SC ™ 4812ET Optimization/ATP Manual

Software Release R16.1.x.x

800 and 1900 MHz

CDMA

PRELIMINARY

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Aug 2002
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SC™ 4812ET Optimization/ATP Manual

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FCC Requirements

Content

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

FCC Part 15 Requirements

Part 15.19a(3) - INFORMATION TO USER

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

Part 15.21 - INFORMATION TO USER

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

15.105(b) - INFORMATION TO USER

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

FCC Part 68 Requirements

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

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

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

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

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

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

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

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

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

Foreword

Scope of manual

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

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

Obtaining Manuals

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

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

Text conventions

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

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

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

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

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

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

Reporting manual errors

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

Motorola appreciates feedback from the users of our manuals.

Contact us

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

Motorola appreciates feedback from the users of our information.

Manual banner definitions

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

24-hour support service

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

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

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

General Safety

Remember! . . . Safety depends on you!!

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

Ground the instrument

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

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

Do not operate in an explosive atmosphere

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

Keep away from live circuits

Operating personnel must:

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

Do not service or adjust alone

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

Use caution when exposing or handling the CRT

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

Do not substitute parts or modify equipment

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

Dangerous procedure warnings

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

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

Revision History

Manual Number

68P09255A57-2

Manual Title

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

Version Information

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

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

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Chapter 1

Introduction

1

Introduction

Scope of This Document

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

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

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

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

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

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

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

Document Composition

This document covers the following major areas:

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

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

CDMA LMF Product Description

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

- Installation
- Maintenance
- Calibration
- Optimization

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

Online Help

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

Why Optimize?

Proper optimization and calibration assures:

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

What Is Optimization?

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

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

- The RX path starts at the ancillary equipment frame RFDS RX directional coupler antenna feedline port, through the RX input port

on the rear of the frame, through the DDRCs, Multicoupler Preselector Card (MPC), and additional splitter circuitry, ending at a CDMA Channel Processor (C-CCP) backplane Broad Band Transceiver (BBX) slot in the C-CCP shelf.

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

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

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

When to Optimize

New Installations

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

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

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

Site Expansion

Optimization is also required after expansion of a site.

Periodic Optimization

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

Repaired Sites

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

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

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Documentation Site Documents

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

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

Product Documentation

For other information, refer to the following manuals:

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

Test Equipment

Overview

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

Table 1-1: CDMA LMF Test Equipment Support Table

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

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

1

LMF Hardware Requirements

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

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

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

Test Equipment Guidelines

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

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

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

Test Equipment Calibration

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

Test Cable Calibration

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

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

Equipment Warm-up

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

- Communications test set
- Rubidium time base
- Power meter

Test Equipment List

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

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

10BaseT/10Base2 Converter

Ethernet LAN transceiver *(part of CGDSLMFCPQ1700)*

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

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

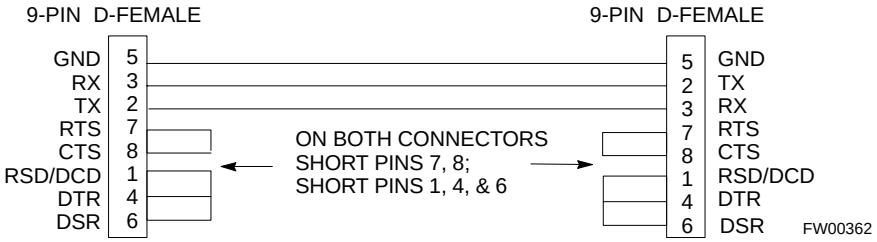
NOTE	Xircom model PE3-10B2 or equivalent can also be used to interface the LMF Ethernet connection to the frame.

RS-232 to GPIB Interface

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

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

Figure 1-1: Null Modem Cable Detail



Model SLN2006A MMI Interface Kit

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

Communications System Analyzer

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

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

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

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

GPIB Cables

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

Power Meter

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

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

Timing Reference Cables

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

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

- BNC "T" adapter with 50 ohm termination.

