MOTOROLA

■ **Preliminary**
□ Field Trial
□ Controlled Introduction
□ Volume Deployment
□ DV&V Approval

TIPS Document Manual Review Form

PCDMR No. & Title: ***68P09255A69-3 SC4812ET Lite BTS Opt/ATP manual***

Review Period From: ***08/23/02*** ***To:*** ***09/06/02***

Review by (Engineer/DV&V Evaluator): _____

Deliver Reviewed Manual to: ***Bill Covert*** ***Phone:*** ***817-245-7204***

Located at TX14-Mail slot 5G

The accompanying document(s) must be reviewed and approved prior to publishing. Carefully review/validate the document(s) and make any necessary technical corrections or comments. Mark the attached documents, but please use RED to mark any additions and YELLOW to mark items for deletion.

Indicate your APPROVAL/DISAPPROVAL, along with any comments in the space provided below. Return this form along with the reviewed material to the person indicated above.

If multiple reviewers are involved, the review coordinator should photocopy and distribute to all reviewers, then consolidate any comments/corrections onto a single copy before returning the material for correction. Please list the name of all reviewers.

Comments: ❑ APPROVED ❑ NOT APPROVED

_____

_____

_____

_____

_____

_____

Reviewer's Signature: _____ ***Date:*** _____

Any delay in the review process could cause production delays and result in late delivery of manuals.

This sheet must be returned with the reviewed material.

Technical Information Products & Services 5555 North Beach, TX-14, 5G, Fort Worth, TX 76137
Fax: 817-245-7566

MOTOROLA

■ **Preliminary**
□ Field Trial
□ Controlled Introduction
□ Volume Deployment
□ DV&V Approval

Notes:

1X SC™ 4812ET Lite BTS Optimization/ATP

Software Release 2.16.1.x

800 and 1900 MHz

CDMAS

PRELIMINARY

English
Aug 2002
68P09255A69- 3

Notice

While reasonable efforts have been made to assure the accuracy of this document, Motorola, Inc. assumes no liability resulting from any inaccuracies or omissions in this document, or from use of the information obtained herein. The information in this document has been carefully checked and is believed to be entirely reliable. However, no responsibility is assumed for inaccuracies or omissions. Motorola, Inc. reserves the right to make changes to any products described herein and reserves the right to revise this document and to make changes from time to time in content hereof with no obligation to notify any person of revisions or changes. Motorola, Inc. does not assume any liability arising out of the application or use of any product, software, or circuit described herein; neither does it convey license under its patent rights or the rights of others.

It is possible that this publication may contain references to, or information about Motorola products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that Motorola intends to announce such Motorola products, programming, or services in your country.

Copyrights

This instruction manual, and the Motorola products described in this instruction manual may be, include or describe copyrighted Motorola material, such as computer programs stored in semiconductor memories or other media. Laws in the United States and other countries preserve for Motorola certain exclusive rights for copyrighted material, including the exclusive right to copy, reproduce in any form, distribute and make derivative works of the copyrighted material. Accordingly, any copyrighted Motorola material contained herein or in the Motorola products described in this instruction manual may not be copied, reproduced, distributed, merged or modified in any manner without the express written permission of Motorola. Furthermore, the purchase of Motorola products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applications of Motorola, as arises by operation of law in the sale of a product.

Usage and Disclosure Restrictions

License Agreement

The software described in this document is the property of Motorola, Inc. It is furnished by express license agreement only and may be used only in accordance with the terms of such an agreement.

Copyrighted Materials

Software and documentation are copyrighted materials. Making unauthorized copies is prohibited by law. No part of the software or documentation may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, without prior written permission of Motorola, Inc.

High Risk Activities

Components, units, or third-party products used in the product described herein are NOT fault-tolerant and are NOT designed, manufactured, or intended for use as on-line control equipment in the following hazardous environments requiring fail-safe controls: the operation of Nuclear Facilities, Aircraft Navigation or Aircraft Communication Systems, Air Traffic Control, Life Support, or Weapons Systems (“High Risk Activities”). Motorola and its supplier(s) specifically disclaim any expressed or implied warranty of fitness for such High Risk Activities.

Trademarks

and Motorola are registered trademarks of Motorola, Inc.

Product and service names profiled herein are trademarks of Motorola, Inc. Other manufacturers’ products or services profiled herein may be referred to by trademarks of their respective companies.

Copyright

Printed on
Recyclable Paper

REV012501

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

MOTOROLA

1X SC™ 4812ET Lite BTS Optimization/ATP

Table of Contents

Contents

List of Figures

List of Tables

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. It is assumed that the user of this information has a general understanding of telephony, as used in the operation of the Public Switched Telephone Network (PSTN), and is familiar with these concepts as they are applied in the cellular mobile/portable radiotelephone environment. The user, however, is not expected to have any detailed technical knowledge of the internal operation of the equipment.

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.

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.

Changes to manual

Changes that occur after the printing date are incorporated into your manual by Cellular Manual Revisions (CMRs). The information in this manual is updated, as required, by a CMR when new options and procedures become available for general use or when engineering changes occur. The cover sheet(s) that accompany each CMR should be retained for future reference. Refer to the Revision History page for a list of all applicable CMRs contained in this manual.

Receiving updates

Technical Information Products and Services (TIPS) maintains a customer database that reflects the type and number of manuals ordered or shipped since the original delivery of your *Motorola* equipment. Also identified in this database is a "key" individual (such as Documentation Coordinator or Facility Librarian) designated to receive manual updates from TIPS as they are released.

To ensure that your facility receives updates to your manuals, it is important that the information in our database is correct and up-to-date. Therefore, if you have corrections or wish to make changes to the information in our database (i.e., to assign a new *"key" individual*), please contact Technical Information Products and Services.

MOTOROLA, INC.
Technical Information Products and Services

Phone:
Within U.S.A. and Canada 800-872-8225
Outside of U.S.A. and Canada . . +1-847-435-5700
FAX: . . . . . +1-847-435-5541

Reporting manual errors

In the event that you locate an error or identify a deficiency in your manual, please take time to write to us at the address above. Be sure to include your name and address, the complete manual title and part number (located on the manual spine, cover, or title page), the page number (found at the bottom of each page) where the error is located, and any comments you may have regarding what you have found. We appreciate any comments from the users of our manuals.

24-hour support service

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

Arlington Heights, IL	800-433-5202
Arlington Heights, International . .	+1-847-632-5390
Cork, Ireland	44-1793-565444
Swindon, England	44-1793-565444

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 in the format < US: IHEXDNANGLI3-1X>. 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) *	US: IHEXDNANGLI3-1X
Cisco Model 1900-27	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.

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.

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.

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

68P09255A69-3

Manual Title

1X SC™ 4812ET Lite BTS Optimization/ATP Software Release 2.16.1.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	Jun 2002	Initial draft to support R2.16.1.x CDMA2000 1X and packet operation BTS optimization and acceptance testing. Initial draft will cover circuit operation only.
2	Jul 2002	Preliminary
3	Aug 2002	Preliminary, incorporate engineering markups.

Patent Notification

Patent numbers

This product is manufactured and/or operated under one or more of the following patents and other patents pending:

4128740	4661790	4860281	5036515	5119508	5204876	5247544	5301353
4193036	4667172	4866710	5036531	5121414	5204977	5251233	5301365
4237534	4672657	4870686	5038399	5123014	5207491	5255292	5303240
4268722	4694484	4872204	5040127	5127040	5210771	5257398	5303289
4282493	4696027	4873683	5041699	5127100	5212815	5259021	5303407
4301531	4704734	4876740	5047762	5128959	5212826	5261119	5305468
4302845	4709344	4881082	5048116	5130663	5214675	5263047	5307022
4312074	4710724	4885553	5055800	5133010	5214774	5263052	5307512
4350958	4726050	4887050	5055802	5140286	5216692	5263055	5309443
4354248	4729531	4887265	5058136	5142551	5218630	5265122	5309503
4367443	4737978	4893327	5060227	5142696	5220936	5268933	5311143
4369516	4742514	4896361	5060265	5144644	5222078	5271042	5311176
4369520	4751725	4910470	5065408	5146609	5222123	5274844	5311571
4369522	4754450	4914696	5067139	5146610	5222141	5274845	5313489
4375622	4764737	4918732	5068625	5152007	5222251	5276685	5319712
4485486	4764849	4941203	5070310	5155448	5224121	5276707	5321705
4491972	4775998	4945570	5073909	5157693	5224122	5276906	5321737
4517561	4775999	4956854	5073971	5159283	5226058	5276907	5323391
4519096	4797947	4970475	5075651	5159593	5228029	5276911	5325394
4549311	4799253	4972355	5077532	5159608	5230007	5276913	5327575
4550426	4802236	4972432	5077741	5170392	5233633	5276915	5329547
4564821	4803726	4979207	5077757	5170485	5235612	5278871	5329635
4573017	4811377	4984219	5081641	5170492	5235614	5280630	5339337
4581602	4811380	4984290	5083304	5182749	5239294	5285447	D337328
4590473	4811404	4992753	5090051	5184349	5239675	5287544	D342249
4591851	4817157	4998289	5093632	5185739	5241545	5287556	D342250
4616314	4827507	5020076	5095500	5187809	5241548	5289505	D347004
4636791	4829543	5021801	5105435	5187811	5241650	5291475	D349689
4644351	4833701	5022054	5111454	5193102	5241688	5295136	RE31814
4646038	4837800	5023900	5111478	5195108	5243653	5297161	
4649543	4843633	5028885	5113400	5200655	5245611	5299228	
4654655	4847869	5030793	5117441	5203010	5245629	5301056	
4654867	4852090	5031193	5119040	5204874	5245634	5301188	

MOTOROLA

Chapter 1

Introduction

1

Optimization Manual Scope and Layout

Manual Scope and Layout

This document provides information pertaining to the optimization and audit tests of the Motorola SC4812ET Lite Radio Frequency (RF) Base Transceiver Station (BTS) equipment frame and its associated internal and external interfaces in stand-alone and companion frame installations. The following subjects are addressed: preliminary background information; optimization and alarm/redundancy tests; Acceptance Test Procedures (ATP) to verify site operation and regulation compliance; site turnover; troubleshooting.

Most applications use the same test procedure for all equipment variations. However, decision break points are provided throughout the procedure when equipment-specific tests are required. For example, when tests using external test equipment are performed instead of those using the RFDS, additional test procedures and illustrations are provided to cover both applications.

This optimization procedure consists of a group of task-oriented tests. Each major test category (Audit, Initial power-up, Calibration, etc.) is described in chapters which are broken down into multi-page information “maps.”

Each “map” contains the information necessary to perform the test or operation. Included are all required input levels, output levels, Local Maintenance Facility (LMF) application software commands, and test point identification. Also described are important test process concepts and equipment operation which should be understood by the operator. Whenever possible, graphics, flowcharts, or written examples complement the information or procedural steps.

Assumptions and Prerequisites

This document assumes that the BTS frames and cabling have been installed per the *Frame Mounting Guide Analog/CDMA/TDMA; 68P09226A18*, which covers the physical “bolt down” of all SC series equipment frames, and the *SC4812ET Lite Installation; 68P09253A36*, which covers BTS-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 Cellular Field Engineer (CFE) before performing optimization or tests.
- Preliminary Operations, consisting of jumper configuration of BTS sub-assemblies, pre-power-up tests, initial application of power to the BTS equipment frames, and initial power-up tests.
- Optimization/Calibration, consisting of procedures for downloading all BTS processor boards, test equipment set-up, RF path verification, BLO calibration and calibration audit, and Radio Frequency Diagnostic System (RFDS) calibration.
- Acceptance Test Procedures (ATP), consisting of automated ATP tests, executed by the LMF, and used to verify all major transmit (TX) and receive (RX) performance characteristics on all BTS equipment. This chapter also covers generating an ATP report.
- Prepare to Leave the Site, discussing site turnover after ATP is completed.
- Basic Troubleshooting, consisting of procedures to perform when an ATP fails, as well as when incorrect results are obtained during logon, test equipment operation, calibration, and Global Positioning System (GPS) operation.
- Appendices that contain a module replacement test matrix; test equipment set-up information; ROM code download procedures; in-service calibration procedures; pertinent PN offset, frequency programming, and output power data tables; and additional data sheets that are filled out manually by the CFE at the site.

1

Purpose of the Optimization

Why Optimize?

Proper optimization and calibration ensures that:

- 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. 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 and cause improper site operation.

What Happens During Optimization?

Overview - During optimization, the accumulated path loss or gain is first determined for each RF transmit path in the BTS. These transmit path loss or gain values are then stored in a database along with RF receive path default values.

RF path definitions - For definitions of the BTS transmit (TX) and receive (RX) paths, see “What is Bay Level Offset Calibration?” in the Bay Level Offset Calibration section of Chapter 3.

RF paths and transceiver optimization - Six of the seven Broad Band Transceiver (BBX) boards in each SCCP shelf are optimized to specific RX and TX antenna connectors. The seventh BBX board acts in a redundant capacity for BBX boards 1 through 6, and is optimized to *all* antenna connectors. A single optimization value is generated for each complete path. This eliminates the accumulation of error that would occur from individually measuring and summing the gain and loss of each element in the path.

Using RF path gain/loss values - BTS equipment factors in the derived optimization values internally to adjust transceiver power levels, leaving only site-specific antenna feedline loss and antenna gain characteristics to be factored in by the CFE when determining required site Effective Radiated Power (ERP) output power levels.

When to Optimize

New Installations

The following operations and optimization/test actions should be accomplished for a new BTS or frame installation:

1. After the initial site installation, the BTS must be prepared for operation. This preparation includes verifying hardware installation, initial power-up, downloading of operating code, verifying GPS operation, and verifying transmit and receive paths.
2. Next, the optimization is performed. Optimization includes performance verification and calibration of all transmit and receive RF paths, and download of accumulated calibration data.
3. A calibration audit of all RF transmit paths may be performed any time after optimization to verify BTS calibration.
4. After optimization, a series of manual *pre-* Acceptance Test Procedure (ATP) verification tests are performed to verify alarm/redundancy performance.
5. After manual pre-ATP verification tests, an ATP is performed to verify BTS performance. An ATP is also required to demonstrate regulation compliance before the site can be placed in service.

Site Expansion

Optimization is required after expansion of a site with additional BTS frames.

Periodic Optimization

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

Repaired Sites

NOTE	Refer to Appendix ***B*** for a detailed FRU Optimization/ATP Test Matrix outlining the minimum tests that must be performed *any time* a BTS RF subassembly or cable associated with an RF path is replaced.

1

Required Test Equipment and Software

Policy

To ensure consistent, reliable, and repeatable optimization test results, test equipment and software meeting the following technical criteria should be used to optimize the BTS equipment. Test equipment can, of course, be substituted with other test equipment models *if the equipment meets the same technical specifications*.

It is the responsibility of the customer to account 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 and calibration prior to BTS optimization. Follow the original equipment manufacturer (OEM) recommended maintenance and calibration schedules closely.

Test Cable Calibration

Test cables can make critical differences in optimization accuracy. It is recommended that cable calibration be run at every BTS with the complete *test equipment set*. 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 to account for cable loss is by entering it into the LMF during the optimization procedure. This method requires accurate test cable characterization using shop test equipment. Characterized cables should be tagged with the characterization information, and the measured losses entered into the LMF before field optimization.

Equipment Warm-up

After arriving at a site, test equipment should be plugged in and turned on immediately to provide the longest possible time for warm up and stabilization. The following pieces of test equipment must be warmed up for *a minimum of 60 minutes* prior to use for BTS optimization or RFDS calibration:

- Communications test set.
- Rubidium time base.
- Power meter.

Required Test Equipment and Software

The following test equipment and software is required for the optimization procedure. Common assorted tools such as screwdrivers and frame keys are also needed. Read the owner's manual for all of the test equipment to understand its individual operation before using the tool in the optimization.

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

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
- SVGA 12.1-inch active matrix color display with 1024 x 768 (recommended) or 800 x 600 pixel resolution and capability to display more than 265 colors
- Memory requirements:
  - Minimum required RAM: 96 MB
  - Recommended RAM:
    -- 128 MB for Windows 98 SE
    -- 256 MB for Windows 2000
- 20X CD-ROM drive
- 3 1/2 inch floppy drive
- 56kbps V.90 modem
- Serial port (COM 1)
- Parallel port (LPT 1)
- PCMCIA Ethernet interface card (for example, 3COM Etherlink III) with a 10BaseT-to-coax adapter
- MS® Windows 98® Second Edition (SE) or *Windows* 2000 operating system

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

LMF Software

The Local Maintenance Facility (LMF) application program is a graphical user interface (GUI)-based software tool. This product is specifically designed to provide cellular communications field personnel with the capability to support the following CDMA Base Transceiver Station (BTS) operations:

- Installation
- Maintenance
- Calibration
- Optimization

Ethernet LAN Transceiver *(part of CGDSLMFCOMPAQNOV96)*

- PCMCIA Ethernet Adpater + Ethernet UTP Adapter
  3COM Model - Etherlink III 3C589B

used with

- Transition Engineering Model E-CX-TBT-03 10BaseT/10Base2 Converter (or equivalent)

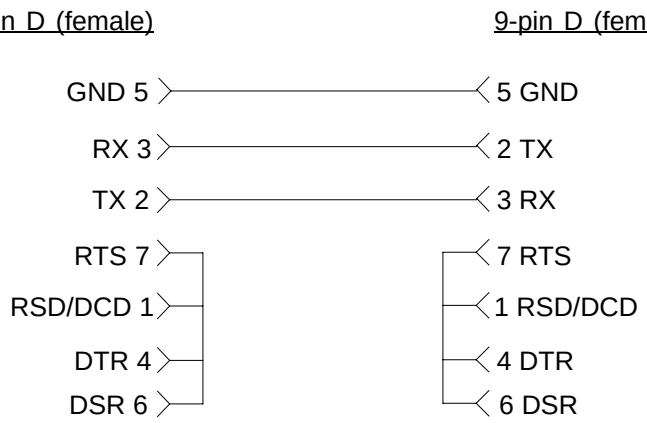
NOTE	Xircom Model PE3-10B2 or its equivalent can also be used to interface the LMF Ethernet connection to the RFM frame.

Ethernet LAN External In/Out Port Adapter

Trompeter Electronics, Inc., ADBJ20-E1-PL75 or equivalent BNC (F) to TRB (M) adapter is required if it is necessary to connect the LMF computer to the LAN external interface triaxial connectors located in the power entry compartment.

RS-232 to GPIB interface

- National Instruments GPIB-232-CT with Motorola CGDSEDN04X RS232 serial cable or equivalent; used to interface the LMF to the test equipment.
- *A standard RS-232 cable can be used with the following modifications:*
  - Pin 8 (CTS) does not have to be jumpered/shorted to the others as it is a driver output. The DTR is already a driver output signal. The other pins are to receivers. Short pins 7, 1, 4, 6 on each cable end:



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 be used for 25-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 computer serial port connection to the Group Line Interface (GLI), Clock Synchronization Manager (CSM), External Trunked Interface Board (ETIB), and module debug serial ports.

Communications system analyzer CDMA/analog

IS-95A/B-only test capability - The following communications system analyzers which provide *only* IS-95A/B test capability are supported by the LMF:

- Motorola CyberTest
- Advantest R3465 spectrum analyzer with R3561L signal generator
- Hewlett Packard Model HP 8921A/600 Analyzer including 83203B CDMA Interface, manual control system card, and, for 1900 MHz BTSs, 83236A/B PCS Interface

CDMA2000 1X and IS-95A/B test capability - The following communications system analyzers which provide *both* CDMA2000 1X *and* IS-95A/B test capability are supported by the LMF:

- Agilent 8935 series E6380A communications test set (formerly HP 8935) with option 200 or R2K for CDMA2000 1X support
- Agilent E4406A
- Advantest R3267 spectrum analyzer

A combination of test equipment supported by the LMF may also be used during optimization and testing of the RF communications portion of BTS equipment when the communications system analyzer does not perform all of the following functions:

- Frequency counter
- Deviation meter
- RF power meter (average and code domain)

- RF signal generator (capable of DSAT/CDMA modulation)
- Audio signal generator
- AC voltmeter (with 600-ohm balanced audio input and high impedance input mode)
- Noise measurement meter
- C-Message filter
- Spectrum analyzer
- CDMA code domain analyzer

GPIB cables

Hewlett Packard 10833A or equivalent; one or two meters long, used to interconnect test equipment and LMF computer.

