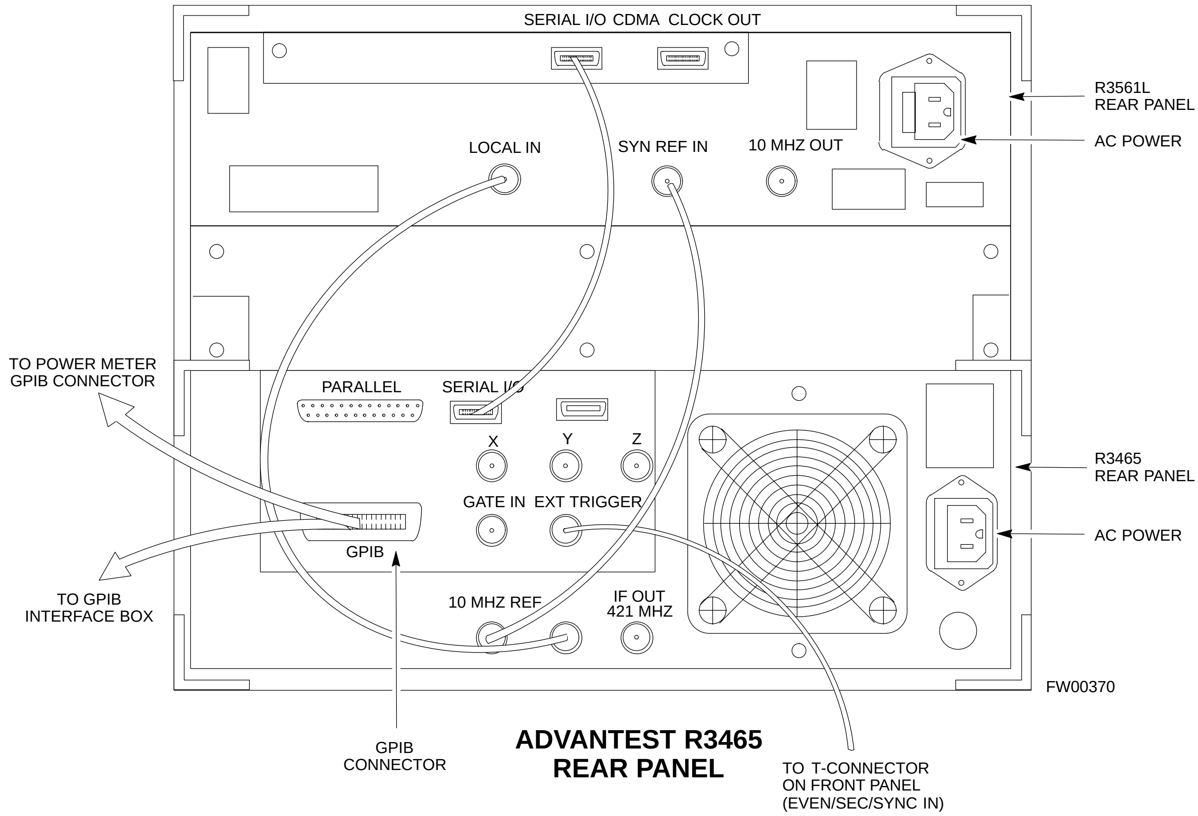


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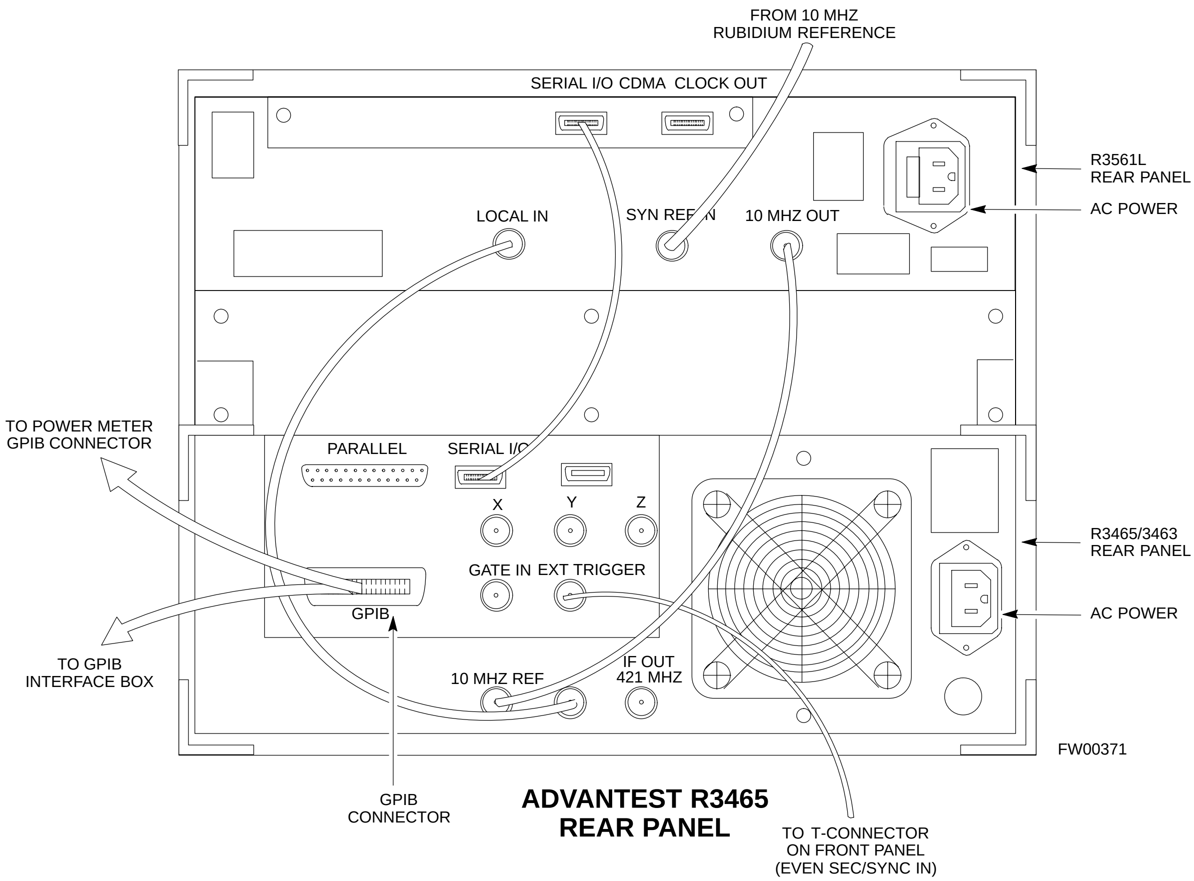
Figure F-4 shows the connections when **using** an external 10 MHz Rubidium reference.

Figure F-4: Cable Connections for Test Set with 10 MHz Rubidium Standard



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R3465 GPIB Address & Clock setup

Follow the steps in Table F-7 to set the GPIB address and clock for the **Advantest** R3465 equipment.

Table F-7: Advantest R3465 GPIB Address and Clock Setup

Step	Action
1	Communications test set GPIB address=**18** *(perform the following to view/set as required)* Perform the following to set the standard parameters on the test set: • Push the **SHIFT** then **PRESET** pushbutton (just below the CRT display). • Push the **LCL** pushbutton (CW in Measurement just below the CRT display) - Push the **GPIB and Others** CRT menu key to view the current address. - ***If required,*** change GPIB address to **18** *(rotate the vernier knob to set, push the vernier knob to enter)*
2	Verify the current Date and Time in upper/right of the CRT display (*perform the following to set if required)* Communications test set GPIB address=**18** *(perform the following to view/set as required)* • Push the **Date/Time CRT** menu key • ***If required,*** change to correct Date/Time *(rotate the vernier knob to select and set, push the vernier knob to enter)* • Push the **SHIFT** then **PRESET** pushbutton (just below the CRT display).

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Pretest Setup for Advantest R3465

Before the Advantest R3465 analyzer is used for LMF controlled testing it must be set up correctly for automatic testing.

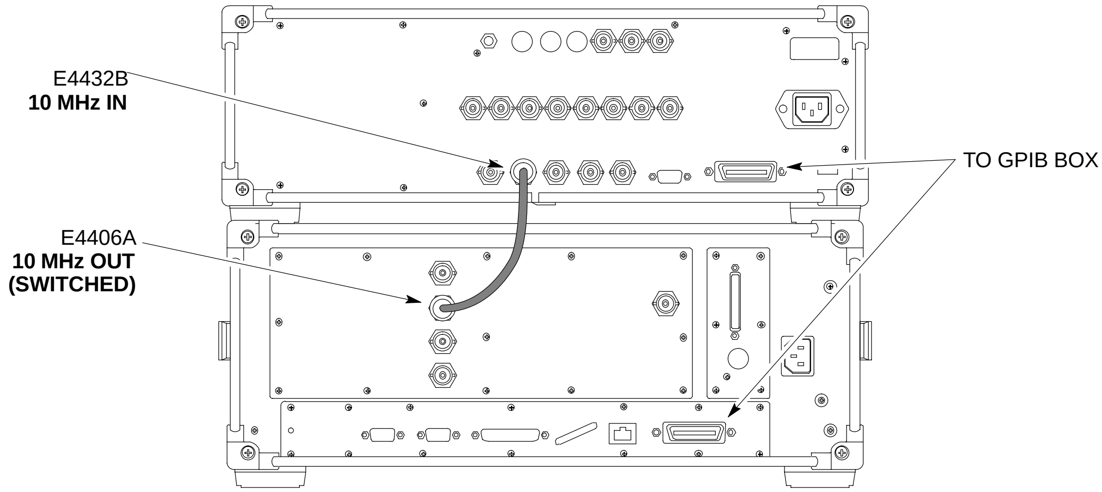
Table F-8: Pretest Setup for Advantest R3465

Step	Action
1	Press the **SHIFT** button so the LED next to it is illuminated.
2	Press the **RESET** button.

Agilent E4406A/E4432B Test Equipment Interconnection

To provide proper operation during testing when both units are required, the 10 MHz reference signal from the E4406A transmitter test set must be provided to the E4432B signal generator. Connect a BNC (M)-BNC (M) cable from the E4406A **10 MHz OUT (SWITCHED)** connector to the E4432B **10MHz IN** connector as shown in Figure F-5.

Figure F-5: Agilent 10 MHz Reference Connections



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Calibrating Test Cable Setup using HP PCS Interface (HP83236)

Table F-9 covers the procedure to calibrate the test equipment using the HP8921 Cellular Communications Analyzer equipped with the HP83236 PCS Interface.

NOTE	Table:note. Note 10pt Helvetica This calibration method ***must be executed with great care.*** Some losses are measured close to the minimum limit of the power meter sensor (-30 dBm).

Prerequisites

Ensure the following prerequisites have been met before proceeding:

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

Table F-9: Calibrating Test Cable Setup (using the HP PCS Interface)

Step	Action	
	NOTE Verify that GPIB controller is turned off.	
1	Insert HP83236 Manual Control System card into memory card slot.	
2	Press the **Preset** pushbutton.	
3	Under **Screen Controls**, press the **TESTS** pushbutton to display the **TESTS** (Main Menu) screen.	
4	Position the cursor at **Select Procedure Location** and select it. In the Choices selection box, select **CARD.**	
5	Position the cursor at **Select Procedure Filename** and select it. In the Choices selection box, select **MANUAL**.	
6	Position the cursor at **RUN TEST** and select it. HP must be in Control Mode **Select YES.**	
7	If using **HP 83236A:** Set channel number=<*chan#*>: - Position cursor at **Channel Number** and select it. - Enter the *chan#* using the numeric keypad; press **[Enter]** and the screen will go blank. - When the screen reappears, the *chan#* will be displayed on the channel number line.	If using **HP 83236B:** Set channel frequency: - Position cursor at **Frequency Band** and press **Enter**. - Select **User Defined Frequency**. - Go **Back to Previous Menu**. - Position the cursor to **83236** generator frequency and enter actual RX frequency. - Position the cursor to **83236** analyzer frequency and enter actual TX frequency.
8	Set RF Generator level: - Position the cursor at **RF Generator Level** and select it. - Enter **-10** using the numeric keypad; press [**Enter**] and the screen will go blank. - When the screen reappears, the value -10 dBm will be displayed on the RF Generator Level line.	

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Table F-9: Calibrating Test Cable Setup (using the HP PCS Interface)	
Step	**Action**
9	Set the user fixed Attenuation Setting to **0 dBm:** - Position cursor at **Analyzer Attenuation** and select it - Position cursor at **User Fixed Atten Settings** and select it. - Enter 0 (zero) using the numeric keypad and press [**Enter**].
10	Select **Back to Previous Menu**.
11	Record the HP83236 Generator Frequency Level: Record the HP83236**B** Generator Frequency Level: - Position cursor at **Show Frequency and Level Details** and select it. - Under HP83236 Frequencies and Levels, record the Generator Level. - Under HP83236**B** Frequencies and Levels, record the Generator Frequency Level (1850 - 1910 MHz). - Position cursor at **Prev Menu** and select it.
12	Click on **Pause for Manual Measurement**.
13	Connect the power sensor directly to the *RF OUT ONLY* port of the PCS Interface.
14	On the HP8921A, under **To Screen,** select **CDMA GEN**.
15	Move the cursor to the **Amplitude** field and click on the Amplitude value.
16	Increase the Amplitude value until the power meter reads **0 dBm ±0.2 dB**. **NOTE** The Amplitude value can be increased coarsely until 0 dBM is reached; then fine tune the amplitude by adjusting the **Increment Set** to 0.1 dBm and targeting in on 0 dBm.
17	Disconnect the power sensor from the *RF OUT ONLY* port of the PCS Interface. *** IMPORTANT** The Power Meter sensor's lower limit is -30 dBm. Thus, only components having losses ≤30 dB should be measured using this method. **For further accuracy, always re-zero the power meter before connecting the power sensor to the component being calibrated. After connecting the power sensor to the component, record the calibrated loss immediately.**
18	Disconnect all components in the test setup and calibrate each one separately by connecting each component, one-at-a-time, between the *RF OUT ONLY PORT* and the power sensor. Record the calibrated loss value displayed on the power meter. • Example: (A) Test Cable(s) = -1.4 dB (B) 20 dB Attenuator = -20.1 dB (B) Directional Coupler = -29.8 dB
19	After all components are calibrated, reassemble all components together and calculate the total test setup loss by adding up all the individual losses: • Example: Total test setup loss = -1.4 -29.8 -20.1 = -51.3 dB. This calculated value will be used in the next series of tests.
20	Under **Screen Controls** press the **TESTS** button to display the **TESTS** (Main Menu) screen.
21	Select **Continue** (K2).
22	Select **RF Generator Level** and set to -119 dBm.

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Table F-9: Calibrating Test Cable Setup (using the HP PCS Interface)	
Step	**Action**
23	Click on **Pause for Manual Measurement**.
24	Verify the HP8921A Communication Analyzer/83203A CDMA interface setup is as follows (fields not indicated remain at default): • Verify the GPIB (HP-IB) address: - under **To Screen,** select **More** - select **IO CONFIG** - Set HP-IB Adrs to **18** - set Mode to **Talk&Lstn** • Verify the HP8921A is displaying frequency (instead of RF channel) - Press the blue **[SHIFT]** button, then press the Screen Control **[DUPLEX]** button; this switches to the **CONFIG** (CONFIGURE) screen. - Use the cursor control to set RF Display to **Freq**
25	Refer toChapter 3 for assistance in setting the cable loss values into the LMF.

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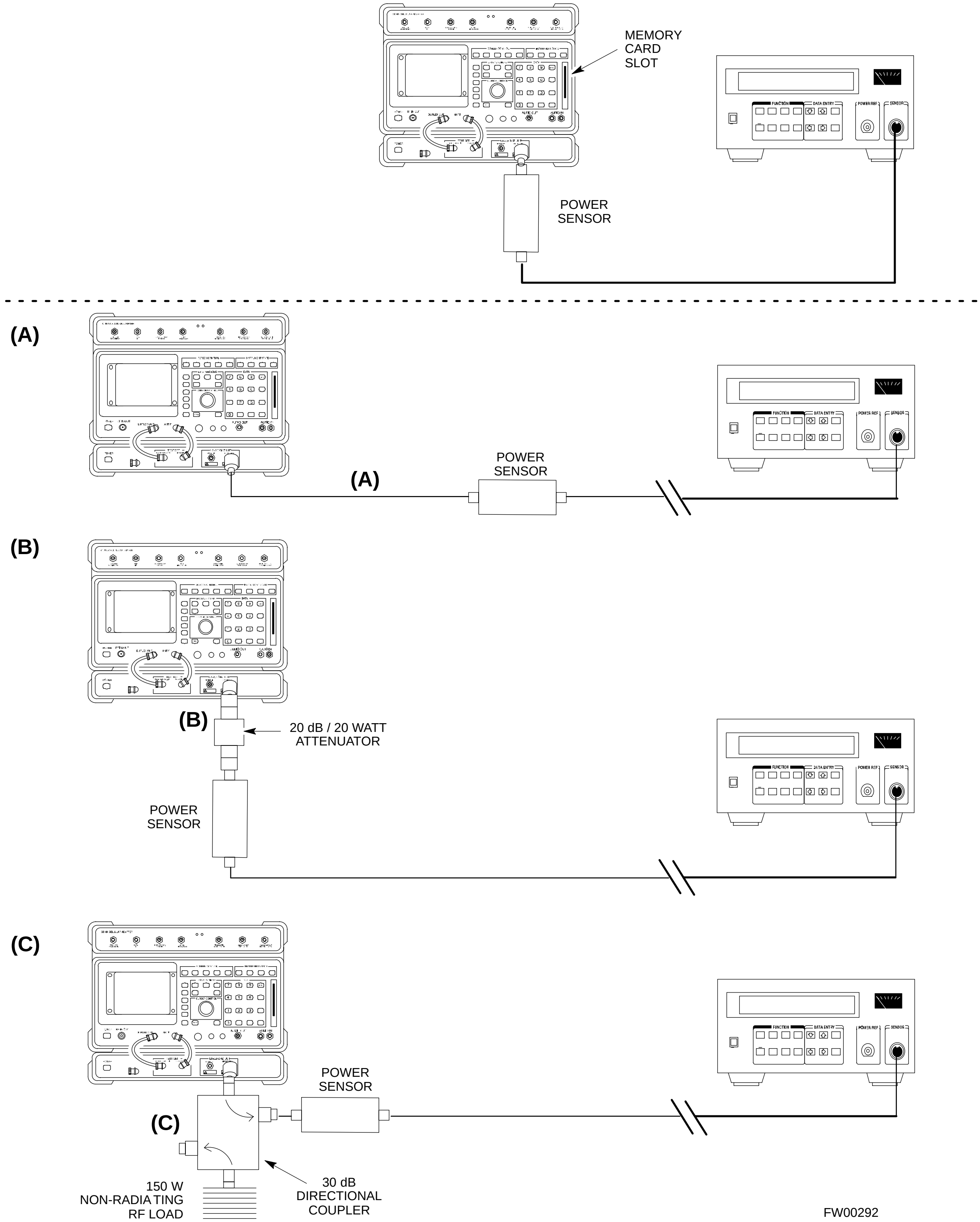
Figure F-6: Cable CalibrationUsing HP8921 with PCS Interface



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Calibrating Test Cable Setup using Advantest R3465

NOTE	Be sure the GPIB Interface is OFF for this procedure.

Advantest R3465 Manual Test setup and calibration must be performed at both the TX and RX frequencies.

Table F-10: Procedure for Calibrating Test Cable Setup Using Advantest R3465

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

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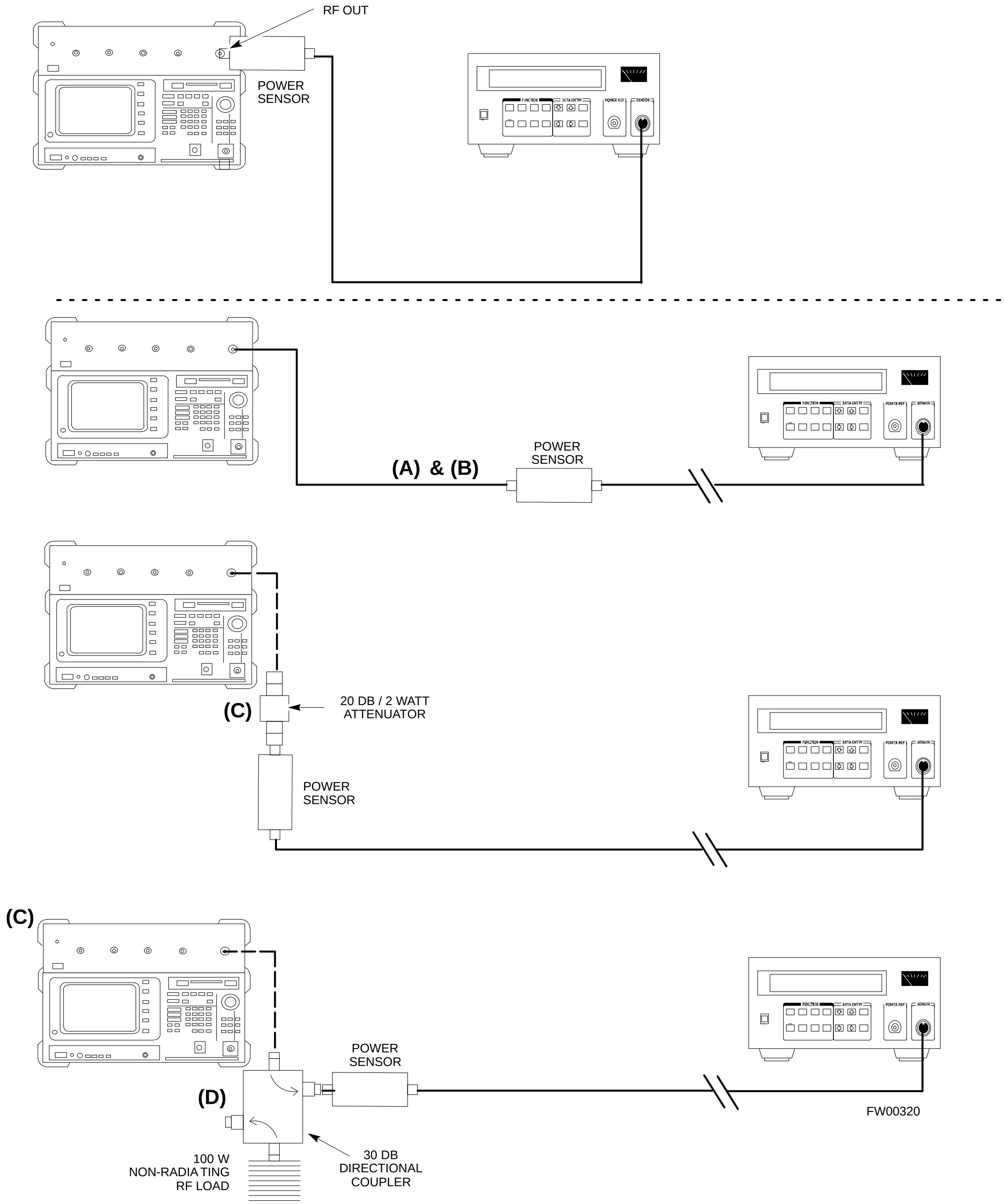
Table F-10: Procedure for Calibrating Test Cable Setup Using Advantest R3465	
Step	**Action**
16	Disconnect the power meter sensor from the R3561L RF OUT jack.
	*** IMPORTANT** The Power Meter sensor's lower limit is -30 dBm. Thus, only components having losses ≤ 30 dB should be measured using this method. **For best accuracy, always re-zero the power meter before connecting the power sensor to the component being calibrated. Then, after connecting the power sensor to the component, record the calibrated loss immediately.**
17	Disconnect all components in the the test setup and calibrate each one separately. Connect each component one-at-a-time between the "RF OUT" port and the power sensor (see Figure F-7, "Setups A, B, and C"). Record the calibrated loss value displayed on the power meter for each connection. Example: (A) 1st Test Cable = -0.5 dB (B) 2nd Test Cable = -1.4 dB (C) 20 dB Attenuator = -20.1 dB (D) 30 dB Directional Coupler = -29.8 dB
18	Press the **Output** CRT menu key to toggle Output OFF.
19	Calculate the total test setup loss by adding up all the individual losses: Example: Total test setup loss = 0.5 + 1.4 + 20.1 + 29.8 = 51.8 dB This calculated value will be used in the next series of tests.
20	Press the **FREQ** key in the ENTRY area
21	Using the keypad entry keys, set the test frequency to the RX frequency
22	Repeat steps 9 through 19 for the RX frequency.
23	Refer to Chapter 3 for assistance in setting the cable loss values into the LMF.

Figure F-7: Cable Calibration using Advantest R3465



Calibrating HP 437 Power Meter

Precise transmit output power calibration measurements are made using a bolometer-type broadband power meter with a sensitive power sensor. Follow the steps outlined in Table F-11 to enter information unique to the power sensor before calibrating the test setup. Refer to Figure F-8 as required.

NOTE	Table:note. Note 10pt Helvetica This procedure must be done *in conjunction with* the automated calibration to enter power sensor specific calibration values.

