Technical Information

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1X SC480 BTS HARDWARE INSTALLATION, OPTIMIZATION/ATP, AND FRU

SOFTWARE RELEASE 2.16.4.X

800 MHZ

CDMA2000 1X

PRELIMINARY

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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, or order manuals (original or revised), visit the Motorola Lifecycles Customer web page at https://mynetworksupport.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 four categories of these special paragraphs are:

NOTE

Presents additional, helpful, non-critical information that you can use.

IMPORTANT

Presents 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 damage to software, stored data, or equipment could occur, thus avoiding the damage.

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: for example, 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 SR (Service 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 (CNRC) for immediate assistance. The 24 hour telephone numbers are:

North America	+1–800–433–5202
Europe, Middle East, Africa	+44– (0) 1793–565444
Asia Pacific	+86–10–88417733
Japan & Korea	+81–3–5463–3550

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

Content

This section presents the Federal Communications Commission (FCC) Rules Parts 15 and 68 requirements and compliance information for the *SC*480 domestic series Radio Frequency Base TransceiverStations.

FCC Part 15 Requirements

Part 15.19a(3) – Information to User

NOTE

This device complies with Part 15 of the FCC Rules. Operationis subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, includinginterference that may cause undesired operation.

Part 15.21 – Information to User

CAUTION

Changes or modifications not expressly approved by Motorolacould void your authority to operate the equipment.

Part 15.105(b) – Information to User

NOTE

This equipment has been tested and found to comply with thelimits for a Class B digital device, pursuant to Part 15 of theFCC Rules. These limits are designed to provide reasonableprotection against harmful interference in a residentialinstallation. This equipment generates, uses and can radiate radiofrequency energy and, if not installed and used in accordancewith the instructions, may cause harmful interference to radiocommunications. However, there is no guarantee thatinterference will not occur in a particular installation. If thisequipment does cause harmful interference to radio or televisionreception, which can be determined by turning the equipmentOFF and ON, the user is encouraged to try to correct theinterference 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.

Part 68 Requirements

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

FCC Part 68 Registered Devices	
Device	**FCC Part 68 ID**
*SC*480–800MHz 1X/EVDO See Note	US: IHEDENANSC4801XDO

NOTE

The *SC*480–800MHz 1X/EVDO BTS is registered with an FCC part number (US: IHEDENANSC4801XDO) which will cover all the internal cards and modules.

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:

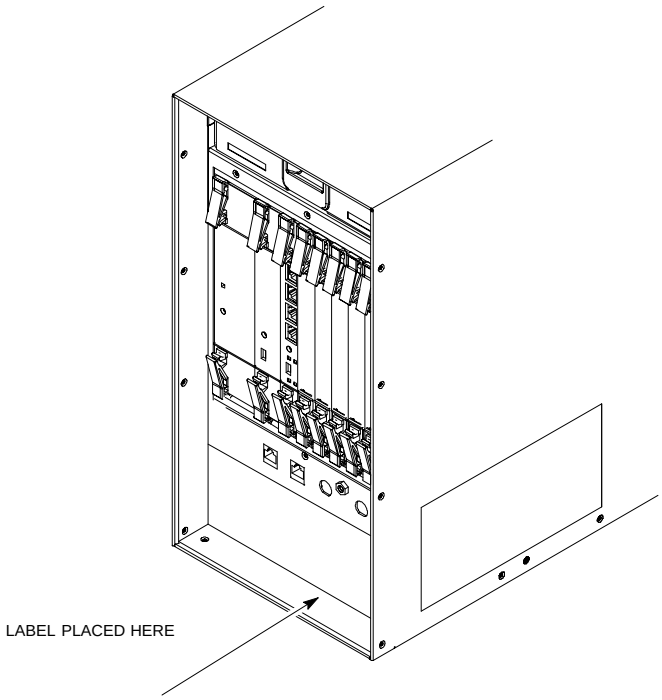
Global Customer Network Resolution Center (CNRC)
1501 W. Shure Drive, 3436N
Arlington Heights, Illinois 60004
Phone Number: (847) 632–5390

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.

FCC Label and Location

LABEL SHOWN ISFOR DISPLAY PURPOSES ONLY.