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

Digital Multimeter

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

Directional Coupler

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

RF Attenuators

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

Miscellaneous RF Adapters, Loads, etc

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

High-impedance Conductive Wrist Strap

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

RF Load (at least three for trunked cabinets)

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

RF Network Box (and calibrated cables)

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

Optional Equipment

Frequency Counter

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

Spectrum Analyzer

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

Local Area Network (LAN) Tester

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

Span Line (T1/E1) Verification Equipment

- As required for local application

RF Test Cable (if not Provided with Test Equipment)

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

Oscilloscope

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

2-way Splitter

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

High Stability 10 MHz Rubidium Standard

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

Abbreviations and Acronyms

Table 1-2: Abbreviations and Acronyms	
Acronym	**Definition**
ACLC	AC Load Center
ASU	Antenna Selection Unit
AMR	Alarm Monitor Reporting
ATP	Acceptance Test Plan
BBX	Broadband Transceiver
BLO	Bay Level Offset
BTS	Base Transceiver Subsystem
CBSC	Centralized Base Station Controller
C-CCP	Combined CDMA Channel Processor
CCD	CDMA Clock Distribution
cdf	command data file
CDMA	Code Division Multiple Access
CE	Channel Element
CHI	Concentration Highway Interface
CLI	Command Line Interface
CIO	Combiner Input/Output
CMR	Cellular Manual Revision
CSM	Clock Synchronization Manager
CSU	Clock Synchronization Unit
DBPF	Dual Bandpass Filter
DBM	Debug Monitor
DLM	Download Manager
DMAC	Digital Metering and Alarm Control (also see MAP)
DRDC	Duplexer/RX Filter/Directional Coupler
DSP	Digital Signal Processor
EMPC	Expansion Multicoupler Preselector Card
FRU	Field Replaceable Unit
FSI	Frame Status Indicator
FWTIC	Fixed Wireless Terminal Interface Card
GFCI	Ground Fault Connection Interrupt
GLI 2	Group Line Interface II
GPS	Global Positioning System
GUI	Graphical User Interface
HSO	High Stability Oscillator
IFM	Integrated Frame Modem
I&Q	Interphase and Quadrature
ISB	InterShelf Bus

. . . continued on next page

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

BTS Overview

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

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

C-CCP Shelf Card/Module Device ID Numbers

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

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

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

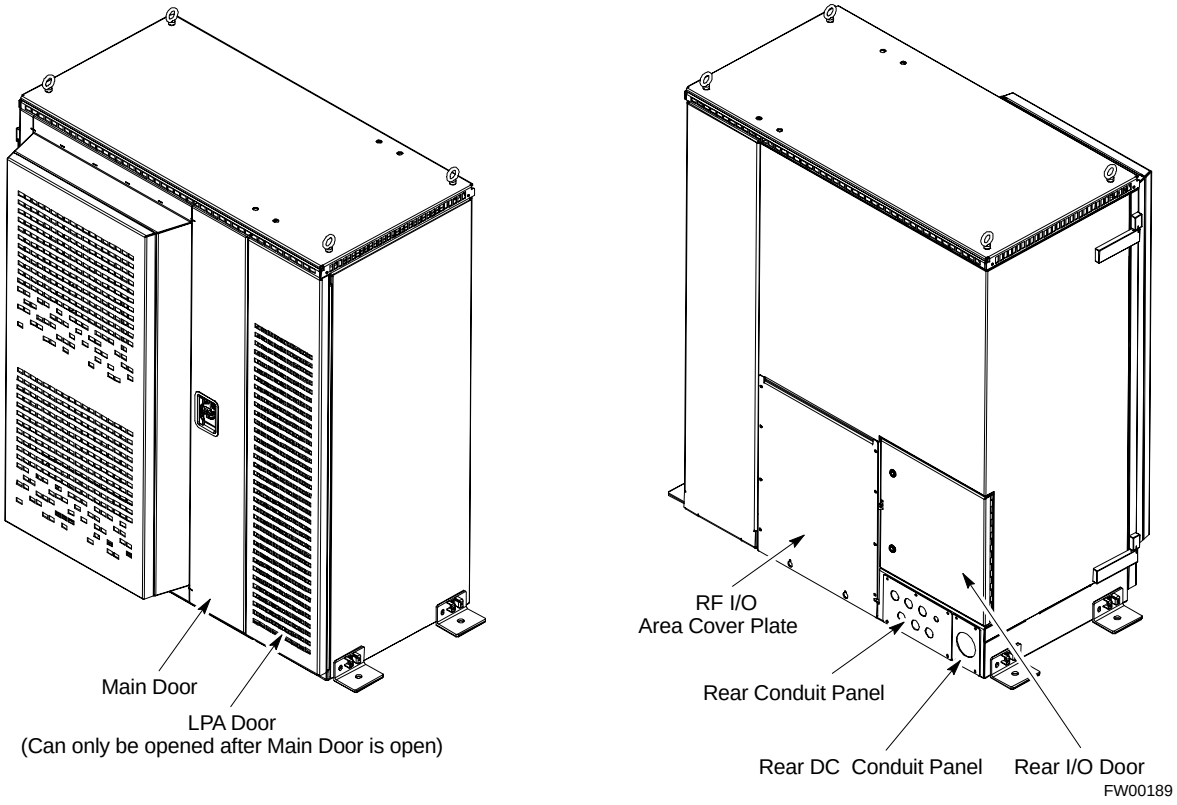
Table 1-4: C-CCP Shelf/Cage Card/Module Device ID Numbers (Bottom Shelf)