Figure F-8: Power Meter Detail

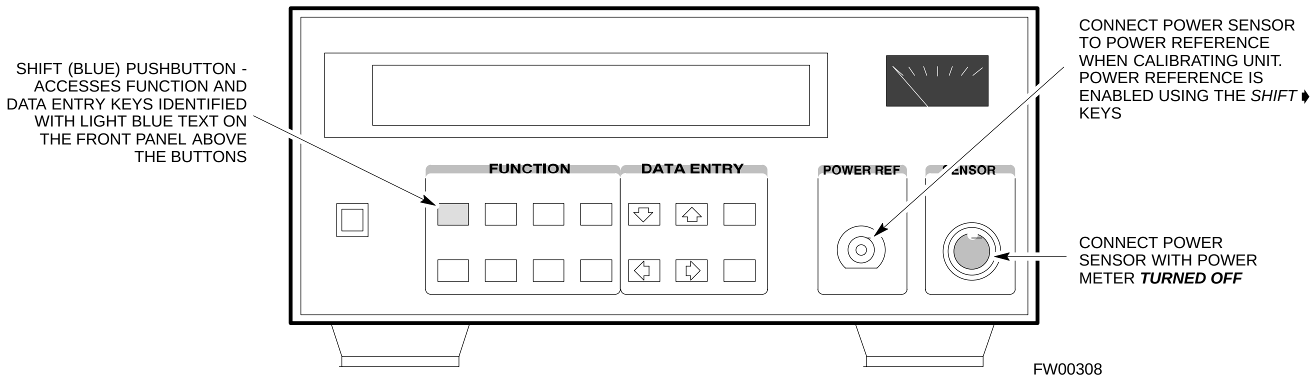


Table F-11: Power Meter Calibration Procedure

Step	Action
	! CAUTION Do not connect/disconnect the power meter sensor cable with ac power applied to the meter. Disconnection could result in destruction of the sensing element or mis-calibration.
1	- Make sure the power meter **AC LINE** pushbutton is **OFF**. - Connect the power sensor cable to the **SENSOR** input.
2	Set the **AC LINE** pushbutton to **ON.** **NOTE** The calibration should be performed only after the power meter and sensor have been allowed to warm-up and stabilize for a *minimum of 60 minutes*.
3	Perform the following to set or verify the GPIB address: - To enter the **SPECIAL** data entry function, press **[SHIFT]** then **[PRESET]**. - Use the **[▲]** or **[▼]** button to select HP-IB ADRS; then press **[ENTER]**. - Use the **[▲]** or **[▼]** button to select HP-IB ADRS 13; then press **[ENTER]**. - To **EXIT** the **SPECIAL** data entry function press **[SHIFT]** then **[ENTER]**.

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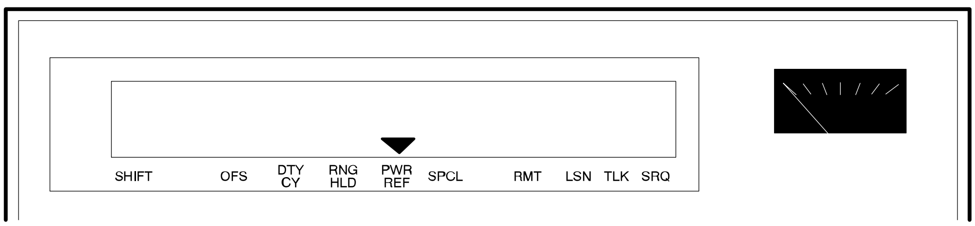
Table F-11: Power Meter Calibration Procedure

Step	Action
4	Perform the following to set or verify the correct power sensor model: - Press **[SHIFT]** then **[←]** to select **SENSOR**. - Identify the power sensor model number from the sensor label. Use the **[↑]** or **[↓]** button to select the appropriate model; then press **[ENTER]**. **NOTE** Be sure the **PWR REF** (power reference) output is OFF (observe that the triangular indicator is NOT displayed as shown in Step 7). If on, press **[SHIFT]** then **[→]** to turn it off.
5	Press **[ZERO]**. Display will show “Zeroing ******.” Wait for process to complete.
6	Connect the power sensor to the **POWER REF** output.
7	To turn on the **PWR REF**, perform the following: - Press **[SHIFT]** then **[→]**. - Verify that the triangular indicator (below) appears in the display above “PWR REF”. 
8	Perform the following to set the **REF CF %**: - Press (**[SHIFT]** then **[ZERO]**) for **CAL**. - Enter the sensor’s **REF CF %** from the sensor’s decal using the arrow keys and press **[ENTER]**. (The power meter will display ”CAL *****” for a few seconds.) **NOTE** If the REF CAL FACTOR (REF CF) is not shown on the power sensor, assume it to be 100%.
9	Perform the following to set the **CAL FAC %**: - Press **[SHIFT]** then **[FREQ]** for **CAL FAC**. - On the sensor’s decal, locate an approximate calibration percentage factor (**CF%**) at 2 GHz. Enter the sensor’s calibration % (**CF%**) using the arrow keys and press **[ENTER]**. When complete, the power meter will typically display 0.05 dBm. (Any reading between 0.00 and 0.10 is normal.)
10	To turn off the **PWR REF**, perform the following: - Press **[SHIFT]** then **[→]**. - Disconnect the power sensor from the **POWER REF** output.

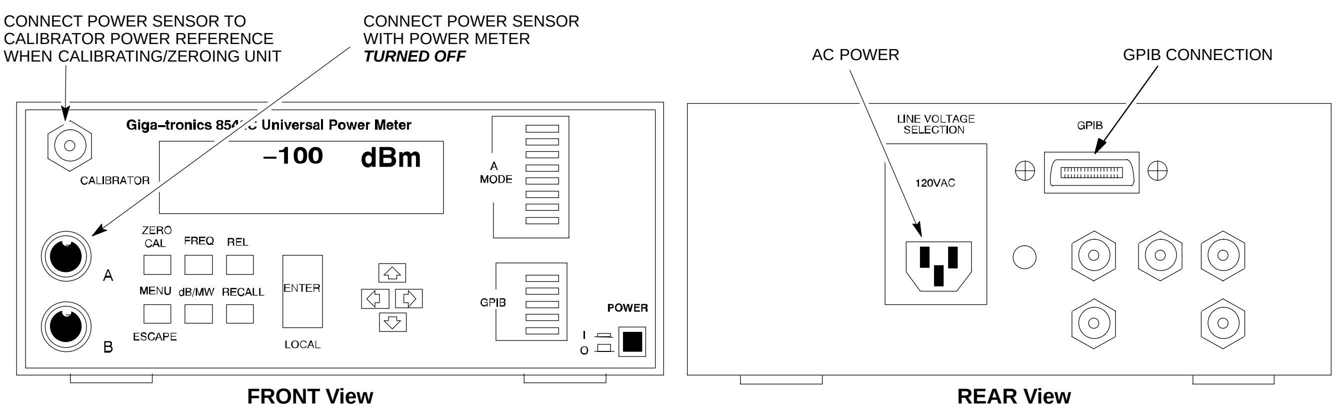
Calibrating Gigatronics 8541C power meter

Precise transmit output power calibration measurements are made using a bolometer-type broadband power meter with a sensitive power sensor. Follow the steps in Table F-12 to enter information unique to the power sensor.

Table F-12: Calibrate Gigatronics 8541C Power Meter

Step	Action
	! CAUTION Do not connect/disconnect the power meter sensor cable with AC power applied to the meter. Disconnection could result in destruction of the sensing element or miscalibration.
	NOTE Allow the power meter and sensor to warm up and stabilize for a *minimum of 60 minutes* before performing the calibration procedure.
1	• Make sure the power meter **POWER** pushbutton is **OFF**. • Connect the power sensor cable to the **SENSOR** input. • Set the **POWER** pushbutton to **ON.**
2	Verify the Power GPIB mode and address: • Press **MENU**. Use the ⬇ arrow key to select **CONFIG MENU,** and press **ENTER**. • Use the ⬇ arrow key to select **GPIB,** and press **ENTER**. • Use the ⬇⬆ arrow keys to set MODE to **8541C**. • Press ➡ and use the ⬇⬆ arrow keys as required to set ADDRESS to **13**. • Press **ENTER**.
3	• Connect the power sensor to the **CALIBRATOR** output connector. • Press **ZERO**. • Wait for the process to complete. Sensor factory calibration data is read to power meter during this process. • Disconnect the power sensor from the **CALIBRATOR** output.

Figure F-9: Gigatronics 8541C Power Meter Detail



Notes

Appendix G

Power Calibration

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Calibrating Output Power

Power Calibration

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

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

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

Equipment Warm up

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

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

Power Delta Calibration Introduction

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

HP8921A Power Delta Calibration

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

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

NOTE	This procedure requires two HP8921As.

Table G-1: HP8921A Power Delta Calibration Procedure

Step	Action
	*** IMPORTANT** Perform this procedure *after* test equipment has been allowed to warm-up and stabilize for a *minimum of 60 minutes*.
1	Connect a short RF cable between the HP8921A **Duplex Out** port and the HP437B power sensor (see Figure G-1).
2	Set the HP8921A signal source as follows: - Measure mode to **CDMA Generator** - Frequency to the CDMA Calibration target frequency - CW RF Path to **IQ** - Output Port to **Dupl** - Data Source to **Random** - Amplitude to **0 dBm**
3	Measure and record the power value reading on the HP437B Power Meter.
4	Record the Power Meter reading as result **A** ________________________.
5	Turn off the source HP8921A signal output, and disconnect the HP437B. **NOTE** Leave the settings on the source HP8921A for convenience in the following steps.
6	Connect the short RF cable between the source HP8921A **Duplex Out** port and the measuring HP8921A **RF-IN** port (see Figure G-2).
7	Ensure that the source HP8921A settings are the same as in Step 2.
8	Set the measuring HP8921A as follows: - Measure mode to **CDMA Anl** - Frequency to the CDMA calibration target frequency - Input Attenuation to **0 dB** - Input port to **RF-IN** - Gain to **Auto** - Analyzer Direction to **Fwd**
9	Turn on the source HP8921A signal output.
10	Measure and record the channel power reading on the measuring HP8921A as result **B** ________________________.
11	Turn off the source HP8921A signal output and disconnect the equipment.

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Table G-1: HP8921A Power Delta Calibration Procedure	
Step	**Action**
12	Compute the delta between HP437B and HP8921A using the following formula: **Delta = A - B** Example: Delta = -0.70 dBm - (-1.25 dBm) = 0.55 dBm Example: Delta = 0.26 dBm - 0.55 dBm = -0.29 dBm These examples are included to show the mathematics and do not represent actual readings. **NOTE** Add this delta value to the **TX Cable Loss** value during In-Service Calibration.

Figure G-1: Delta Calibration Setup - HP8921A to HP437B

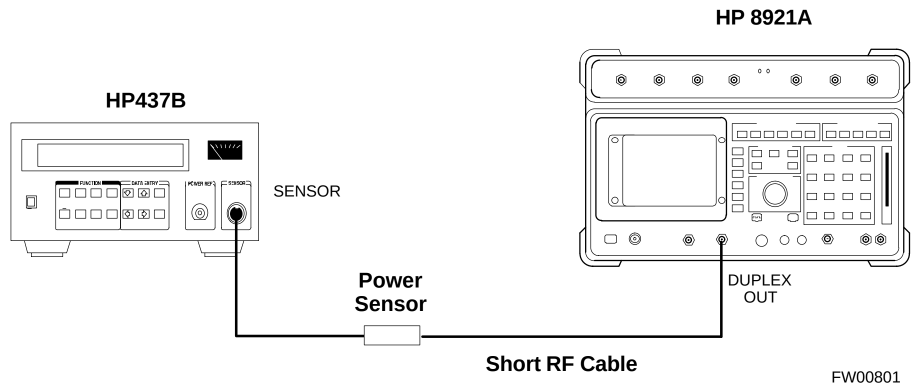
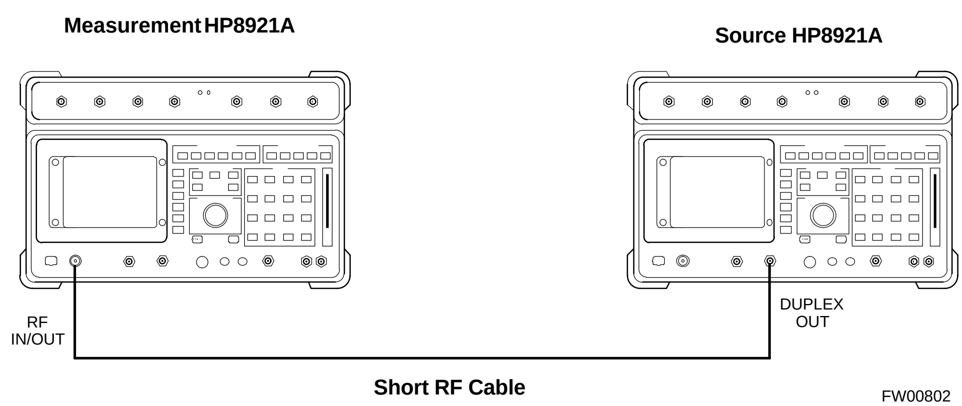


Figure G-2: Delta Calibration Setup - HP8921A to HP8921A



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Advantest R3465 Power Delta Calibration

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

Table G-2: Advantest Power Delta Calibration Procedure	
Step	**Action**
	*** IMPORTANT** Perform this procedure *after* test equipment has been allowed to warm-up and stabilize for a *minimum of 60 minutes*.
On the Advantest R3465:	
1	Press the **SHIF**T and the **PRESET** keys located below the CRT display.
2	Press the **ADVANCE** key in the Measurement area of the control panel.
3	Press the **CDMA Si**g CRT menu key.
4	Press the **FREQ** key in the Entry area of the control panel.
5	Set the frequency to the desired value using the keypad entry keys.
6	Press the **LEVEL** key in the Entry area of the control panel.
7	Set the **LEVEL** to **0 dBm** using the keypad entry keys.
8	Verify the **Mod** CRT menu key is highlighting **OFF**, if not press the **Mod** key to toggle it **OFF**.
9	Verify the **Output** CRT menu key is highlighting **OFF**, if not press the **Output** key to toggle it **OFF**.
On the HP 437 Power Meter:	
10	Zero the Power Meter prior to connecting the power sensor to the RF cable from the signal generator. *** IMPORTANT** For best accuracy, always re-zero the power meter before connecting the power sensor to the component being calibrated.
11	Connect the RF cable from the R3561L CDMA Test Source Unit **RF OUT** port to the power sensor, refer to Figure G-3.
12	Press the **Output** CRT menu key to toggle the Output to **ON**.
13	Record the Power Meter reading as result **A** ________________________.
14	Press the Output **CRT** menu key to toggle the Output to **OFF**.
15	Connect the RF cable from the R3561L CDMA Test Source Unit **RF OUT** port to the Spectrum Analyzer **INPUT** Port, refer to Figure G-4.
16	Press the **Output** CRT menu key to change the Output to **ON**.
17	Press the **CW** key in the Measurement area of the control panel.
18	Press the **LEVEL** key in the Entry area of the control panel.
19	Set the REF LEVEL to **10 dBm** using the keypad entry keys.
20	Press the **dB/div** CRT menu key.
21	Press the **10 dB/div** CRT menu key.
22	Press the **FREQ** key in Entry area of the control panel.
23	Set the frequency to the desired value using the keypad entry keys.
24	Press the **more 1/2** CRT menu key.

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Table G-2: Advantest Power Delta Calibration Procedure	
Step	**Action**
25	Press the **Preselector** CRT menu key to highlight **3.0G**.
26	Press the **FORMAT** key in the Display Control area of the control panel.
27	Press the **TRACE** CRT menu key.
28	Press the **AVG A** CRT menu key.
29	Set AVG to **20** using keypad entry keys.
30	Press the **return** CRT menu key.
31	Press the **SPAN** key in the Entry area of the control panel.
32	Press the **Zero Span** CRT menu key.
33	Press the **BW** key in the Entry area of the control panel.
34	Press the **RBW** CRT menu key to highlight **MNL**. using keypad entry keys enter **30 kHz**.
35	Set **RBW** to **30 kHz** using keypad entry keys.
36	Press the **VBW** CRT menu key to highlight **MNL**.
37	Set **VBW** to **1 MHz** using keypad entry keys.
38	Press the Marker **ON** key in the Display Control area of the control panel.
39	Record the Marker Level reading as result **B** ________________________.
40	Calculate the **Power Calibration Delta** value. The delta value is the power meter measurement minus the Advantest measurement. Delta = A - B Example: Delta = -0.70 dBm - (-1.25 dBm) = 0.55 dBm Example: Delta = 0.26 dBm - 0.55 dBm = -0.29 dBm These examples are included to show the mathematics and do not represent actual readings. **NOTE** Add this delta value to the **TX Cable Loss** value during In-Service Calibration.

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Figure G-3: Delta Calibration Setup - R3561L to HP437B

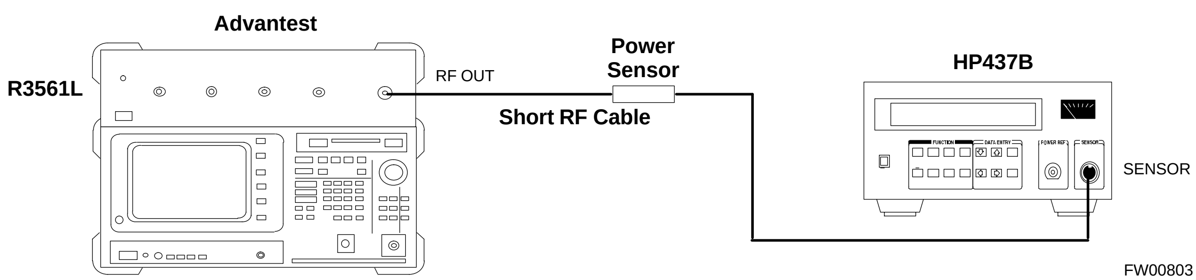
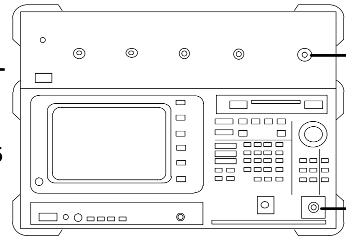


Figure G-4: Delta Calibration Setup - R3561L to R3465



HP8935 Power Delta Calibration

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

Table G-3: HP8935 Power Delta Calibration Procedure

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

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Table G-3: HP8935 Power Delta Calibration Procedure	
Step	**Action**
9	Turn on the source HP8935 signal output.
10	Set the Chn Pwr Cal to **Calibrate** and select to calibrate.
11	Measure and record the channel power reading on the measuring HP8935 as result **B** ________________________.
12	Turn off the source HP8935 signal output and disconnect the equipment.
13	Calculate the **Power Calibration Delta** value. The delta value is the power meter measurement minus the Advantest measurement. Delta = A - B Example: Delta = -0.70 dBm - (-1.25 dBm) = 0.55 dBm Example: Delta = 0.26 dBm - 0.55 dBm = -0.29 dBm These examples are included to show the mathematics and do not represent actual readings. **NOTE** Add this delta value to the **TX Cable Loss** value during In-Service Calibration.

Figure G-5: Delta Calibration Setup - HP8935 to HP437B

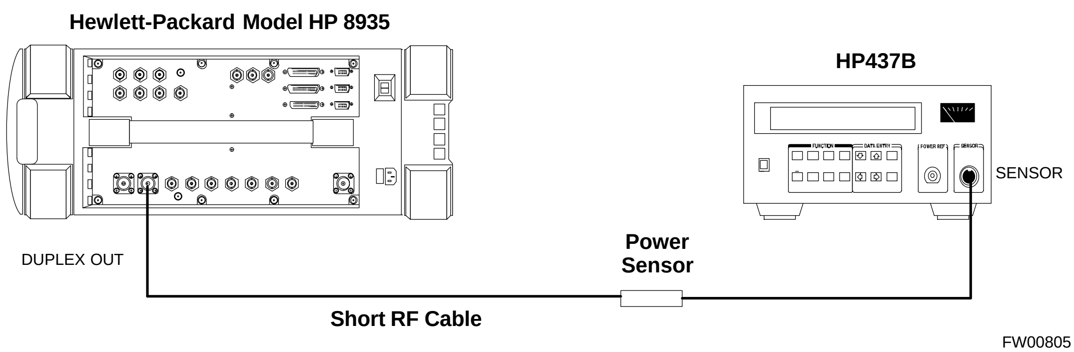

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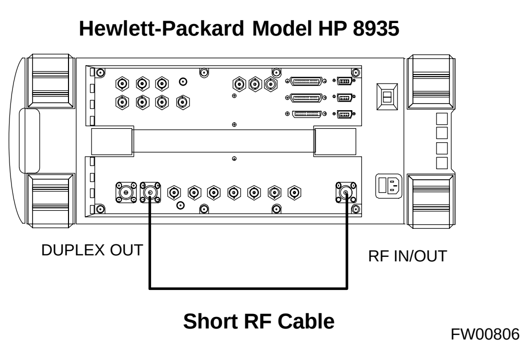
Figure G-6: Delta Calibration Setup - HP8935 to HP8935



Agilent E4406A Power Delta Calibration

The Agilent E4406A transmitter tester and E4432B signal generator test equipment combination can be used for CDMA 2000 as well as IS-95A/B operation modes. The power delta calibration is performed on the E4406A, but the E4432B is required to generate the reference signal used to calculate the power delta offset. After the offset value has been calculated, add it to the TX cable loss value in the LMF.

Follow the procedure in Table G-4 to perform the Agilent E4406A Power Delta Calibration procedure.

Table G-4: Agilent E4406A Power Delta Calibration Procedure

Step	Action
	*** IMPORTANT** Perform this procedure *after* test equipment has been allowed to warm-up and stabilize for a *minimum of 60 minutes.* After it is warmed up and stabilized, calibrate the test equipment as described in the "Test Set Calibration" section of the Optimization/Calibration chapter in the *SC 4812ET Optimization/ATP manual*.
1	Zero the Power Meter prior to connecting the power sensor to the RF cable from the signal generator. *** IMPORTANT** For best accuracy, always re-zero the power meter before connecting the power sensor to the component being calibrated.
2	Connect a short RF cable from the E4432B **RF OUTPUT** connector the HP437 power meter power sensor (see Figure G-7).
3	Set the E4432B signal generator as follows: - Press **Preset** to exit any modes for which the signal generator is configured. - Press **Frequency** and enter the *frequency* of the channel to be calibrated on the numeric keypad. - Using the soft keys to the right of the screen, select the frequency range to be measured; for example **MHz**. - Press **Amplitude** and, using the numeric keypad, set signal amplitude to **0** (zero). - Using the soft keys, set the measurement type to **dBm**.
4	On the E4432B, press **RF On/Off** to toggle the RF output to **RF ON**. - Note that the RF On/Off status in the screen display changes.
5	Measure and record the value reading on the HP437 power meter as result **A**_____________________.
6	On the E4432B, press **RF On/Off** to toggle the RF output to **RF OFF**. - Note that the RF On/Off status in the screen display changes.
7	Disconnect the short RF cable from the HP437 power meter power sensor, and connect it to the **RF INPUT** connector on the E4406A transmitter tester (see Figure G-8).

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Table G-4: Agilent E4406A Power Delta Calibration Procedure

Step	Action
8	*** IMPORTANT** Do not change the frequency and amplitude settings on the E4432B when performing the following steps. Set the E4406A as follows: - Press **Preset** to exit any modes for which the transmitter tester is configured - Press **MODE** and, using the soft keys to the right of the screen, select **cdmaOne** - Press **MEASURE** and, using the soft keys, select **spectrum** - Press **Frequency** and, using the soft keys, select **Center Frequency** - Enter the *frequency* of the channel to be calibrated using the numeric keypad - Using the soft keys, select the frequency range to be measured; for example, **MHz** - Press Input/Output and, using the soft keys, select **Input Atten** - Using the numeric keypad, set **Input Atten** to **0** (zero) and, using the soft keys, select **dB** - Using the soft keys, select **External Atten** and then select **Mobile** - Using the numeric keypad, set **Mobile** to **0** (zero) and, using the soft keys, select **dB** - Using the soft keys, select **Base** - Using the numeric keypad, set **Base** to **0** (zero) and, using the soft keys, select **dB** - Press **MEASURE** and, using the soft keys, select **Channel Power**
9	On the E4432B signal generator, press **RF On/Off** to toggle the RF output to **RF ON**. - Note that the RF On/Off status in the screen display changes.
10	Read the measured Channel Power from the E4406A screen display and record it as result **B**____________________.
11	On the E4432B, press **RF On/Off** to toggle the RF output to **RF OFF**. - Note that the RF On/Off status in the screen display changes.
12	Calculate the **Power Calibration Delta** value. The delta value is the power meter measurement minus the Agilent measurement. **Delta = A - B** Example: Delta = -0.70 dBm - (-1.25 dBm) = 0.55 dBm Example: Delta = 0.26 dBm - 0.55 dBm = -0.29 dBm These examples are included to show the mathematics and do not represent actual readings. **NOTE** Add this delta value to the **TX Cable Loss** value during In-Service Calibration.