Model No. _____ **SERIAL NO.** **Complies with Part 68, FCC Rules FCC Reg. No.**

MOTOROLA **FCC ID:** IHET5EJ1 US: IHEDENANSC4801XDO

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.

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

68P09260A11–7

Manual Title

1X SC480 BTS Hardware Installation, Optimization/ATP, and FRU Software Release 2.16.4.X

Version Information

The following table lists the manual version, date of version, and remarks on the version.

Version Level	Date of Issue	Remarks
–1	Feb 4, 2004	DRAFT – For General engineering review
–2	Feb 23, 2004	PRELIMINARY – Incorporated Engineering review comments.
–3	Mar 16, 2004	First Order Application – Incorporated comments from engineering and test groups.
–4	Apr 10, 2004	FOA updated. Corrected text and illustrations due to SRs
–5	Apr 29, 2004	FOA updated, corrected grounding information and other minor text errors, added in AC/DC power cabling information for outdoor enclosures.
–6	May 7, 2004	FOA for indoor circuit configuration
–7	May 27, 2004	Preliminary for Packet configuration

Notes

Chapter 1: Introduction

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Introduction

Scope of this Document

This document provides information pertaining to the hardware installation, cabling installation, ATP and Field Replaceable Unit (FRU) procedures of the Motorola SC™480 CDMA Base Transceiver Subsystem (BTS), 800 MHz, –48 and +27 VDC versions. Information on Circuit and Packet Backhaul, Expansion, and Logical BTS are also included

The FRU procedures cover all components that are considered replaceable.

An individual SC™480 BTS will be referred to as the “BTS” for the remainder of this document.

For detailed installation information of non-Motorola equipment, refer to the vendor manuals provided with such equipment.

Manual Order

The installation order is the order of the manual starting at Chapter 1 and continuing through Chapter 5. After hardware installation has been completed, run the ATP for the system by following the procedures defined in Chapter 6 of this manual.

Chapter 1

“Introduction” — This is a brief outline of the manual. Also provided is a list of additional documents and tools necessary to complete the procedures.

Chapter 2

“Site Preparation” — This chapter contains the necessary information to verify the condition of the site.

Chapter 3

“BTS Cables” — This chapter contains the general information on the cables required for the Compact BTS.

Chapter 4

“Installation of Equipment, Cables, and GPS” — This chapter contains procedures for installing the equipment, external AC, DC, data, ground antenna, and GPS cabling.

Chapter 5

“Pre–Power–Up, Initial Power, and Removal of Power” — This chapter contains procedures for performing electrical power checks.

Chapter 6

“Optimization and Calibration Procedures” – This chapter contains general information and procedures for optimizing the BTS.

Chapter 7

"Acceptance Test Procedures" – This chapter contains general information and procedures for testing the BTS.

Chapter 8

"Leaving the Site" – This chapter contains general information and procedures for preparing to leave and departing the site.

Chapter 9

"Field Replaceable Units" – This chapter contains general information and procedures for removing and installing boards, cards and modules of the BTS.

Chapter 10

"Reference Procedures Performed at OMC–R " – This chapter contains general information and procedures to be followed by the OMC–R operator.

Appendix A

"MCC–Data Only " – This appendix contains general information and test procedures for the DO card.

Appendix B

"Test Equipment Preparation " – This appendix contains general information and procedures for setting up the test equipment.

Appendix C

"Download ROM Code " – This appendix contains general information and procedures for the loading ROM code into the BTS cards.

Appendix D

"MMI Cable " – This appendix contains general information and procedures for making an MMI cable.

Appendix E

"Expansion BTS Configuration" – This appendix contains general information and interconnect diagrams for expansion configuration.

Appendix F

"Logical BTS LAN Configuration for Compact BTS (Indoor) " – This appendix contains general information and interconnect diagrams for logical BTS.

Appendix G

"Integrated BTS Router Preliminary Operations" – This appendix contains general information and procedures IBR and span line verification.

Appendix H

"Integrated BTS Router Installation " – This appendix contains general information and procedures IBR and span line installation.

Appendix I

"Packet Backhaul BTS " – This appendix contains general information and procedures for packet backhaul operation with LMF Help.