CDMA2000 1X signal generators

- Agilent E4432B signal generator (required for use with Agilent E4406A when performing Frame Erasure Rate acceptance testing)

  or

- Advantest R3562 signal generator (required for use with Advantest R3267 when performing Frame Erasure Rate acceptance testing)

Power meter

- Hewlett Packard Model HP437B with HP8481A power sensor capable of measuring from -30 dBm to 20 dBm

  or

- Gigatronics 8542B power meter

Timing reference cables

- *Two* Huber & Suhner 16MCX/11BNC/K02252D or equivalent; right angle MCX-male to standard BNC-male RG316 cables; 10 ft. long are required to interconnect the communications system analyzer to SGLN4132A and SGLN1145A CSM board timing references

or

- *Two* BNC-male to BNC-male RG316 cables; 3 meters (10 feet) long, used to interconnect the communications system analyzer to SGLN4132B and SGLN1145B (and later) CSM front panel timing references in the RF Modem Frame

Digital multimeter

Fluke Model 8062A with Y8134 test lead kit or equivalent; used for precision DC and AC measurements to four decimal places.

Directional coupler

Narda Model 3020A 20 dB coupler terminated with two Narda Model 375BN-M loads, or equivalent.

RF attenuators

- 20 dB Fixed attenuator, 20 Watt (Narda 768-20), used in conjunction with calibration of test cables or during general troubleshooting procedures.

- 10 dB Fixed attenuator, 20 Watt (Narda 768-10), for cable calibration with a Cybertest CDMA analyzer.

Clamp-on DC current probe

Amprobe CT600, or equivalent, 600 A capability with jaw size which accommodates 2/0 cable. Used with the DMM for back-up battery charging testing.

Miscellaneous RF adapters, loads, etc.

As required to interface test cables and BTS equipment and for various test setups. Should include at least (2) 50 Ohm loads (type N) for calibration and (1) RF short.

RF load

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

High-impedance conductive wrist strap

Motorola Model 42-80385A59; used to prevent damage from ESD when handling or working with modules.

Driver bit for tamper-resistant fasteners

Star fastener tamper-resistant insert bit set, Grainger 5F530 or equivalent, to remove tamper-resistant fasteners securing the frame rear access cover.

Optional Equipment

This section provides a list of additional equipment that might be required during maintenance and troubleshooting operations.

NOTE	Not all optional equipment specified in this section will be supported by the LMF in automated tests.

Duplexer

Filtronics Low IM Duplexer (Cm035-f2) or equivalent; used during Spectral Purity Receive band noise tests.

Frequency counter

Stanford Research Systems SR620 or equivalent; used 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 *manual* tests other than standard Receive band spectral purity tests performed by the LMF.

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 the 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; used for waveform viewing, timing, and measurements, or during general troubleshooting procedures.

2-way splitter

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

CDMA subscriber mobile or portable radiotelephone

Safco Model 2136-150 with power supply and antenna; used to provide test transmission and reception during BTS maintenance and troubleshooting. *Do not substitute other models that do not feature special test modes*. Two radios will be required for system and drive-around testing *after* optimization and BTS ATP are completed.

RF circulator

Circulator (FERROCOM 5809866C01) or equivalent; can substitute for a duplexer during Receive sensitivity Frame Erasure Rate (FER) testing in conjunction with Safco CDMA mobile.

High stability 10 MHz rubidium standard

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

Required Documents and Related Publications

Required 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 plan
  - RF power levels
  - Frequency plan (includes Site PN and operating frequencies)
  - Channel allocation (paging, traffic, etc.)
  - Board placement
  - Site wiring list
  - *Site-specific CDF file*
- Demarcation Document (Scope of Work Agreement)
- Equipment manuals for non-Motorola test equipment

Related Publications

Additional, detailed information about the installation, operation, and maintenance of the SC4812ET Lite BTS and its components is included in the following publications:

- *CDMA RFDS User's Guide; 68P64114A51*
- *LMF Help function on-line documentation*
- *LMF CLI Reference; 68P09253A56*
- *CDMA RFDS Hardware Installation; 68P64113A93*
- *SC4812ET Lite Installation; 68P09253A36*
- *SC4812ET Lite Field Replaceable Units; 68P09253A49*
- *SC4812T/ET/ET Lite Troubleshooting; 68P09253A65*
- *Frame Mounting Guide Analog/CDMA/TDMA; 68P09226A18*
- *Cellular Glossary of Terms and Acronyms; 68P09213A95*
- M-PATH™ T1 Channel Service Unit User's Guide, Kentrox® part number 65-77538101
- *M-PATH* T1 Channel Service Unit Installation Guide, *Kentrox* part number 65-77538001
- *M-PATH* E1 Channel Service Unit User's Guide, *Kentrox* part number 1174139
- *M-PATH* E1 Channel Service Unit Installation Guide, *Kentrox* part number 1174662
- 2-Slot Universal Shelf Installation Guide, *Kentrox* part number 65-78070001

1

Terms and Abbreviations

Standard and Non-standard Terms and Abbreviations

Standard terms and abbreviations used in this manual are defined in *Cellular Glossary of Terms and Acronyms; 68P09213A95*. Any non-standard terms or abbreviations included in this manual are listed in Table 1-1.

Table 1-1: Non-Standard Terms and Abbreviations

Term or Abbreviation	Definition
1X	One of two bandwidths currently defined in the IS-2000 CDMA specification, which extends the capability of the IS-95A and B specifications. 1X bandwidth provides wireless packet voice and data transmission capability at up to 144 Mbps.
ACLC	AC Load Center. An SC4812ET Lite RF Base Transceiver Station (BTS) subassembly which provides the frame interface for external AC power connection and internal AC circuit control and protection.
BBXR	The redundant BBX for a CCP shelf or cage. In the SC4812ET Lite BTS SCCP cage, the BBX installed in *slot* BBX-R1 (Figure 1-6).
BBX-1X	Broad Band Transceiver, 1X. Third generation BBX card with CDMA2000 1X packet as well as IS-95A/B capability.
BBX2	Broad Band Transceiver, second generation, card
CCD	Clock Combining and Distribution. SC4812-series BTS CDMA Channel Processor (CCP) shelf module which accepts timing signals from the active source and distributes them to other CCP shelf modules.
CIO	Combiner Input/Output
companion frame	A BTS frame configured to operate at the same site with another companion frame. Companion frames may share antenna signals, but are not inter-connected on the same LAN. Companion frames are managed as *separate* BTSs in the Base Station System (BSS).
DLM	DownLoad Manager. Software application resident on the GLI card which permits download of software upgrades from the Centralized Base Station Controller (CBSC) to BTSs without the need for a site visit.
DMAC	Digital Metering, Alarm, Control. Part of the Meter Alarm Panel (MAP) which provides control of and status information for the AC power rectifiers as well as back-up battery monitoring and test capability. Term is used interchangeably with MAP (see below).
DPLL	Digital Phase-Locked Loop
DRDC	Duplexer, Receive Filter, Dual Directional Coupler. Provides duplexing of BTS transmit and receive signals to a single antenna and antenna signal sampling in either the forward (transmit) or reflected (receive) direction for use by an RF Diagnostic Subsystem (RFDS).
EMPC	Expansion Multi-coupler Preselector Card. BTS expansion frame MPC module which is used to receive, amplify, and distribute RX signals from the starter frame MPC.

. . . continued on next page

Table 1-1: Non-Standard Terms and Abbreviations

Term or Abbreviation	Definition
ETIB	External Trunked Interface Board. Module providing status indicators and MMI interface connections for Linear Power Amplifiers (LPA) in SC4812ET and SC4812ET Lite BTS frames.
GLI2	Group Line Interface card, second generation
HSO	High Stability Oscillator. Module providing backup timing source for a BTS when the timing signal from the GPS or Remote GPS module is unavailable.
HSO2	HSO card, second generation
HSOX	HSO Expansion. Module used in a BTS expansion frame to interface with the starter frame HSO or LFR and distribute the timing signals to the expansion frame CSM modules.
ISC	In-Service Calibration. Technique for performing calibration sector by sector on a BTS to avoid completely removing the site from service.
LPAC	Linear Power Amplifier Controller
LFR2	Low Frequency Receiver, second generation. Low-cost LFR card with capability to distribute synchronization signals to multiple RF modem frames.
MAP	Meter Alarm Panel. SC4812ET Lite Field Replaceable Unit (FRU) which contains the functions of both the Temperature Compensation Panel (TCP) and the DMAC. Term is used interchangeably with DMAC.
MCC8E	Multichannel CDMA Card supporting 8 IS-95A/B channels.
MCC24E	Multichannel CDMA Card supporting 24 IS-95A/B channels.
MCC-1X	Multichannel CDMA Card supporting 16 or 48 CDMA2000 1X or (with Software Release 2.16.0.84.3 and higher) IS-95A/B channels.
MPC	Multi-coupler Preselector Card. BTS CCP shelf module used to amplify and distribute RX signals to BBX modules.
OLF	Object List File. File containing a list of the ROM and RAM code versions which should be operating on every device installed in a BTS. The file is resident on the Central Base Station Controller (CBSC) Mobility Manager (MM) and is passed to the GLI after a DLM job is invoked. The GLI uses the OLF to determine which devices require code download to meet the OLF-specified version.
PDA	Power Distribution Assembly. Assembly in an SC4812ET Lite BTS providing internal DC power distribution and circuit protection.
R16.0	Motorola BSS Software Release 2.16.0.x. The version of the software which must be loaded on BSS equipment to upgrade it to software release 2.16.0.x and support initial 1X capability.
RFMF	RF Modem Frame
RGD	Remote Global Positioning System (GPS) Distribution. Module which provides distribution of digital timing information to up to four BTS RF modem frames (RFMFs) from a single Remote GPS receiver.

. . . continued on next page

Table 1-1: Non-Standard Terms and Abbreviations

Term or Abbreviation	Definition
RGPS	Remote Global Positioning System. GPS receiver and signal distribution subsystem which provides digital timing information for up to four BTS RFMFs at a cell site.
RGPS expansion primary frame	BTS frame where the RGD is located and which serves as the distribution point for RGPS digital timing signals to other (*secondary)* BTS frames at a cell site.
RGPS expansion secondary frame	BTS frame which receives RGPS digital timing signals distributed from the *primary* RGPS expansion frame at a cell site.
RHSO	Remote High-Stability Oscillator. Subsystem which generates and distributes synchronization signals from a single HSO to up to four RF modem frames.
SCCP	Small CDMA Channel Processor. The type of CCP shelf used in the SC4812ET Lite BTS.
test equipment set	The LMF computer, communications test set, directional couplers, attenuators, termination loads, associated test cables, and adapters needed for the complete calibration and acceptance testing of a BTS. The *test equipment set* is calibrated and maintained as a unit. When one component of a set is replaced, the complete set must be recalibrated to ensure measurement errors are not introduced during BTS optimization and ATP.
stand-alone frame	See *starter frame*
starter frame	A BTS frame which can operate as a stand-alone BTS or serve as the initial frame in a companion frame installation. After an SC4812ET Lite starter frame is modified to operate with a companion frame, its configuration is identical to the added companion frame.
TCP	Temperature Compensation Panel. A function of the SC4812ET Lite MAP which provides the capability to adjust DC voltage output of the rectifiers to compensate for variations resulting from temperature changes.
TRDC	Transmit & Receive Dual Directional Coupler (Non-duplexed, Receive Filter). TRDCs contains separate transmit and receive paths and bandpass filters which are not connected electrically. Transmit and receive antenna signals are not duplexed and must be handled by separate antennas. Each RF path contains a dual directional coupler on the antenna port which allows sampling of antenna signals in the forward (transmit) and reflected (receive) directions for use by an RFDS.

BTS Equipment Identification

Equipment Overview

Frame - The SC4812ET Lite BTS frame consists of a single, outdoor, weatherized cabinet containing RF and power components. The BTS is functionally similar to the two-cabinet SC4812ET, but provides more flexibility in site selection because of its smaller footprint and lower weight. The BTS is powered by 208/240 Vac (North American frame) or 230 Vac (International frame), rectified internally to +27 Vdc, and can support up to two carriers in a 3-sector configuration. Six-sector operation is not supported with any SC4812ET Lite configuration.

Frame Configurations - The SC4812ET Lite is available in starter and companion frame configurations. Following are brief descriptions of each:

1. **Starter -** This frame configuration is available with one- and two-carrier capability with separate antenna sets for each carrier. It can operate as a stand-alone BTS, or can be modified in the field to the companion frame configuration.
2. **Companion -** This frame configuration is available with one- and two-carrier capability using 2:1 TX combiners and a single antenna set for the frame. It operates with another SC4812ET Lite companion frame which has its own antennas and different carriers. Companion frames share RX signals to provide diversity RX for the opposite frame. Companion frames allow equipping a single SC4812ET Lite site with up to four carriers. Each companion frame is managed in the Base Station System (BSS) as a separate BTS.

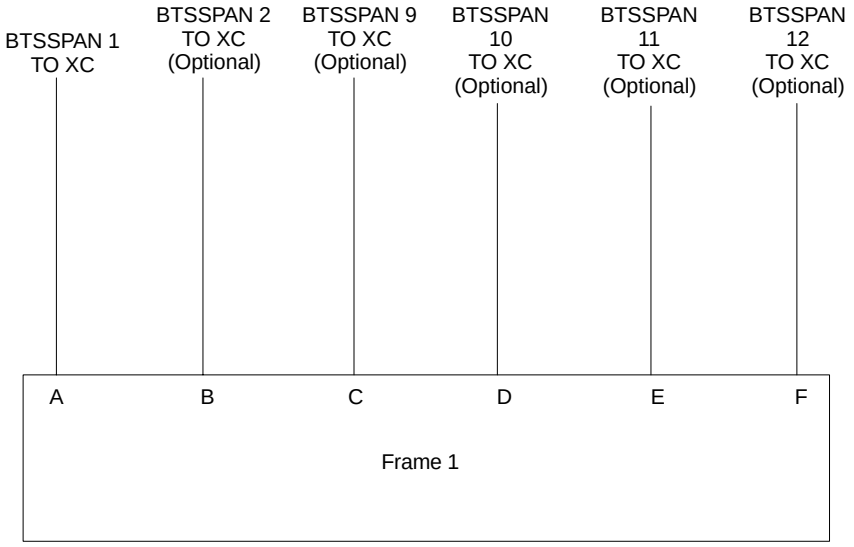
Internal components - The BTS frame houses the fan modules, RF compartment heat exchanger, Small CDMA Channel Processor (SCCP) shelf, RF Linear Power Amplifier (LPA) modules, LPA trunking modules, bandpass filters or 2:1 combiners, and Duplexer Directional Couplers (DRDC) or Triplexer Directional Couplers (TRDC). Power system components include an AC Load Center (ACLC), rectifiers, a +27 Vdc Power Distribution Assembly (PDA), backup batteries, battery heaters, and one duplex GFCI 115 Vac utility outlet.

BTS, Frame, Span, and Device Numbering

BTS and frame numbering - An SC4812ET Lite is a single-frame BTS. Within a BTS, all RF Modem Frames (RFMF) are identified as parts of a single, numbered BTS (for example, **BTS-812)** . Each RFMF is assigned a unique frame number. SC4812ET Lite BTSs consisting of either a starter or a companion frame have a single RFMF. Because of this, each frame is numbered as a BTS **-1** frame of its own unique BTS number. As an example, at a site with two frames in a companion configuration, each frame would have a different BTS number, such as **BTS-812** and **BTS-813** . Each frame would be numbered as frame **-1** of its BTS: **BTS-812-1** and **BTS-813-1** .

Span numbering - Figure 1-1 shows the frame span configuration for a BTS consisting of an SC4812ET Lite starter or companion frame. The figure also shows the BTS-to-CBSC Transcoder span configurations which can be employed with an SC4812ET Lite BTS.

Figure 1-1: SC4812ET Lite BTS Starter and Companion Frame Span Cabling



NOTE:
The SC4812ET Lite BTS has the capability to connect to up to six spans; however, the internal CSUs only support a maximum of two spans.

SCCP shelf card/module device ID numbers - All Ethernet LAN-addressable modules in the BTS starter and companion frames at a single site are also identified with device ID numbers. Refer to Table 1-2, Table 1-3, and Figure 1-6 for specific device ID numbers.

Table 1-2: SCCP Cage Module Device ID Numbers (Top Shelf)

Frame #	Module ID Number (Left to Right)										
	Power (PS-1)	Power (PS-2)	AMR -1	GLI-1	MCC		BBX			BBX-R	MPC/ EMPC -1
1	-	-	1	1	1	2	1	2	3	R1	-

Table 1-3: SCCP Cage Module Device ID Numbers (Bottom Shelf)

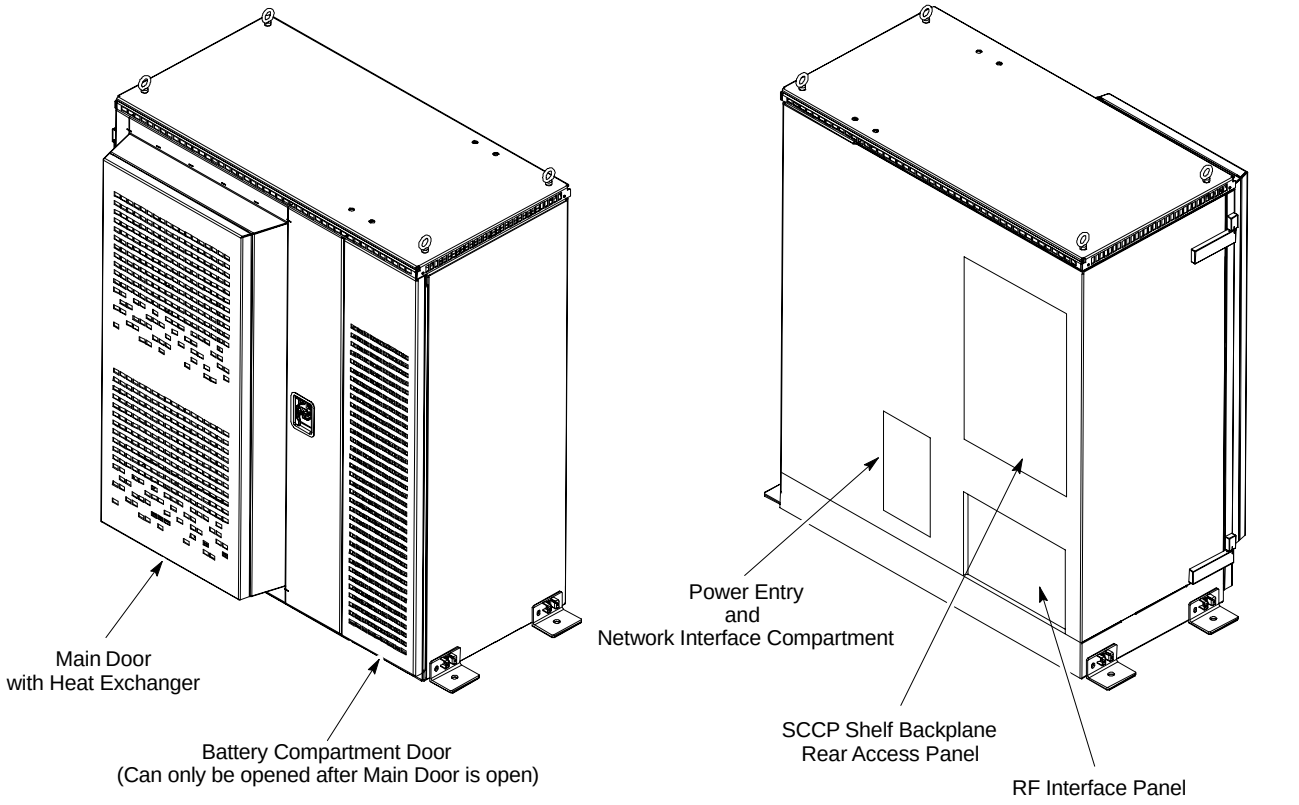
Frame #	Module ID Number (Left to Right)														
	HSO/ LFR	CSM -1	CSM -2	CCD A	CCD B		AMR -2	GLI-2	MCC		BBX			SW	MPC/ EMPC -2
1	-	1	2	-	-	-	2	2	3	4	4	5	6	-	-

Cabinet Identification

Major Components

Figure 1-2 illustrates the external features of the BTS frame, the single major component of the Motorola SC4812ET Lite. The frame cabinet is identical for stand-alone (starter) and companion frames.