Figure G-7: Delta Calibration Setup - Agilent E4432B to HP437

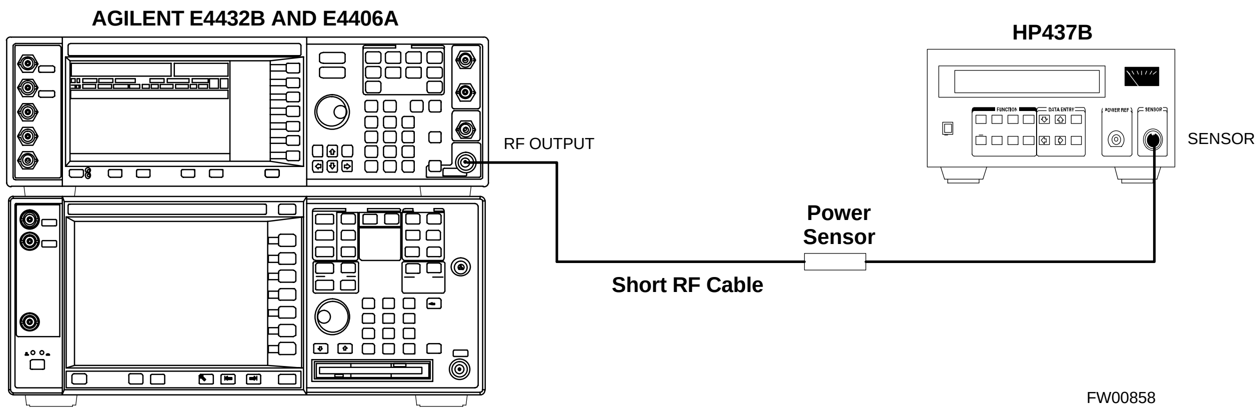
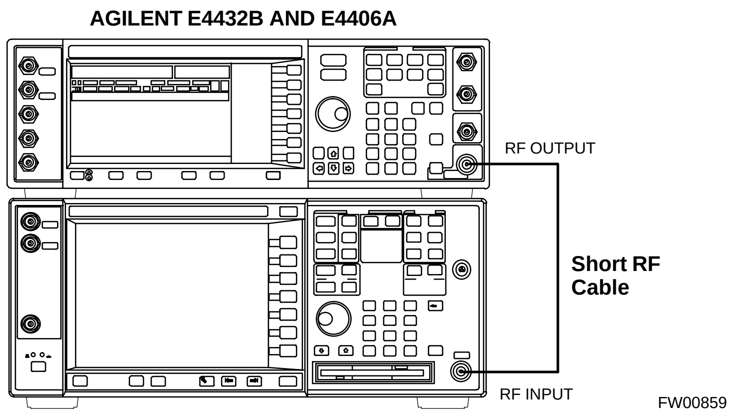


Figure G-8: Delta Calibration Setup - Agilent E4432B to Agilent E4406A



In-Service Calibration

NOTE	This feature does NOT have fault tolerance at this time. The system has no safe-guards to stop you from doing something that will take the BTS out of service. If possible, perform this procedure during a maintenance window. Follow the procedures in this section precisely, otherwise the entire BTS will most likely go OUT OF SERVICE. At the CBSC, only perform operations on expansion hardware when it is in the OOS_MANUAL state. The operator must be trained in the LMF operation prior to performing this procedure.

Prerequisites

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

NOTE	
	Do not download code or data to any cards other than those you are working on. Downloading code or data to other cards will take the site OUT OF SERVICE. The code file version numbers must match the version numbers on the other cards in the frame. If the numbers do not match, the site may go OUT OF SERVICE. The BTS-#.cdf, CBSC-#.cdf, and CAL files for this BTS must have come from the CBSC.

- Test equipment has been configured per Figure G-9 or Figure G-10.
- An RFDS (or at a minimum a directional coupler), whose loss is already known, must be in line to perform the in-service calibration.
- Test equipment has been calibrated after 1 hour warm up.
- A short RF cable and two BNC-N adapters are available to perform Cable Calibration.
- The Power Delta Calibration has been performed (see Table G-1, Table G-2, or Table G-3).

Figure G-9: Optimization/ATP Test Setup Using RFDS

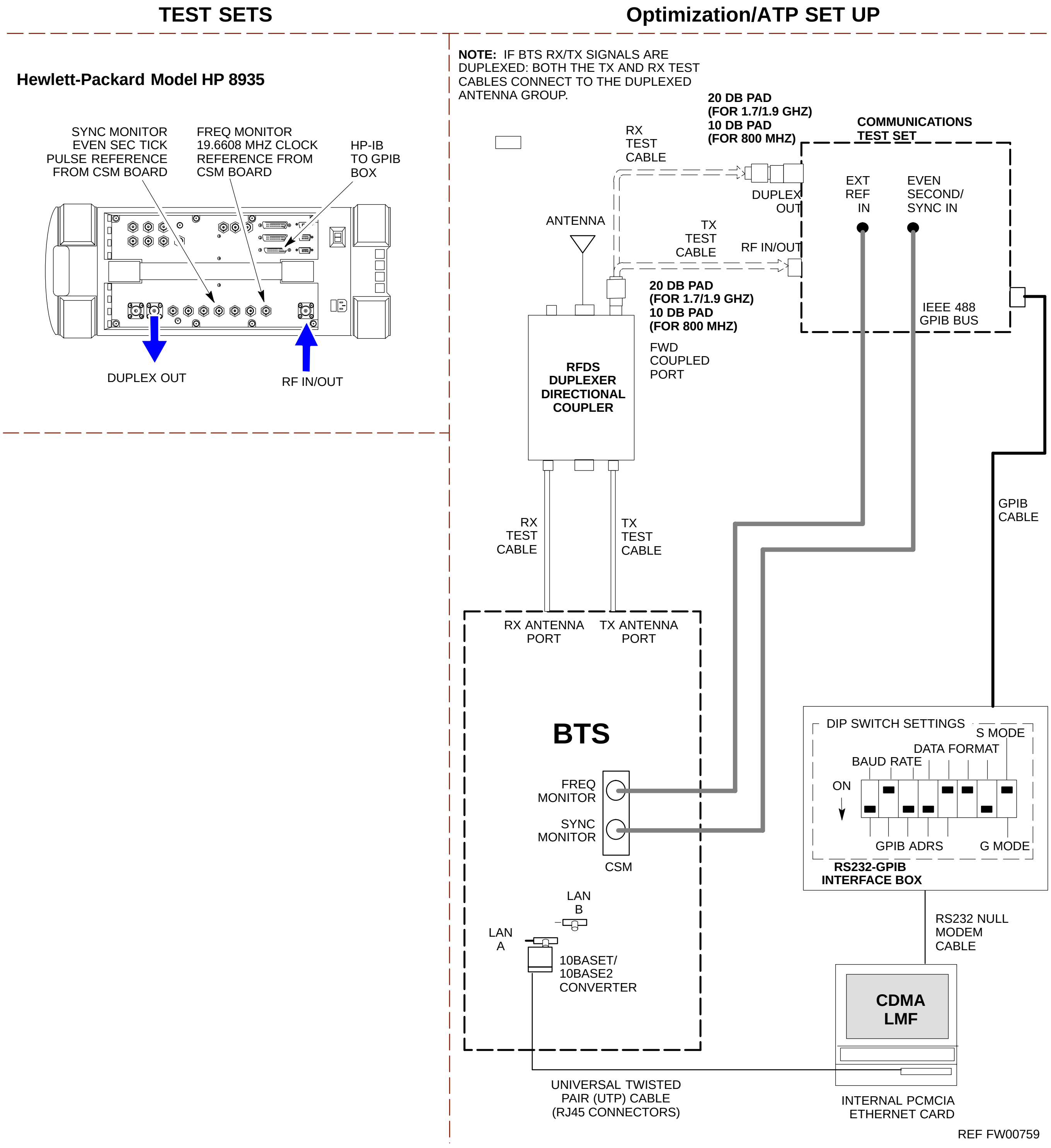


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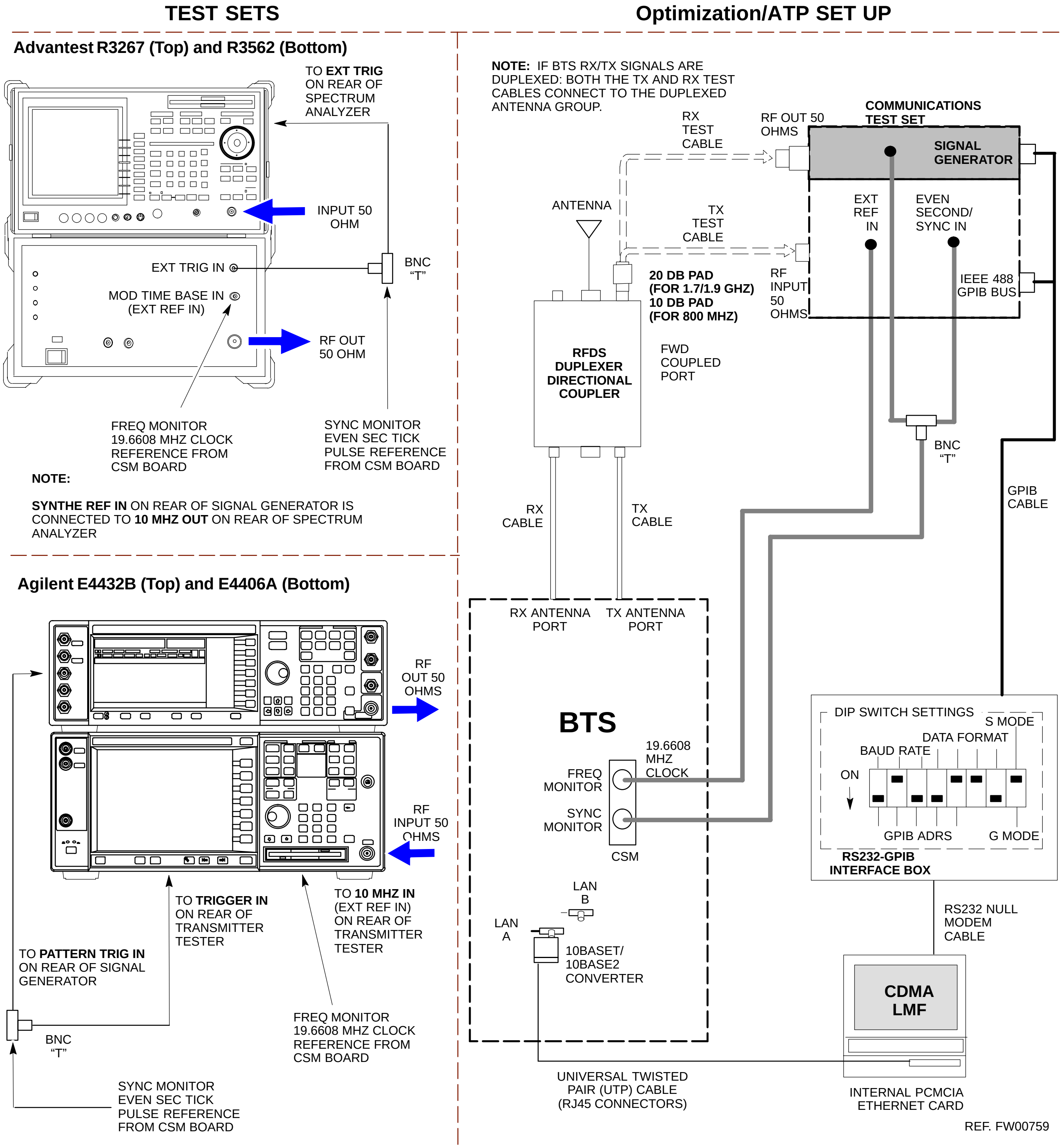
Figure G-10: IS-95 A/B/C Optimization/ATP Test Setup Using RFDS



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Follow the procedure in Table G-5 to perform the In-Service Calibration.

Table G-5: In-Service Calibration

Step	Action
	*** IMPORTANT** Perform this procedure *after* test equipment has been allowed to warm-up and stabilize for a *minimum of 60 minutes*.
1	Set up the LMF for In-Service Calibration: - Start the LMF by double-clicking the LMF icon on the Windows desktop. - Click **Tools>Options** from the menu bar at the login screen. - Check the applicable spectrum analyzer check box and the signal generator check box on the **Test Equipment** tab. Ensure that the GPIB address is **18** for the CDMA analyzer and **1** for the signal generator. - Uncheck any other other equipment that is selected. - Click the **Apply** button. - Select the **BTS Options** tab in the LMF Option window. - Check the **In-Service Calibration** check box. - Click the **Apply** button. - Click the **Dismiss** button to close the LMF Option window.
2	Login to the target BTS: - Select the target BTS icon. - Click the **Login** button at the login screen.
3	Measure the Cable Loss using the Cable Calibration function: - Click **Util>Cable Calibration** from the menu bar at the main window. - Set the desired channel(s) and select **TX and RX CABLE CAL** at the cable calibration pop up window. - Click the **OK** button to perform cable calibration. - Follow the on-screen instructions to complete the cable loss measurement. **NOTE** - The measured value is input automatically to the cable loss file. - To view the cable loss file, click **Util>Examine>Cable Loss>TX** or **RX**.
4	Add the spectrum analyzer power delta to the **Cable Loss**. - To view the cable loss file, click **Util>Examine>Cable Loss>TX** or **RX**. - Add the value computed in Table G-1, Table G-2, or Table G-3 to the TX Cable Loss. **NOTE** Be sure to include the sign of the value. The following examples are included to show the mathematics and do not represent actual readings: - Example: 5.65 dBm + 0.55 dBm = 6.20 dBm - Example: 5.65 dBm + (-0.29 dBm) = 5.36 dBm - Example: -5.65 dBm + 0.55 dBm = -5.10 dBm - Example: -5.65 dBm + (-0.29 dBm) = -5.94 dBm

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Table G-5: In-Service Calibration

Step	Action
5	Input the Coupler Loss for the TX and RX tests: - Click **Util>Edit>Coupler Loss>TX** or **RX** from the menu bar at the main window. - Input the appropriate coupler loss for the target carrier(s) by referring to the information taken at the time of BTS installation. - Click the **Save** button. - Click the **Dismiss** button to close the window. - To view the coupler loss file, click **Util>Examine>Coupler Loss>TX** or **RX**.
6	Have the CBSC operator put the redundant BBX OOS_MANUAL.
7	**! CAUTION** Be sure to download OOS devices only. Loading in-service devices takes them OUT OF SERVICE and can result in dropped calls. The code file version numbers must match the version numbers on the other cards in the frame. If the numbers do not match, the site may go OUT OF SERVICE. **NOTE** Be sure to include the redundant BBX in steps 9, 10, and 11. Download code and data to the target devices: - Click **Tools>Update NextLoad>CDMA** to set the code version that will be downloaded. - Select the BTS(s) you need, check the appropriate code version in the pop up window, and click the **Save** button to close. - Select the target BBX(s) on the C-CCP cage picture. - Click **Device>Download>Code/Data** to start downloading code. - Select the target BBX(s) on the C-CCP cage picture. - Click **Device>Download>Data** to start downloading data.

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Table G-5: In-Service Calibration	
Step	**Action**
	! CAUTION Perform the In-service Calibration procedure on OOS devices only.
8	Select the desired test: - Select the target BBX(s) on the C-CCP cage picture. - Click **Tests**>`[desired test]` from the menu bar at the main window. - Select the target carrier and confirm the channel number in the pop up window. - Leave the **Verify BLO** check box checked. - From the **Test Pattern** pick list, select a test pattern. - Click the **OK** button to start calibration. - Follow the on-screen instructions, except, do not connect to the BTS antenna port, connect to the directional coupler (fwd) port associated with the on screen prompt antenna port. **NOTE** • Selecting **Pilot** (default) performs tests using a pilot signal only. • Selecting **Standard** performs tests using pilot, synch, paging and six traffic channels. This requires an MCC to be selected. • Selecting CDFPilot performs tests using the CDF value for pilot gain and IS-97 gain values for all the other channels included in the Standard pattern setting (paging, synch, and six traffic). Using this pattern setting requires the selection of both a BBX and at least one MCC. • Selecting **CDF** performs tests using pilot, synch, paging and six traffic channels, however, the gain for the channel elements is specified in the CDF file.
9	Save the result and download the BLO data to the target BBX(s): - Click the **Save Result** button on the result screen. The window closes automatically.
10	Logout from the BTS and close the LMF session: - Click **BTS>Logout** to close the BTS connection. - Close the LMF window.
11	Restore the new “bts-*.cal” file to the CBSC.
12	Enable the target device(s) from the CBSC.

Notes

MOTOROLA

Appendix H

Cable Interconnection

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Intra-Cabinet Cabling

SC 4812ET Intra-Cabinet Cabling

This appendix provides the identification and location of the cables connecting the components which make up the SC 4812ET RF cabinet. The number of cables and components incorporated in the RF cabinet will vary depending on the the manner in which the cabinet is equipped. For example, a 3 sector, 2 carrier system will require less components and less cables than a 6 sector 2 carrier system.

Refer to Table H-1 and Figure H-1 through Figure H-19 for the cable you wish to research.

NOTE	In some cases cables with the same number are used to connect two different signalling paths. These cables are designated A & B and the point they connect to and from is also designated A & B. Ensure the correct cable (A or B) is connected to the correct designation (A or B) connector or plug.

Table H-1: SC4812ET RF CABINET INTER-CONNECT CABLES

DRDC, Combiner, Trunking Backplane Cables			
CABLE #	**FROM**	**NOTE's**	**TO**
3064795A05	TX CIO	Figure H-6	Trunking BP
3064735A10	TX Trunking BP	Figure H-5	Combiner Connector Pnl
3064735A07	TX Combiner	See Figure H-1, Figure H-11, Figure H-12, Figure H-13, and Figure H-14	DRDC
3064735A11	TX Combiner	(See Above)	DRDC
3064735A12	TX Combiner	(See Above)	DRDC
3064795A07	TX CIO	Figure H-11	Trunking BP
3086435H01	TX Combiner QDS		PkZ Adptr
3086435H02	TX Combiner QDS		PkZ Adptr
3086435H03	TX Combiner QDS		PkZ Adptr
3086168H01	Power LPA PDA	Figure H-5	Trunk BP
C-CCP Cables			
CABLE #	**FROM**	**NOTE's**	**TO**
3064809A01	Power CCCP/PDA	See Figure H-1 & Figure H-5	C-CCP Backplane
3064899A04	LAN I/O A in	See Figure H-1 & Figure H-5	C-CCP LAN I/O A In
C-CCP Cables (cont)			
CABLE #	**FROM**	**NOTEs**	**TO**
3064899A04	LAN I/O B in	See Figure H-1 & Figure H-5	C-CCP LAN I/O B In
3086033H03	GPS Surge Arrestor	See Figure H-1 & Figure H-5	C-CCPBackplane
3064899A04	LAN I/O B in	See Figure H-1 & Figure H-5	C-CCP LAN I/O B In

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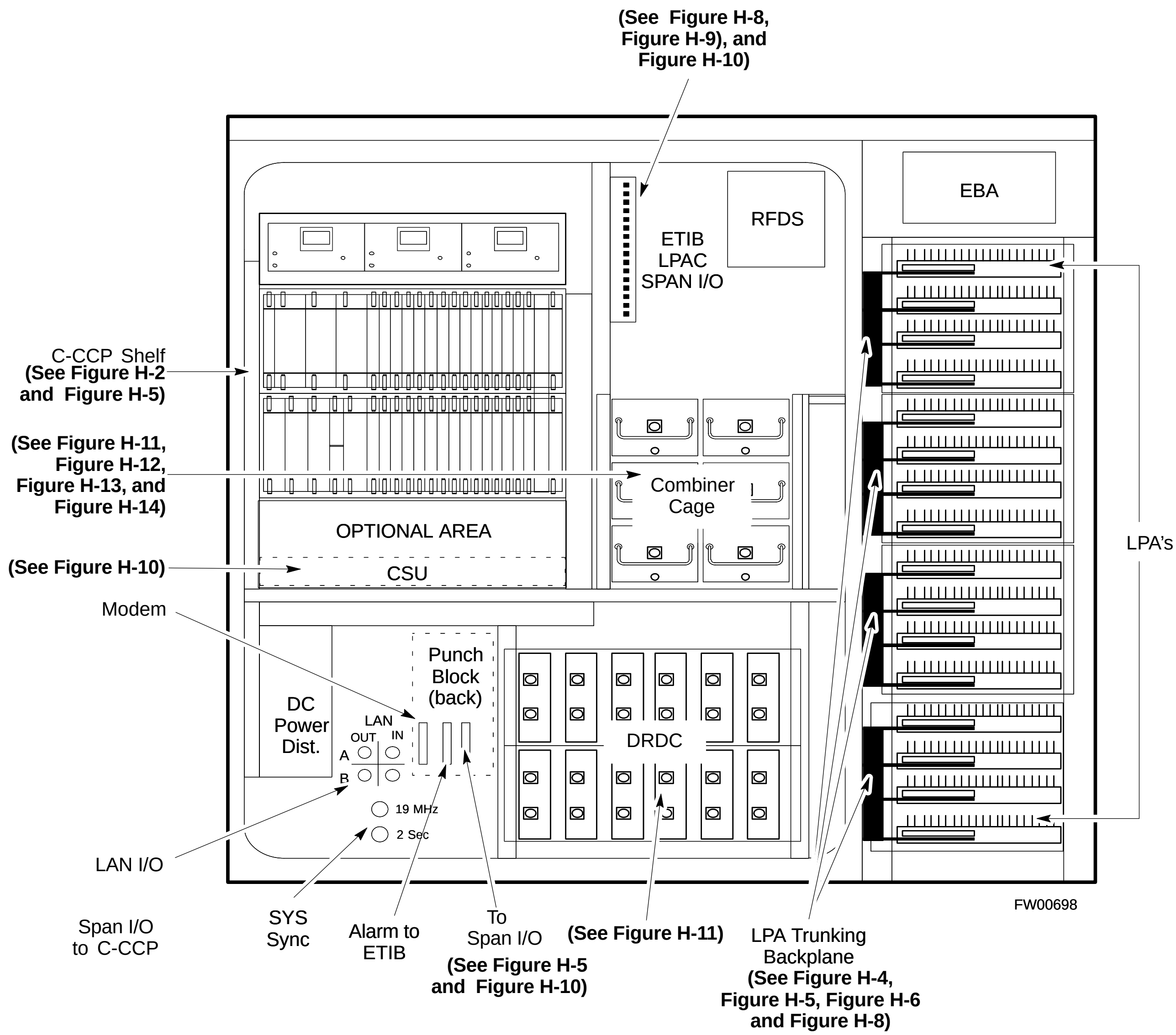
Table H-1: SC4812ET RF CABINET INTER-CONNECT CABLES			
3064899A03	C-CCP LAN I/O A Out	See Figure H-1 & Figure H-5	LAN I/O A Out
3064899A03	C-CCP LAN I/O B Out	See Figure H-1 & Figure H-5	LAN I/O B Out
3064899A07	Sync CSM	See Figure H-1	I/O
3086000H02	Site I/O C-CCP	See Figure H-9	J2 on ETIB
3086001H02	A SPAN I/O BlkHd	See Figure H-1 & Figure H-5	C-CCP/A SPAN I/O
3086001H02	B SPAN I/O BlkHd	See Figure H-1 & Figure H-5	C-CCP/B SPAN I/O
3086086H02	Alarm C-CCP	See Figure H-1 & Figure H-9	J1 on ETIB
3086366H02	HSO/LFR	See Figure H-1 & Figure H-5	C-CCP HSO/LFR
4886044H01	LBD	See Figure H-1 & Figure H-5	C-CCP Backplane
Span I/O Board Cables			
CABLE #	**FROM**	**NOTEs**	**TO**
3086601H01	SPAN I/O Pblock	See Figure H-1 & Figure H-10	CSU
3086601H02	SPAN CSU	See Figure H-1 & Figure H-10	A & B SPAN I/O BRD
3086001H02	SPAN CSU	See Figure H-1 & Figure H-10	A & B SPAN Connector on C-CCP Backplane
RFDS Cables			
CABLE #	**FROM**	**NOTE's**	**TO**
3064238A17	RFDS/ASU-1	Figure H-16 & Figure H-17	DRDC
3064238A18	RFDS/ASU-2	Figure H-16 & Figure H-17	DRDC
3064238A19	RFDS/ASU-1	Figure H-16 & Figure H-17	DRDC
3064238A20	RFDS/ASU-2	Figure H-16 & Figure H-17	DRDC
ETIB/LPAC Cables			
CABLE #	**FROM**	**NOTE's**	**TO**
3064794A03	LPAC	See Figure H-8	C-CCP Bkpln
3064794A05	ETIB	See Figure H-1 & Figure H-9	RFDS
3086433H04	RGPS I/O	See Figure H-1 & Figure H-9	ETIB (15 position)
3086169H01	Power, Heat Exchanger, PDA	See Figure H-1 & Figure H-9	ETIB, OPT, HX, EBA
3086500H01	Alm/Ctrl ETIB	See Figure H-1 & Figure H-9	HX/LPA
3086505H01	DC Cable (DC Power Dist)	See Figure H-1 & Figure H-19	EBA Blower Assembly
3086566H01	LPAC	See Figure H-1 & Figure H-8	1 Cable to each LPA Bk Pln
3086569H01	Door Intrusion Alarm	See Figure H-5 & Figure H-19	Door Switch
3086655H02	LPAC	See Figure H-8, Figure H-5 & Figure H-19	ETIB

Figure H-1: 4812ET RF Cabinet Internal FRU Locations



C-CCP Cables and Cable Connectors

The C-CCP Shelf assembly consists of the C-CCP Shelf and the attached backplane with cables and connectors (see Figure H-2 and Figure H-3).