Site Cleanliness

While performing the procedures provided in this document, ensure that:

- for an internal installation, the site is kept clean and free of tracked-in dirt
- all packing material has been removed from the equipment.
- all tools not currently in use are picked-up as the installation progresses.
- all trash is removed from the site at the end of each day and after the installation is complete.
- equipment is covered with a tarpaulin whenever possible.
- use a shop-vac whenever you perform an internal installation procedure that generates dust, such as drilling or cutting.

Site Manager

The site manager is the person in charge of and responsible for the full site. The installer will be verifying a variety of conditions with the site manager.

System Diagrams

Figure 1-1 shows the BTS mounted on a rack. The configuration is for indoor operation.

Configurations

The BTS supports the omni configuration.

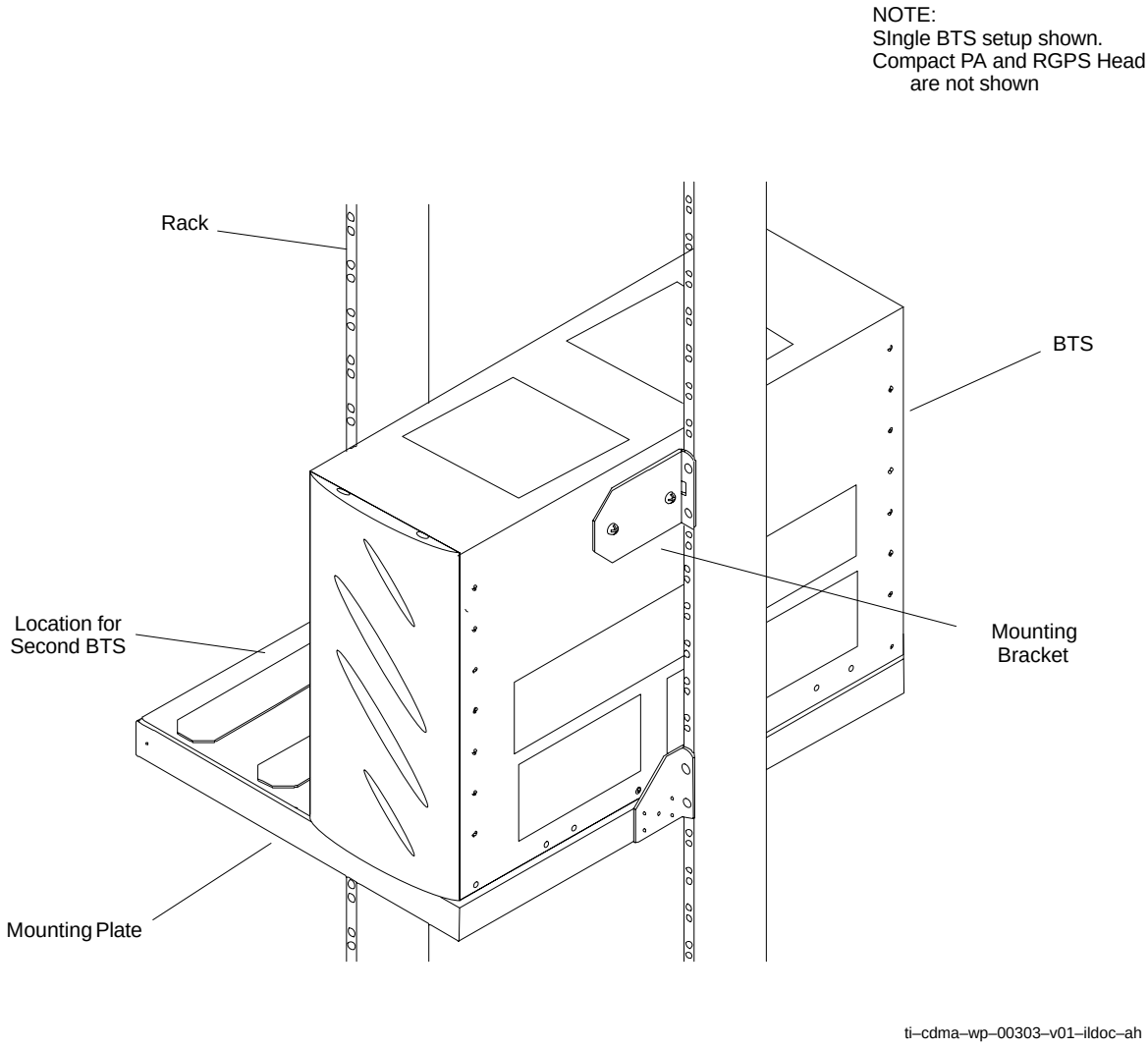
The power configuration for the BTS is:

- DC power only

The synchronization configurations for the BTS are:

- Remote GPS Receiver – synchronous operation
- RF GPS

Figure 1-1: Mounted BTS and Rack



Installation

The following documents are required to perform the installation, ATP and FRU procedures of the cell site equipment:

- *SC™480 BTS Hardware Installation, Optimization/ATP and FRU – 68P09260A11* (This manual)
- Standards and Guidelines for Communication Sites
  - Hard copy (Motorola Part Number 6881089E50–A)
  - CD–ROM (Motorola Part Number 9882904Y01)
- *Grounding Guidelines for Cellular Radio Installations* (Motorola part number 68P81150E62) or
  - Appendix C of Standards and Guidelines for Communication Sites
- Site Document (generated by Motorola Systems Engineering), which includes:
  - site specific documentation
  - channel allocation
  - contact list (customer)
  - ancillary/expendable equipment list
  - site wiring lists
  - contact list (Motorola support)
  - job box inventory
- Demarcation Document (Scope of Work agreement)
- Installation manuals for non-Motorola equipment (for reference purposes).

Abbreviations and acronyms

Table 1–1 contains a list of the abbreviations and acronyms used in this manual.

Table 1-1: Abbreviations and Acronyms

Acronym	Description
ACT	Active
ALM	Alarm
ATP	Acceptance Test Procedure
AUX	Auxiliary
BLO	Bay Level Offset
BSS	Base Station System
BTS	Base Transceiver Station or Subsystem
BBX	Broad Band Transceiver

table continued on next page

Table 1-1: Abbreviations and Acronyms	
Acronym	**Description**
CAL	Calibration
CBIO	Compact BTS Input/Output
CBSC	Centralized Base Station Controller
cCLPA	Compact Combined Linear Power Amplifier
CCP2	CDMA Channel Processor 2
CDF	Configuration Data File
CDMA	Code Division Multiple Access
cMPC	Compact Multi–coupler Preselector Card
CRMS	Cellular Remote Monitoring System
CSA	Clock Synchronization Alarms
DLM	Download Manager
EMPC	Expansion Compact Mulit–Preselector Card
ERP	Effective Rated Power
ESD	Electrostatic Discharge
EXP	Expansion
FREQ	Frequency
FRU	Field Replaceable Unit
FTP	File Transfer Protocol
GLI 3	Group Line Interface III
GPS	Global Positioning System or Satellite
HMS	Heat Management System
HSO	High Stability Oscillator
HX	Heat Exchanger
INS	In–Service
INS_ACT	In–Service Active
INS_SBY	In–Service Standby
LAN	Local Area Network
LIF	Load Information File
LMF	Local Maintenance Facility

table continued on next page

Table 1-1: Abbreviations and Acronyms	
Acronym	**Description**
LMT	Local Maintenance Tool
MCC	Multi–Channel CDMA
MCC–DO	Multi–Channel CDMA Data Only
MMI	Man–Machine Interface
MON	Monitor
MSO	Medium Stability Oscillator
NECB	Network Element Configuration Base
NECF	Network Element Configuration File
NECJ	Network Element Change Journal
OMC–R	Operations and Maintenance Center – Radio
OOS	Out–of–Service
PDE	Power Distribution Enclosure
PSM	Power Supply Module
PWR	Power
RAM	Random Access Memory
ROM	Read Only Memory
RF GPS	Radio Frequency Global Positioning System
RGPS	Remote Global Positioning System
RX	Receive
SDCX	Synchronization Daisy–Chaining and eXpansion
STA	Status
SYNC	Synchronization
TME	Thermal Management Enclosure
TX	Transmit