Figure 1-2: SC4812ET Lite BTS Frame, Starter and Companion



1

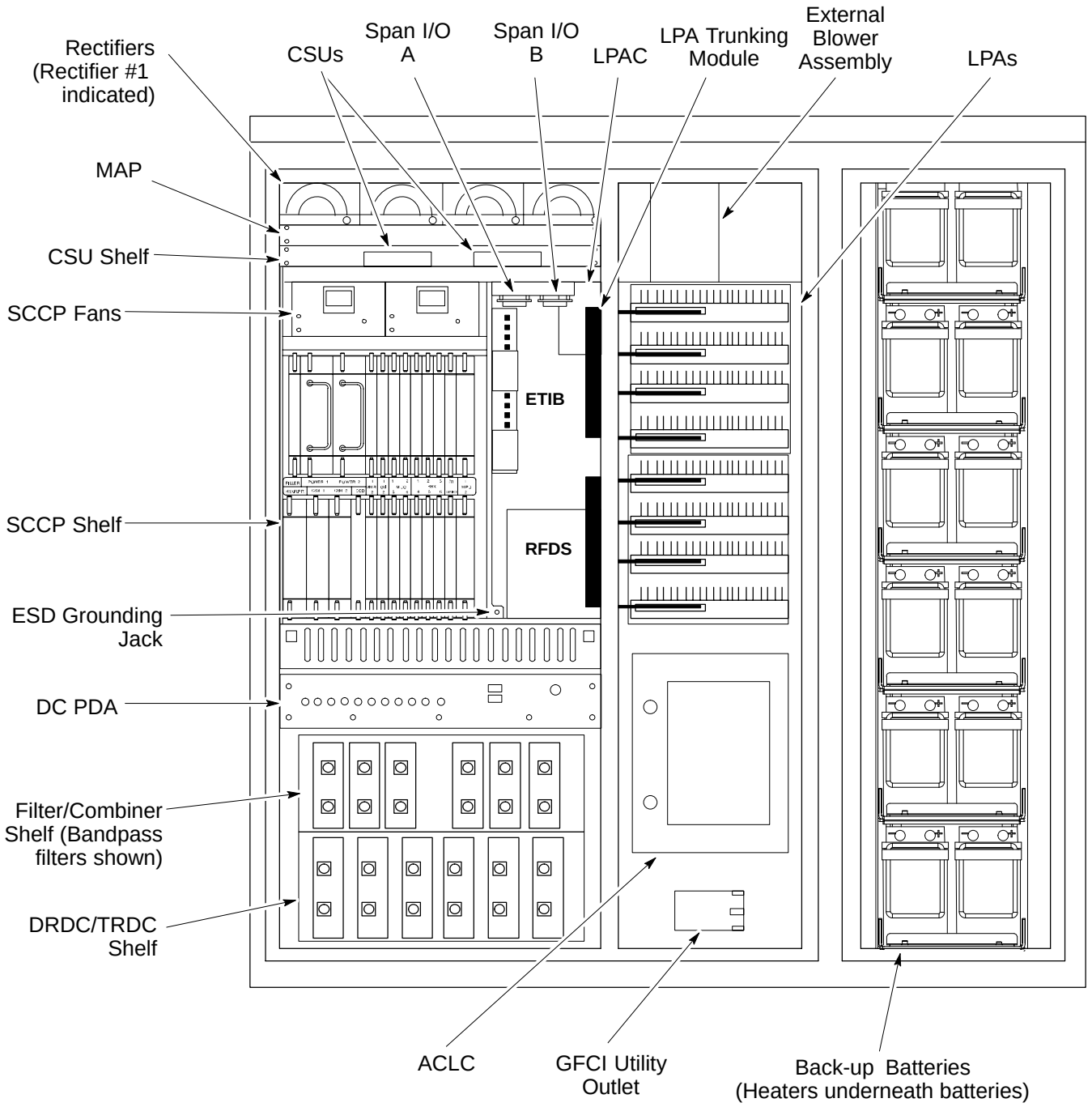
Internal Assembly Identification and Location

Internal Assemblies and FRUs

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

Figure 1-3: Internal Assemblies and FRUs

NOTE Cabinet doors not shown for clarity.

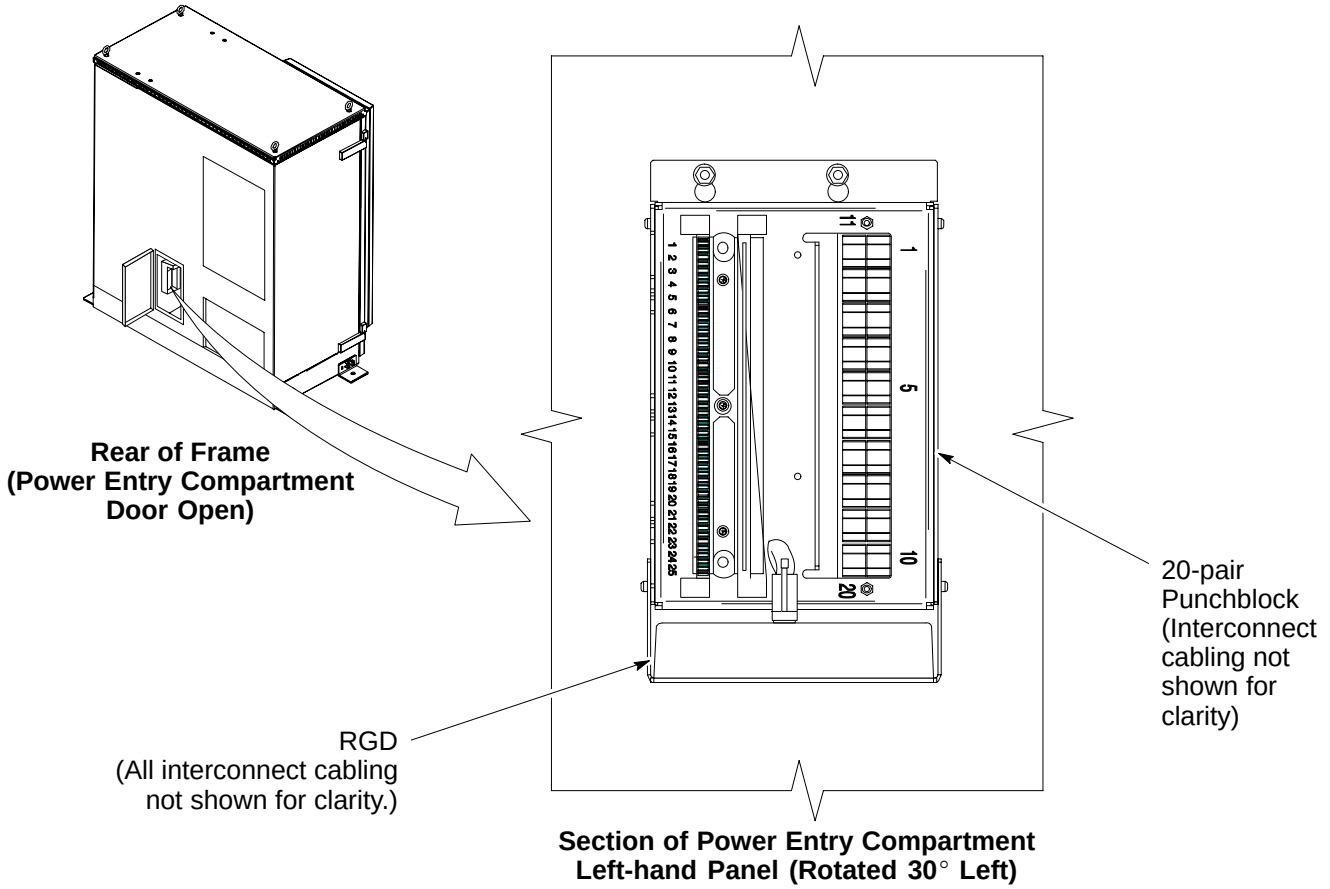


SC4812ETL0002-5

20-pair Punchblock with Remote GPS Distribution Module

Assembly installed in the *RGPS expansion primary* BTS frame which enables distribution of digital GPS timing signals to other (RGPS expansion *secondary)*) BTS frames located at the same cell site. The assembly is located on the left-hand side of the power entry compartment (Figure 1-4) at the rear of the frame, opposite the 50-pair punchblock.

Figure 1-4: 20-pair Punchblock with RGD Module



2:1 Combiners

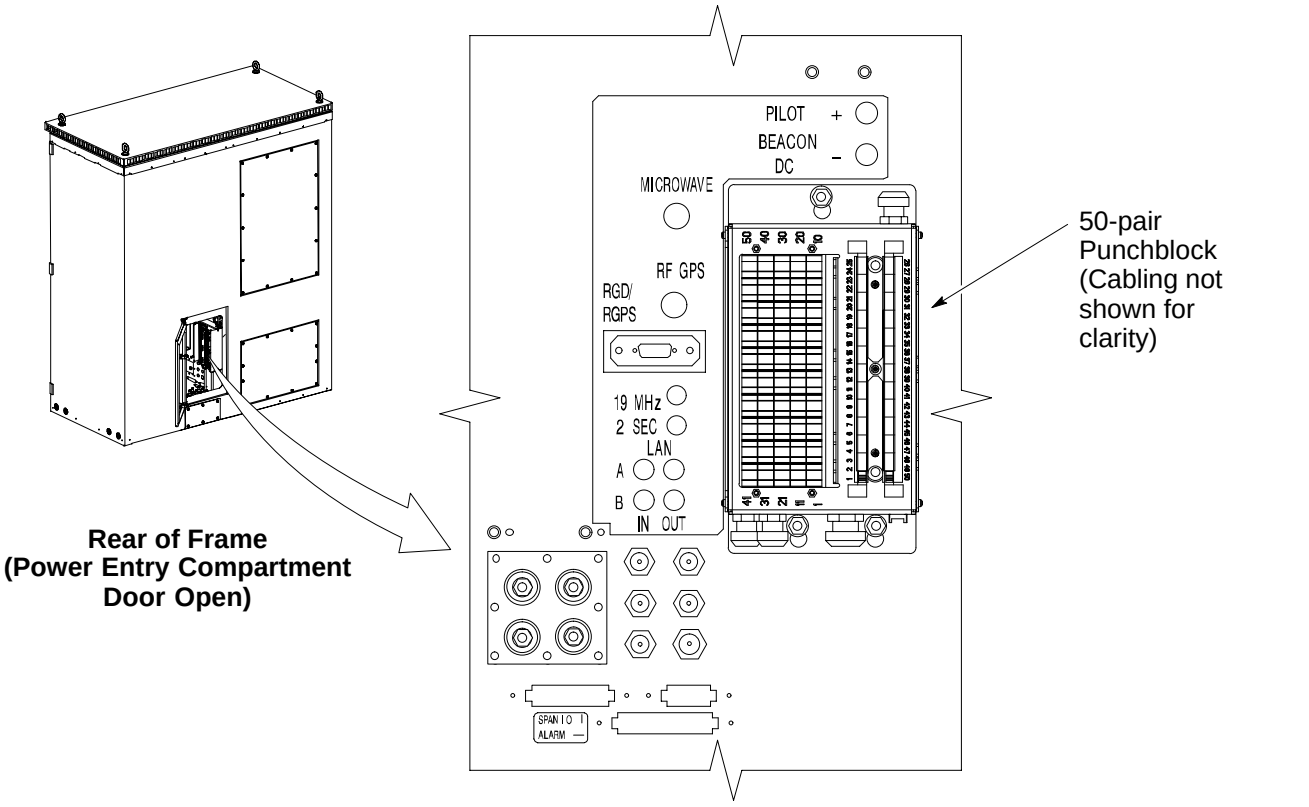
In the SC4812ET Lite BTS, one 2:1 combiner is used per sector to combine the trunked LPA-amplified TX signals for two carriers into one signal for input to the applicable sector DRDC or TRDC.

1

50-pair Punchblock

The 50-pair punchblock (Figure 1-5) is the interface between the frame and the T1/E1 span lines. It is located on the right-hand side of the power entry compartment at the rear of the frame. The punchblock provides the initial interconnection between the spans and the Customer-defined I/O, alarms, multi-frame timing source (Remote GPS and HSO), and pilot beacon control (optional).

Figure 1-5: 50-Pair Punchblock



SC4812ETL0024-2

AC Load Center (ACLC)

The ACLC is the frame entry point for AC power. It incorporates AC power control, distribution, and surge protection (Figure 1-3). Two versions are available, depending on the type of AC input power available at the operating site:

1. International
2. North American

Back-up Batteries

The batteries (Figure 1-3) provide +24 Vdc back-up for the frame should AC power be interrupted. The frame can accommodate a total of 12 12V batteries grouped in six strings. Each string consists of two batteries connected in series for 24 Vdc output. The six strings are connected in parallel to meet the current-draw requirements of the frame. The maximum time duration of the back-up capability depends on system configuration.

Battery Heaters

The battery heater pads warm the batteries to provide improved cold-weather performance. A separate heater pad is required for each battery string and is located between each battery string and its respective support shelf.

Channel Service Units (CSU) (Optional)

The SC4812ET Lite can be equipped with up to two *M-PATH* 537 CSU modules for T1 spans or two *M-PATH* 437 CSU modules for E1 spans. These modules install in the CSU shelf (Figure 1-3). The CSUs allow monitoring of span performance and provide capability for remote network management.

CSU Shelf

The CSU shelf is an *ADC Kentrox* 2-slot Universal Shelf which can accommodate two *M-PATH 537* or two *M-PATH 437* CSU modules. When the optional CSU modules are not installed, cover plates are installed over the CSU card slots (Figure 1-3).

DC Power Distribution Assembly (PDA)

Both rectifier output voltage and back-up battery voltage are routed to the PDA (Figure 1-3) where they are combined into system DC bus voltage. The PDA provides distribution of DC power and system DC bus protection from the loads with MAIN BREAKER and the smaller post-distribution circuit breakers. MAIN BREAKER permits removal of *all* frame loading from the bus. The 13 post-distribution circuit breakers permit removal of individual loads.

Duplexer, Receive filter, Dual Directional Coupler (DRDC)

DRDCs permit duplexing of sector transmit and receive signals on a single antenna. The DRDCs also incorporate a receive bandpass filter and dual directional couplers which permit signal monitoring by the RF Diagnostic Subsystem.

ET Interface Board (ETIB) and LPA Control (LPAC) Board

The ETIB is an interconnect module with status LEDs, MMI receptacles, and secondary surge protection for the LPA modules. The LPAC board provides the interface for the LPA connections (Figure 1-3).

Filter/Combiner Shelf (Bandpass Filters or 2:1 Combiners)

The filter/combiner shelf (Figure 1-3) holds the transmit bandpass filters or 2:1 combiners, depending on system configuration.

Heat Exchanger

The heat exchanger provides cooling to the frame RF compartment. The fan speed of the heat exchanger adjusts automatically with temperature. The heat exchanger is located in the frame main door (Figure 1-2).

Rectifiers

The rectifiers (Figure 1-3) convert AC power supplied to the frame to +27.4 Vdc which powers the frame and maintains the charge of the back-up batteries. Rectifier positions are numbered 1 through 4 from left to right when facing the frame. Single-carrier frames are equipped with three rectifiers installed in positions 1, 2, and 3. Two-carrier frames are equipped with four rectifiers. The number of rectifiers supplied with each configuration provides N+1 redundancy.

RF Diagnostic Subsystem (RFDS)

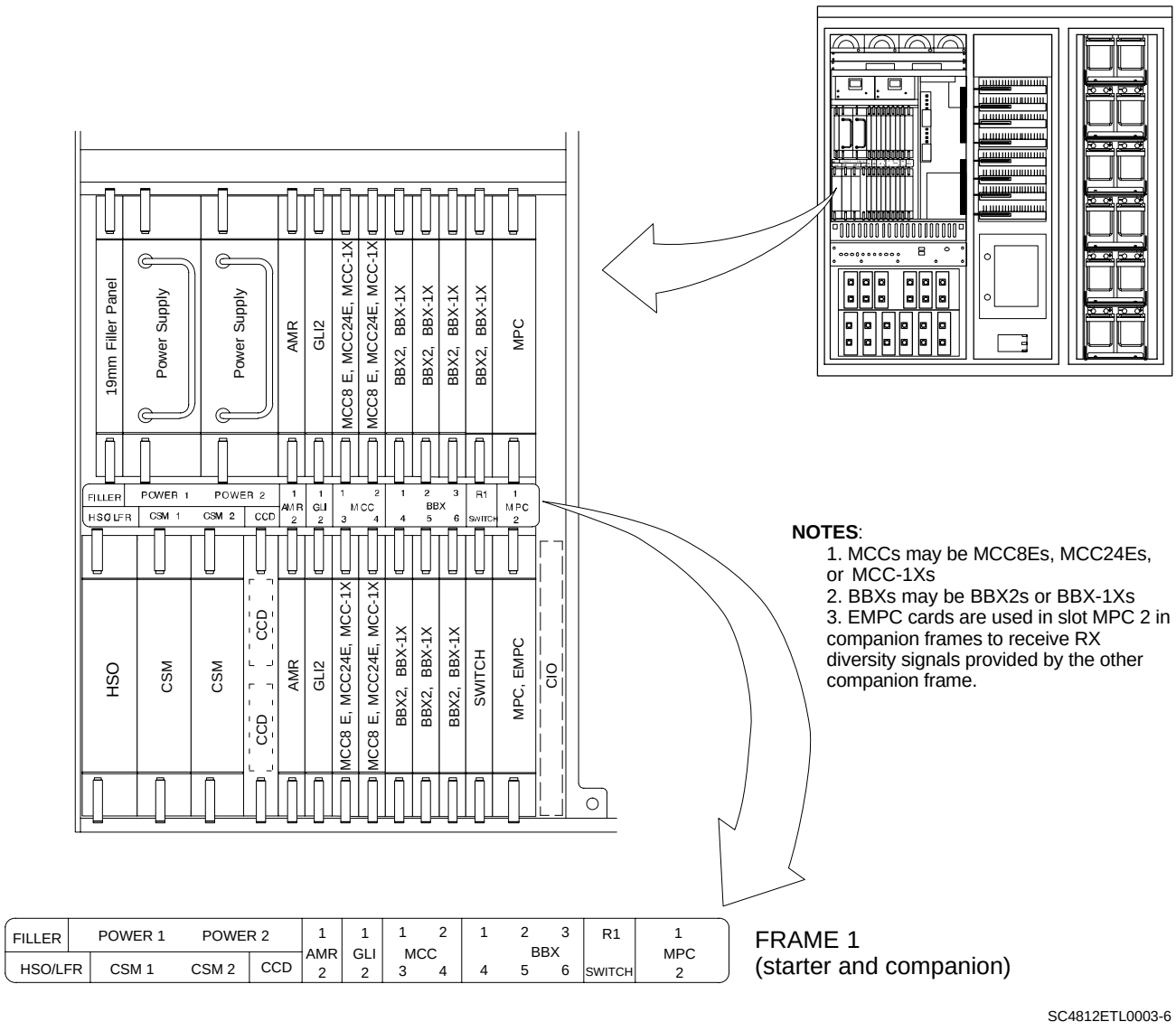
The RFDS (Figure 1-6) provides capability for remotely monitoring the status of the SC4812ET Lite transmit and receive paths. For IS-95A/B operation, the RFDS is a COBRA model. To support 1X operation, the RFDS must the 1X-capable COBRA-II.