The C-CCP shelf contains all of the CDMA unique functions within the SC 4812ET RF frame. The C-CCP shelf contains the following components:

- Broadband Transceiver (BBX) cards
- Multi-Channel CDMA (MCC) cards
- Combiner Input/Output (CIO) card
- Power Supply cards
- Group Line Interface (GLI3) cards
- Alarm Monitor Reporting (AMR) cards
- Clock Synchronization Modules (CSM)
- High Stability Oscillator/Low frequency Receiver (HSO/LFR)
- Multicoupler Preselector Cards (MPC)
- CDMA Clock Distribution (CCD) card
- Integrated Frame Modem (IFM) card
- Switch card
- C-CCP Fan Modules

Figure H-2: C-CCP Shelf Cable Numbers and Connectors

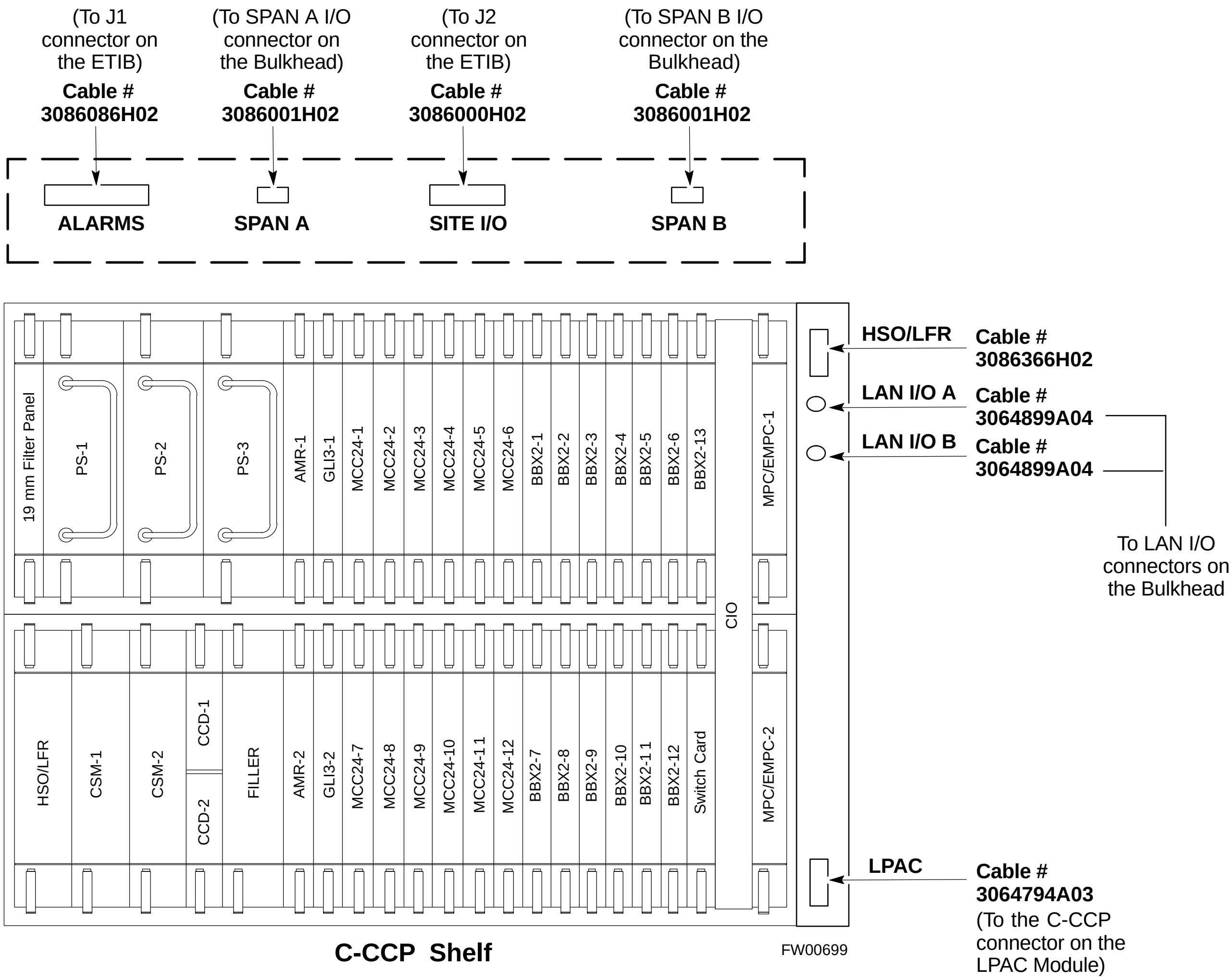


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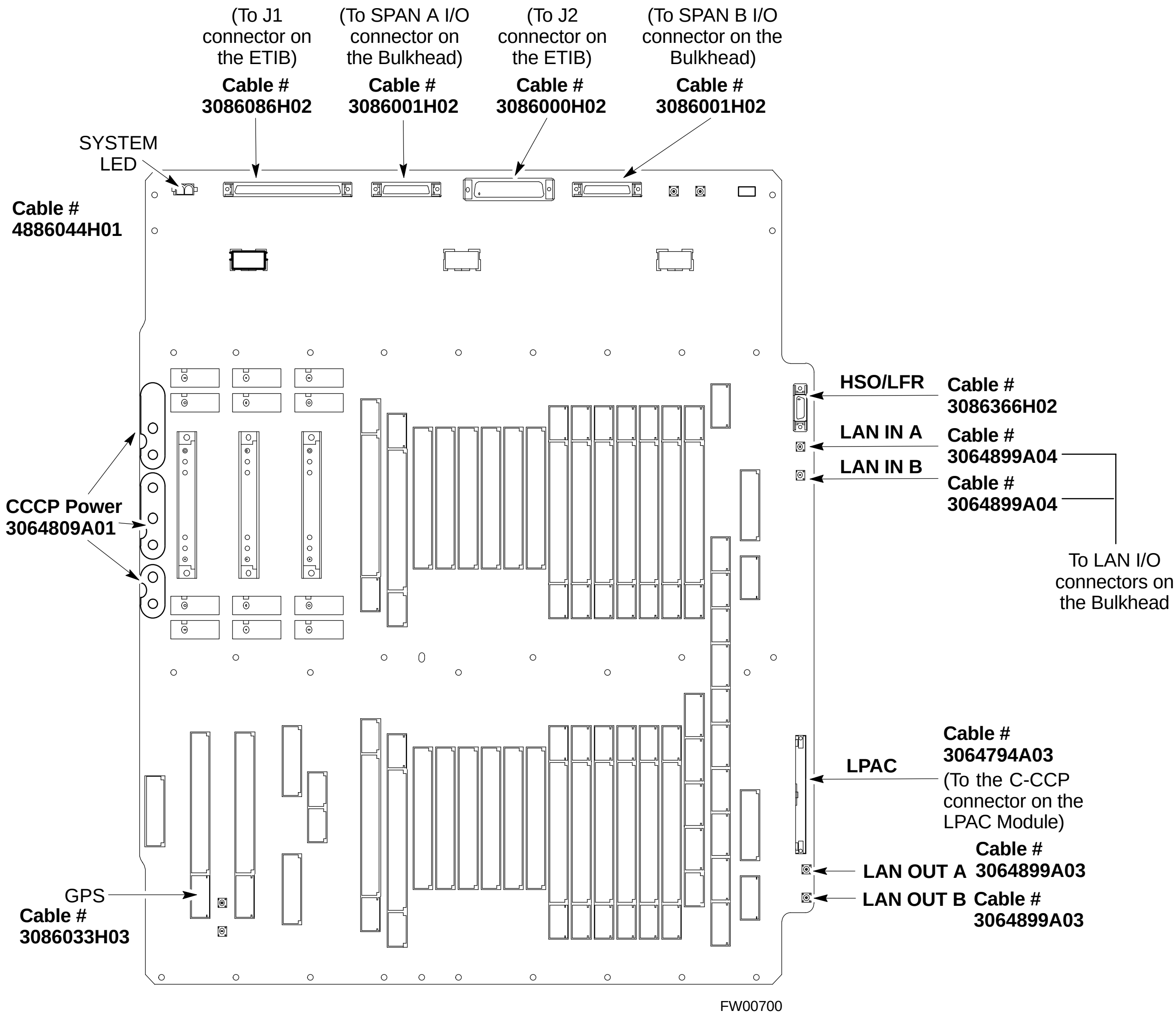
Figure H-3: C-CCP Backplane



RF Cabinet LPA Cables

There can be a maximum of 16 LPAs in an RF cabinet. The connections shown are for one LPA backplane which controls four LPAs. The remaining LPAs are connected in the same manner. Refer to Figure H-4, through Figure H-8 for the cables connected to the LPAs in the 4812ET RF cabinet.

Figure H-4: LPAs for the SC 4812ET

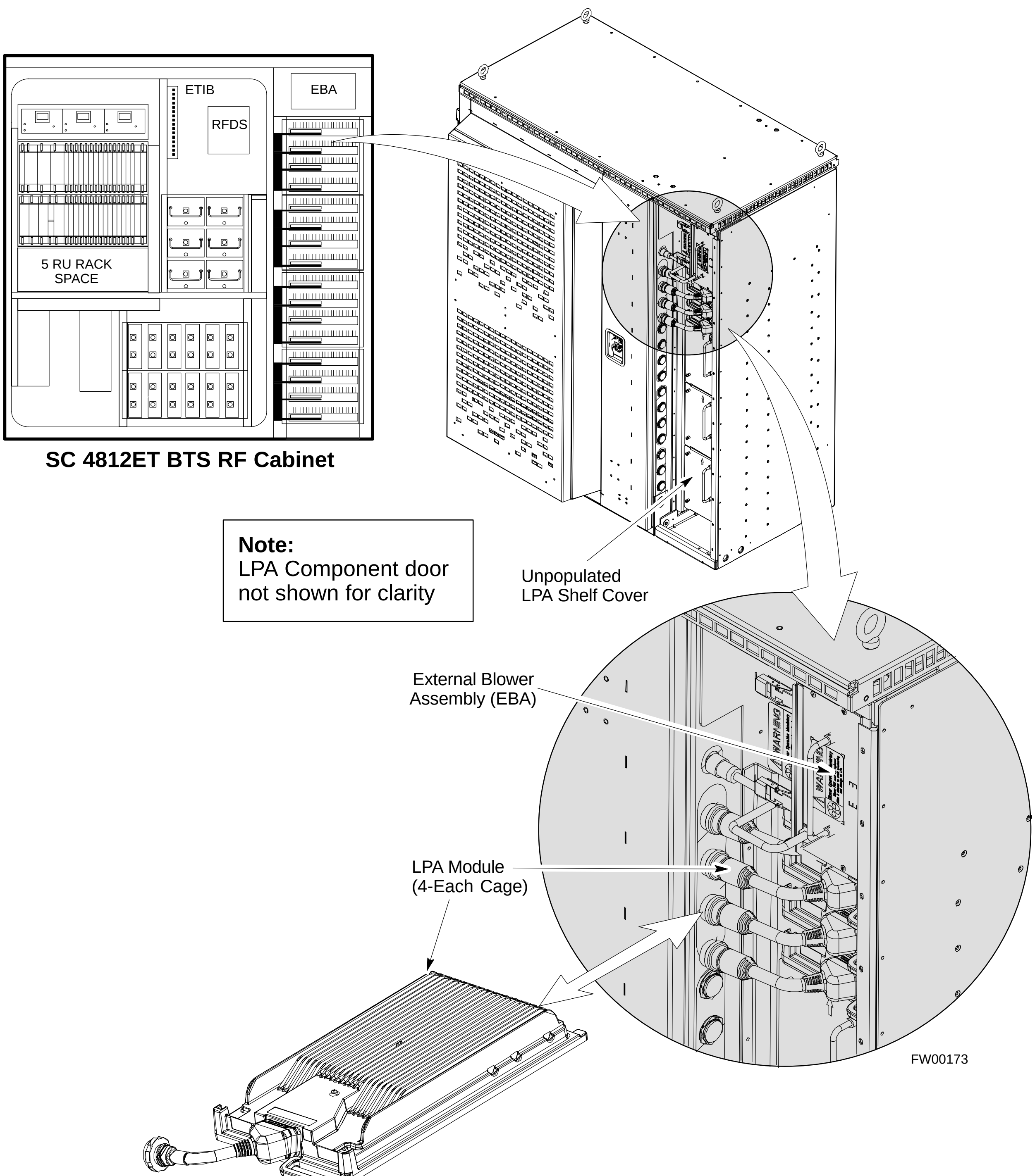


Figure H-5: BTS Combiner to LPA Backplane Cables

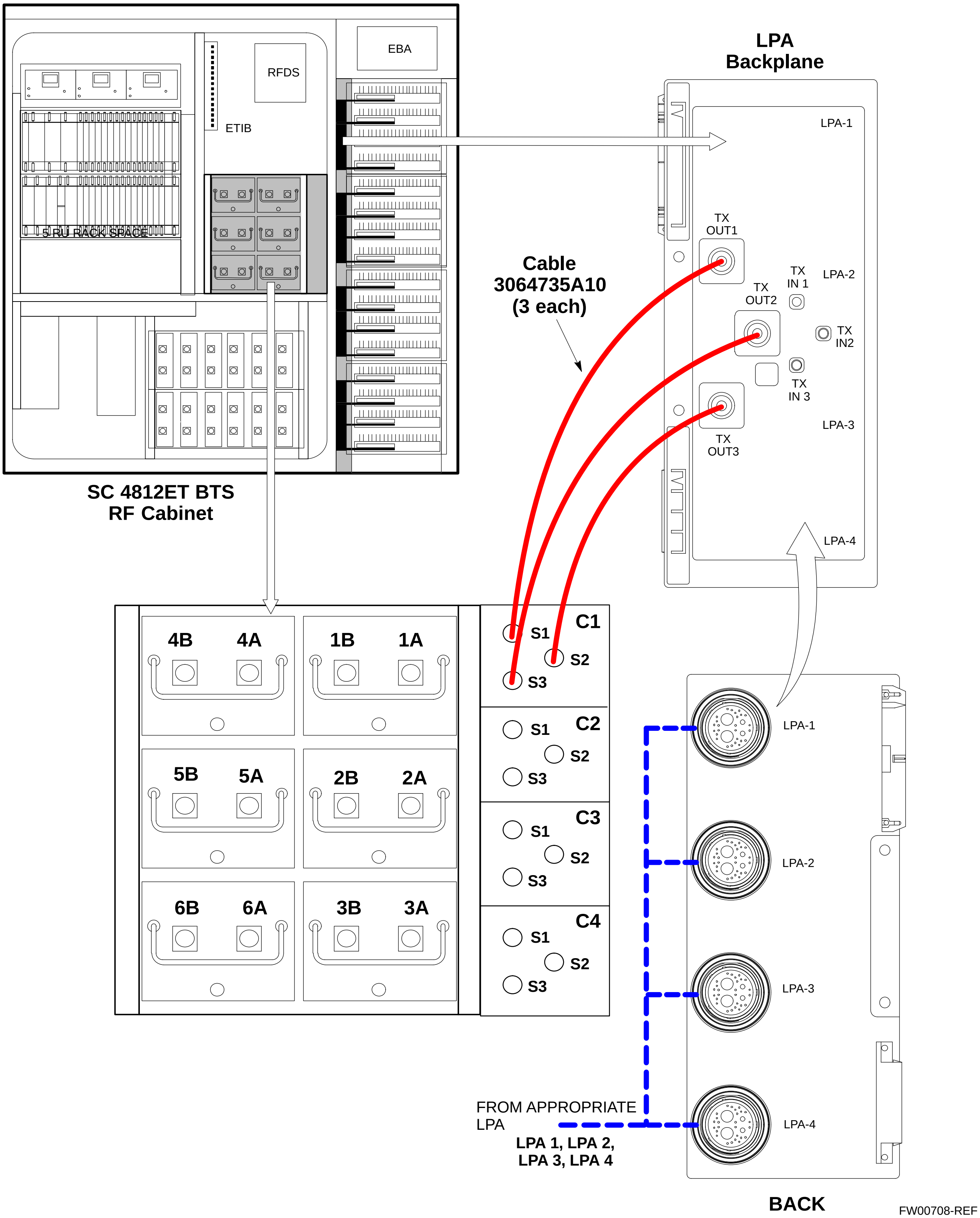


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Figure H-6: Combiner to LPA Backplane/LPA Backplane To CIO Board Cables

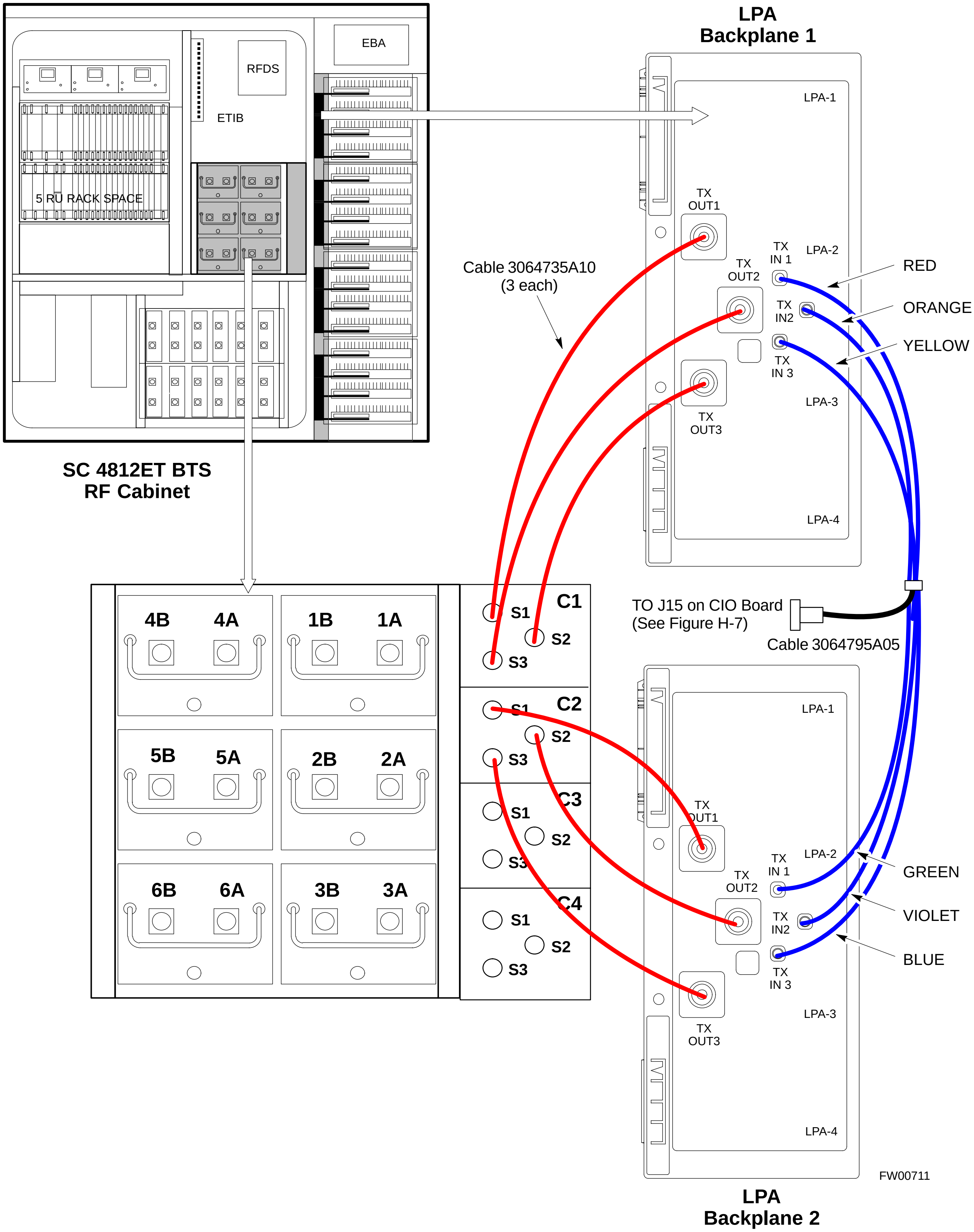
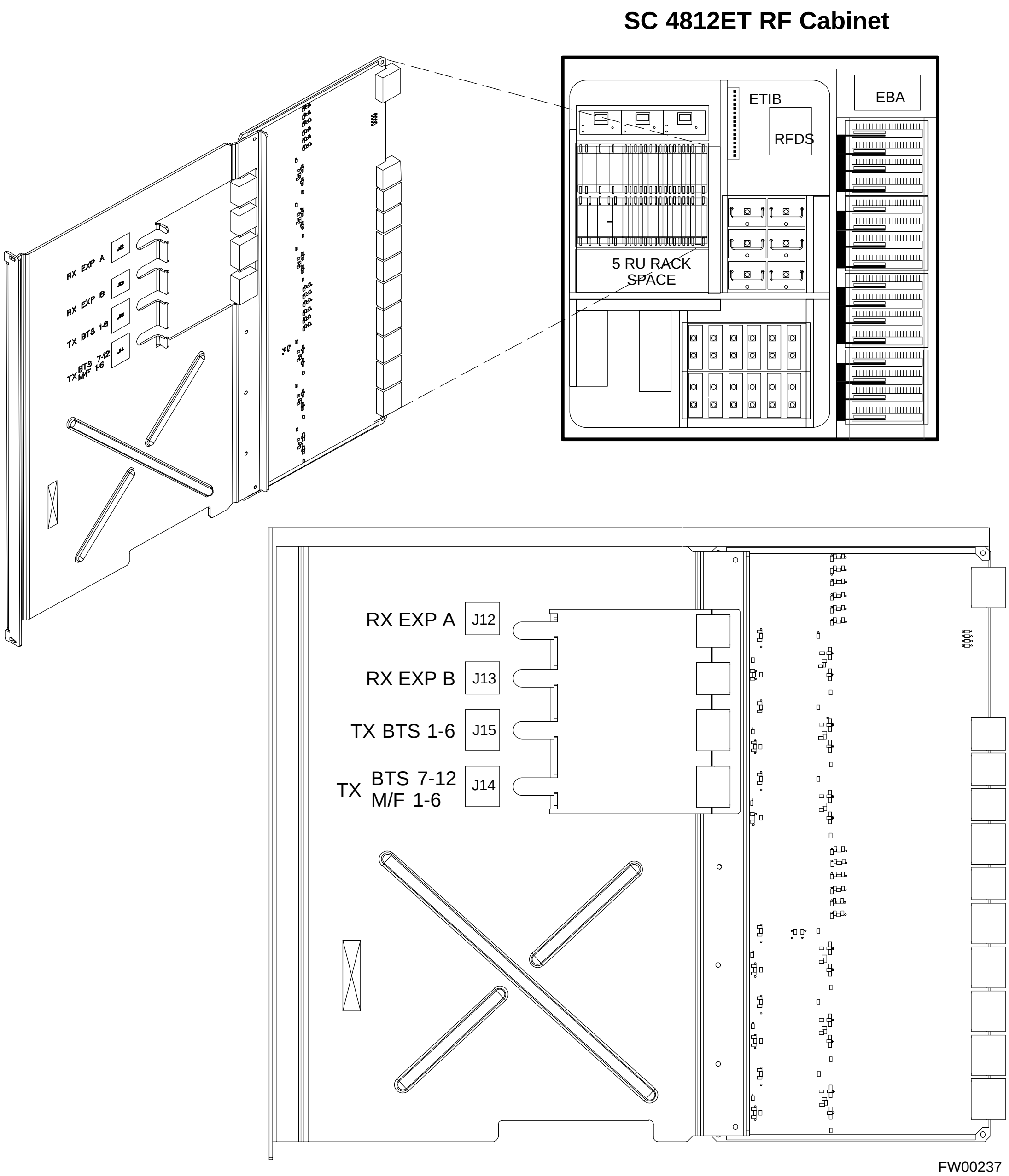


Figure H-7: Components Located on CIO Card

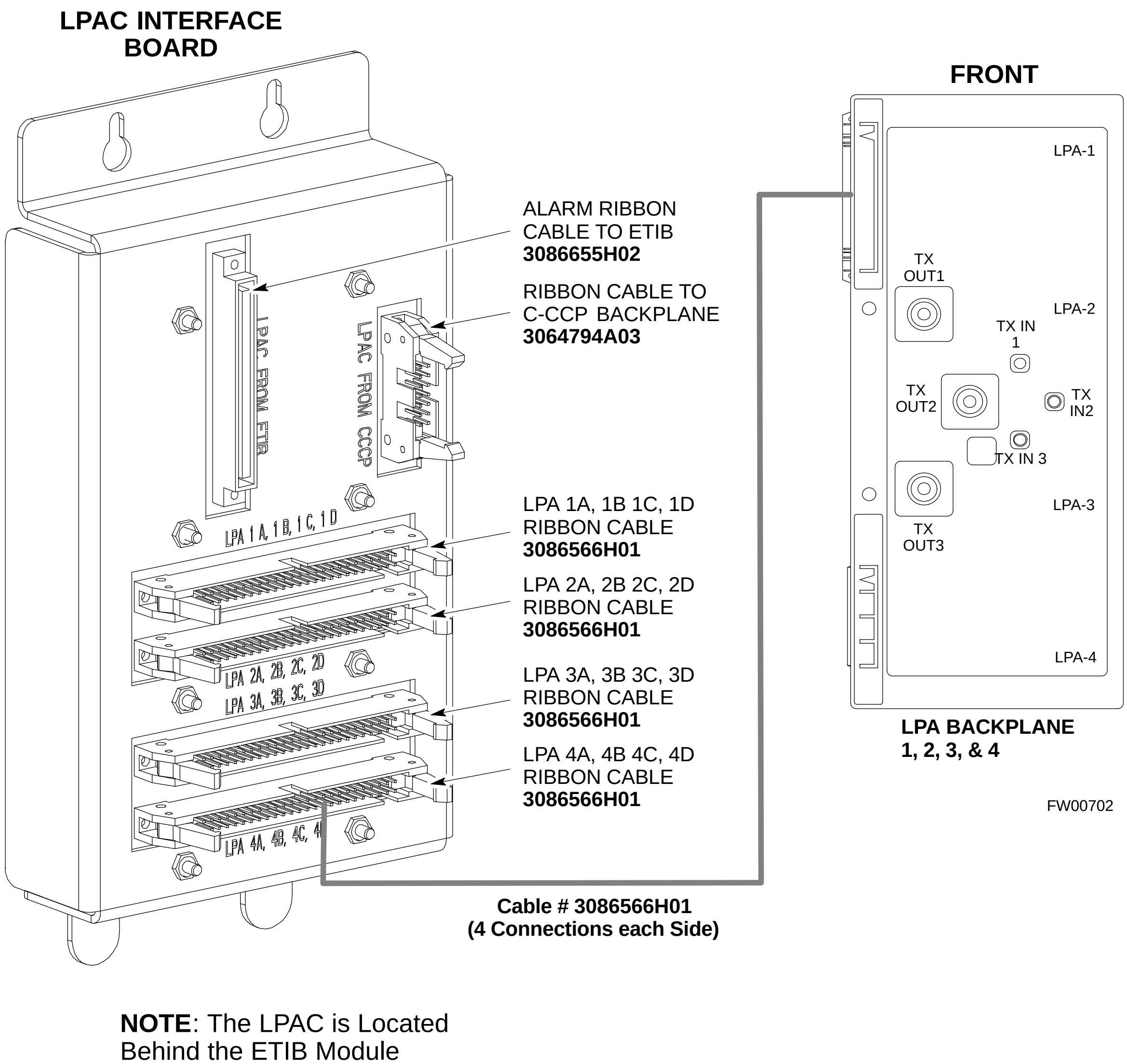


LPAC Cabling

The LPAC module provides the communication interface from the ETIB and C-CCP to the LPA through the trunking backplane. The LPAC interface board is contained in a protective housing which is mounted on the RF cabinet frame behind the ETIB module. See Figure H-3, Figure H-8 and Figure H-9 for connecting cables and connector locations.