800 MHz Center Frequencies

Table 1-2 lists the selected 800 MHz CDMA candidate operating channels and the corresponding transmit and receive frequencies for Regular Band Class 0 (North America). Figure 1-2 shows the CDMA Frequency Spectrum for Table 1-2. Center frequencies (in MHz) for channels not shown in the table may be calculated as follows:

For Channels 1 – 799

- For TX
  TX = 870 + (0.03 * Channel #)
  Example: Channel 262
  TX = 870 +0.03 * 262
  TX = 877.86 MHz
- For RX
  RX = 825 + (0.03 * Channel#)
  Example: Channel 262
  RX = 825 + (0.03 * 262)
  RX = 832.860 MHz

For Channels 991 – 1023

- For TX
  TX = 870 + [0.03 *(Channel# – 1023)]
  Example: Channel 1015
  TX = 870 + [0.03 * (1015 – 1023)]
  TX = 870.240 MHz
- For RX
  RX = 825 + [0.03 * (Channel# – 1023)]
  Example: Channel 262
  RX = 825 + [0.03 * (262–1023)]
  RX = 847.830 MHz

NOTE

Conditionally Valid – Valid channels in TIA/EIA–97–D that are <885 kHz from the operator's band edge. If the operator's system must coexist with another system that uses an adjacent frequency band, it is recommended that the operator coordinate with the other operator to determine if the usage of the Reduced–Sideband Spectral Mask is required for Conditionally Valid channels. The Reduced–Sideband Spectral Mask is in addition to other spectral masks that apply.

CAUTION

Certain widely–spaced combinations of A–Band transmit frequencies, when combined to drive one antenna, can produce 3rd order intermodulation products that are within the receive band. During system planning, the proper selection of combined frequencies or the use of multiple transmit antennas will prevent this situation. Additional receive filtering at a particular cell site can also help. China A Band is used in the China *SC*480–800 BTS in conjunction with a GSM Elimination Filter.

Table 1-2: Regular Band Class 0 TX and RX Frequency vs Channel

System Designator	CDMA Channel Validity	CDMA Channel Number	Transmit Center Frequency (MHz)	Receive Center Frequency (MHz)
A (1 MHz)	Conditional Valid	1013 – 1019	824.700 – 824.880	869.700 – 869.880
	Valid	1020 – 1023	824.910 – 825.000	869.910 – 870.000
A (10 MHz)	Valid	1 – 303	825.030 – 834.090	870.030 – 879.090
	Conditional Valid	304 – 311	834.120 – 834.330	879.120 – 879.330
B (10 MHz)	Conditional Valid	356 – 362	836.680 – 835.860	880.680 – 880.860
	Valid	363 – 637	835.890 – 844.110	880.890 – 889.110
	Conditional Valid	638 – 644	844.140 – 844.320	889.140 – 889.320
A (1.5 MHz)	Conditional Valid	689 – 694	845.670 – 845.820	890.670 – 890.820
B (2.5 MHz)	Conditional Valid	739 – 746	847.170 – 847.380	892.170 – 892.380
	Valid	747 – 770	847.410 – 848.100	892.410 – 893.100
	Conditional Valid	771 – 777	848.130 – 848.310	893.130 – 893.310

China 800 MHz Frequencies

The receive and transmit frequency ranges (A–Band) for China are as follows:

- RX – 825.5000 MHz – 834.1000 MHz
- TX – 870.5000 MHz – 879.1000 MHz

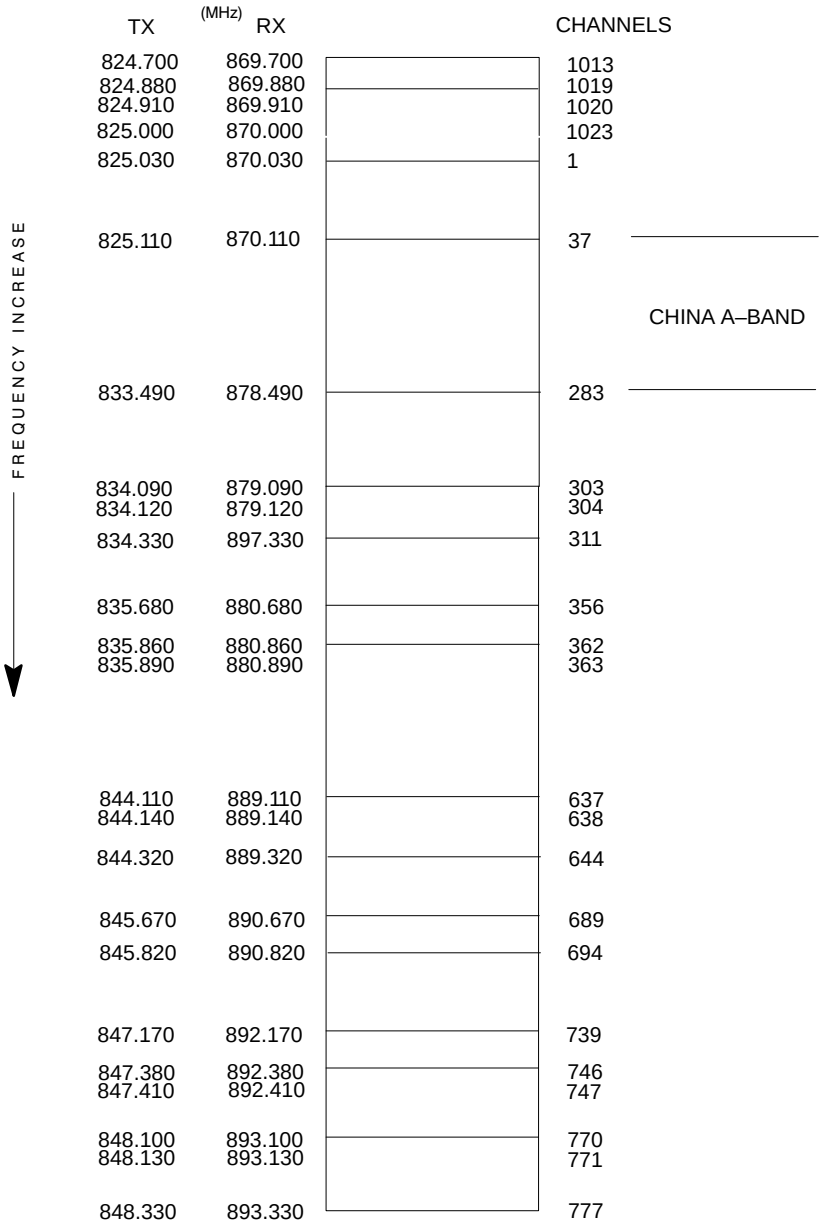
Table 1-3 lists the China A–Band frequencies and channels.

Table 1-3: China A–Band TX and RX Frequency vs Channel

System Designator	CDMA Channel Validity	CDMA Channel Number	Transmit Center Frequency (MHz)	Receive Center Frequency (MHz)
China A–Band	Valid	37 – 283	826.110 – 833.490	871.110 – 878.490

800 MHz CDMA Frequencies and Channels – continued

Figure 1-2: CDMA Frequency Spectrum



Introduction

Many of the tools and materials depend on the style of the wall, pole, or rack on which the mounting bracket is being installed. The tools and materials required to install the BTS hardware are specified for each mounting style. Due to the variability of mounting styles, additional tools and materials may be required to meet specific site needs.

Tools and Materials for Installation

The tools and materials listed in Table 1-4 are recommended to properly and safely perform the installation procedures.

Table 1-4: Recommended Tools and Materials for Rack Mounting

Hand Tools	Materials	Purpose
Adjustable Torque ratchet and socket set	Customer Supplied	General torquing of screws and nuts.
T10, T20, T30, Security T20, Security T30 Torx, cross–recess, flathead bits, 1/4–in. hex	Customer Supplied	General purpose use
Torque driver wrench, 1/4–in. hex female drive, 0–10 N–M	(Utica P/N TCI–150 R/A 3/8–in. or equivalent) Customer Supplied	General torquing of screws and nuts.
Power Drill, 1/4–in or 3/8–in drive	Appropriate wood and masonry drill bits (Standard set may be adequate) Customer Supplied	Drill holes in wood and light concrete
Hammer Drill	Appropriate masonry drill bits (Customer Supplied)	Rack installation to floor and RGPS to wall
Adjustable Wrench	Customer Supplied	General purpose use
Mechanical lifting device	Customer Supplied	For lifting equipment
Bucklestrap Cutting Tool	(Motorola P/N 6604809N01)	Pole Mounting
Tape Measure	Customer Supplied	General purpose measurement
Heavy Gloves	Customer Supplied	Hand Safety
Safety Glasses	Customer Supplied	Eye Safety
Tin Snips	Customer Supplied	General purpose metal cutting
Hacksaw	Various blades (Customer Supplied)	Cutting large coax cable
Metal File	Fine cut (Customer Supplied)	Coax cable preparation
Flashlight	Customer Supplied	General purpose use
Utility Knife	Customer Supplied	General purpose cutting
Small Flathead Screwdriver	Customer Supplied	General purpose use