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

Major Components

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

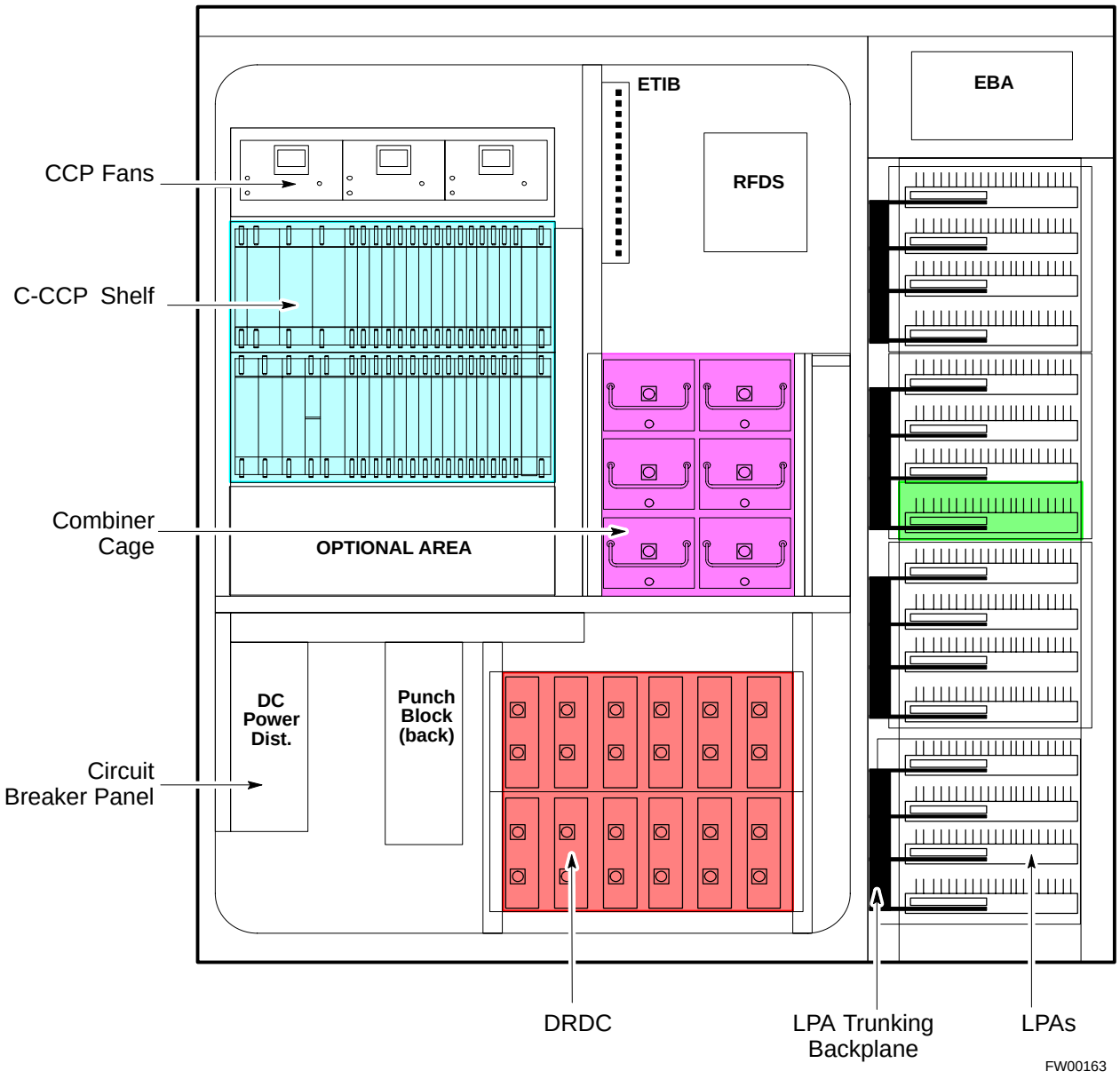
Figure 1-2: SC 4812ET RF Cabinet



RF Cabinet Internal FRUs

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

Figure 1-3: RF Cabinet Internal FRUs