The LPAC is located internally to the frame as shown in Figure H-1.

Figure H-8: LPAC Interface Board Connectors and Attaching Cable Numbers

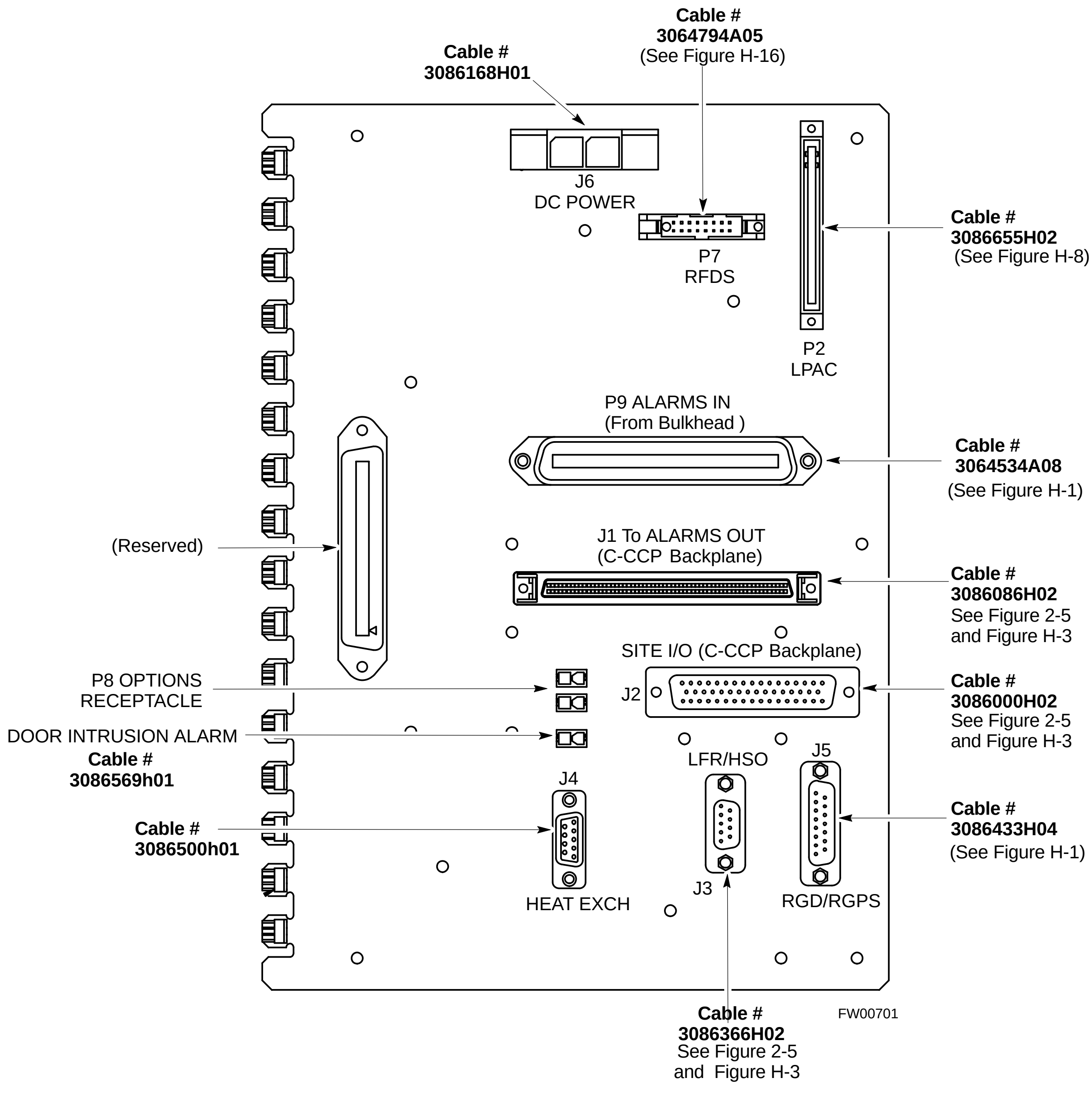


ETIB Cables and Cable Connectors

The ETIB module (see Figure H-9) provides the interface for the LPA's through the LPAC, punchblock, heat exchanger and alarms to the C-CCP backplane. The ETIB interface board is contained in a protective housing which is mounted on the RF cabinet frame.

The ETIB is located internally to the frame as shown in Figure H-1.

Figure H-9: ETIB I/O Connectors and Attaching Cable Numbers



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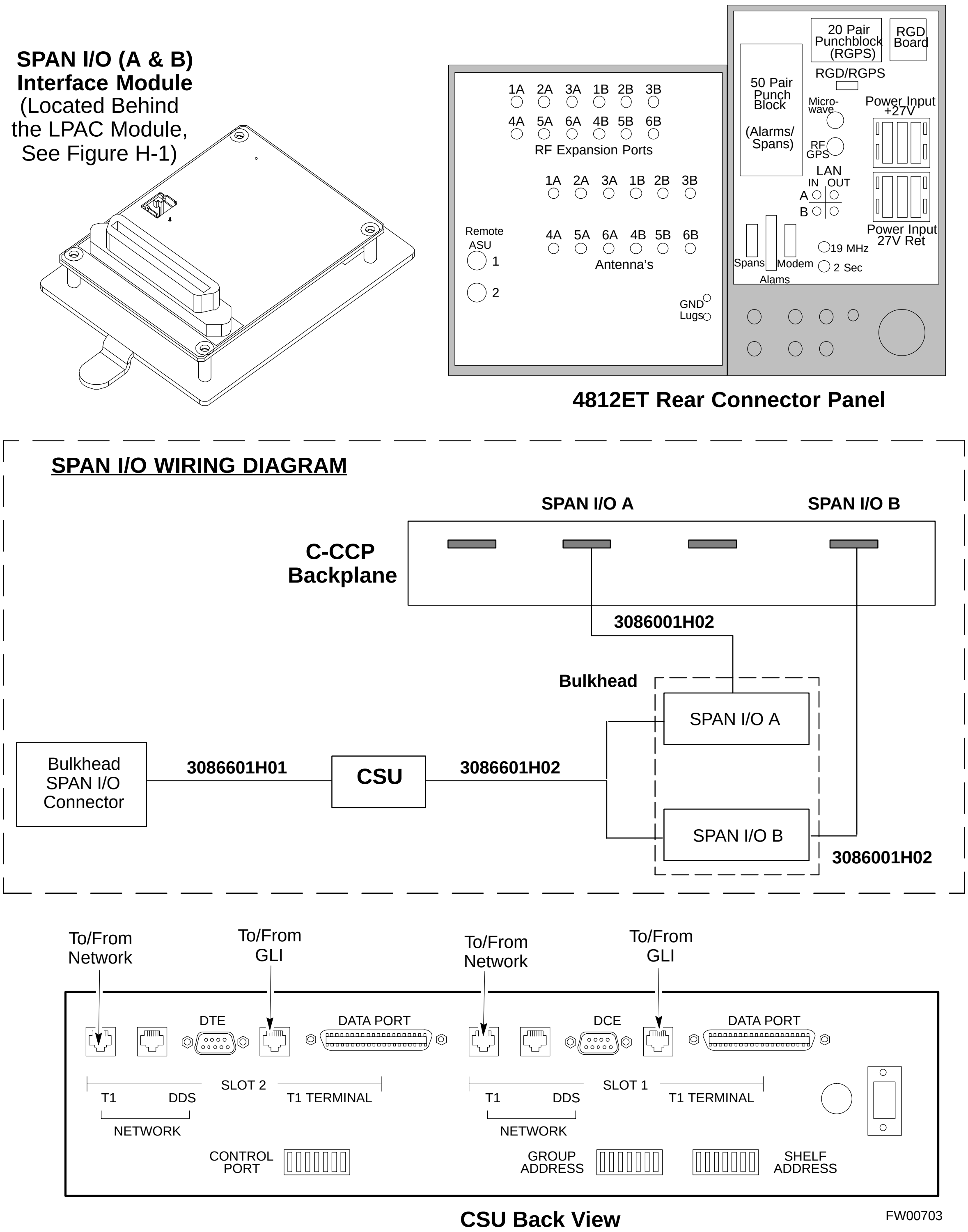
SPAN I/O Cable Connection Diagram

The SPAN I/O card provides the frame interface and secondary surge protection for the T1 lines. There are two span cards in an RF cabinet. SPAN I/O A supports spans A, C, and E. SPAN I/O B supports span B, D, and F. See Figure H-10 for SPAN cables and cable connections.

The SPAN I/O is located internally to the frame as shown in Figure H-1.

Figure H-10: SPAN I/O Cables and Connectors



DRDC/TRDC Cables and Cable Connections

The DRDC is a Duplexer, RX Filter, and Directional Coupler which provides the RF interface at the rear of the cabinet. The connections are the antenna connection (outside rear), transmit into the DRDC TX filter. Receive out of DRDC (RX filter), and Directional coupler.

The TRDC is a TX filter/RX filter/Directional Coupler that is the same as the DRDC except the TRDC has two antenna outputs (TX only and RX only) The TRDC is not available in the 1.9 GHz band.

See Figure H-11, Figure H-12, Figure H-13, and Figure H-14 for the cable diagram that fits the configuration of your BTS site.

Figure H-11: 3 Sector, 2 Carrier BTS Combiner DRDC/TRDC Cable Connection

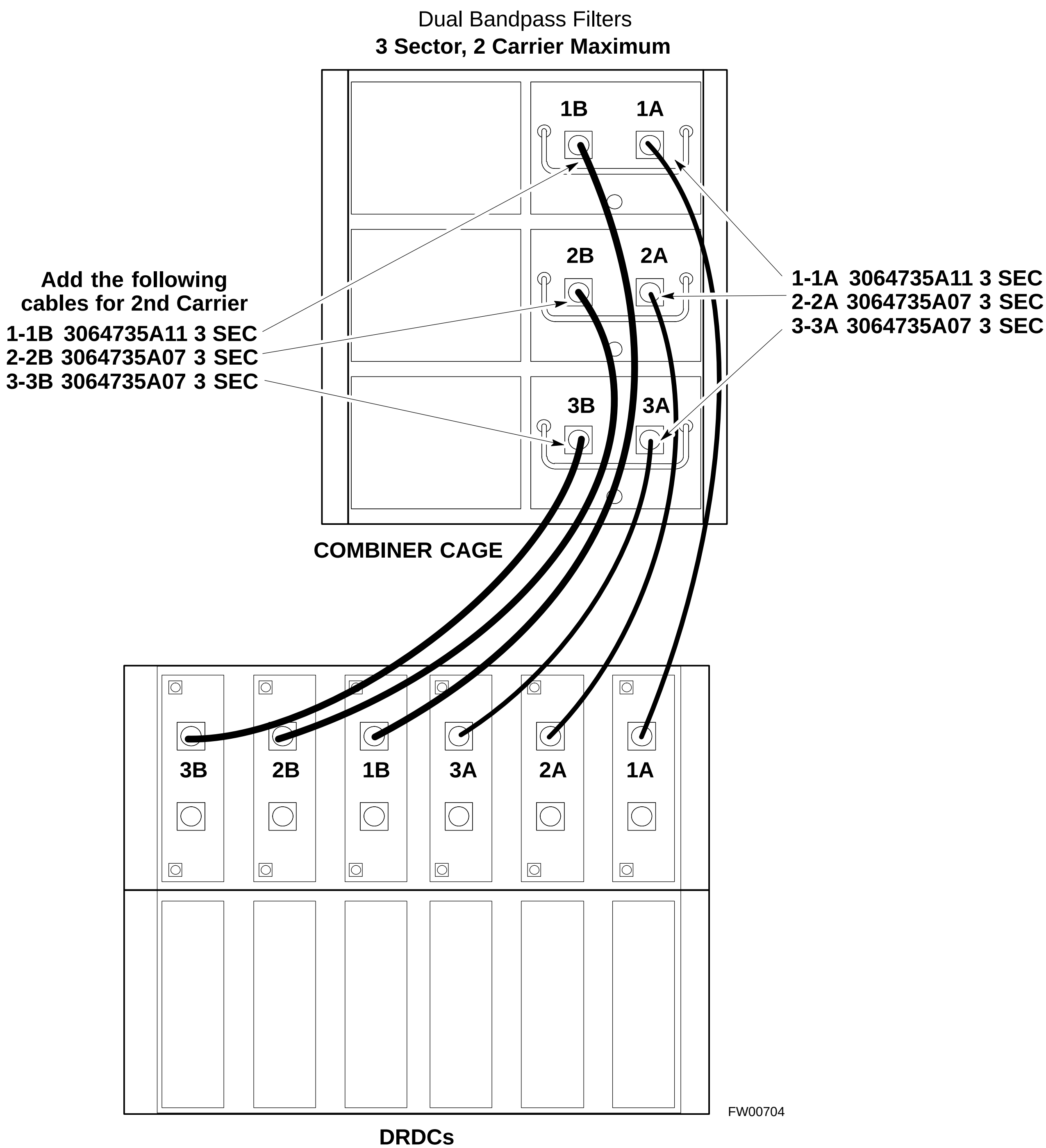


Figure H-12: BTS 2 to 1, 3 or 6 Sector Combiner DRDC/TRDC Cable Connection

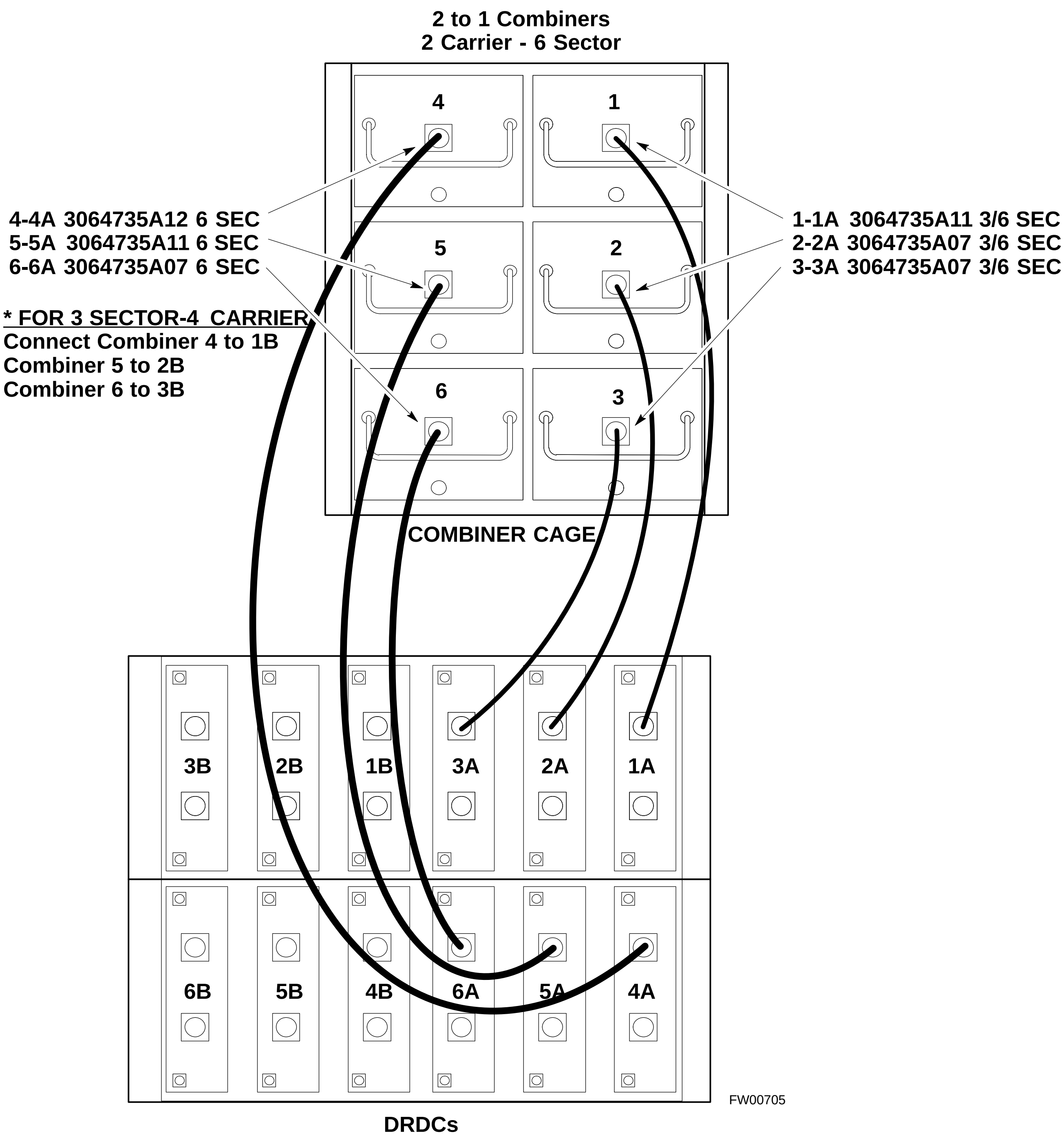


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Figure H-13: BTS Combiner DRDC/TRDC Cable Connection

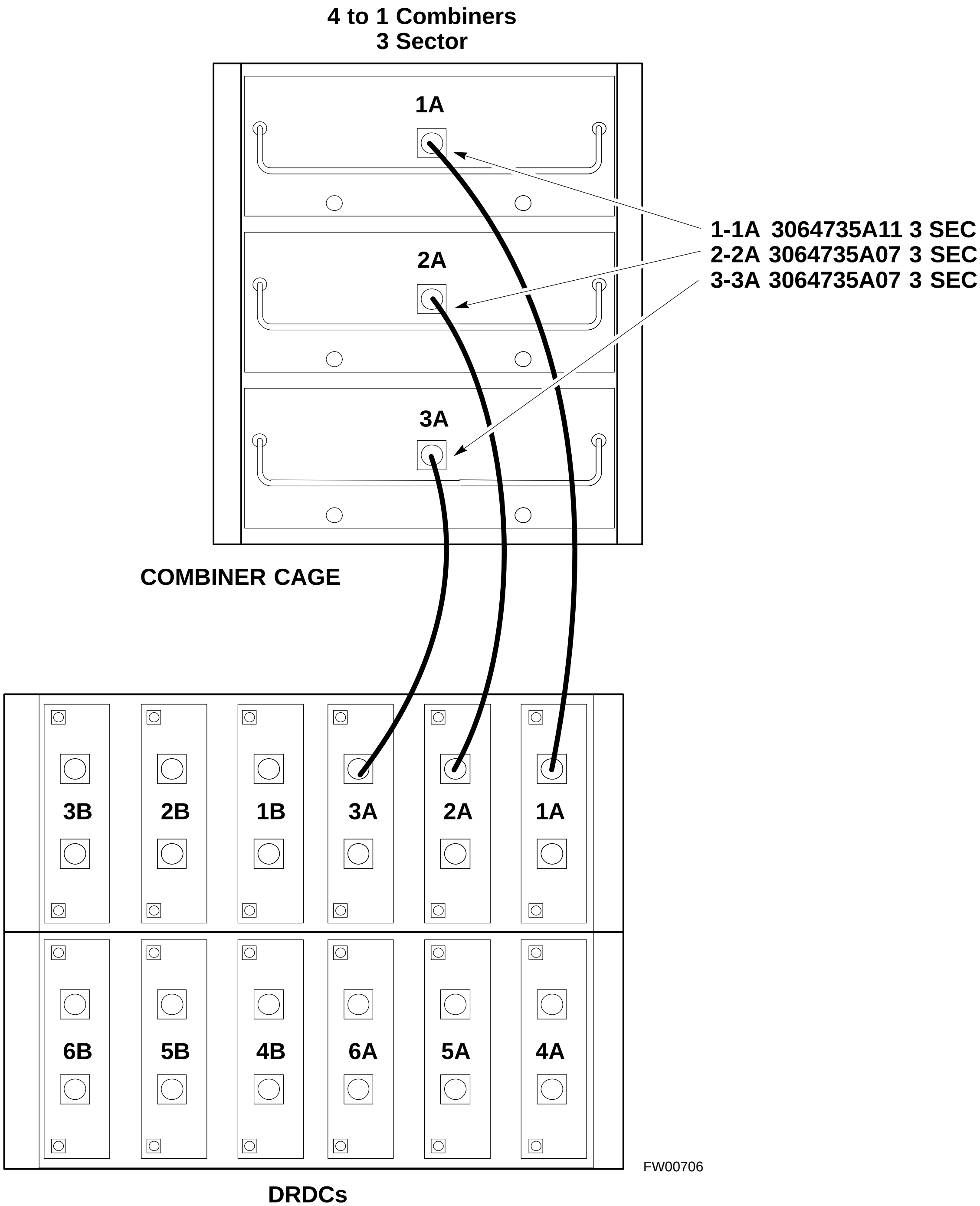

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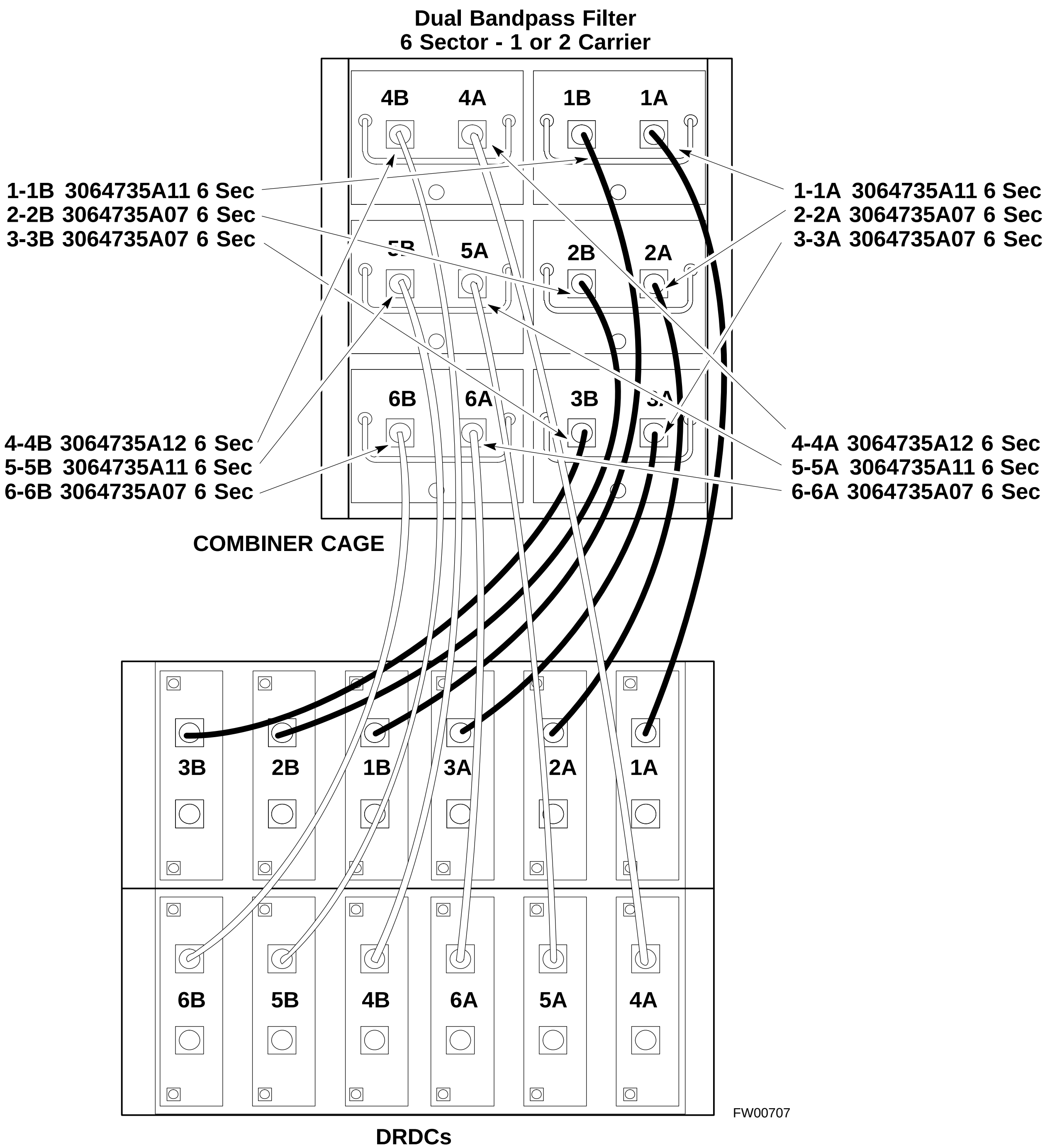
Figure H-14: SC 4812ET BTS Combiner DRDC/TRDC Cable Connection