Small CDMA Channel Processor (SCCP) Shelf

The SCCP shelf has provisions for the following types and quantities of modules (Figure 1-3 and Figure 1-6):

- Alarm Monitoring and Reporting (AMR) cards (2)
- Broad Band Transceiver, second generation or 1X, (BBX2 or BBX-1X) cards, primary (6)
- BBX2 or BBX-1X card, redundant (1)
- CDMA Clock Distribution (CCD) cards (2)
- Clock Synchronization Manager (CSM) on two cards (one with GPS receiver, if ordered)
- Combiner Input/Output (CIO) card (1)
- Fan modules (2)
- Filler panel (as required)
- Group Line Interface, second generation, (GLI2) cards (2)
- High Stability Oscillator (HSO)/Low Frequency Receiver (LFR) card (Optional) (1)
- Multi-coupler Preselector Cards (MPC) (2 per starter frame; 1 per companion frame)
- Expansion Multi-coupler Preselector Card (EMPC) (1 per companion frame)
- Multi-Channel CDMA (MCC8E, MCC24E, or MCC-1X) cards (4)
- Power supply cards (2)
- Switch card (1)

Figure 1-6: SCCP Shelf, IS-95A/B and 1X Devices



Span I/O Boards

The two span I/O boards, Span I/O A and Span I/O B (Figure 1-3), provide the span line interface from the punchblock or the CSU modules, if equipped, to the SCCP backplane.

Transmit & receive, non-duplexed, Receive filter, Dual Directional Coupler (TRDC)

TRDCs provide separate, bandpass-filtered sector transmit and receive paths. When TRDCs are used, separate transmit and receive antennas are required for each sector. As with DRDCs, dual directional couplers for each antenna path are incorporated in TRDCs to permit signal monitoring by the RFDS.

1

Figure 1-7: RF Interface Panel, Starter Frame, DRDCs Installed

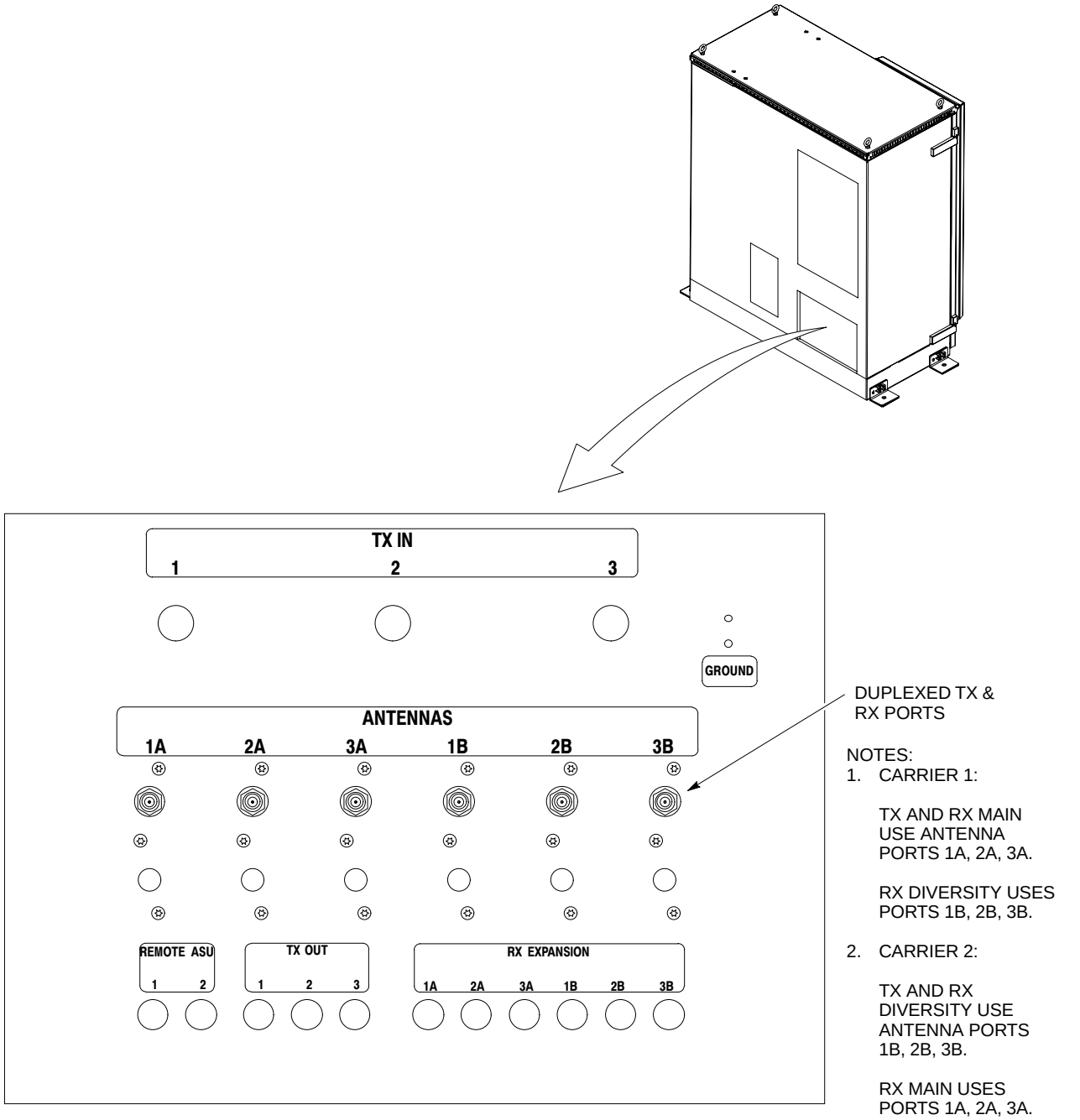
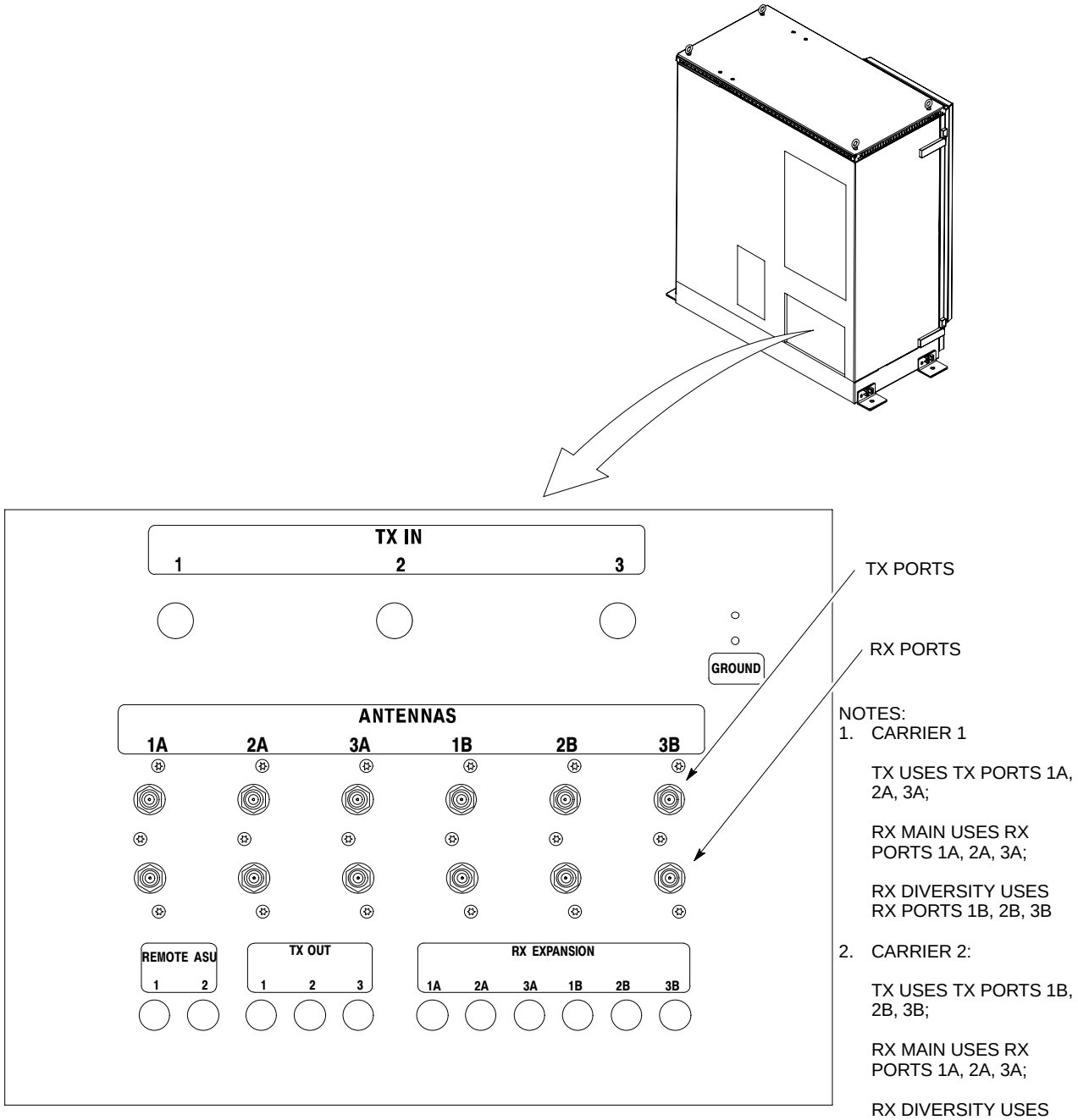
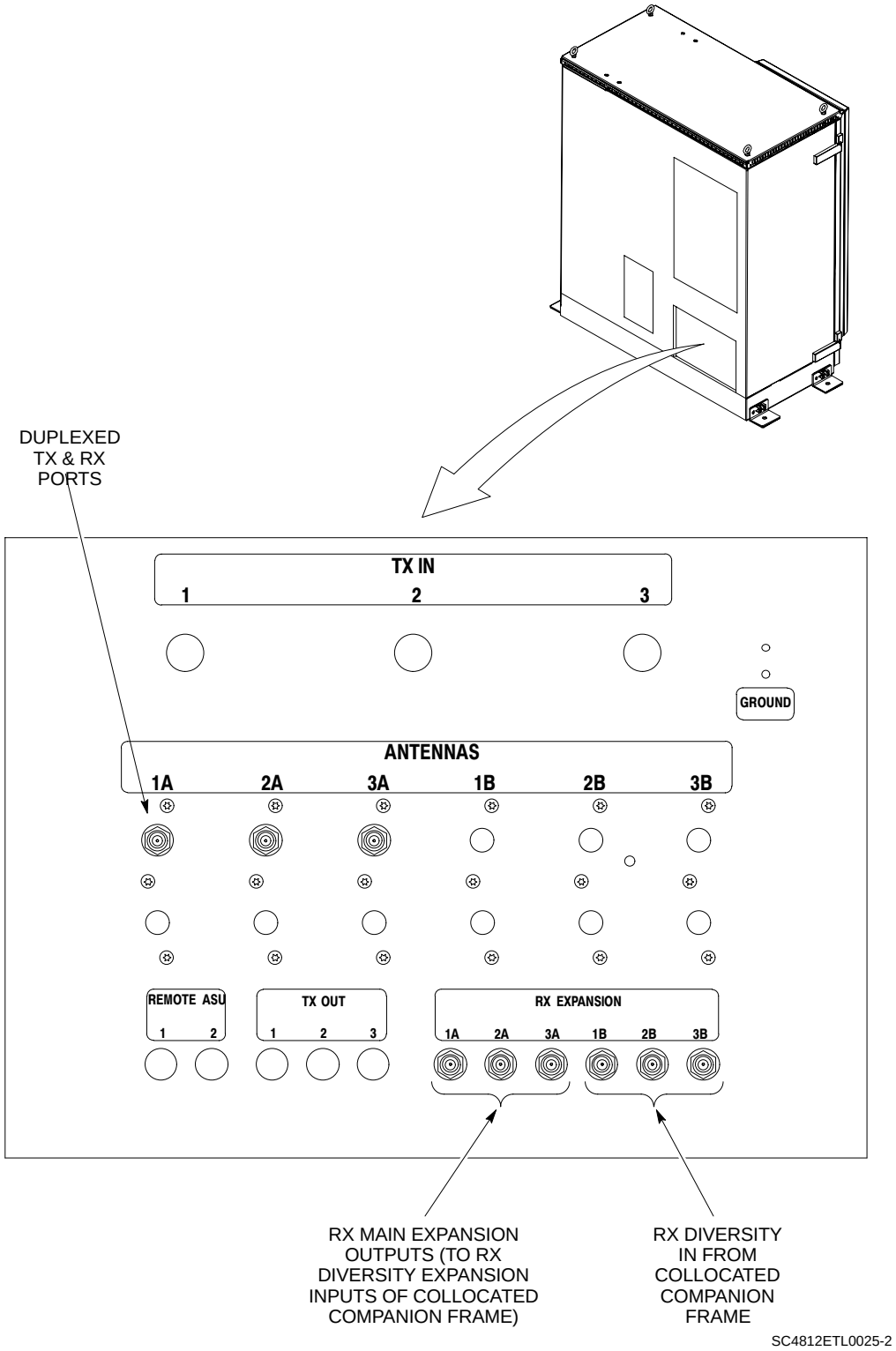


Figure 1-8: RF Interface Panel, Starter Frame, TRDCs Installed



1

Figure 1-9: RF Interface Panel, Companion Frame, 2:1 Combiners and DRDCs



NOTES:
1. CARRIER 1:

   TX AND RX MAIN USE ANTENNA PORTS 1A, 2A, 3A

   RX DIVERSITY RECEIVED FROM COMPANION FRAME THROUGH RX EXPANSION PORTS 1B, 2B, 3B.

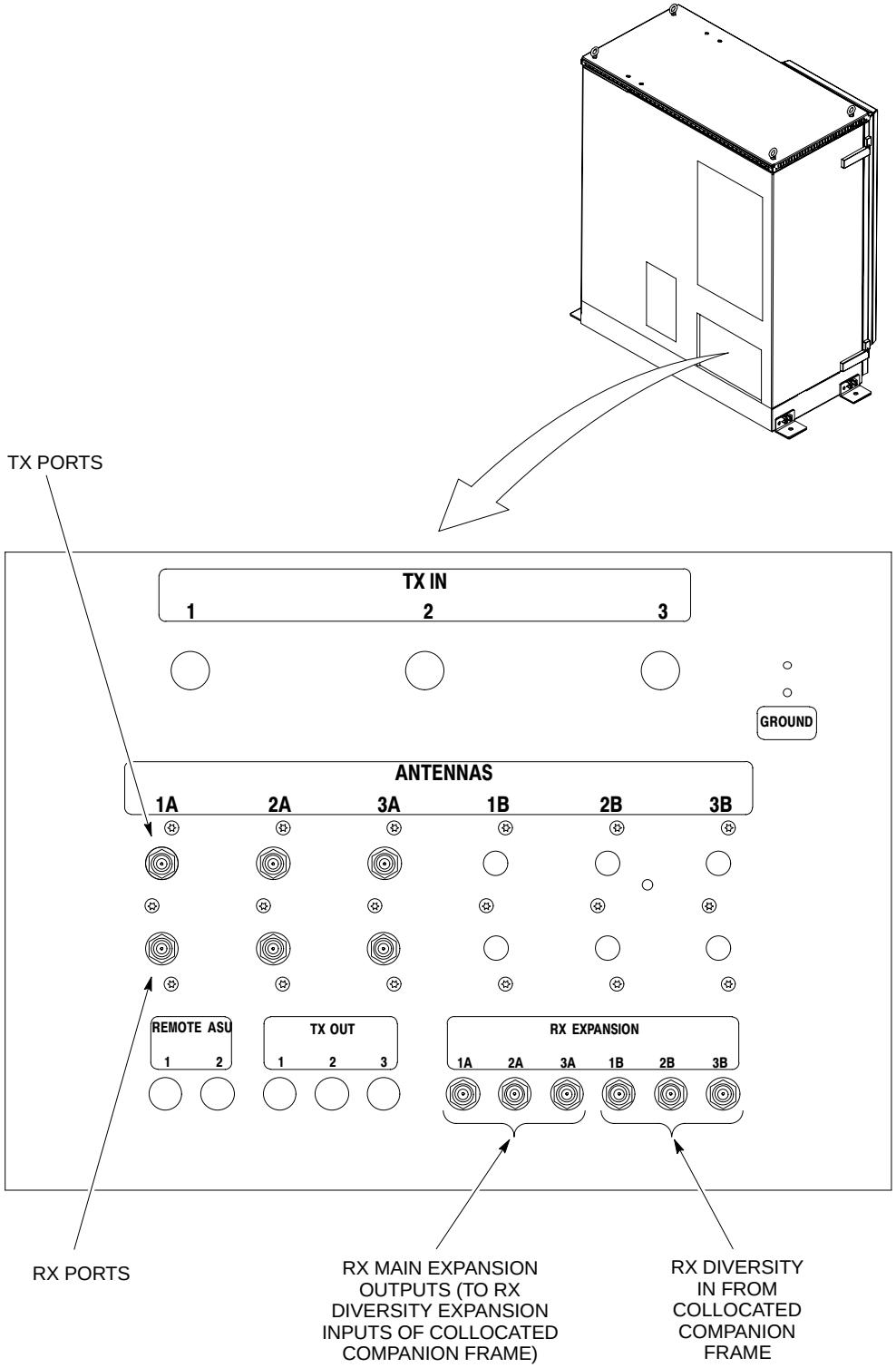
2. CARRIER 2:

   TX AND RX MAIN USE ANTENNA PORTS 1A, 2A, 3A

   CARRIER 2 RX DIVERSITY RECEIVED FROM COMPANION FRAME THROUGH RX EXPANSION PORTS 1B, 2B, 3B.

3. COLLOCATED COMPANION FRAME CARRIER 1 & 2 RX DIVERSITY PROVIDED THROUGH RX EXPANSION PORTS 1A, 2A, 3A.

Figure 1-10: RF Interface Panel, Companion Frame, 2:1 Combiners and TRDCs



NOTES:

1. CARRIER 1:

   TX USES TX PORTS 1A, 2A, 3A;

   RX MAIN USES RX PORTS 1A, 2A, 3A;

   RX DIVERSITY RECEIVED FROM COLLOCATED COMPANION FRAME THROUGH RX EXPANSION PORTS 1B, 2B, 3B.