Duplexer/RX Filter Directional Coupler

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

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

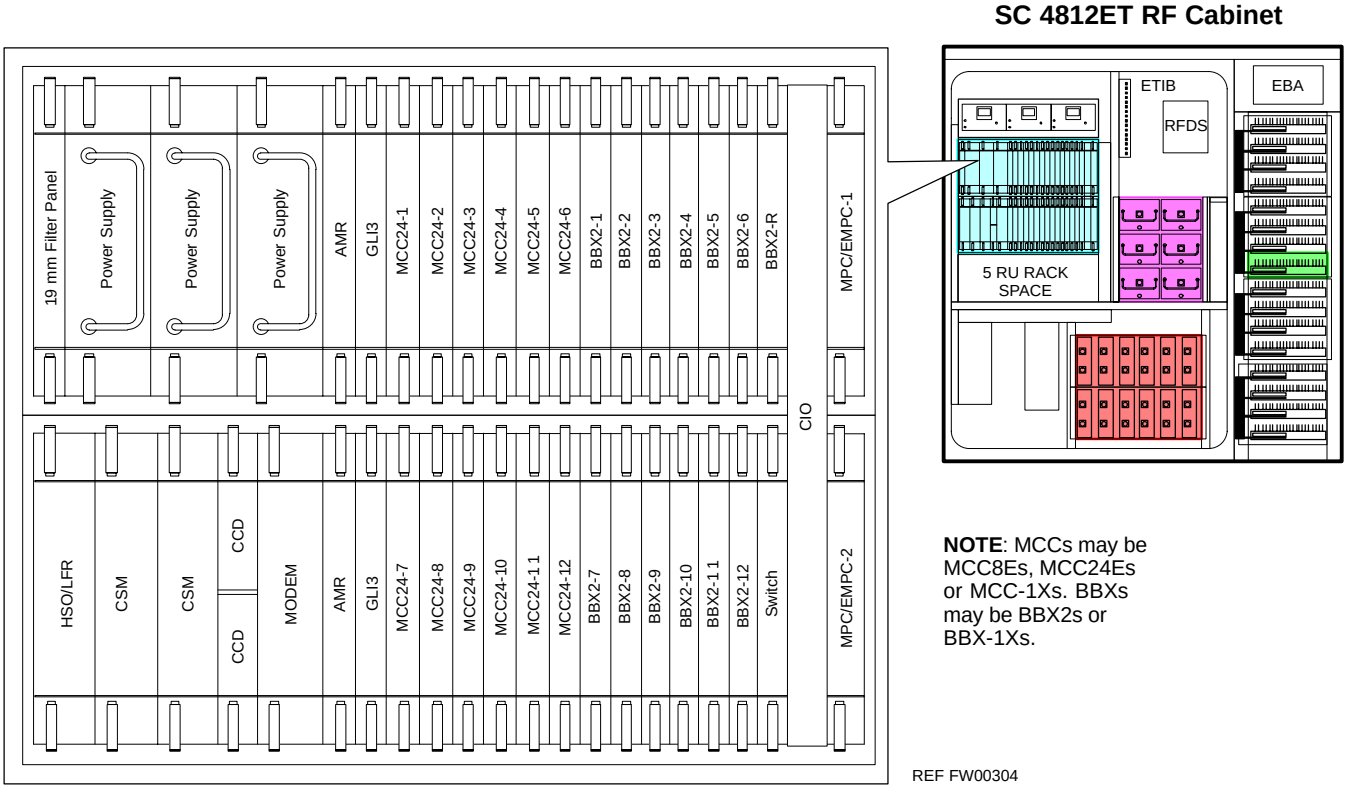
The Combiner Cage holds the transmit band pass filters, 2:1 combiners, or 4:1 combiners, depending on system configuration.