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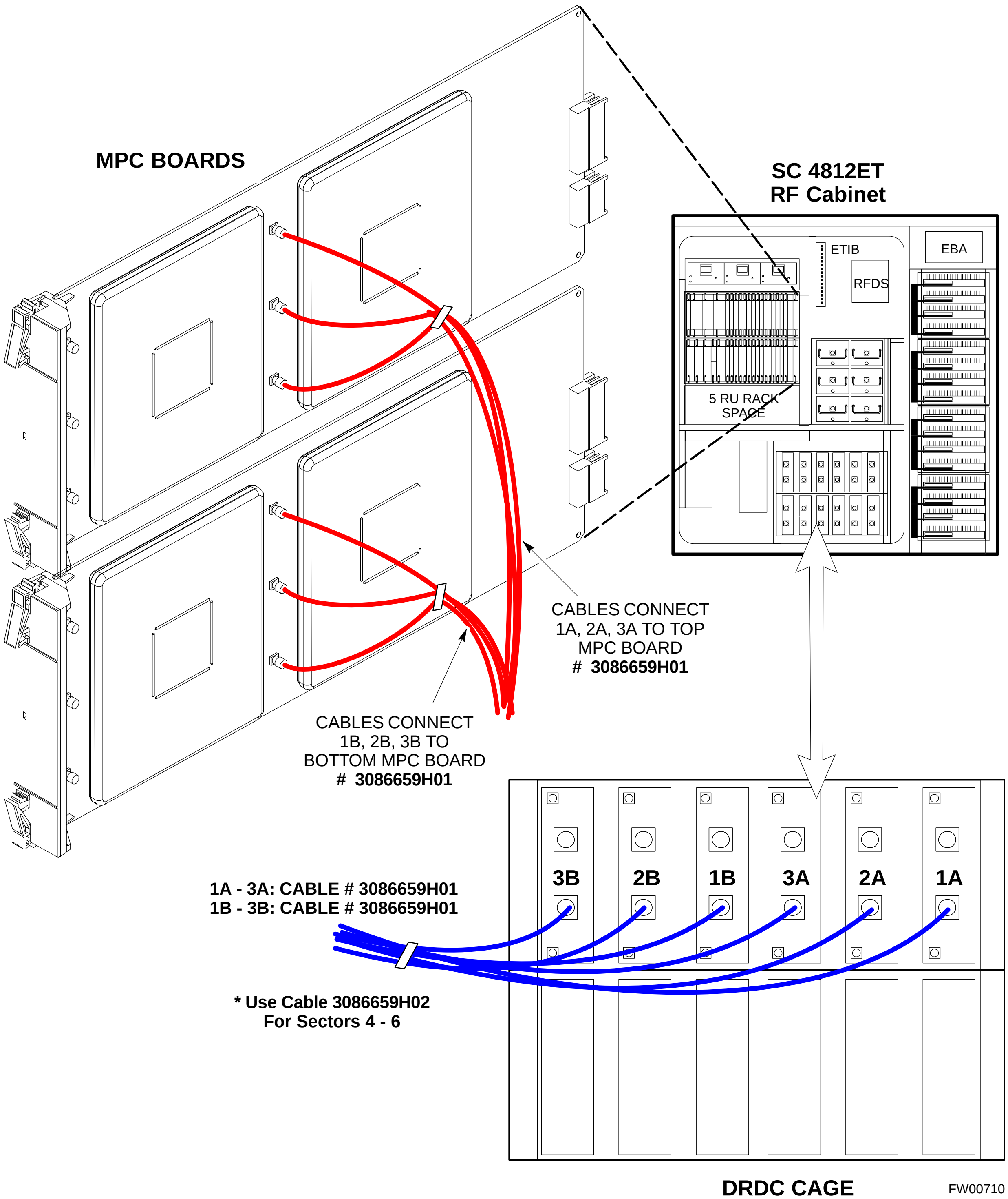
MPC Functional Description

The MPC card provides (see Figure H-15) low-noise amplification for all RX path signals. The low noise, high gain design improves frame RX sensitivity and overcomes the splitting loss in the receive path. DC voltages are monitored on the RF devices and regulators and are used to generate hard and soft alarms. The MPC is not redundant at the card-level, but includes dual-path amplifiers which provide soft-fail redundancy for all sectors.

MPC to DRDC Cabling

The cables connecting the MPC cards to the DRDCs for a three sector RF cabinet are shown in Figure H-15. A six sector RF cabinet would have six more DRDC's and they would be connected to the front of the MPC cards.

Figure H-15: DRDC To C-CCP Cage MPC Boards Cable Connections



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RFDS Cabling Details

Figure H-16 shows the components of the RFDS. Table H-2 depicts the cabling for a 3-Sector Duplexed configuration and Table H-3 depicts the cabling for a 6-Sector Duplexed configuration. Figure H-17 shows the connection of the RFDS to the BTS combiners.

Figure H-16: RFDS Component Identification

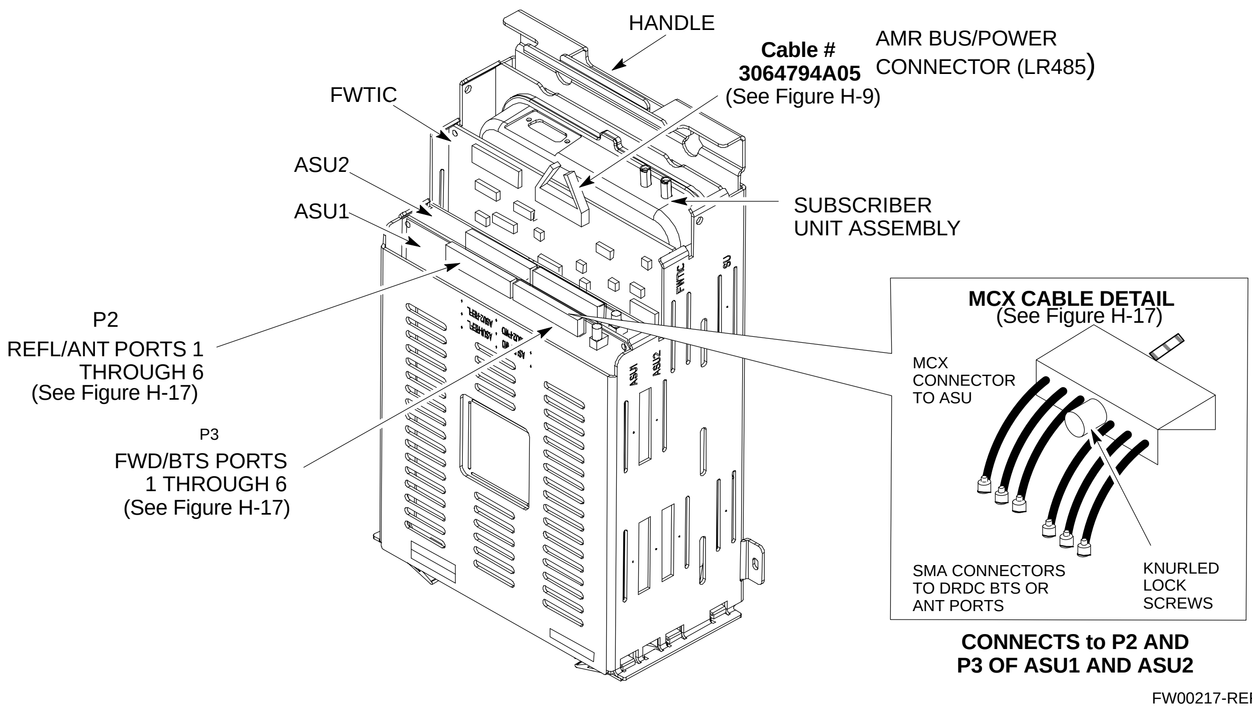

Table H-2: SC 4812ET Series 3-Sector Duplexed Directional Coupler to RFDS Cabling Table

DRDC Label	Directional Coupler Port	Cobra RFDS Port
ASU 1 - FWD (six pack MCX)		
1A BTS	Sector 1 Main BTS	ASU1-FWD BTS-1
1B BTS	Sector 1 Diversity BTS	ASU1-FWD BTS-2
2A BTS	Sector 2 Main BTS	ASU1-FWD BTS-3
2B BTS	Sector 2 Diversity BTS	ASU1-FWD BTS-4
3A BTS	Sector 3 Main BTS	ASU1-FWD BTS-5
3B BTS	Sector 3 Diversity BTS	ASU1-FWD BTS-6
ASU 1 - REF (six pack MCX)		
1A ANT	Sector 1 Main ANT	ASU1-REF ANT-1
1B ANT	Sector 1 Diversity ANT	ASU1-REF ANT-2
2A ANT	Sector 2 Main ANT	ASU1-REF ANT-3
2B ANT	Sector 2 Diversity ANT	ASU1-REF ANT-4
3A ANT	Sector 3 Main ANT	ASU1-REF ANT-5
3B ANT	Sector 3 Diversity ANT	ASU1-REF ANT-6

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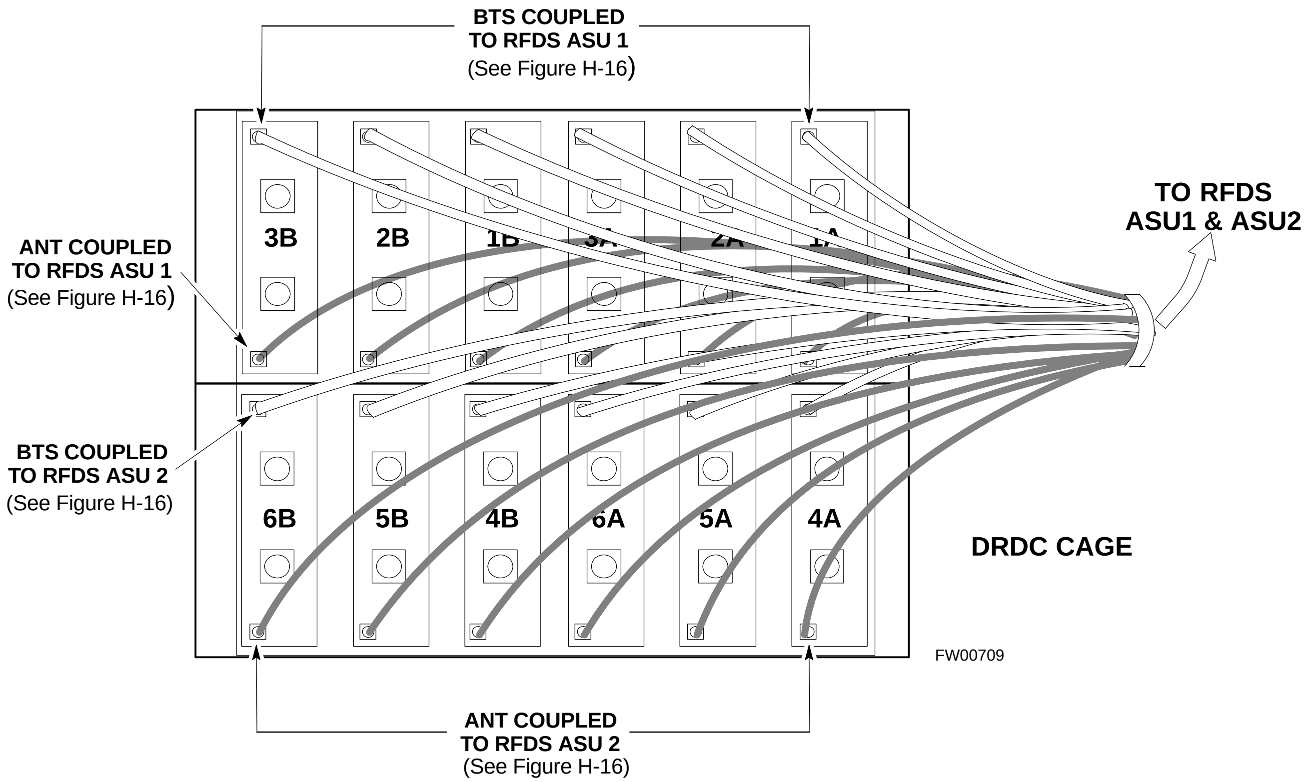
Table H-3: SC 4812ET Series 6-Sector Duplexed Directional Coupler to RFDS Cabling Table

DRDC Label	Directional Coupler Port	Cobra RFDS Port
ASU 1 - FWD (six pack MCX)		
1A BTS	Sector 1 Main BTS	ASU1-FWD BTS-1
1B BTS	Sector 1 Diversity BTS	ASU1-FWD BTS-2
2A BTS	Sector 2 Main BTS	ASU1-FWD BTS-3
2B BTS	Sector 2 Diversity BTS	ASU1-FWD BTS-4
3A BTS	Sector 3 Main BTS	ASU1-FWD BTS-5
3B BTS	Sector 3 Diversity BTS	ASU1-FWD BTS-6
ASU 2 - FWD (six pack MCX)		
4A BTS	Sector 4 Main BTS	ASU2-FWD BTS-1
4B BTS	Sector 4 Diversity BTS	ASU2-FWD BTS-2
5A BTS	Sector 5 Main BTS	ASU2-FWD BTS-3
5B BTS	Sector 5 Diversity BTS	ASU2-FWD BTS-4
6A BTS	Sector 6 Main BTS	ASU2-FWD BTS-5
6B BTS	Sector 6 Diversity BTS	ASU2-FWD BTS-6
ASU 1 - REF (six pack MCX)		
1A ANT	Sector 1 Main ANT	ASU1-REF ANT-1
1B ANT	Sector 1 Diversity ANT	ASU1-REF ANT-2
2A ANT	Sector 2 Main ANT	ASU1-REF ANT-3
2B ANT	Sector 2 Diversity ANT	ASU1-REF ANT-4
3A ANT	Sector 3 Main ANT	ASU1-REF ANT-5
3B ANT	Sector 3 Diversity ANT	ASU1-REF ANT-6
ASU 2 - REF (six pack MCX)		
4A ANT	Sector 4 Main ANT	ASU2-REF ANT-1
4B ANT	Sector 4 Diversity ANT	ASU2-REF ANT-2
5A ANT	Sector 5 Main ANT	ASU2-REF ANT-3
5B ANT	Sector 5 Diversity ANT	ASU2-REF ANT-4
6A ANT	Sector 6 Main ANT	ASU2-REF ANT-5
6B ANT	Sector 6 Diversity ANT	ASU2-REF ANT-6

Figure H-17: SC 4812ET BTS Combiner DRDC/TRDC RFDS Cable Connection



50 Pair Punchblock

The 50 pair punchblock is the main interface point for RGPS, span lines, customer I/O, Power Cabinet alarm lines, and the modem. The punchblock provides primary protection for all lines. Refer to Figure H-18 and Table H-4 for punchblock pin-out.

CAUTION	SC4812ET Span Line Labeling for Span B and Span C is swapped - On the SC4812ET's, the span cabel internal to the base station that connects the 50 pin header on the I/O plate to the CSU has Span B and Span C (RJ-45) connectors mis-labeled. - CFE will punch down the span on the 50 pair bunchblock as per Motorola documentation and punchdown chart. When conecting the span input to the CSU re-label "Span B" cable to"Span C" cable to "Span B". Connect to CSU as per documentation - Note: The labeling issue on the cable from the I/O plate to the CSU Part Number 3086601H01 Rev C shall be corrected on revision "D" to address this issue. The cut over date to Rev. D will be approximately January 30, 2001.

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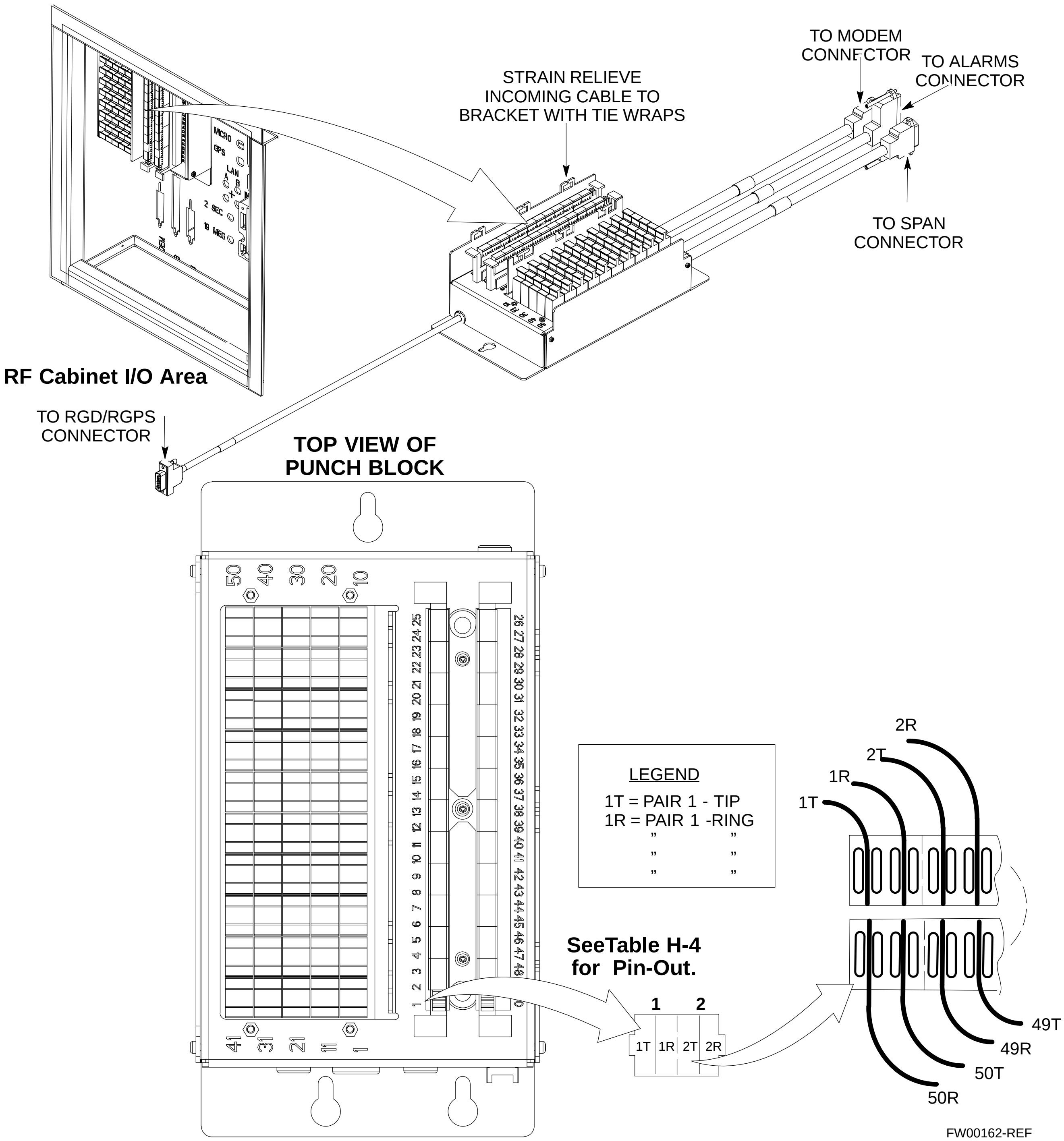
CAUTION	A wiring discrepancy exists between the manuals and the frame for remote GPS. - The TX and RX are reversed in the ETIB, leading to inoperability of the RGPS. The RGPS will not work in either a single standalone or multiple frame configuration. - Swap the White and White/Bk wires to punch pins 44T and 44R. The Green and Green/Bk go to 45T and 45R. This will correct non-expansion configurations. - Single frame and expansion BTSs without RGPS can use this workaround as a permanent solution. - For expansion with RGPS required a new cable (P/N 3086433H10) will correct the problem.

Figure H-18: 50 Pair Punchblock



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Alarm and Span Line Cable Pin/Signal Information

Table H-4 lists the complete pin/signal identification for the 50-pin punch block.