2. CARRIER 2:

   TX USES TX PORTS 1A, 2A, 3A;

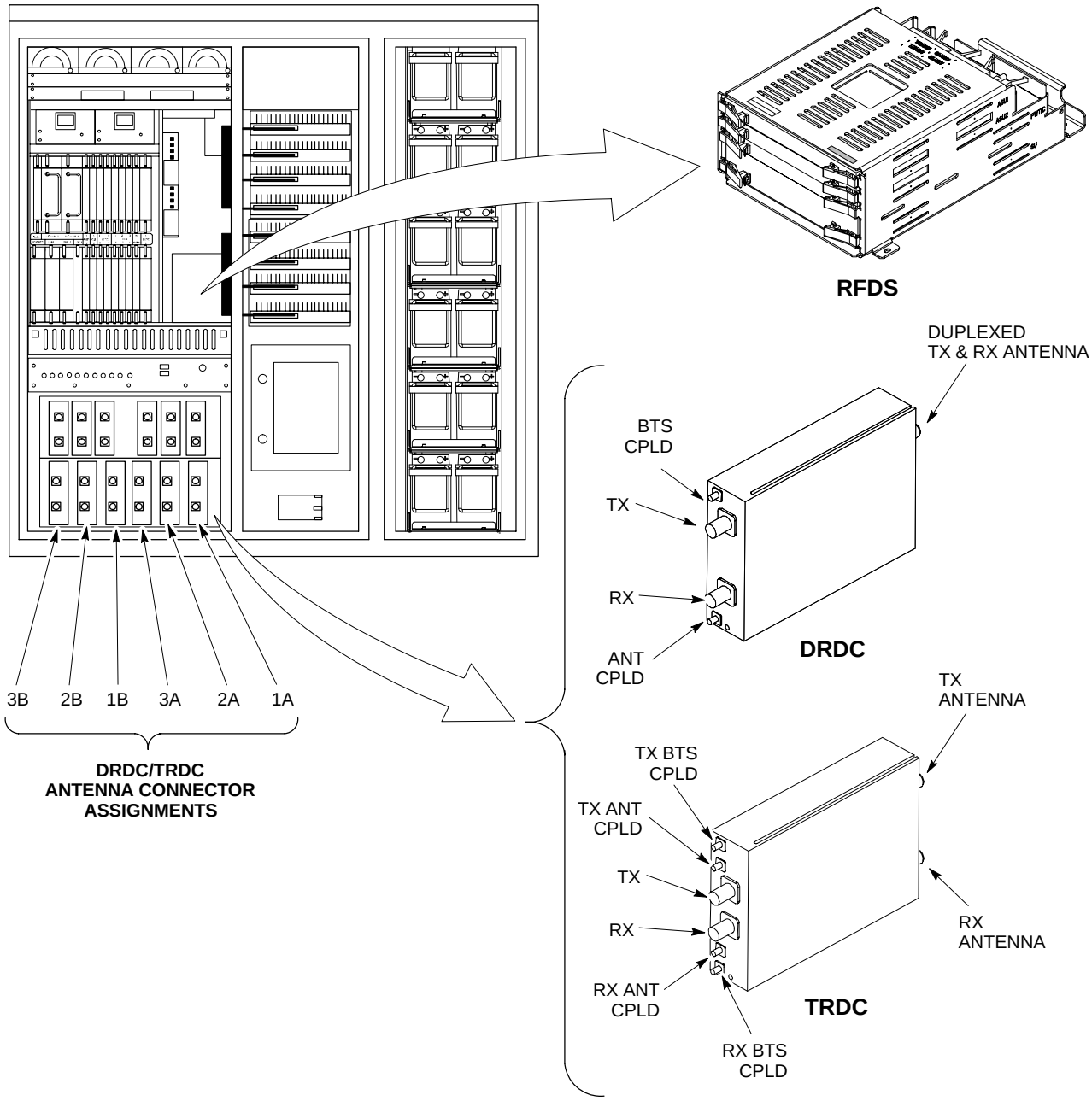
   RX MAIN USES RX PORTS 1A, 2A, 3A;

   RX DIVERSITY RECEIVED FROM COLLOCATED COMPANION FRAME THROUGH RX EXPANSION PORTS 1B, 2B, 3B.

3. COLLOCATED COMPANION FRAME CARRIER 1 & 2 RX DIVERSITY PROVIDED THROUGH RX EXPANSION PORTS 1A, 2A, 3A.

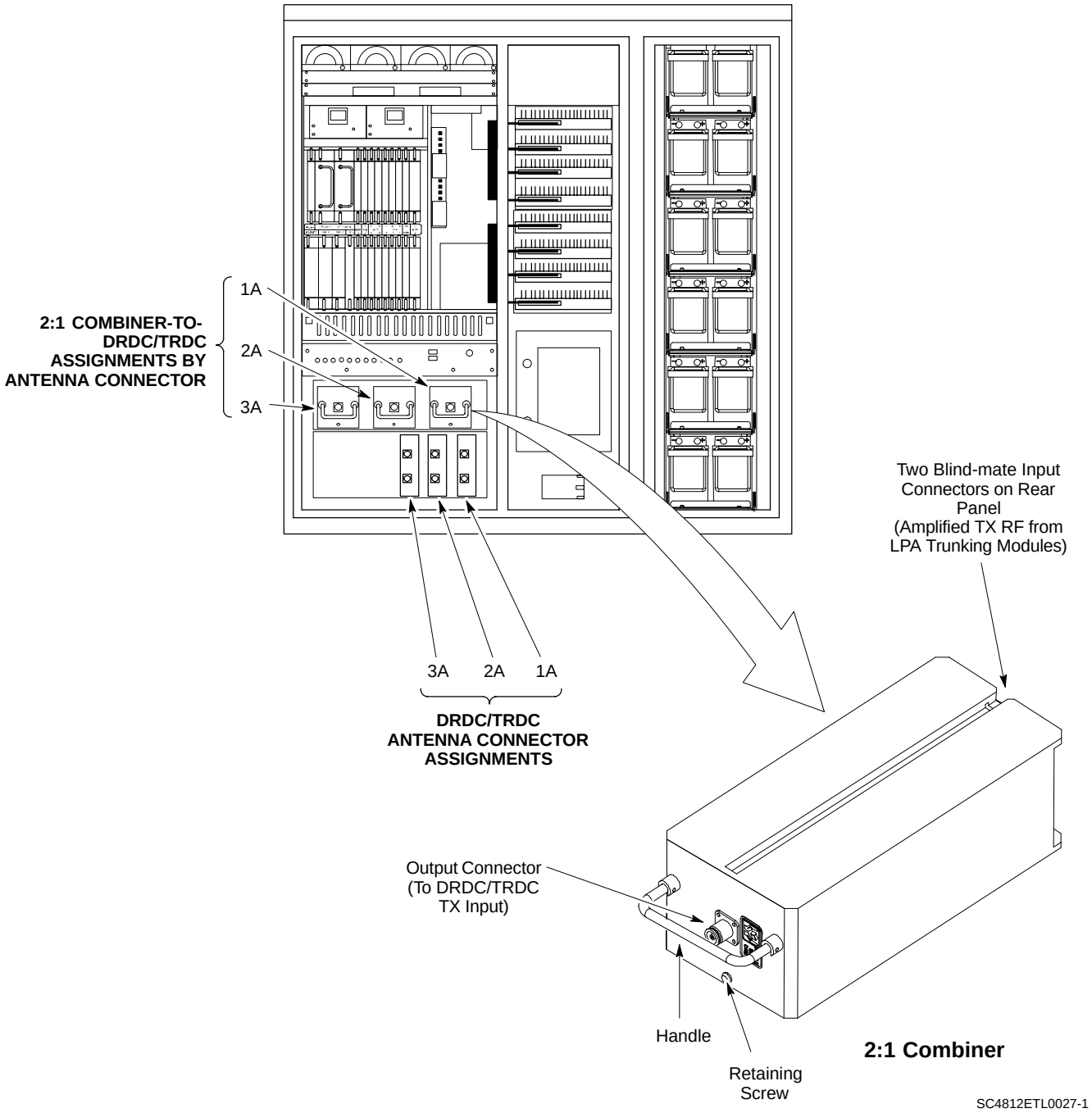
SC4812ETL0026-2

Figure 1-11: RFDS, DRDC, and TRDC Details



SC4812ETL0005-4

Figure 1-12: 2:1 Combiner Details, Companion Frame Only



1

SCCP Cage Configuration and 1X Devices

SC4812ET Lite frames have one SCCP cage which will support up to four MCC cards and six BBX cards.

MCC Cards

A BTS may be configured with a mix of MCC-8E, MCC-24E, and MCC-1X cards. Any SCCP cage MCC card slot will support any of the three MCC types. For 1X capability under R16.0, at least one MCC card must be an MCC-1X which can be installed in any MCC card slot. In a BSS operating with Software Release 2.16.0.84.3 and higher, MCC-1X cards will support IS-95A and B traffic as well as CDMA2000 1X. When operating with Software Release 2.16.0.5x.x, the MCC-1X cards do not support IS-95A/B operation. For additional software release compatibility and capability information, contact the local Motorola account team.

BBX Cards

Up to six BBX cards of mixed BBX2s and BBX-1Xs can also be supported. SCCP cage BBX2 card slots 1 through 6 are carrier- and sector-dependent. As a result, the BBX slots dedicated to the sectors for one carrier should be populated with the same type of cards. Refer to Table 1-5 for BBX card slot carrier and sector correlations.

The SCCP cage R1 card slot is dedicated to the *redundant* BBX. This slot will support either a BBX2 or a BBX-1X. If a cage has BBX-1X carriers, the redundant BBX (BBXR) *must* be a BBX-1X card to provide 1X redundancy.

BBX-1X and BBX2 Interchangeability

In a BSS operating with R16.0 software, BBX-1X cards can be used as direct replacements for BBX2 cards; however, *different types of BBXs should not be mixed on the same carrier.* Therefore, if a BBX2 card is replaced with a BBX-1X, all remaining BBX2 cards for the carrier supported by the replaced card must also be replaced with BBX-1X cards.

BTS Sector Configurations

Sector Configuration

There are a number of ways to configure the BTS frame. Table 1-4 outlines the basic requirements. For more detailed information also see Table 1-5 and Figure 1-13. Bandpass filters are used for single-carrier configurations and two-carrier systems when carriers are either *adjacent* or *not* adjacent

Table 1-4: BTS Sector Configuration

Number of Carriers	Number of Sectors	Channel Spacing	Filter Requirements
1	3	N/A	Bandpass Filter or 2:1 Combiner
2	3	Adjacent or Non-adjacent	Bandpass Filter
2	3	Non-adjacent	2:1 Combiner

The matrix in Table 1-5 shows the correlation between the various sector configurations and BBX cards.

Table 1-5: Sector Configurations

Configuration	Description						
1	**3-Sector / 1 Carrier** The configuration below maps RX and TX with bandpass filters for a 3-sector/1-carrier frame.						
	ANT 1A	**ANT 2A**	**ANT 3A**	**ANT 1B**	**ANT 2B**	**ANT 3B**	
	TX1 / RX1A	TX2 / RX2A	TX3 / RX3A	RX1B	RX2B	RX3B	**Carrier #**
	BBX-1	BBX-2	BBX-3	BBX-1 (diversity RX)	BBX-2 (diversity RX)	BBX-3 (diversity RX)	1
2	**3-Sector / 1 Carrier** The configuration below maps RX and TX with 2:1 combiners for 3-sector/1-carrier frames in *companion* configuration.						
	ANT 1A	**ANT 2A**	**ANT 3A**	**ANT 1B**	**ANT 2B**	**ANT 3B**	
	TX1 / RX1A	TX2 / RX2A	TX3 / RX3A				**Carrier #**
	BBX-1	BBX-2	BBX-3				1
	NOTE Diversity RX (RX1B, 2B, and 3B) is received from the opposite companion frame through RX EXPANSION connectors 1B, 2B, and 3B (see Figure 1-9 or Figure 1-10). Diversity RX is provided to the opposite companion frame from antenna connectors 1A, 2A, and 3A through RX EXPANSION connectors 1A, 2A, and 3A.						
3	**3-Sector / 2-ADJACENT or 2-NON-ADJACENT Carriers** The configuration below maps RX and TX with bandpass filters for 3-sectors/2-carriers for both *adjacent* and *non-adjacent* channels.						
	ANT 1A	**ANT 2A**	**ANT 3A**	**ANT 1B**	**ANT 2B**	**ANT 3B**	
	TX1 / RX1A	TX2 / RX2A	TX3 / RX3A	TX4 / RX1B	TX5 / RX2B	TX6 / RX3B	**Carrier #**
	BBX-1	BBX-2	BBX-3	BBX-1 (diversity RX)	BBX-2 (diversity RX)	BBX-3 (diversity RX)	1
	BBX-4 (RX)	BBX-5 (RX)	BBX-6 (RX)	BBX-4 (TX & diversity RX)	BBX-5 (TX & diversity RX)	BBX-6 (TX & diversity RX)	2
4	**3-Sector / 2-NON-ADJACENT Carriers** The configuration below maps RX and TX with 2:1 combiners for 3-sectors/2-carriers for *non-adjacent* channels for frames in *companion* configuration.						
	ANT 1A	**ANT 2A**	**ANT 3A**	**ANT 1B**	**ANT 2B**	**ANT 3B**	
	TX1 & 4 / RX1A & 4A	TX2 & 5 / RX2A & 5A	TX3 & 6 / RX3A & 6A				**Carrier #**
	BBX-1	BBX-2	BBX-3				1
	BBX-4	BBX-5	BBX-6				2
	NOTE Diversity RX (RX1B, 2B, 3B and RX4B, 5B, 6B) is received from the opposite companion frame through RX EXPANSION connectors 1B, 2B, and 3B (see Figure 1-9 or Figure 1-10). Diversity RX is provided to the opposite companion frame from antenna connectors 1A, 2A, and 3A through RX EXPANSION connectors 1A, 2A, and 3A.						

Figure 1-13: SC4812ET Lite LPA Configuration with Bandpass Filters and 2:1 Combiners (Stand-alone and Companion Frames)

Table 1-5
Configuration Numbers 1 and 3
Stand-alone Frames

Bandpass Filters
3-Sector

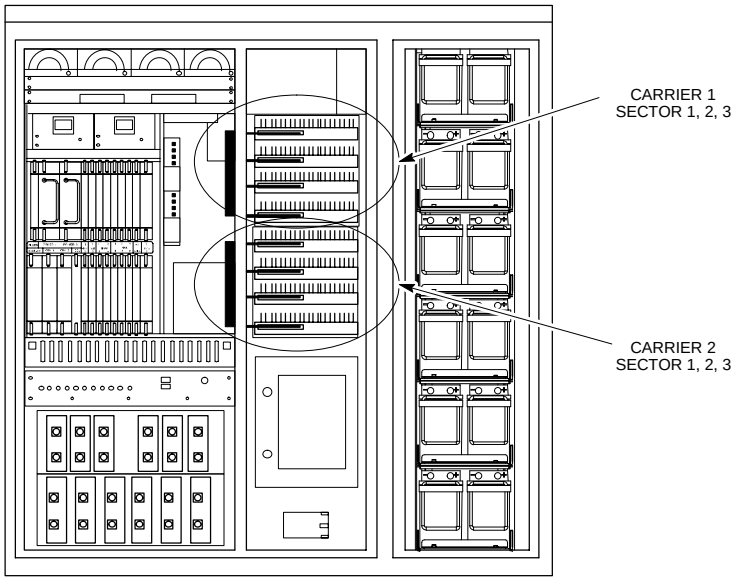
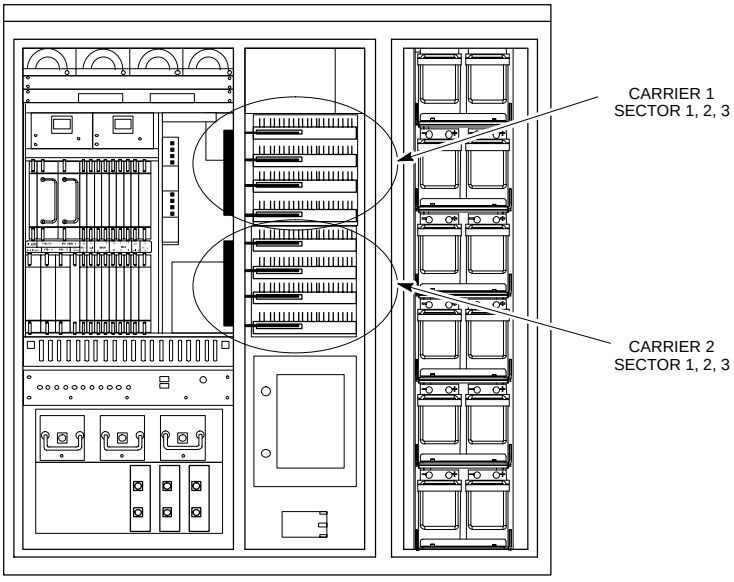


Table 1-5
Configuration Numbers 2 and 4
Companion Frames

2:1 Combiners
3-Sector



SC4812ETL0011-4

Notes

Chapter 2

Preliminary Operations

Preliminary Operations: Overview

Introduction

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

Cell-site Types

Sites are configured as 3-sector with one or two carriers. Each type has unique characteristics and must be optimized accordingly.

Configuration Data File

The Configuration Data File (CDF), also called Cell-site Data File, contains site type and equipage data information. The LMF application program reads data directly from the CDF during optimization. The number of BTS frames, number and types of BBX and MCC boards, 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 frame.

CAUTION	Always wear an approved anti-static 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 packaging in which it was shipped.

Initial Installation of Boards/Modules

Table 2-1: Initial Installation of Boards/Modules

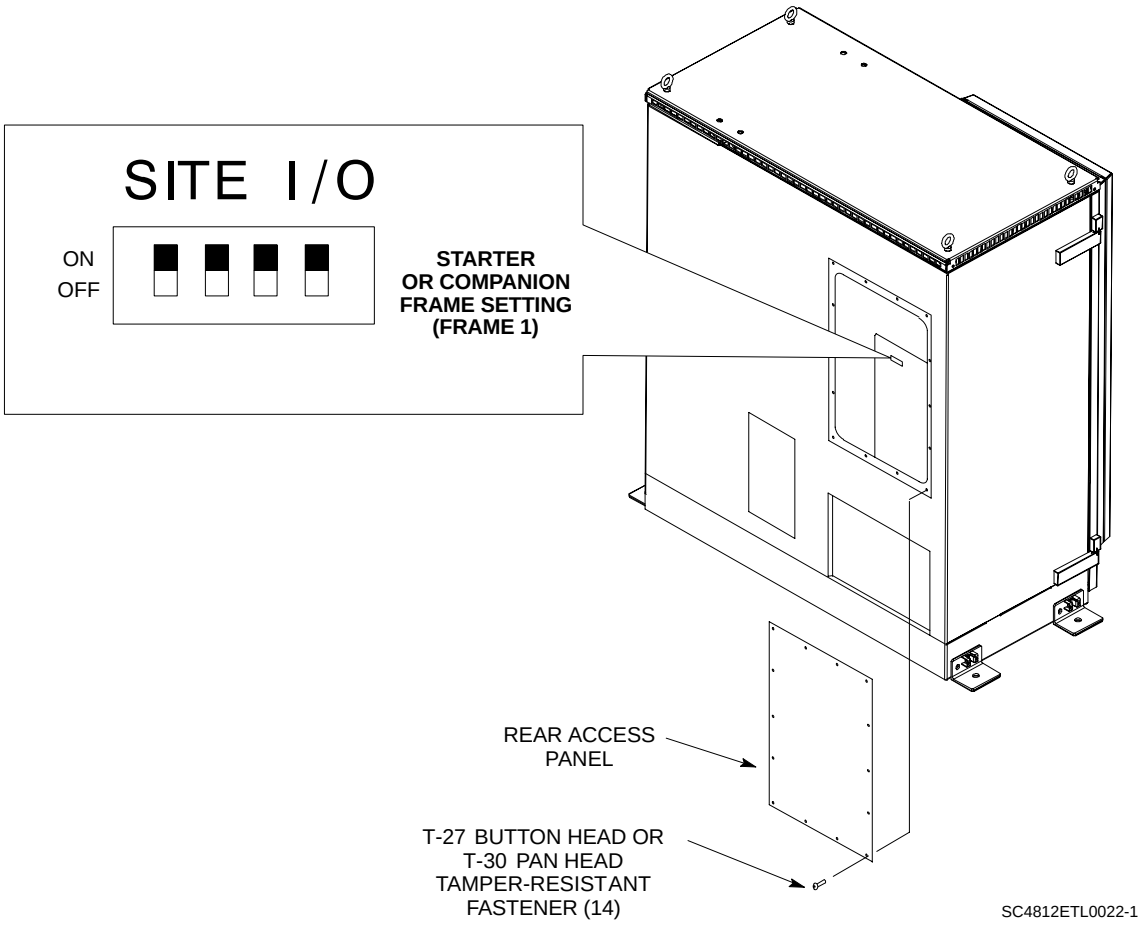
Step	Action
1	Refer to the site documentation and, if it was not previously done, slide all boards and modules into the appropriate shelves as required. **DO NOT SEAT the boards and modules at this time.**
2	As the actual site hardware is installed, record the serial number of each module on a “Serial Number Checklist” in the site logbook.