Combined CDMA Channel Processor Shelf

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

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

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



Punch Block

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

Span I/O Board

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

RF Diagnostic Subsystem

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

Heat Exchanger

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

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

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

SC 4812ET Trunking Backplane

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

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

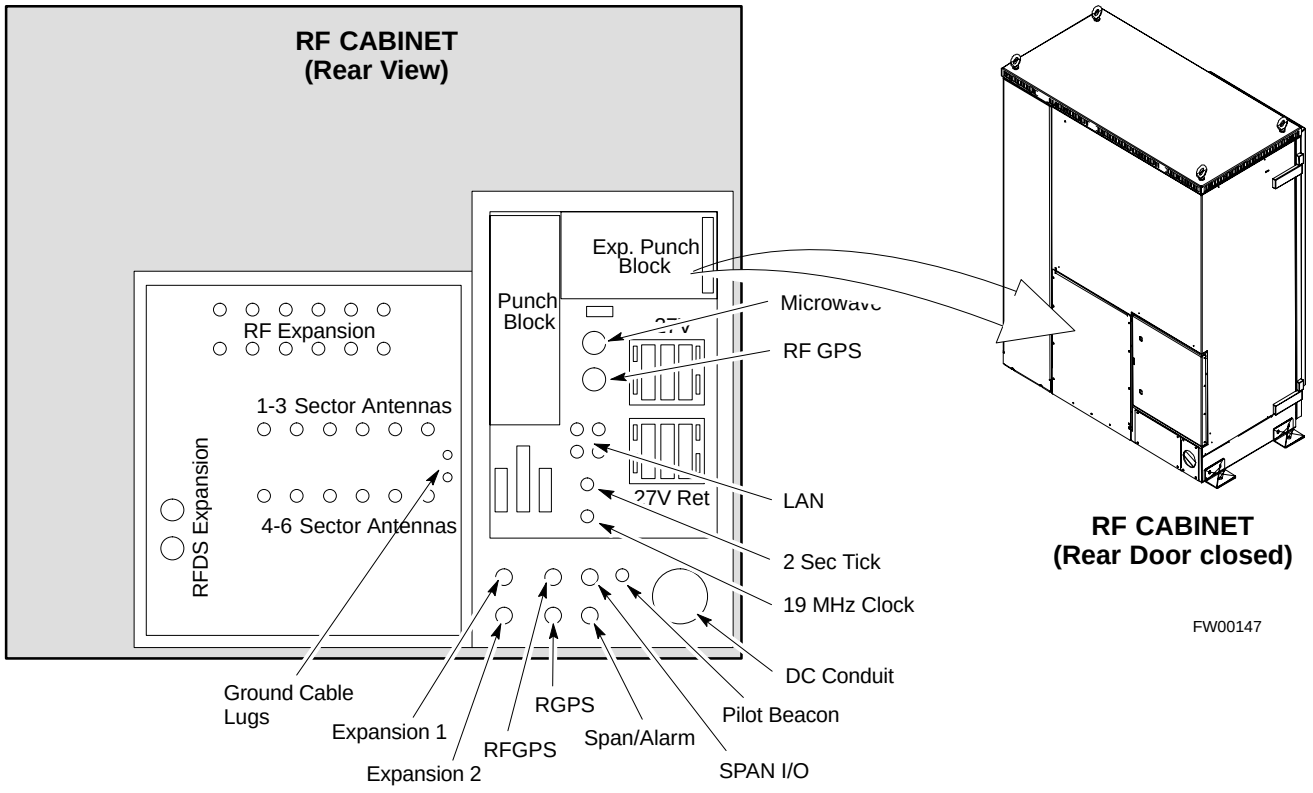


Figure 1-6: SC 4812ET I/O Plate Diagram