Table H-4: Pin-Out for 50-Pair Punchblock

Punchblock Cable Connector	Function	Signal Name	Punch Pin	Ext. Cable Wire Color
ALARM	Power Cabinet	Power Cab Control - NC	1T	Blue
		Power Cab Control - NO	1R	Blk/Blue
		Power Cab Control-Com	2T	Yellow
		Reserved	2R	N/C
		Rectifier Fail	3T	Blk/Yellow
		AC Fail	3R	Green
		Power Cab Exchanger Fail	4T	Blk/Grn
		Power Cab Door Alarm	4R	White
		Power Cab Major Alarm	5T	Blk/White
		Battery Over Temp	5R	Red
		Power Cab Minor Alarm	6T	Blk/Red
		Reticifier Over Temp	6R	Brown
		Power Cab Alarm Rtn	7T	Blk/Brn
	HSO/LFR Extension	LFR_HSO_GND	7R	
		EXT_1PPS_POS	8T	
		EXT_1PPS_NEG	8R	
	LFR Antenna	CAL_+	9T	
		CAB_-	9R	
		LORAN_+	10T	
		LORAN_-	10R	
	Pilot Beacon	Pilot Beacon Alarm - Minor	11T	
		Pilot Beacon Alarm - Rtn	11R	
		Pilot Beacon Alarm - Major	12T	
		Pilot Beacon Control-NO	12R	
		Pilot Beacon Control - COM	13T	
		Pilot Beacon Control - NC	13R	

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Table H-4: Pin-Out for 50-Pair Punchblock

Punchblock Cable Connector	Function	Signal Name	Punch Pin	Ext. Cable Wire Color
ALARM	Customer Outputs	Customer Outputs 1 - NO	14T	
		Customer Outputs 1 - COM	14R	
		Customer Outputs 1 - NO	14T	
		Customer Outputs 1 - COM	14R	
		Customer Outputs 1 - NC	15T	
		Customer Outputs 2 - NO	15R	
		Customer Outputs 2 - COM	16T	
		Customer Outputs 2 - NC	16R	
		Customer Outputs 3 - NO	17T	
		Customer Outputs 3 - COM	17R	
		Customer Outputs 3 - NC	18T	
		Customer Outputs 4 - NO	18R	
		Customer Outputs 4-COM	19T	
		Customer Outputs 4 - NC	19R	
ALARM	Customer Inputs	Customer Inputs 1	20T	
		Cust_Rtn_A_1	20R	
		Customer Inputs 2	21T	
		Cust_Rtn_A_2	21R	
		Customer Inputs 3	22T	
		Cust_Rtn_A_3	22R	
		Customer Inputs 4	23T	
		Cust_Rtn_A_4	23R	
		Customer Inputs 5	24T	
		Cust_Rtn_A_5	24R	
		Customer Inputs 6	25T	
		Cust_Rtn_A_6	25R	
		Customer Inputs 7	26T	
		Cust_Rtn_A_7	26R	
		Customer Inputs 8	27T	
		Cust_Rtn_A_8	27R	
		Customer Inputs 9	28T	
		Cust_Rtn_A_9	28R	
		Customer Inputs 10	29T	
		Cust_Rtn_A_10	29R	

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Table H-4: Pin-Out for 50-Pair Punchblock

Punchblock Cable Connector	Function	Signal Name	Punch Pin	Ext. Cable Wire Color
SPAN I/O	Span 1	RCV_TIP_A	30T	
		RCV_RING_A	30R	
		XMIT_TIP_A	31T	
		XMIT_RING_A	31R	
	Span 2	RCV_TIP_B	32T	
		RCV_RING_B	32R	
		XMIT_TIP_B	33T	
		XMIT_RING_B	33R	
	Span 3	RCV_TIP_C (Note)	34T	
		RCV_RING_C (Note)	34R	
		XMIT_TIP_C (Note)	35T	
		XMIT_RING_C(Note)	35R	
	Span 4	RCV_TIP_D (Note)	36T	
		RCV_RING_D (Note)	36R	
		XMIT_TIP_D (Note)	37T	
		XMIT_RING_D(Note)	37R	
	Span 5	RCV_TIP_E (Note)	38T	
		RCV_RING_E (Note)	38R	
		XMIT_TIP_E (Note)	39T	
		XMIT_RING_E(Note)	39R	
	Span 6	RCV_TIP_F (Note)	40T	
		RCV_RING_F (Note)	40R	
		XMIT_TIP_F (Note)	41T	
		XMIT_RING_F(Note)	41R	
		NOTE Span 3 through 6 are spares for expansion purposes		

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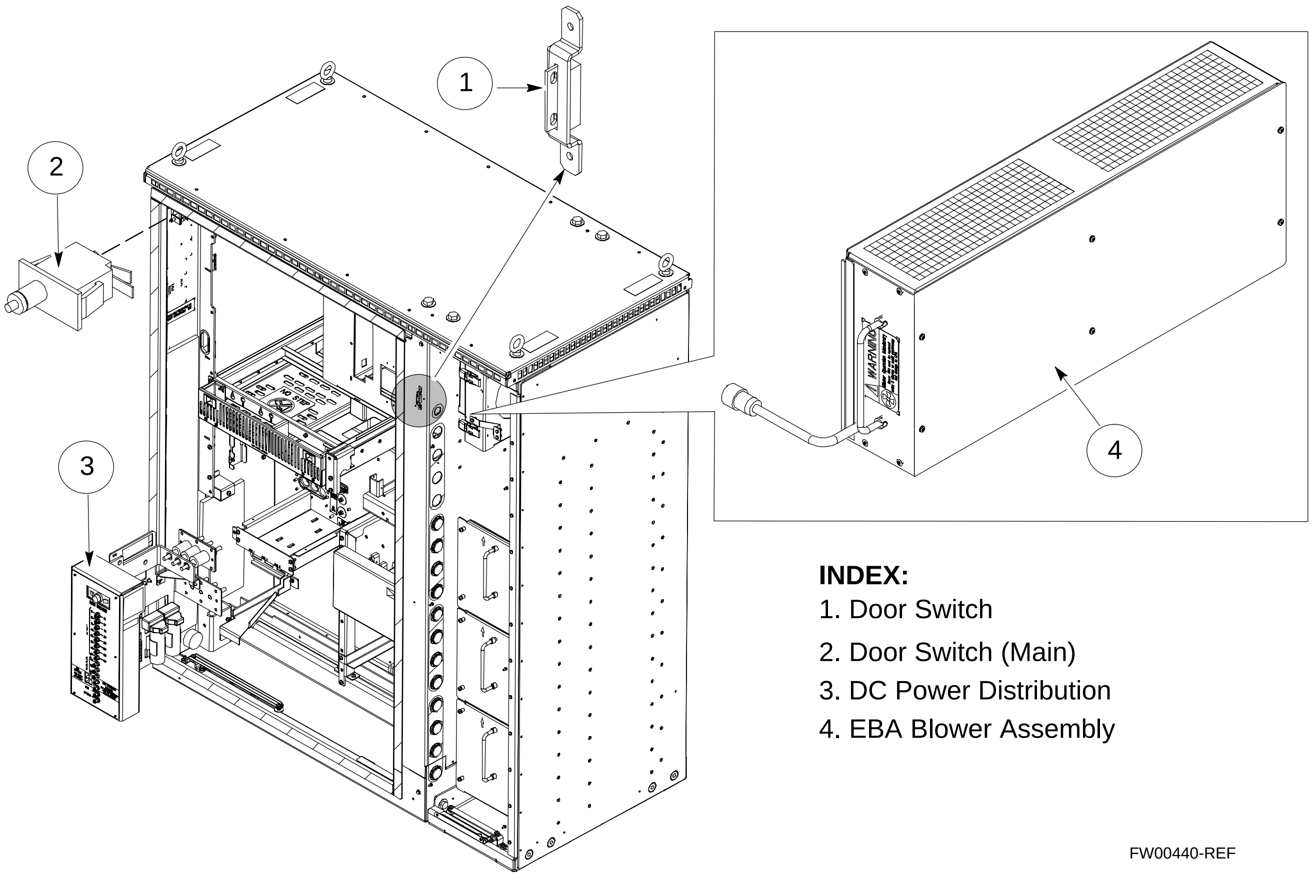
Table H-4: Pin-Out for 50-Pair Punchblock

Punchblock Cable Connector	Function	Signal Name	Punch Pin	Ext. Cable Wire Color
RGD/RGPS	**For frame without RGD Expansion Punchblock** Single Frame BTS;RGPS Head Connection **OR** Multiple Frame BTS; RGD Connection at RGPS Secondary Frame	GPS_Power_A	42T	Yellow
		GPS_Power_A_Return	42R	Yellow/Black
		GPS_Power_B	43T	Blue
		GPS_Power_B_Return	43R	Blue/Black
		GPS_TXD+	44T	White
		GPS_TXD-	44R	White/Black
		GPS_RXD+	45T	Green
		GPS_RXD-	45R	Green/Black
		Signal Ground (TDR+)	46T	Red
		Signal Ground (TDR-)	46R	Red/Black
		GPS_1PPS+	47T	Brown
		GPS_1PPS-	47R	Brown/Black
RGD/RGPS	**For frame with RGD Expansion Punchblock** **OR** Multiple Frame BTS; RGPS Head Connection at RGPS Primary Frame	GPS_Power_A	42T	Yellow
		GPS_Power_A_Return	42R	Yellow/Black
		GPS_Power_B	43T	Blue
		GPS_Power_B_Return	43R	Blue/Black
		GPS_TXD+	44T	White
		GPS_TXD-	44R	White/Black
		GPS_RXD+	45T	Green
		GPS_RXD-	45R	Green/Black
		Signal Ground (TDR+)	46T	Red
		Master Frame (TDR-)	46R	Red/Black
		GPS_1PPS+	47T	Brown
		GPS_1PPS-	47R	Brown/Black
MODEM		Reserved	48T	
		Reserved	48R	
RGD/RGPS		Chassis Ground	49T	N/A
None		No Connection	49R	None
ALARM		Reserved	50T	None
		Reserved	50R	None

RF Cabinet Parts Locator

Figure H-19 illustrates the location of door switch interlocks, DC Power distribution and the EBA blower assembly.

Figure H-19: SC 4812ET RF Cabinet Parts Locator



Appendix I

GPIB Addressing

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GPIB

GPIB Introduction

Use the procedures in this appendix to verify and/or change the GPIB addresses of the applicable test equipment.

HP437 Power Meter GPIB Address

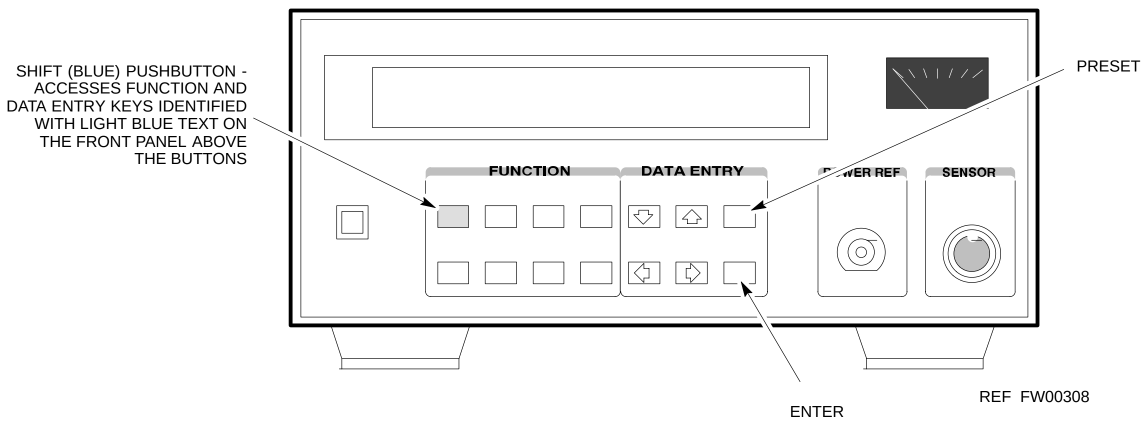
Follow the steps in Table I-1 to verify and, if necessary, change the HP437 GPIB address.

NOTE	This procedure assumes that the test equipment is set up and ready for testing.

Table I-1: Verify and/or Change HP437 Power Meter GPIB Address

Step	Action
1	Press **Shift** and **PRESET** (see Figure I-1).
2	Use the ▲ arrow key to navigate to HP-IB ADRS and press **ENTER**. The HP-IB address is displayed. **NOTE** HP-IB is the same as GPIB.
3	If the current GPIB address is not set to **13**, perform the following to change it: - Use the ▲ ▼ arrow keys to change the HP-IB ADRS to **13**. - Press **ENTER** to set the address.
4	Press **Shift** and **ENTER** to return to a standard configuration.

Figure I-1: HP437 Power Meter



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Gigatronics 8541C Power Meter GPIB Address

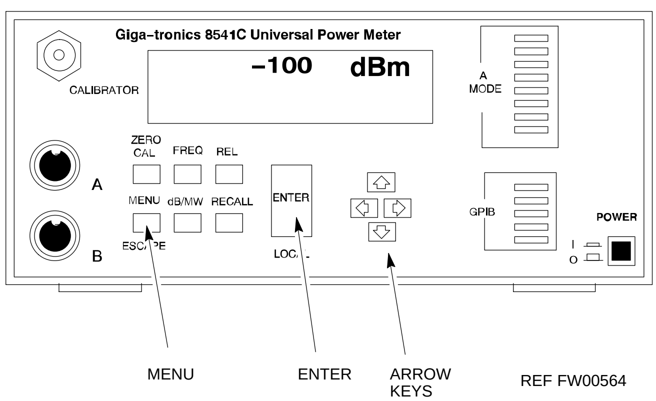
Follow the steps in Table I-2 to verify and, if necessary, change the Gigatronics 8541C power meter GPIB address.

NOTE	This procedure assumes that the test equipment is set up and ready for testing.

Table I-2: Verify and/or Change Gigatronics 8541C Power Meter GPIB Address

Step	Action
	! CAUTION Do not connect/disconnect the power meter sensor cable with AC power applied to the meter. Disconnection could result in destruction of the sensing element or miscalibration.
1	Press **MENU** (see Figure I-2).
2	Use the ▼ arrow key to select **CONFIG MENU** and press **ENTER**.
3	Use the ▼ arrow key to select **GPIB** and press **ENTER**. The current **Mode** and GPIB **Address** are displayed.
4	If the **Mode** is not set to **8541C**, perform the following to change it: Use the ◀ ▶ arrow keys as required to select **MODE**. Use the ▼▲ arrow keys as required to set **MODE** to **8541C**.
5	If the GPIB address is not set to **13**, perform the following to change it: Use the ▶ arrow key to select **ADDRESS**. Use the ▼▲ arrow keys as required to set the GPIB address to **13**.
6	Press **ENTER** to return to normal operation.

Figure I-2: Gigatronics 8541C Power Meter Detail



Motorola CyberTest GPIB Address

Follow the steps in Table I-3 to verify and, if necessary, change the GPIB address on the Motorola CyberTest. Changing the GPIB address requires the following items:

- Motorola CyberTest communications analyzer
- Computer running Windows 3.1/Windows 95
- Motorola CyberTAME software program “TAME”
- Parallel printer port cable (shipped with CyberTest)

NOTE	This procedure assumes that the test equipment is set up and ready for testing.

Table I-3: Verify and/or Change Motorola CyberTest GPIB Address

Step	Action
1	On the LMF desktop, locate the CyberTAME icon. Double click on the icon to run the CyberTAME application.
2	In the CyberTAME window taskbar, under **Special,** select **IEEE.488.2.**
3	CyberTAME software will query the CyberTest Analyzer for its current GPIB address. It then will open the IEEE 488.2 dialog box. If the current GPIB address is not 18, perform the following procedure to change it: - Use the up or down increment arrows, or double-click in the field and type the number. - Click on the **OK** button. The new address will be written to the CyberTest via the parallel port and saved.
	NOTE Verify that the address has been set by repeating steps 2 and 3. The new address should now appear in the IEEE 488.2 dialog box Address field.

HP8935 Test Set GPIB Address

Follow the procedure in Table I-4 to verify and, if necessary, change the HP8935 GPIB address.

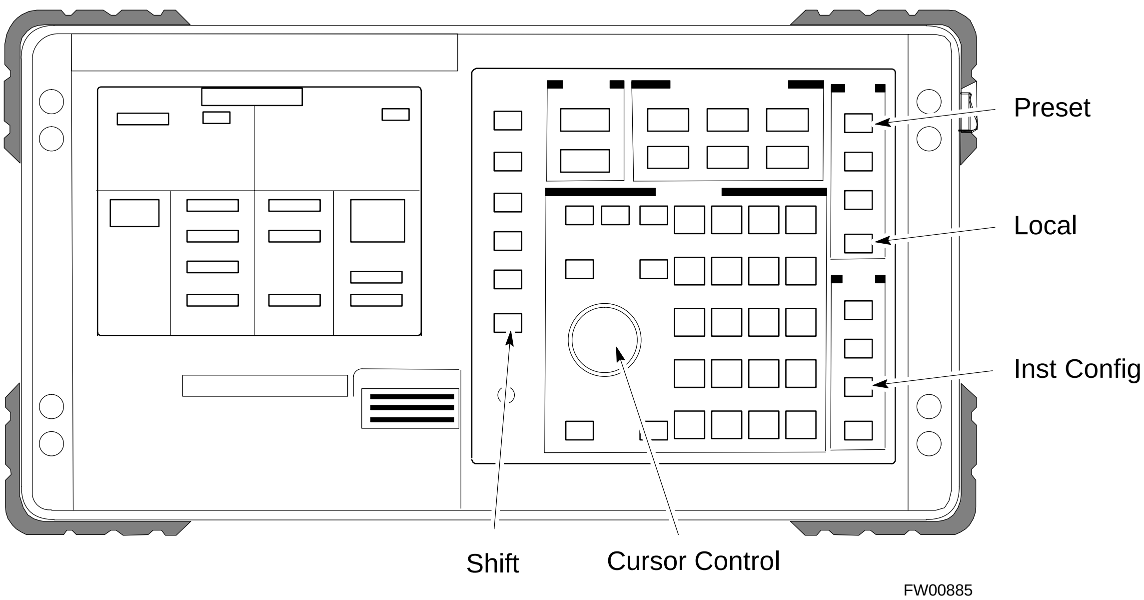
NOTE	This procedure assumes that the test equipment is set up and ready for testing.

Table I-4: Verify and/or Change HP8935 GPIB Address

Step	Action
	*** IMPORTANT** The HP I/O configuration MUST be set to **Talk & Listen,** or NO device on the GPIB bus will be accessible. (Consult test equipment OEM documentation for additional information as required.)
1	To verify that the GPIB addresses are set correctly, press **Shift** and **LOCAL** on the HP8935 (see Figure I-3). The current HP-IB address is displayed at the top of the screen. **NOTE** HP-IB is the same as GPIB.

Table I-4: Verify and/or Change HP8935 GPIB Address	
Step	**Action**
2	If the current GPIB address is not set to **18**, perform the following to change it: - Press **Shift** and **Inst Config**. - Turn the **Cursor Control** knob to move the cursor to the **HP-IB Adrs** field. - Press the **Cursor Control** knob to select the field. - Turn the **Cursor Control** knob as required to change the address to 18. - Press the **Cursor Control** knob to set the address.
3	• Press **Preset** to return to normal operation.

Figure I-3: HP8935 Test Set



Setting HP8921A and HP83236A/B GPIB Address

Follow the procedure in Table I-5 to verify and, if necessary, change the HP8921A HP83236A GPIB addresses.

NOTE	This procedure assumes that the test equipment is set up and ready for testing.

Table I-5: Verify and/or Change HP8921A and HP83236A GPIB Addresses

Step	Action
1	To verify that the GPIB addresses are set correctly, press **Shift** and **LOCAL** on the HP8921A (see Figure I-4). The current HP-IB address is displayed at the top of the screen. **NOTE** HP-IB is the same as GPIB.
2	If the current HP-IB address is not set to **18**, perform the following to change it: - Turn the **Cursor Control** knob to move the cursor to **More** and press the knob to select the field. - Turn the **Cursor Control** knob to move the cursor to **I/O Config** and press the knob to select the field. - Turn the **Cursor Control** knob to move the cursor to **Adrs** and press the knob to select the field. - Turn the **Cursor Control** knob to change the HP-IB address to 18 and press the knob to set the address. - Press **Shift** and **Preset** to return to normal operation.
3	To set the HP83236A (or B) PCS Interface GPIB address=19, set the dip switches as follows: - A1=1, A2=1, A3=0, A4=0, A5=1, HP-IB/Ser = 1

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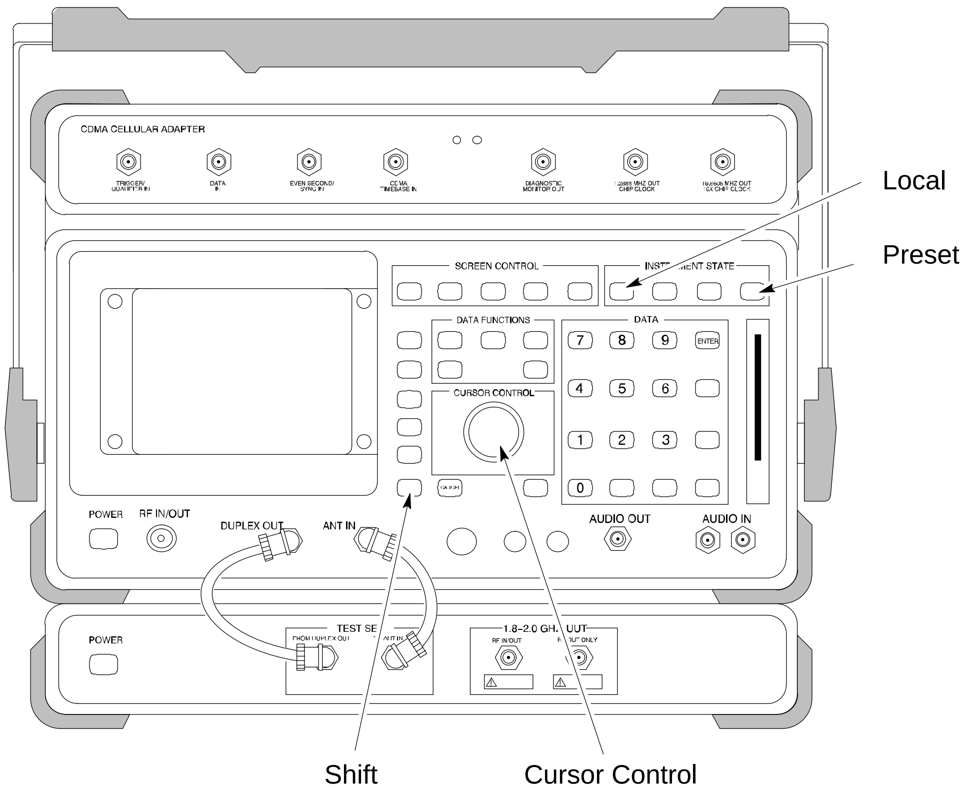
Figure I-4: HP8921A and HP83236A/B



Advantest R3465 GPIB Address

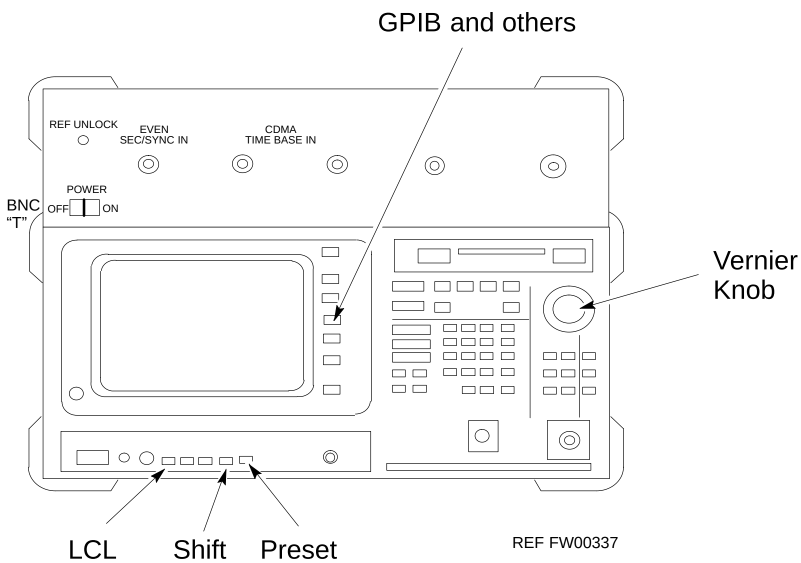
Table I-6 describes the steps to verify and, if necessary, change the GPIB address for the Advantest R3465.

NOTE	This procedure assumes that the test equipment is set up and ready for testing.

Table I-6: Verify and/or Change Advantest R3465 GPIB Address

Step	Action
1	To verify that the GPIB address is set correctly, perform the following procedure: - Press **SHIFT** then **PRESET** (see Figure I-5). - Press **LCL**. - Press the **GPIB and Others** CRT menu key to view the current address.
2	If the current GPIB address is not set to **18**, perform the following to change it: - Turn the vernier knob as required to select **18**. - Press the vernier knob to set the address.
3	To return to normal operation, press **Shift** and **Preset**.

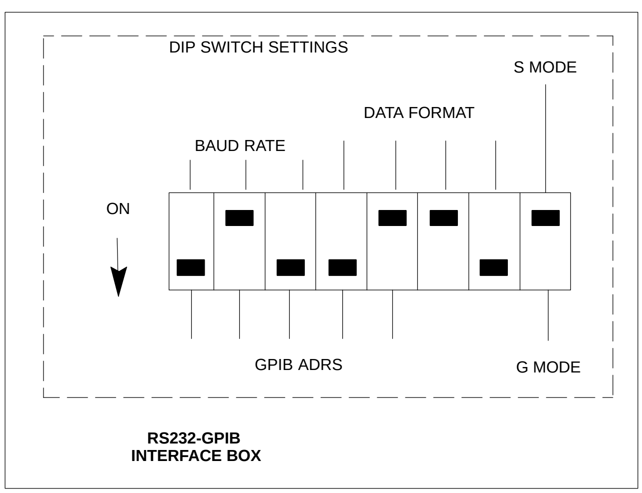
Figure I-5: R3465 Communications Test Set



RS232 GPIB Interface Box

Ensure that the RS232 GPIB interface box dip switches are set as shown in Figure I-6.