Setting Frame SCCP Configuration Switch

The backplane configuration switch is located behind the frame rear access panel. It must be set for the frame type as shown in 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



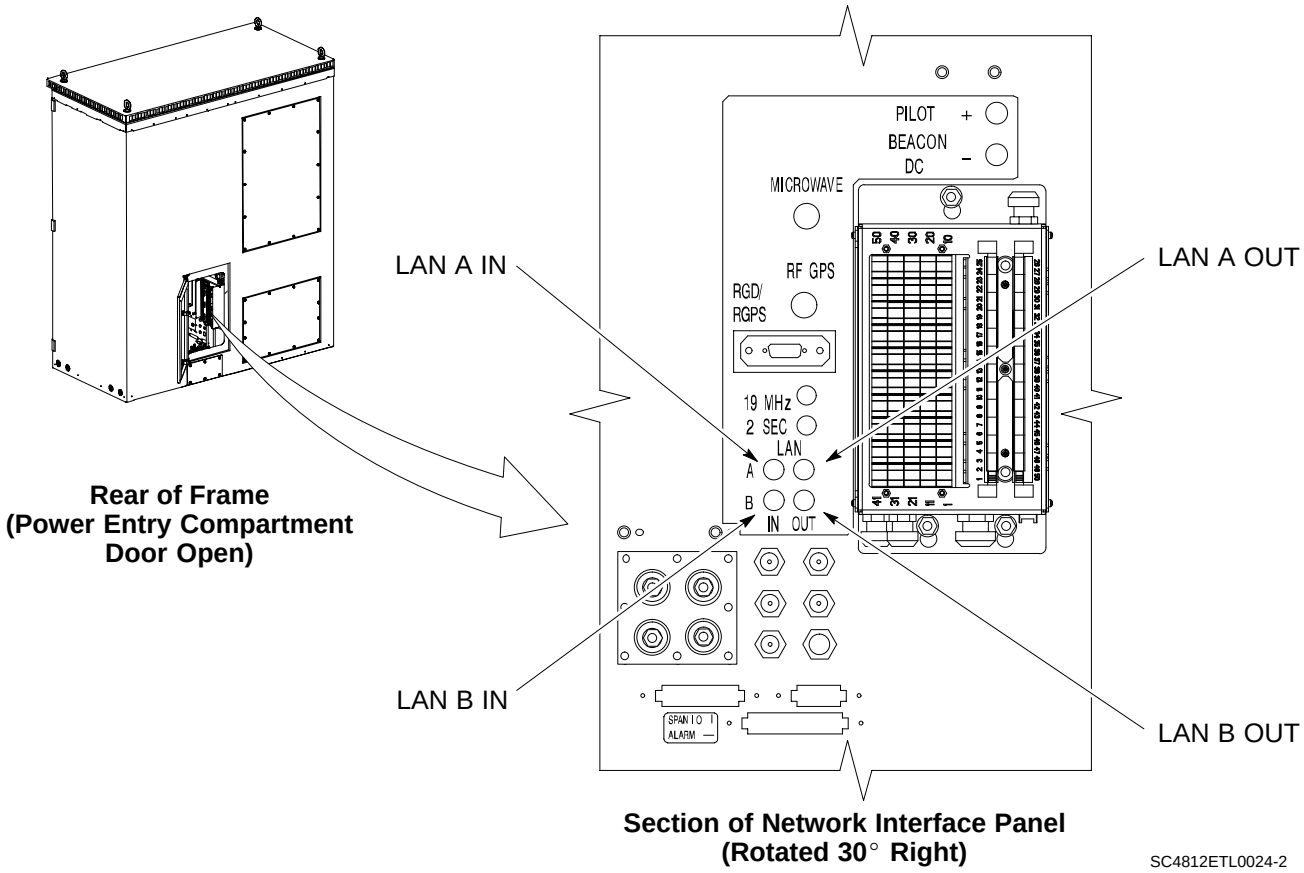
Ethernet LAN

Ethernet LAN Termination

For proper operation, each end of the primary and redundant BTS Ethernet Local Area Networks (LAN) must be terminated with a 50-ohm load. For a BTS consisting of a stand-alone or a companion frame, this is done by placing 50-ohm triaxial terminations on the LAN A and B external IN and OUT connectors located in the power entry compartment (Figure 2-2).

Check the LAN A and B external IN and OUT connectors in the power entry compartment of each frame, and be sure terminations are installed on all the uncabled external LAN connectors.

Figure 2-2: External Ethernet LAN Connectors



Initial Power-up

Introduction

The following information is used to check for any electrical short circuits and to verify the operation and tolerances of each frame at the site before applying power *for the first time*. It contains instructional information on the proper *initial* power up procedures for the SC4812ET Lite stand-alone and companion frames for both the North American version and the International version. If directions are different for either version, they are called out within the procedure. Please pay attention to all cautions and warning statements in order to prevent accidental injury to personnel.

NOTE	Unless otherwise noted, all procedures in this section are to be followed for *each frame* at a site.

Required Tools

The following tools are used in the procedures.

- Clamp-on DC current probe (600 A capability with jaw size to accommodate 2/0 cable).
- Digital Multimeter (DMM) with standard 2mm (.080”) tip probes
- Hot Air Gun - (optional for part of the Alarm Verification)

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 six RX cables
- Transmit RF cabling - up to six TX cables
- For companion frame installations, inter-frame RX diversity cabling - six RX cables

NOTE	For DC 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 shelf circuit breakers (Figure 2-3) for unused battery positions are set to **OFF** (pulled out) before and during the entire power up process. Leave these breakers in the **OFF** position when leaving the site.

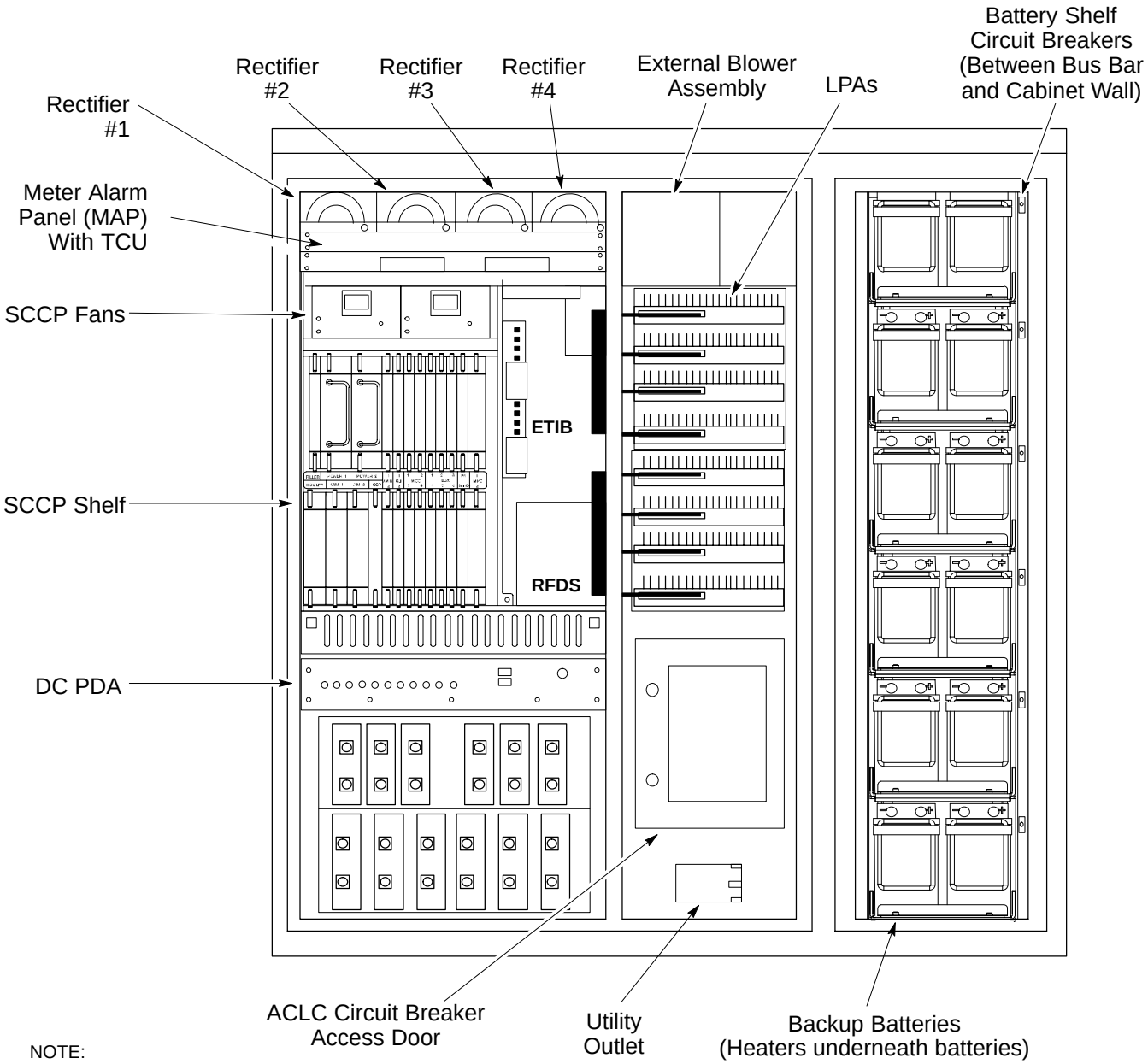
Table 2-2: Initial Inspection and Setup

Step	Action
1	Be sure that the facility circuit breaker controlling external AC power supplied to the frame is set to **OFF.**
2	Be sure that *all* AC Load Center (ACLC) (Figure 2-4 or Figure 2-5), *all* DC Power Distribution Assembly (PDA) (Figure 2-6), and *all* battery shelf circuit breakers (Figure 2-3) are set to **OFF**.

. . . continued on next page

Table 2-2: Initial Inspection and Setup	
Step	**Action**
3	Confirm that the Meter Alarm Panel (MAP) POWER switch and all LEDs (Figure 2-9) are **OFF**. If any LEDs are lighted, re-check and turn **OFF** *all* battery shelf circuit breakers.
4	If a heat source was placed in the RF compartment to prevent condensation prior to BTS power-up, turn off the heat source and remove it and any associated cabling from the BTS before proceeding.
5	Verify that the external AC power supply is correctly connected to the ACLC input by performing the procedure in Table 2-4.

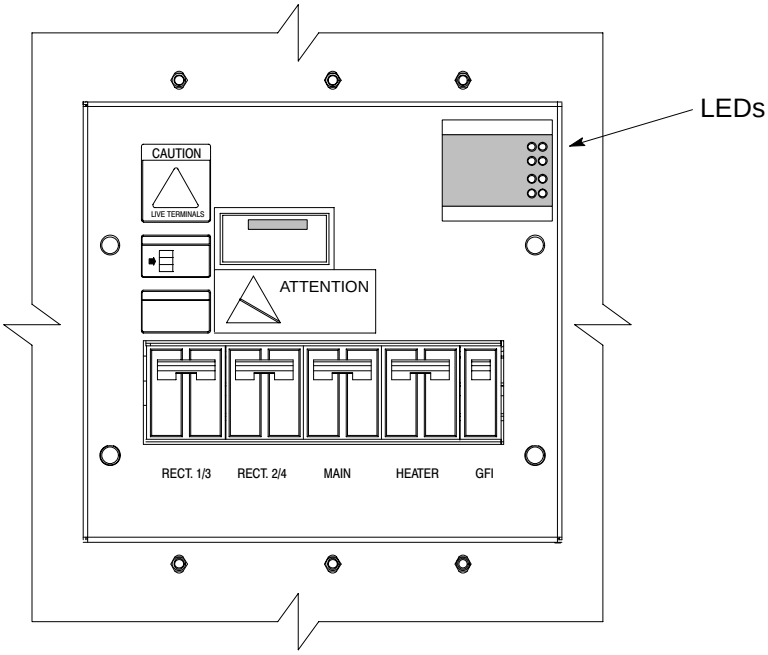
Figure 2-3: Frame Power Subassemblies, North American and International Cabinets



NOTE:
GFCI capability is built into the Utility Outlet of the North American Cabinet.
GFCI capability is built into the circuit breakers of the International Cabinet

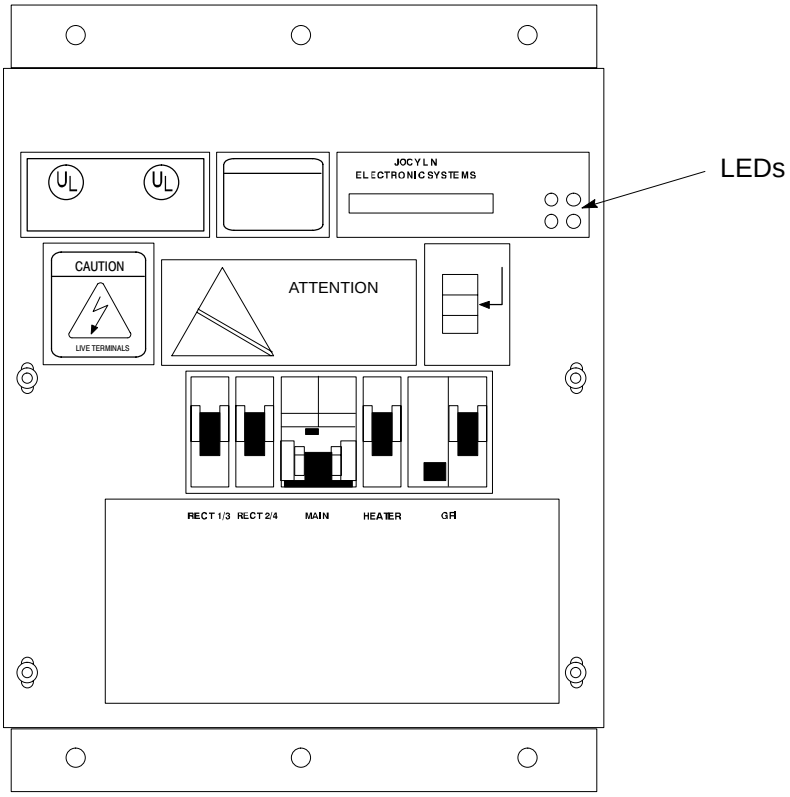
SC4812ETL0002-4

Figure 2-4: ACLC Circuit Breaker Panel - North American



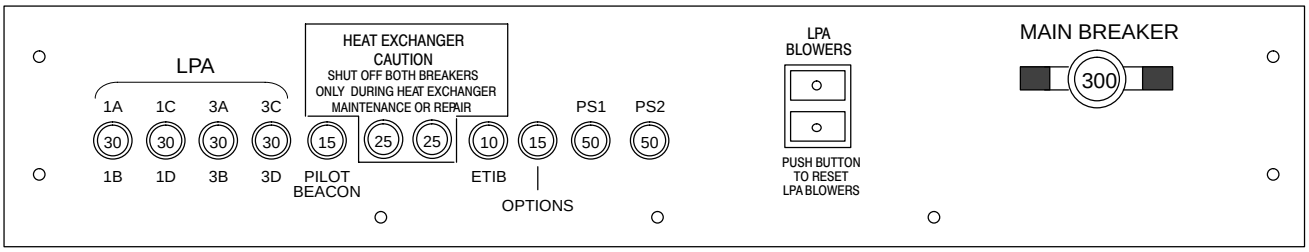
SC4812ETL0008-1

Figure 2-5: ACLC Circuit Breaker Panel - International



SC4812ETL0008-29

Figure 2-6: DC PDA



SC4812ETL0009-3

DC Power System Pre-power Application Test

Before applying any power to the BTS frame, follow the procedure in Table 2-3 to verify there are no shorts in the DC power distribution system.

NOTE	The procedure in Table 2-3 is required only on initial frame power-up or following maintenance when any major power components (e.g., ACLC, DC PDA, Meter Alarm Panel) were replaced or internal DC power cables were disconnected.

Table 2-3: DC Power System Pre-Power Application Test

Step	Action
1	*Physically verify all* ACLC front-panel circuit breakers (Figure 2-4) are **OFF** (down), *all* DC PDA circuit breakers (Figure 2-6) are set to **OFF** (pulled out), and *all* battery shelf circuit breakers (Figure 2-3) are **OFF** (pulled out).
2	Visually ensure that all AC rectifier modules (Figure 2-3) are *not* powered (DC, PWR, and bar graph LEDs *are not lighted*), that the MAP power switch (Figure 2-9) is **OFF**, and that no LEDs on the MAP are lighted.
3	Inside the battery compartment, measure the *voltage* between the + (red) and - (black) battery bus bars. There should be no 27 Vdc present.
4	**NOTE** Do not unseat the AC rectifier modules in the following step. Perform the following:
4a	- *In the frame RF compartment*, unseat all circuit boards/ modules (except CCD and CIO cards) in the SCCP shelf, but leave them in their respective slots.
4b	- *In the frame LPA compartment*, disconnect the Linear Power Amplifier (LPA) cables from the compartment bulkhead feed-through connector.
5	Set the DMM to measure resistance, and inside the battery compartment, measure the resistance between the + (red) and - (black) battery bus bars. The resistance should measure $\geq$ **1 MΩ**.
6	Leave the DMM set to measure resistance, and insert the probes into the MAP VOLT and AMP TEST POINTS (Figure 2-9). Place the (+) DMM probe into the (-) AMP TEST POINT. Place the (-) DMM probe into the (-) VOLT TEST POINT. Resistance should measure greater than **750 Ω**.

. . . continued on next page

Table 2-3: DC Power System Pre-Power Application Test	
Step	**Action**
7	On the DC PDA, set the MAIN BREAKER to the **ON** position by pushing it in. Resistance between the MAP (-) VOLT TEST POINT and the (-) AMP TEST POINT should measure between **300 Ω** minimum **900 Ω** maximum.
8	Before proceeding, be sure the SCCP shelf power/converter modules PS1 and PS2 are correct by verifying that the locking/retracting tabs appear as follows: - STPN4009 PWR CONV CDMA RCVR (in +27 volt systems) **! CAUTION** Using the incorrect type of power/converter modules will damage the module, the SCCP shelf, and other modules installed in the SCCP shelf.
9	**NOTE** In the following steps, if the DMM reads between **300 Ω** minimum and **900 Ω** maximum after inserting any board/module, a low impedance problem probably exists in that board/module. Replace the suspect board/module and repeat the test. If test still fails, isolate the problem before proceeding. Insert and lock the PS1 DC-DC converter module into its slot, and and turn **ON** the PS1 DC circuit breaker on the DC PDA.
10	Resistance between the MAP (-) VOLT TEST POINT and the (-) AMP TEST POINT should typically increase as capacitors charge, finally measuring between **300 Ω** minimum and **900 Ω** maximum.
11	Repeat steps 9 and 10 for the PS2 converter module/circuit breaker and all other remaining modules in the SCCP shelf.
12	On the DC PDA, set the LPA 1A-1B circuit breaker to the **ON** position *by pushing it in,* and repeat step 10.
13	Repeat step 12 for each of the three remaining LPA circuit breakers.
14	*Carefully* reconnect each LPA cable *one at a time*. Repeat step 10 after reconnecting each cable. - A typical response is that the ohmmeter will steadily climb in resistance as module input capacitors charge, finally indicating between **300 Ω** minimum and **900 Ω** maximum.
15	Set the Pilot Beacon, *both* Heat Exchanger, ETIB, and Options circuit breakers to **ON** *one at a time*. Repeat step 10 after pushing in each circuit breaker.
16	Set all DC PDA circuit breakers to **OFF** (pulled out).

External AC Power Connection Verification

Following verification of frame DC power system integrity, external AC power connections must be verified. To accomplish this, the series of AC voltage measurements specified in Table 2-4 is required.

CAUTION	Failure to properly connect the external AC power cable will damage the surge protection module inside the ACLC.

Table 2-4: AC Voltage Measurements

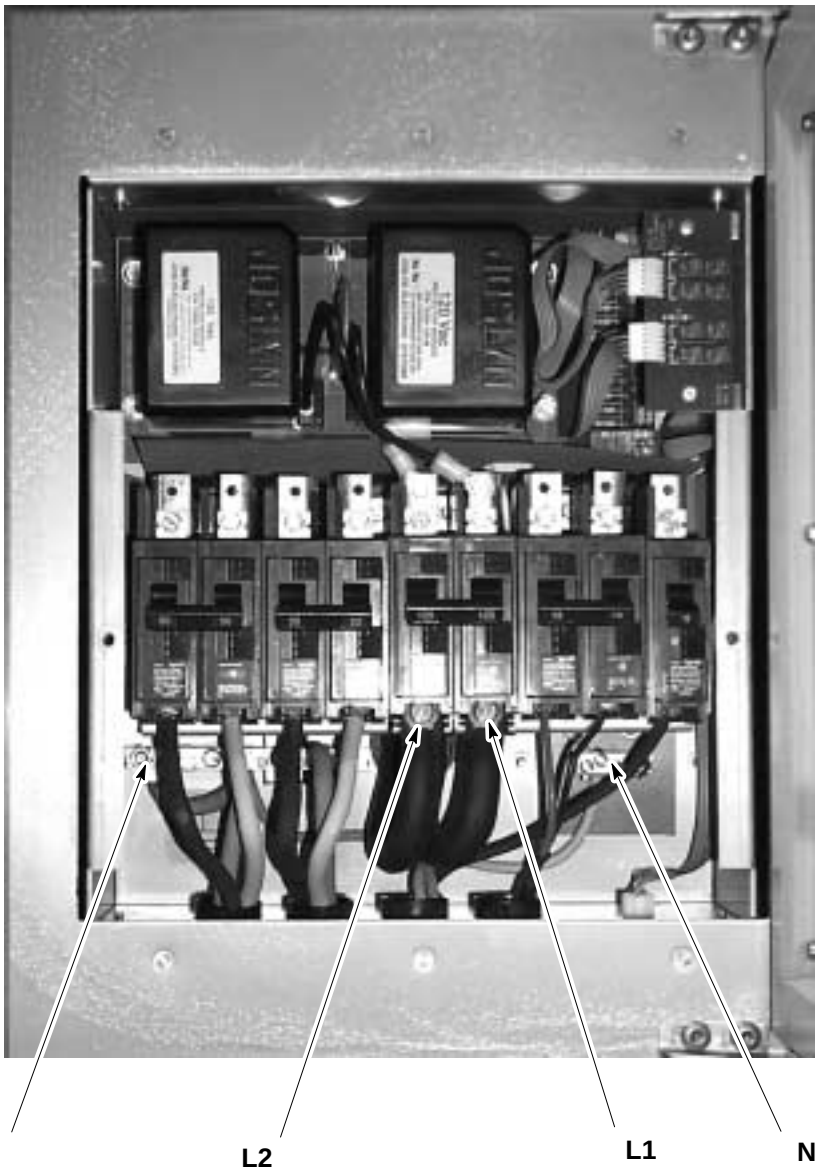
Step	Action
1	**NOTE** This procedure is required only after external AC power wiring has been initially connected or removed and reconnected to the frame. **△ WARNING** Ensure the frame is *unpowered* by setting the facility circuit breaker controlling external AC power supplied to the frame to **OFF**. *Physically verify all* DC PDA circuit breakers are set to **OFF** (pulled out), and *all* battery shelf circuit breakers are **OFF** (pulled out).
2	Open the ACLC circuit breaker access door, and set all ACLC circuit breakers to **OFF** (down).
3	Remove the four screws securing the ACLC front panel assembly, and remove the ACLC front panel assembly to gain access to the AC circuit breaker input terminals (Figure 2-8).
4	Apply external AC power to the frame by setting the facility circuit breaker to **ON**.
5	**△ WARNING** *Do not* perform the following steps while wearing an anti-static wrist strap. Serious personal injury can result from accidently shorting high voltage or high current circuits to ground. **! CAUTION** **North AMERICAN Cabinet only:** If the AC voltages measured in the following steps exceed 120 V when measuring from terminals L1 or L2 to neutral or ground, **STOP** and DO NOT proceed until the cause of the higher voltages are determined. The frame will be damaged if the Main breaker is turned on with excessive voltage on the inputs. Measure the AC voltage from terminal L1 to neutral. North American Cabinet: - Voltage should be in the nominal range of 115 to 120 Vac. International Cabinet: - Voltage should be in the nominal range of 210 to 240 Vac.
6	Measure the AC voltage from terminal L1 to ground. North American Cabinet: - Voltage should be in the nominal range of 115 to 120 Vac. International Cabinet: - Voltage should be in the nominal range of 210 to 240 Vac.
7	Steps 7a through 7c apply to the North American cabinet only. If working on a International cabinet continue to step 8.

. . . continued on next page

Table 2-4: AC Voltage Measurements

Step	Action
7a	- Measure the AC voltage from terminal L2 to neutral on the North American cabinet. -- Voltage should be in the nominal range of 115 to 120 Vac.
7b	- Measure the AC voltage from terminal L2 to ground on the North American cabinet. -- Voltage should be in the nominal range of 115 to 120 Vac.
7c	**! CAUTION** If the AC voltages measured (on the North American cabinet) in the following step exceeds 240 V when measuring between terminals L1 and L2**, STOP** and DO NOT proceed until the cause of the higher voltages are determined. The frame will be damaged if the Main breaker is turned on with excessive voltage on the inputs. - Measure from terminal L1 to terminal L2. -- Voltage should be in the nominal range from 208 to 240 Vac.
8	Remove external AC power from the frame by setting the facility circuit breaker to **OFF**.
9	Install the ACLC front panel assembly and secure with the four screws removed in step 1.
10	Apply external AC power to the frame by setting the facility circuit breaker to **ON**.

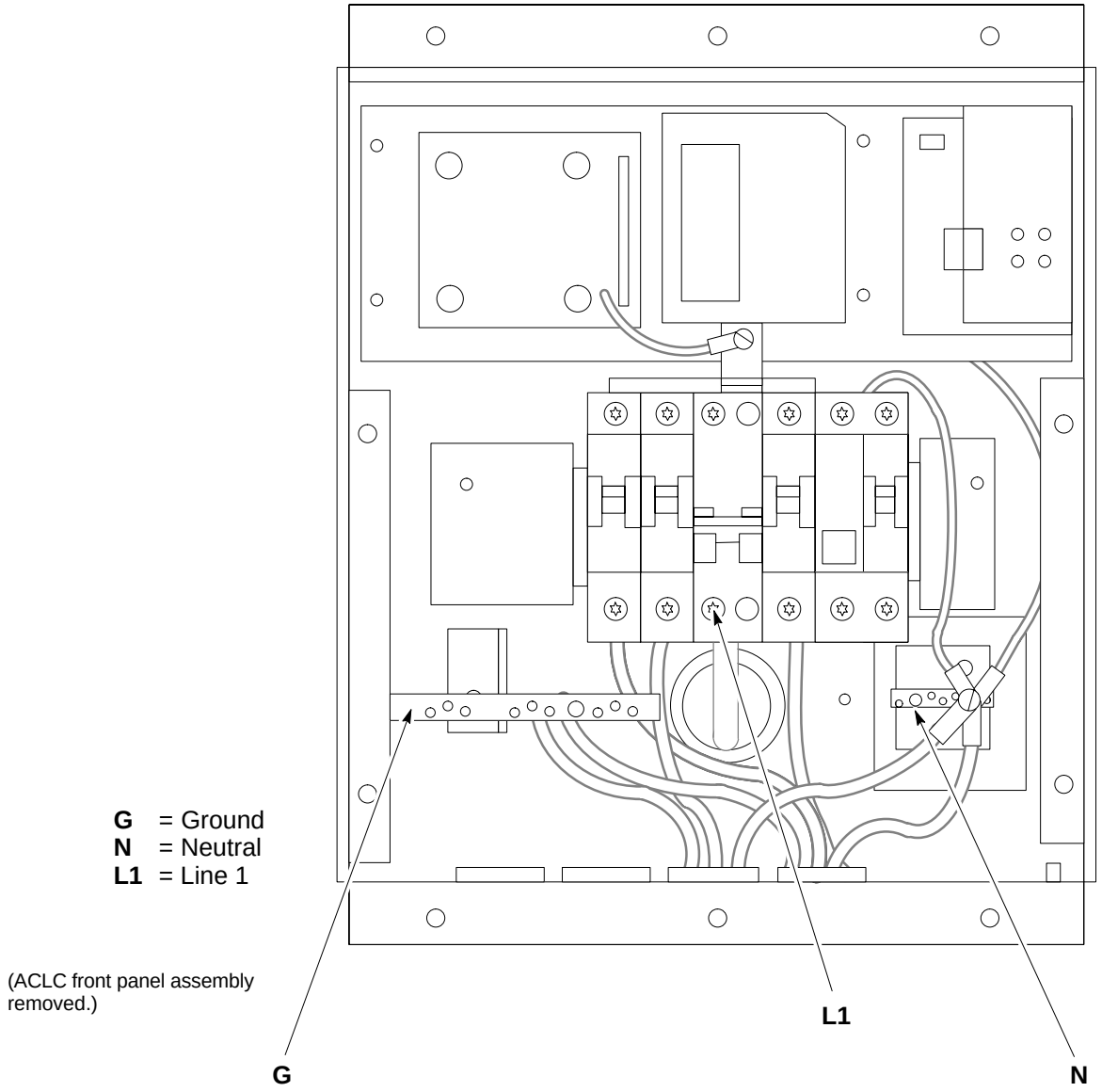
Figure 2-7: ACLC Voltage Measurement Probe Points - North American



G = Ground
N = Neutral
L1 = Line 1
L2 = Line 2

(ACLC front panel assembly removed.)

Figure 2-8: ACLC Voltage Measurement Probe Points - International



Applying AC Power

Once the external AC power connections are verified, AC power may be applied internally to the frame. Table 2-5 provides the procedure for applying internal AC power.

Table 2-5: Applying Internal AC Power

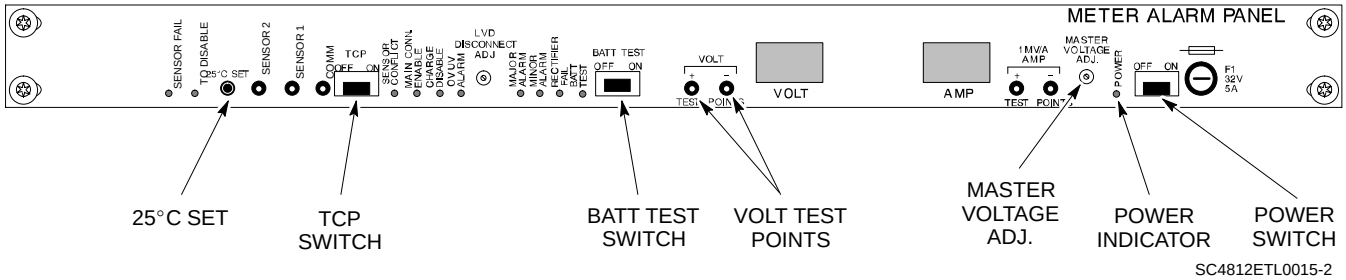
Step	Action
1	Be sure the requirements of Table 2-4 for AC input power connection verification have been met.
2	Be sure *all* DC PDA circuit breakers are set to **OFF** (pulled out), *all* ACLC front-panel circuit breakers are **OFF** (down), and *all* battery shelf circuit breakers are **OFF** (pulled out).
3	Be sure the MAP power switch, TCP switch, and BATT TEST switch are all set to **OFF**.

. . . continued on next page

2

Table 2-5: Applying Internal AC Power	
Step	**Action**
4	*If it has not already been done*, set the facility circuit breaker supplying AC power to the frame to **ON**.
5	Set the ACLC MAIN circuit breaker **ON**. - For the North American cabinet: Observe that all eight (8) green LEDs on the front of the ACLC are illuminated (Figure 2-4). - For the International cabinet: Observe that all four (4) green LEDs on the front of the ACLC are illuminated (Figure 2-5).
6	On the ACLC, set RECT. 1/3 and then RECT. 2/4 branch circuit breakers **ON**. All the installed rectifier modules (Figure 2-3) will start up, and the green DC and PWR LEDs should light on each.
7	Set the MAP power switch to **ON**. The MAP VOLT display should read 27.4 $\pm$ 0.2 VDC with the TCP switch **OFF**. **! CAUTION** Once power is applied to the MAP, be careful not to short either of the VOLT TEST POINTS to ground. Failure to comply will result in severe damage to the MAP.
8	On the MAP, set the TCP switch (Figure 2-9) to **ON**. Verify no alarm LEDs are lighted on the MAP. **NOTE** Depending on battery compartment temperature, the rectifier voltage displayed on the MAP VOLT indicator may change by as much as $\pm$1.5 V when the TCP is set to on.
9	Check the rectifier current bar graph displays (green LED display on the rectifier module). None should be lighted at this time.
10	If batteries are fitted, set the ACLC HEATER circuit breaker to **ON**. **NOTE** The GFCI AC circuit breaker should remain **OFF** *unless* the GFCI outlet is in use.

Figure 2-9: Meter Alarm Panel (MAP)



DC Power Application and Testing

Table 2-6 lists the step-by-step instructions for applying DC power and ensuring the DC power system components are correctly functioning.

Table 2-6: DC Power Application and Tests

Step	Action
1	Be sure *all* DC PDA and battery shelf circuit breakers are **OFF** (pulled out).
2	Be sure the procedures in Table 2-3 (if applicable) and Table 2-5 have been performed.
3	**! CAUTION** When measuring voltage at the VOLT TEST POINTS, be careful not to short either of the test points to ground. Failure to comply will result in severe damage to the MAP. Measure voltage at the MAP VOLT TEST POINTS while pressing the 25° C SET button (Figure 2-9). The voltage should read 27.4 ± 0.2 Vdc. Adjust with the MASTER VOLTAGE ADJ. on the MAP, if necessary, to obtain an indicated 27.4±0.2 Vdc. Release the 25° C SET button.
4	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.
5	Inside the battery compartment, measure the voltage between the cable connection point at the bottom of the + (red) battery bus bar and chassis ground, observing that the polarity is correct. The voltage should be the same as the measurement in step 4.
6	Measure the voltage between the + (red) and - (black) battery bus bars in the battery compartment. Place the probe at the bottom of the bus bars where the cables are connected. The DC voltage should measure the same as in step 4.
7	Close (push in) DC PDA MAIN BREAKER.
8	*On the DC PDA(Figure 2-6)*, set the PS1 and PS2 circuit breakers to the **ON** position by pushing them in one at a time while observing the rectifier output current indicated on the MAP AMP display. - The display should indicate between 20 and 60 amps.
9	*On the DC PDA)*, set the *remaining* circuit breakers to the **ON** position by pushing them in one at a time *in the following sequence*: 1. LPA (four circuit breakers, labeled **1A-1B** through **3C-3D**). 2. HEAT EXCHANGER (two circuit breakers) 3. ETIB 4. PILOT BEACON 5. OPTIONS
10	Confirm that the MAP AMP display continues to indicate between 20 and 60 amps during the initial power application. **NOTE** No battery charging or heavy RF loading is present at this point.
11	*If the frame is not equipped with the pilot beacon option*, set the PILOT BEACON circuit breaker to **OFF**.

Battery Charge Test (Connected Batteries)

Table 2-7 lists the step-by-step instructions for testing the battery charging performance.

Table 2-7: Battery Charge Test (Connected Batteries)

Step	Action
1	Close the battery shelf circuit breakers (Figure 2-3) for connected batteries *only.* This process should be completed quickly to avoid individual battery strings drawing 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 occurs, disconnect the batteries from the 27Vdc bus by setting the MAP power switch to **OFF**, and then engage all the connected battery circuit breakers. The MAP power switch should then be turned **ON**.
2	Using the clamp-on DC current probe and DMM, measure the current in each of the battery string connections to the battery bus bars. 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. **NOTE** The MAP AMP display will indicate the total current output of the rectifiers during this procedure. As an alternative, the bar graph meters on the AC rectifier modules can be used as a rough estimate of the total battery charge current. Each rectifier module bar graph has eight (8) LED elements to represent the output current. Each illuminated LED element indicates that approximately 12.5% (1/8 or 8.75 Amps) of an individual rectifier's maximum current output (70 Amps) is flowing. **RECTIFIER BAR GRAPH EXAMPLE:** **Question:** A system fitted with three (3) rectifier modules each have three bar graph LED elements illuminated. What is the total output current into the batteries? **Answer:** Each bar graph is indicating approximately 12.5% of 70 amps, therefore, 3 x 8.75 equals 26.25 amps per rectifier. As there are three rectifiers, the total charge current is equal to (3 x 26.25 A) 78.75 amps. This charge current calculation is only valid when the RF and LPA compartment electronics are not powered on, and the RF compartment heat exchanger is turned off. This can only be accomplished if the DC PDA MAIN BREAKER is set to **OFF**.
3	The current in each string should be approximately equal (within $\pm$ 5 amps).
4	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 amps.
5	Recheck the DC output voltage. It should remain the same as measured in step 4 of the frame DC Power Application and Test (Table 2-6). **NOTE** If discharged batteries are installed, the MAP AMP display may indicate approximately 288 amps for a two-carrier frame (four rectifiers) or 216 amps for a single-carrier frame (three rectifiers). Alternately, all bar graph elements may be lighted on the rectifiers during the charge test. Either indication shows that the rectifiers are at full capacity and are rapidly charging the batteries. It is recommended in this case that the batteries are allowed to charge and stabilize as in the above step before commissioning the site. This could take several hours.

Battery Discharge Test

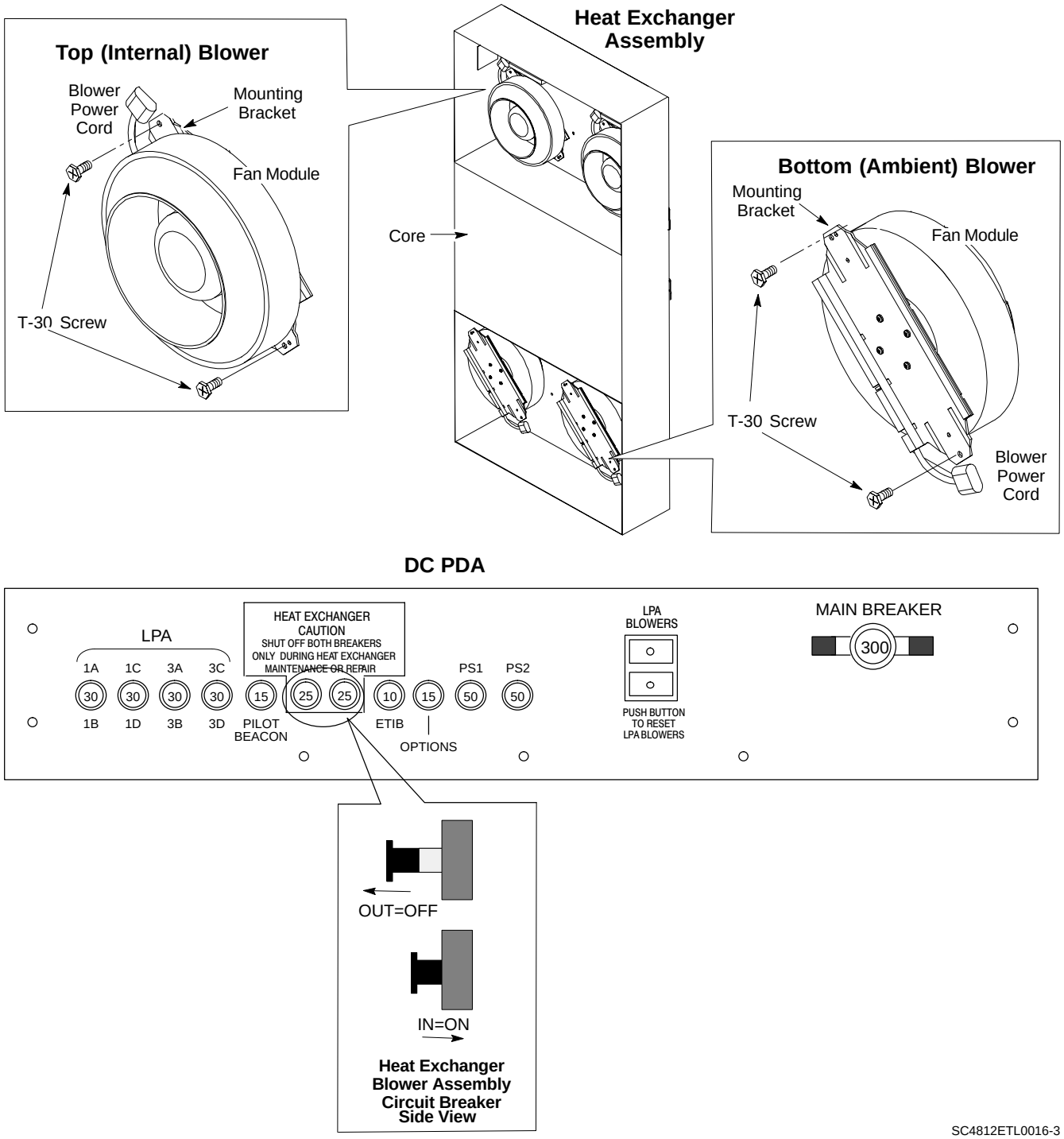
Perform the test procedure in Table 2-8 only when the battery current is less than 5 Amps per string. Refer to Table 2-7 on the procedures for checking current levels.