Figure I-6: RS232 GPIB Interface Box



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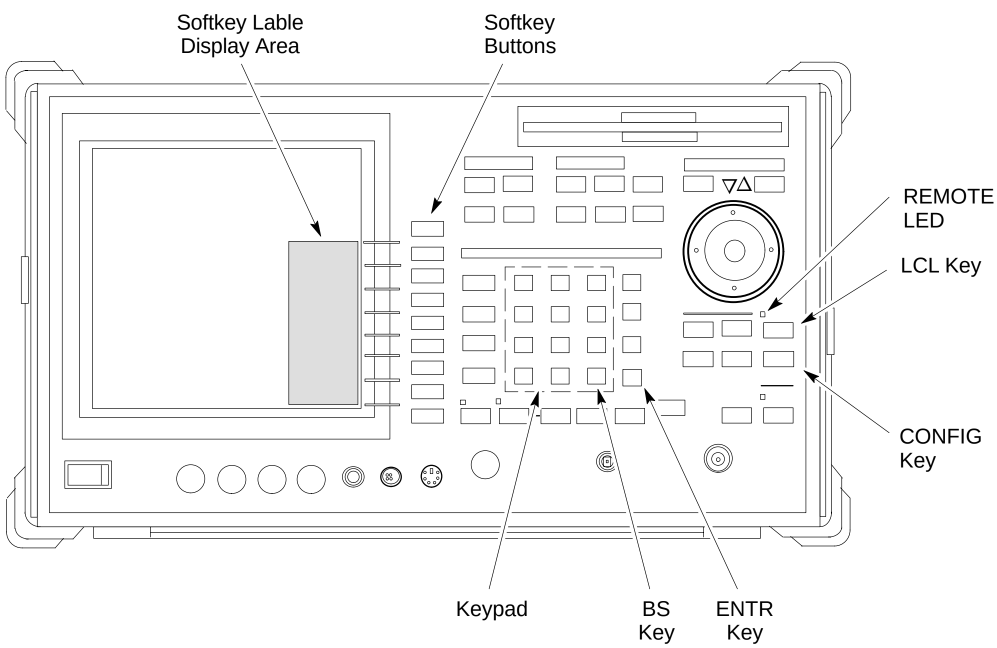
Advantest R3267 Spectrum Analyzer GPIB Address

Perform the procedure in Table I-7 and refer to Figure I-7 to verify and, if necessary, change the Advantest R3267 spectrum analyzer GPIB address.

Table I-7: Verify and Change Advantest R3267 GPIB Address

Step	Action
1	If the **REMOTE** LED is lighted, press the **LCL** key. - The LED turns off.
2	Press the **CONFIG** key. - The **CONFIG** softkey labels will appear in the softkey label display area of the instrument display. - The current GPIB address will be displayed below the **GPIB Address** softkey label.
3	If the current GPIB address is not set to **18**, perform the following to change it:
3a	- Press the **GPIB Address** softkey. -- A **GPIB Address** entry window will open in the instrument display showing the current GPIB address.
3b	- Enter **18** on the keypad in the **ENTRY** section of the instrument front panel. -- Characters typed on the keypad will replace the address displayed in the **GPIB Address** entry window. **NOTE** To correct an entry, press the **BS** (backspace) key at the lower right of the keypad to delete one character at a time.
3c	- Press the **ENTR** key to the lower right of the keypad to enter the address. -- The **GPIB Address** entry window closes. -- The new address is diplayed in the bottom portion of the **GPIB Address** softkey label.

Figure I-7: Setting Advantest R3267 GPIB Address



Advantest R3562 Signal Generator GPIB Address

Set the GP-IB ADDRESS switch on the rear of the Advantest R3562 signal generator to address **1** as shown in Figure I-8.

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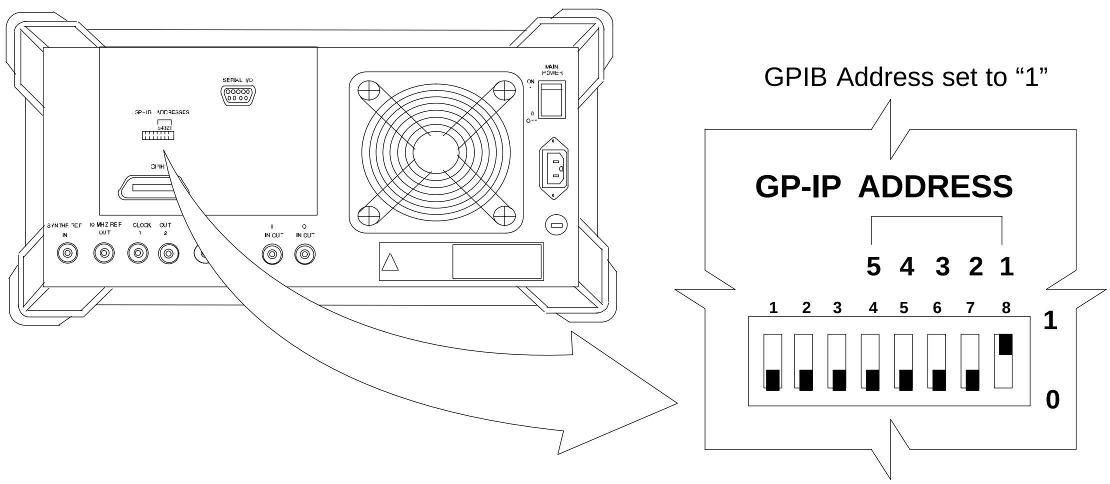
Figure I-8: Advantest R3562 GPIB Address Switch Setting



Agilent E4406A Transmitter Tester GPIB Address

Follow the procedure in Table I-8 and refer to Figure I-9 to verify and, if necessary, change the Agilent E4406A GPIB address.

Table I-8: Verify and Change Agilent E4406A GPIB Address

Step	Action
1	In the **SYSTEM** section of the instrument front panel, press the **System** key. - The softkey labels displayed on the right side of the instrument screen will change.
2	Press the **Config I/O** softkey button to the right of the instrument screen. - The softkey labels will change. - The current instrument GPIB address will be displayed below the **GPIB Address** softkey label.
3	If the current GPIB address is not set to **18**, perform the following to change it:
3a	- Press the GPIB Address softkey button. -- In the on-screen Active Function Area, **GPIB Address** will be displayed followed by the current GPIB address.
3b	- On the front panel Data Entry keypad, enter the communications system analyzer GPIB address of **18**. -- The **GPIB Address** label will change to **Enter**. -- Digits entered with the keypad will replace the current GPIB address in the display. **NOTE** To correct an entry, press the **Bk Sp** key at the upper right of the keypad to delete one character at a time.
3c	- Press the **Enter** softkey button or the keypad **Enter** key to set the new GPIB address. -- The **Config I/O** softkey labels will reappear. -- The new GPIB address will be displayed under the **GPIB Address** softkey label.

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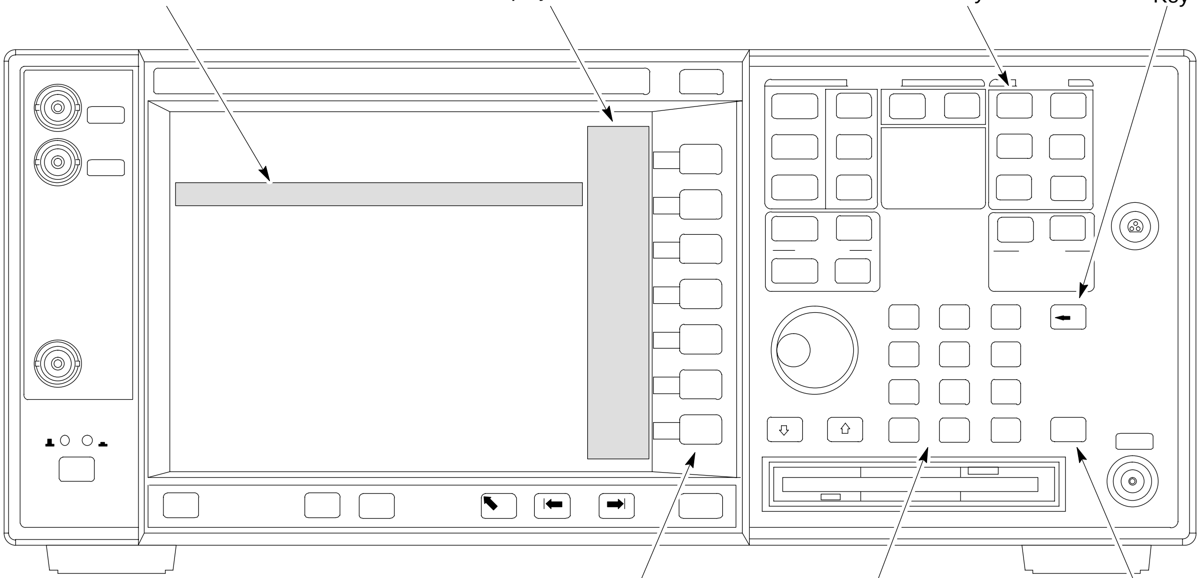
Figure I-9: Setting Agilent E4406A GPIB Address



Agilent E4432B Signal Generator GPIB Address

Follow the procedure in Table I-9 and refer to Figure I-10 to verify and, if necessary, change the Agilent E4432B GPIB address.

Table I-9: Verify and Change Agilent E4432B GPIB Address

Step	Action
1	In the **MENUS** section of the instrument front panel, press the **Utility** key. - The softkey labels displayed on the right side of the instrument screen will change.
2	Press the **GPIB/RS232** softkey button to the right of the instrument screen. - The softkey labels will change. - The current instrument GPIB address will be displayed below the **GPIB Address** softkey label.
3	If the current GPIB address is not set to **1**, perform the following to change it:
3a	- Press the **GPIB Address** softkey button. -- The **GPIB Address** label and current GPIB address will change to boldface. -- In the on-screen Active Entry Area, **Address:** will be displayed followed by the current GPIB address.

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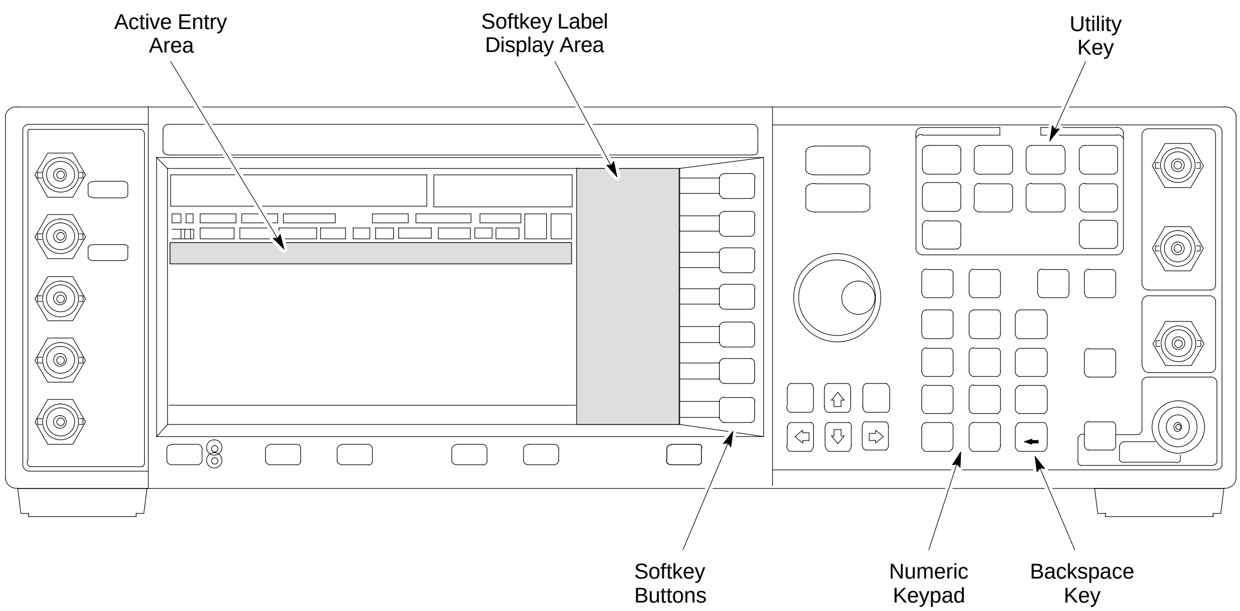
Table I-9: Verify and Change Agilent E4432B GPIB Address	
Step	**Action**
3b	- On the front panel Numeric keypad, enter the signal generator GPIB address of **1**. -- The **GPIB Address** label will change to **Enter**. -- Digits entered with the keypad will replace the current GPIB address in the Active Entry display. **NOTE** To correct an entry, press the backspace key at the lower right of the keypad to delete one character at a time.
3c	- Press the **Enter** softkey button to set the new GPIB address. -- The new GPIB address will be displayed under the **GPIB Address** softkey label.

Figure I-10: Setting Agilent E4432B GPIB Address



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Notes

Appendix J

Downloading ROM

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Downloading ROM Code

Exception Procedure - Downloading ROM Code

This procedure is not part of a normal optimization.

Perform this procedure only on an exception basis when no alternative exists to load a BTS device with the correct version of ROM code.

NOTE	One GLI must be INS_ACT (bright green) before ROM code can be downloaded to non-GLI devices.

CAUTION	The correct ROM and RAM codes for the software release used on the BSS must be loaded into BTS devices. To identify the correct device ROM and RAM code loads for the software release being used on the BSS, refer to the Version Matrix section of the SC™ CDMA Release Notes (supplied on the tape or CD-ROM containing the BSS software). All devices in a BTS must be loaded with the ROM and RAM code specified for the software release used on the BSS before any optimization or ATP procedures can be performed. If a replacement device is loaded with ROM code which is not compatible with the BSS software release being used, the device ROM code can be changed using the LMF before performing the BTS optimization and ATPs. *A device loaded with later release ROM code can not be converted back to a previous release ROM code in the field without Motorola assistance*

If it is necessary to download ROM code to a device from the LMF, the procedure in Table J-1 includes steps *for both ROM and RAM code download using LMF.*

Prerequisites

Prior to performing this procedure, ensure the correct ROM and RAM code files exist in the LMF computer's applicable *lmf home directory* **code** folder for each of the devices to be loaded.

CAUTION	The Release level of the ROM code to be downloaded must be the one specified for the software release installed in the BSS. The release level of the ROM code resident in the other devices in the BTS must also be correct for the BSS software release being used. ROM code must not be downloaded to a frame loaded with code for a BSS software release with which it is not compatible. *This procedure should only be used to upgrade replacement devices for a BTS.* It should NOT be used to upgrade all devices in a BTS. If a BTS is to be upgraded from R15.x to R16.0, the upgrade should be done by the OMC-R using the DownLoad Manager.

Table J-1: Download ROM and RAM Code to Devices

Step	Action
1	Click on the device to be loaded. **NOTE** More than one device of the *same* type can be selected for download by either clicking on each one to be downloaded or from the BTS menu bar **Select** pull-down menu, select the *device* item that applies. Where: *device* = the type of device to be loaded (BBX, CSM, MCC)
2	From the BTS menu bar **Device** pull-down menu, select **Status**. - A status report window will appear.
3	Make a note of the number in the **HW Bin Type** column. **NOTE** “HW Bin Type” is the Hardware Binary Type for the device. This code is used as the last four digits in the filename of a device’s binary ROM code file. Using this part of the filename, the ROM code file can be matched to the device in which it is to be loaded.
4	Click **OK** to close the status window.
5	Click on the device to be loaded.
6	*** IMPORTANT** The LMF will not automatically select ROM code files for download. ROM code files must be selected *manually.* From the BTS menu bar **Device** pull-down menus, select **Download > Code Manual**. - A file selection window will appear.
7	Double-click on the version folder with the desired version number for the ROM code file (for example *2.16.0.x*).
8	Double-click the **Code** folder. - A list of ROM and RAM code files will be displayed.
9	**! CAUTION** A ROM code file with the correct HW Bin Type must be chosen. Using a file with the wrong HW Bin Type can result in unpredictable operation and damage to the device. Click on the ROM code file with the filename which matches the device type and HW Bin Type number noted in step 3 (for example, file **bbx_rom.bin.0604** is the ROM code file for a BBX with a HW Bin Type of 0604). - The file should be highlighted.
10	Click on the **Load** button. - A status report window is displayed showing the result of the download. **NOTE** If the ROM load failed for some devices, load them *individually* by clicking on one device, perform steps 6 through 10 for it, and repeat the process for each remaining device.
11	Click **OK** to close the status window.
12	From the LMF window menu bar **Tools** pull-down menus, select **Update NextLoad > CDMA**.
13	In the left-hand pane of the window which opens, click on the BTS number for the frame being loaded (for example, *BTS-14*).

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Table J-1: Download ROM and RAM Code to Devices

Step	Action
14	On the list of versions displayed in the right-hand pane, click the button next to the version number of the folder that was used for the ROM code download (for example, *2.16.0.x*) and click **Save**. - A pop-up message will appear showing the CDF has been updated.
15	Click on the **OK** button to dismiss the pop-up message.
16	Click on the device that was loaded with ROM code.
17	**NOTE** RAM code is automatically selected for download. From the BTS menu bar **Device** pull-down menus, select **Download > Code/Data** to download RAM code and dds file data. - A status report is displayed showing the result of the download.
18	Click **OK** to close the status window.
19	Observe the downloaded non-GLI device to ensure it is OOS_RAM (yellow).
20	Click on the device which was loaded with code.
21	From the BTS menu bar **Device** pull-down menu, select **Status**. Verify that the correct ROM and RAM version numbers are displayed in the status report window.
22	Click **OK** to close the status window.

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Appendix K

Companion Frame Optimization

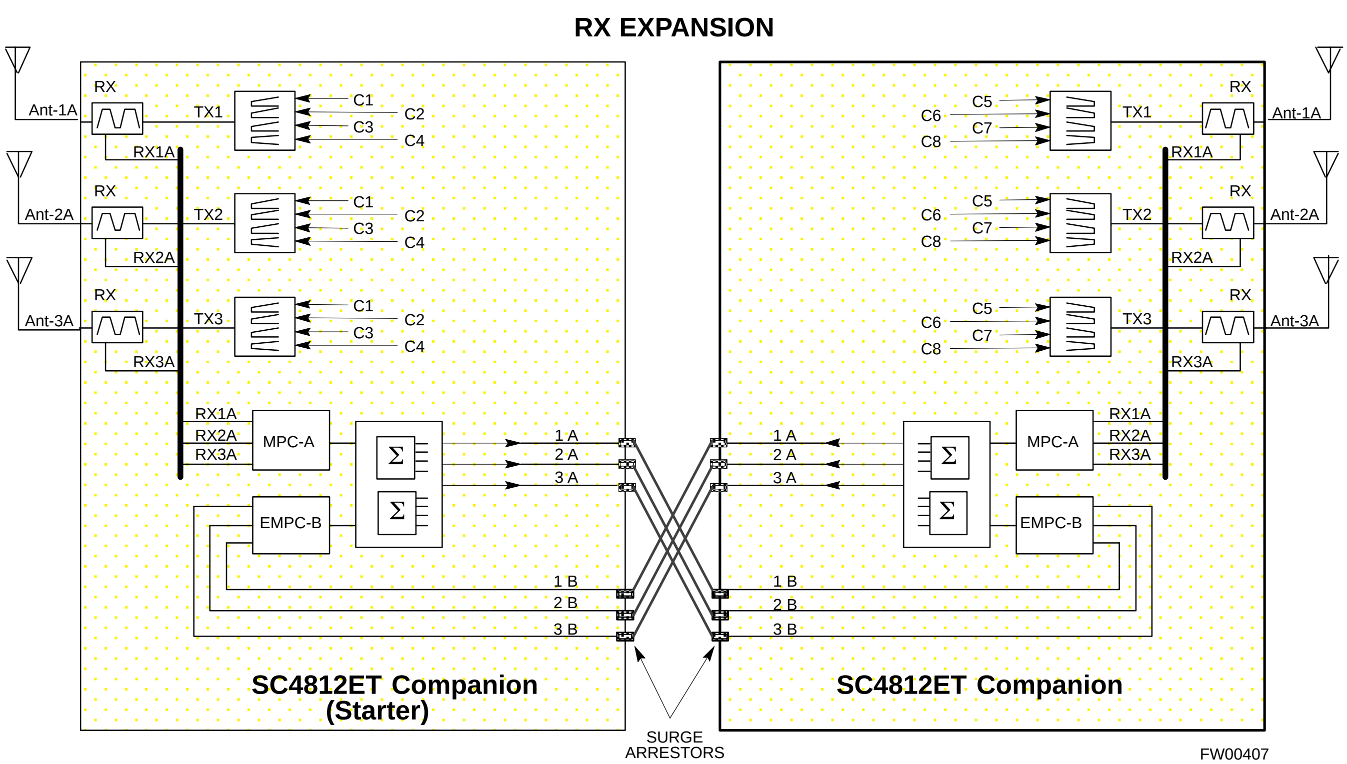
Optimizing the Companion Frame

Optimizing the TX section

The optimization/ATP procedure for the transmit side of the Companion Frame is identical to that of the SC4812ET BTS.

Table K-1: Optimizing the TX section of the Companion Frame		
✓	Step	Action
	1	Please refer to the TX Optimization/ATP - Chapter 3 of this manual for step-by-step TX Optimization/ATP instructions for the standalone frame
	2	Run the TX tests.

Figure K-1: Cabling of SC 4812ET Companion BTS to SC 4812ET Companion BTS (3 Sector)



Optimizing the RX section

RX (Main) Optimization/ATP

To test the RX Main antenna system follow the instructions in Table K-2 and refer to illustration Figure K-1(3-sector configuration).

Table K-2: Optimizing the RX (Main) section of the Companion Frame

✓	Step	Action
	1	Connect the RX test cables to the antenna ports 1A-3A (for 3-sector optimization) or antenna ports 1A-6A (for 6-sector optimization).
	2	Login the LMF and select MPC (see Figure K-2 for display screen and field location).
	3	Run the RX tests.

RX (Diversity) Optimization/ATP (Single Frame)

To test the RX Diversity antenna system follow the instructions in Table K-3.

Table K-3: Optimizing the RX (Diversity) on a Single Frame

✓	Step	Action
	1	Connect the RX test cables to the expansion ports on the I/O plates labeled 1B-3B (for 3-sector optimization) or expansion ports 1B-6B (for 6-sector optimization).
	2	Login the LMF under EMPC (see Figure K-2 for display screen and field location).
	3	Run the RX tests.

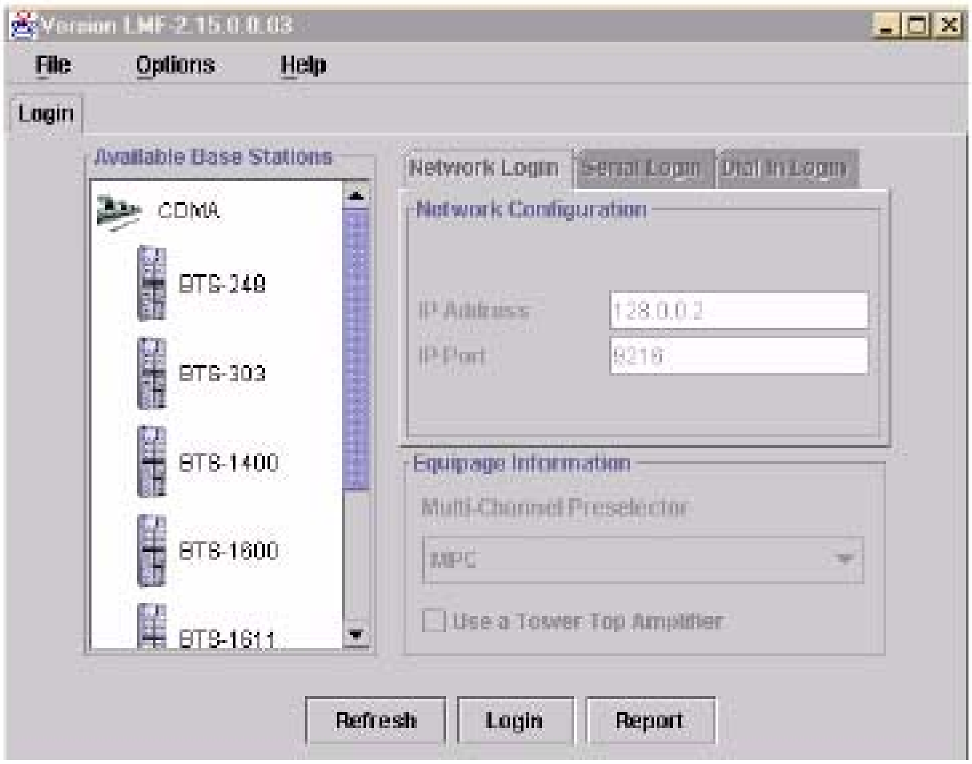
RX (Diversity) Optimization/ATP (Two Frame)

To test the RX Diversity antenna configuration on a two frame Companion BTS system follow the instructions in Table K-4.

Table K-4: Optimizing the RX (Diversity) on a Two Frame Companion Site

✓	Step	Action
	1	Connect RX expansion cables from the expansion ports on the other Companion frame labeled 1A-3A (for 3-sector optimization) or expansion ports 1A-6A (for 6-sector optimization) to the 1B-3B (for 3-sector optimization) or expansion ports 1B-6B (for 6-sector optimization) see Figure K-1 for an illustration of the configuration. **NOTE** Connect the cables from the 2nd frame A ports to the B ports of the 1st frame.
	2	Login using the LMF select MPC (see Figure K-2 for field location on LMF display screen) **NOTE** - Although the test will be done to one frame, the RX cable will be connected to the other frame's corresponding antenna ports. - The other frame has to be powered up and include all the RX Path Components.

Figure K-2: WinLMF Display Screen



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