Table 2-8: Battery Discharge Test

Step	Action
1	Turn the BATT TEST switch on the MAP **ON** (Figure 2-9). The rectifier output voltage and current should decrease by approximately 10% as the batteries assume the load. Alarms for the MAP may occur.
2	Measure the individual battery string current using the clamp-on DC current probe and DMM. The battery discharge current in each string should be approximately the same (within $\pm$ 5 amps).
3	Turn BATT TEST switch **OFF**.

CAUTION Failure to *turn off* the MAP BATT TEST switch before leaving the site will result in low battery capacity and reduce battery life.

Figure 2-10: Heat Exchanger Blower Assembly and Circuit Breakers



Power Removal

Power Removal Procedures

Power removal from an SC4812ET Lite BTS frame is accomplished in the following two-stage sequence:

1. DC power removal
2. AC power removal

Some maintenance, upgrade, or other activities may only require removing DC power. In those situations where *all* power must be removed from a frame, shutting down AC power will also be required.

Remove DC Power

If it becomes necessary to remove DC power from the frame, refer to Figure 2-6 and follow the procedure in Table 2-9.

Table 2-9: DC Power Removal

Step	Action
1	Set all DC PDA circuit breakers to **OFF** (pulled out) in the following sequence: 1. LPA (four circuit breakers, labeled **1A-1B** through **3C-3D**) 2. PILOT BEACON 3. HEAT EXCHANGER (two circuit breakers) 4. ETIB 5. OPTIONS 6. PS1 and PS2 7. MAIN BREAKER
2	△ **WARNING** The surge capacitors in the DC PDA will store a large electrical charge for long periods of time. Failure to discharge these capacitors as specified in this step could result in serious personal injury or damage to equipment. On the DC PDA, set the PS1 and PS2 circuit breakers to **ON** (pushed in), and *wait at least 30 seconds*.
3	Set the DC PDA PS1 and PS2 circuit breakers to **OFF**.
4	Set the MAP power switch to **OFF**.

AC Power Removal

If it is necessary to remove *all* power from a frame, refer to Figure 2-4 or Figure 2-5, and follow the procedure in Table 2-10.

Table 2-10: AC Power Removal

Step	Action
1	Remove DC power from the frame by following the procedure in Table 2-9.
2	Set all ACLC circuit breakers to **OFF** (down) in the following sequence: 1. GFI 2. HEATER 3. RECT. 2/4 4. RECT. 1/3 5. MAIN
3	Set the facility circuit breaker controlling external power to the frame to **OFF**.

Power Application - Normal Power-up

Power Application Procedures

After the first power application, applying power to a BTS frame does not require performing the voltage and resistance measurements called out in the initial power-up procedure. The only exception to this is after maintenance when any major power system components were replaced. Major power system components include:

- ACLC
- DC PDA
- MAP
- Internal DC power cables

Normal power application to a BTS frame is accomplished in the following two-stage sequence:

1. AC power application
2. DC power application

Applying Internal AC Power

To apply AC power to a BTS frame, refer to Figure 2-4 or Figure 2-5, and follow the procedure in Table 2-11.

Table 2-11: Apply AC Power to BTS Frame

Step	Action
1	If the external AC power leads for the BTS frame were disconnected and reconnected, perform the procedure in Table 2-4 before proceeding further.
2	Be sure *all* DC PDA circuit breakers are set to **OFF** (pulled out), *all* ACLC front-panel circuit breakers are **OFF** (down), and *all* battery shelf circuit breakers are **OFF** (pulled out).
3	Be sure the MAP power switch, TCP switch, and BATT TEST switch are all set to **OFF** (Figure 2-9).
4	*If it has not already been done*, set the facility circuit breaker supplying AC power to the frame to **ON**.
5	Set the ACLC MAIN circuit breaker **ON**. - For the North American cabinet: Verify that all eight (8) green LEDs on the front of the ACLC are illuminated (Figure 2-4). - For the International cabinet: Verify that all four (4) green LEDs on the front of the ACLC are illuminated (Figure 2-5).
6	On the ACLC, set RECT. 1/3 and then RECT. 2/4 branch circuit breakers **ON**. - All the installed rectifier modules (Figure 2-3) will start up, and the green DC and PWR LEDs should light on each. **NOTE** In a BTS configured for single-carrier operation (rectifier #4 not installed), a minor alarm may be generated if the RECT. 2/4 circuit breaker is engaged before the RECT. 1/3 circuit breaker.

. . . continued on next page

Table 2-11: Apply AC Power to BTS Frame	
Step	**Action**
7	Set the MAP power switch to **ON**. - The MAP VOLT display should read 27.4 ± 0.2 VDC with the TCP switch set to **OFF**. **! CAUTION** Once power is applied to the MAP, be careful not to short either of the VOLT TEST POINTS to ground. Failure to comply will result in severe damage to the MAP.
8	On the MAP, set the TCP switch (Figure 2-9) to **ON**. - Verify no alarm LEDs are lighted on the MAP. **NOTE** Depending on battery compartment temperature, the rectifier voltage displayed on the MAP VOLT indicator may change by as much as ±1.5 V when the TCP is set to on.
9	Check the rectifier current bar graph displays (green LED display on the rectifier module). - None should be lighted at this time.
10	If batteries are fitted, set the ACLC HEATER circuit breaker to **ON**. **NOTE** The GFCI AC circuit breaker should remain **OFF** *unless* the GFCI outlet is in use.

Apply DC Power

Refer to Figure 2-6 and follow the procedure in Table 2-12 to apply DC power to a BTS frame.

Table 2-12: Apply DC Power to BTS Frame	
Step	**Action**
1	Be sure *all* DC PDA and battery shelf circuit breakers are **OFF** (pulled out).
2	*If it has not already been done*, apply AC power to the frame by following the procedure in Table 2-11.
3	Close (push in) DC PDA MAIN BREAKER.
4	*On the DC PDA(Figure 2-6)*, set the PS1 and PS2 circuit breakers to the **ON** position by pushing them in one at a time while observing the rectifier output current indicated on the MAP AMP display. - The display should indicate between 20 and 60 amps.
5	*On the DC PDA)*, set the *remaining* circuit breakers to the **ON** position by pushing them in one at a time *in the following sequence*: 1. LPA (four circuit breakers, labeled **1A-1B** through **3C-3D**) 2. HEAT EXCHANGER (two circuit breakers) 3. ETIB 4. (If Pilot Beacon option is installed) PILOT BEACON 5. OPTIONS

. . . continued on next page

Table 2-12: Apply DC Power to BTS Frame	
Step	**Action**
6	Confirm that the MAP AMP display continues to indicate between 20 and 60 amps during power application. **NOTE** No battery charging or heavy RF loading is present at this point.
7	If the frame is equipped with back-up batteries, close (push in) the battery shelf circuit breakers (Figure 2-3) for connected batteries *only.* This process should be completed quickly to avoid excess charge current draw by individual battery strings. **NOTE** If the batteries are sufficiently discharged, the battery circuit breakers may not engage individually because of surge current. If this condition occurs, disconnect the batteries from the 27Vdc bus by setting the MAP power switch to **OFF**, and then engage all the connected battery circuit breakers. The MAP power switch should then be turned **ON**.

Notes

Chapter 3

Optimization/Calibration

Optimization/Calibraton - Introduction

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 a text editor to view the ”CAVEATS” section of the ”readme.txt” file in the c:\wlmf folder for any applicable information.

3

Optimization Process Overview

After a BTS is physically installed and the preliminary operations, such as power up, have been completed, the LMF is used to optimize the BTS. Companion frames must be optimized individually as separate BTSs. The basic optimization process consists of the following:

- Download MGLI (GLI-*bts#*-1) with application code and data and then enable MGLI.
- Use the LMF status function and verify that all of the installed devices of the following types respond with status information: CSM, BBX, GLI, MCC8, and, if RFDS is installed, TSU or RFDS-1X RPROC. 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 must be corrected before the device can be accessed by the LMF.
- Download device application code and data to all devices of the following types:
  - CSM
  - BBX
  - Remaining GLI (GLI-*bts#*-2)
  - MCC
- Download the RFDS TSIC or RFDS-1X RPROC (if installed).
- Verify the operation of the GPS and HSO signals.
- Enable the following devices (in the order listed):
  - Secondary CSM (slot CSM 2)
  - Primary CSM (slot CSM 1)
  - All MCCs
- Using the LMF test equipment selection function, select the test equipment to be used for the calibration.
- Calibrate the TX and RX test cables if they have not previously been calibrated with the LMF computer and software build which will be used for the optimization/calibration. Cable calibration values can be entered manually, if required.
- Connect the required test equipment for a full optimization.
- 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, troubleshoot and correct the problem causing 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, troubleshoot and correct the problem causing 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). Sector/Sector sites are the three-sector configuration. The SC4812ET Lite does not support six-sector operation. Each cell site type has unique characteristics and must be optimized accordingly.

Configuration Data File (CDF)

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 unreliable or improper site operation.

The Configuration Data File (CDF), also called the Cell-site Data File, includes the following information:

- Download instructions and protocol
- Site specific equipage information
- SCCP shelf allocation plan
  - BBX equipage (based on cell-site type) including IS-95A/B or CDMA2000 1X capability and redundancy
  - CSM equipage including redundancy
  - Multi Channel Card 24E, 8E, or -1X (MCC24E, MCC8E, or MCC-1X) channel element allocation plan. This plan indicates how the SCCP shelf is configured, and how the paging, synchronization, traffic, and access channel elements (and associated gain values) are assigned among the (up to 4) MCC24Es, MCC8Es, and/or MCC-1Xs in the shelf.
- 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, antenna gain and antenna feed line loss can be combined to calculate the required transmit power at the frame antenna connections. The corresponding BBX output power required to achieve that power level on any channel/sector can then be determined based on Bay Level Offset (BLO) data established during the optimization process.

NOTE	Refer to the Figure 3-1 and the *LMF Help function on-line documentation* for additional information on the layout of the LMF directory structure (including CDF file locations and formats).

The CDF should be obtained from the CBSC. It can be provided on a DOS-formatted diskette, or, if the LMF computer has file transfer protocol (ftp) capability, through an ftp download. Refer to the *LMF Help function on-line documentation* for more information.

CDF Site Equipage Verification

If it has not already been done, review and verify the site equipage data in the CDF with the actual site hardware and the site engineering documentation. Use a text editor to view the CDF contents.

CAUTION	- Use extreme care not to make any changes to the CDF content while viewing the file. Changes to the CDF can cause the site to operate unreliably or render it incapable of operation. - Always wear an approved anti-static 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 packaging in which it was shipped.

BTS Software Release Download

The correct device initialization code (ROM code) for the Software Release being used by the Base Station System (BSS) (for example R16.0.x) must be successfully downloaded to the BTS processor boards before optimization can be performed. Device initialization code is normally downloaded to the processor boards from the CBSC using the DownLoad Manager (DLM). For optimization, device application code (RAM code) and data is loaded at the cell site from the LMF computer.

Preparing the LMF

Overview

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 application program on CD ROM
- Configuration Data File (CDF) for each supported BTS (on floppy disk or CD ROM)
- CBSC File for each supported BTS (on floppy disk or CD ROM)

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

LMF Installation and Update Procedures

NOTE	First Time Installation Sequence: 1. Install Java Runtime Environment (JRE) 2. Install U/WIN K-shell emulator 3. Install LMF application programs 4. Install/create BTS folders

Follow the procedure in Table 3-1 to install the LMF application program using the LMF CD ROM.

Table 3-1: CD ROM Installation

Step	Action
1	Insert the LMF CD ROM disk into your disk drive and perform the following as required:
1a	- If the Setup screen appears, follow the instructions displayed on the screen.
1b	- If the Setup screen is not displayed, proceed to Step 2.
2	Click on the **Start** button
3	Select **Run.**
4	Enter **d:\autorun** in the Open box and click **OK.** **NOTE** *(If applicable, replace the letter **d** with the correct CD ROM drive letter.)*
5	Follow the directions displayed in the **Setup** screen.

LMF Home Directory

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

The 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 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 LMF home directory is located

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

Copy CBSC CDF Files to the LMF Computer

Before logging on to a BTS with the LMF computer 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.

NOTE	When copying CDF files, comply with the following to prevent BTS login problems with the Windows 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 Windows 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 3-2 lists the steps required to transfer the CDF files from the CBSC to the LMF computer. For further information, refer to the *LMF Help function on-line documentation*.

Table 3-2: Copying CBSC CDF Files to the LMF Computer

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 the **Enter** key.
4	Type **mount** and press the Enter key. **NOTE** • Look for the *"floppy/no_name"* message on the last line displayed. • If the **eject** command was previously entered, *floppy/no_name* will be appended with a number. Use the explicit *floppy/no_name* reference displayed when performing step 7.
5	Change to the directory, where the files to be copied reside, by typing **cd <directoryname>** (e.g., **cd bts-248**) and pressing the **Enter** key.
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/no_name**).
8	Repeat steps 5 through 7 for each bts-# which must be supported by the LMF computer.
9	When all required files have been copied to the diskette type **eject** and press the **Enter** key.
10	Remove the diskette from the CBSC 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 *MS Windows* Explorer, create a corresponding bts-# folder in the **<*x*>:\<*lmf home directory*>\cdma** directory for each **bts-#.cdf** /**cbsc-#.cdf** file pair copied from the CBSC.
14	Use *MS Windows* Explorer to transfer the **cbsc-#.cdf** and **bts-#.cdf** files from the diskette to the corresponding **<*x*>:\<*lmf home directory*>\cdma\bts-#** folders created in step 13.

Software Release 2.16.0.x Hardware Binary Files

Follow the procedure in Table 3-3 to make certain the correct R16.0 ROM and RAM code files and device data files are loaded on the LMF computer.

Table 3-3: Verify Software Release 2.16.0.x Device Binary Files Are Installed

Step	Action
1	If it has not been done previously, install the LMF software on the LMF computer in accordance with Table 3-1.
2	If it is not running, start the *MS Windows* operating system on the LMF computer. If the computer is running and the LMF is logged into a BTS, logout and exit the program.
3	Start *MS Windows* Explorer from the *Windows* desktop by selecting **Start > Programs > Windows Explorer**.
4	In the left-hand pane of *MS Windows* Explorer, locate the <*lmf home directory*> folder on ***x*:** drive (installation default is c:\wlmf), and expand it (click on the "+" symbol next to the folder) to display the **cdma** and **help** folders.
5	Expand the **cdma** folder, locate the **loads** folder, and expand it.
6	Determine if there is a **2.16.0.x.x** folder with final numbers as specified for the software release used in the BSS (for example, *2.16.0.84.4*). - If no folder of the correct revision level exists, obtain the latest Software Release 2.16.0.**x.x** device binary files from Motorola and copy them onto the LMF computer in the **<*x*>:\<*lmf home directory*\cdma\loads**<*codeload#*> directory. - If a <*codeload#*> folder of the correct revision level exists, proceed to step 7.
7	Expand the **2.16.0.x.x** folder to display the **code** and **data** folders.
8	In the left-hand pane, click on the **code** folder, and in the right-hand pane look for the following files, as applicable to the devices with which the BTS is equipped: • gli_ram.bin.0103 (RAM code file for GLI2 devices) • gli_rom.bin.0103 (ROM code file for GLI2 devices) • bbx_ram.bin.605 (RAM code for BBX2 devices) • bbx_rom.bin.605 (ROM code for BBX2 devices) • bbx_ram.bin.060A (RAM code for 800 MHz and 1.9 GHz BBX-1X devices) • bbx_rom.bin.060A (ROM code for 800 MHz and 1.9 GHz BBX-1X devices) • mcp_ram.bin.0c01 (RAM code for MCC8/MCC24E devices) • mcp_rom.bin.0c01 (ROM code MCC8/MCC24E devices) • mcp_ram.bin.0c04 (RAM code for MCC-1X devices) • mcp_rom.bin.0c04 (ROM code for MCC-1X devices)

. . . continued on next page

Table 3-3: Verify Software Release 2.16.0.x Device Binary Files Are Installed	
Step	**Action**
9	In the left-hand pane, click on the **data** folder, and in the right-hand pane look for the following file, as applicable to the installed GLIs: • gli.dds.0103 (data file for GLI2 devices) • bbx.dds.0605 (data file for BBX2 devices) • bbx.dds.060A (data file for BBX-1X devices) • mcp.dds.0c01 (data file for MCC8/MCC24E devices) • mcp.dds.0c04 (data file for MCC-1X devices)
10	If the required code and data files are not located on the LMF computer, obtain them from the network administrator and install them as outlined in the *LMF Help function*.
11	Close *MS Windows* Explorer.

Creating a Named HyperTerminal Connection for MMI Communication

Confirming or changing the configuration data of certain BTS Field Replaceable Units (FRU) requires establishing an MMI communication session between the LMF computer 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 3-4 to establish a named HyperTerminal connection and create a *Windows* desktop shortcut for it.

Table 3-4: Create HyperTerminal Connection	
Step	**Action**
1	From the *Windows* Start menu, select: **Programs > Accessories**
2	Select **Communications**, double click the **Hyperterminal** folder, and then double click on the **Hypertrm.exe** icon in the window which opens. **NOTE** • If a **Location Information Window** appears, enter the required information, then click on the **Close** button. (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 on **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**.

. . . continued on next page

Table 3-4: Create HyperTerminal Connection	
Step	**Action**
	NOTE For LMF computer configurations where COM1 is used by another interface such as test equipment and a physical port is available for COM2, select COM2 in the following step to prevent conflicts.
4	From the **Connect using:** pick list in the **Connect To** box displayed, select **Direct to Com 1** or **Direct to Com 2** for the RS-232 connection port, 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 the **Yes** button to disconnect when prompted.
10	If the **Hyperterminal** *folder* window is still open, proceed to step 12.
11	Select **Communications** and double click the **Hyperterminal** folder.
12	Highlight the newly-created connection icon by clicking on it.
13	*Right click and drag* the highlighted connection icon to the Windows desktop and release the right mouse button.
14	From the popup menu which appears, 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.
16	Close the **Hyperterminal** *folder* window by selecting: **File > Close**