Installation Tools and Materials – continued

Table 1-4: Recommended Tools and Materials for Rack Mounting		
Hand Tools	**Materials**	**Purpose**
Small Phillips Screwdriver	Customer Supplied	General purpose use
Hex Crimping Tool	Various die sets (Customer Supplied)	Create RF cabling and power/ground cabling
RJ45 Crimping Tool	(Tyco P/N 2–231652–1, 853400–0, 853400–1, 853400–7 or equivalent) Customer Supplied	Create RJ11/RJ45 cabling
5/16 Breakaway Torque Wrench, 9–in. lb	Customer Supplied	SMA Connectors
13/16 Breakaway Torque Wrench 38–in. lb	Customer Supplied	N Connectors
Volt/Ohmmeter or Digital Multimeter	Customer Supplied	Voltage and continuity testing
Label Maker	Customer Supplied	General purpose marking
cCLPA Installation Handles	Motorola P/N: 5587763T01	For installing the cCLPA
Wire Strippers	Customer Supplied	Accommodates 6 AWG to 26 AWG
	RTV Sealant (Customer Supplied)	Weatherproofing openings for cable pass through
	electrical tape (Customer Supplied)	General purpose use
	Fine Grit Sandpaper (Customer Supplied)	Finishing coax cable surfaces
	Cable Tie–wraps various sizes. (Customer Supplied)	General purpose dressing of cables
	15–pin D–sub plug and termination equipment (Customer Supplied)	For RGPS cabling
	BNC male style connectors (Customer Supplied)	Coaxial span cable, interframe cabling
	N–male and N–female style connectors for 1/2–in Heliax (Customer Supplied)	Cabling between BTS, PA, and Antenna
	7/16 DIN connector for 1/2–in and 7/8–in Heliax (Customer Supplied)	Antenna cabling
	RF Cabling, 1/2–in and 7/8–in Heliax	Cabling between BTS, PA, and Antenna
	Braided Coax (Customer Supplied)	Coaxial span cable, interframe cabling
	10AWG two–wire stranded (Customer Supplied)	Power cabling

Table 1-4: Recommended Tools and Materials for Rack Mounting		
Hand Tools	**Materials**	**Purpose**
	6 AWG stranded (Customer Supplied)	Ground cabling
	Assorted ground lugs (6AWG, 10 AWG) ring style (Customer Supplied)	Site ground cabling, Core power input
	Assortment of flat washers, lock washers (Customer Supplied)	Mounting equipment to racks and for general purpose
	Assortment of nuts M3 – M6 (Customer Supplied)	Mounting equipment to racks and for general purpose
	Rack screws (depends on rack style used) (Customer Supplied)	Rack mounting
	T1/E1 span cabling (4 or 8 wire TP style) (Customer Supplied)	Span and cCLPA signal cabling
	ILSCO p/n CRB–6L2–14–58 two–hole ground lugs or equiv. Hole spacing 5/8”, hole sizes for 1/4” bolt, tang width 13/32”. (Customer Supplied)	Ground Lugs
	Chalk or marker to mark location on rack (Customer Supplied)	

Policy

To ensure consistent, reliable, and repeatable test results, test equipment meeting the following technical criteria should be used to perform the ATP on the BTS equipment.

NOTE

During manual testing, you can substitute supported test equipment with other test equipment models not supported by the LMF. However, they must meet 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 the ATP, make sure that the test equipment needed is on hand and operating properly.

Test equipment calibration

Optimal system performance and capacity depend on regular test equipment service, calibration, and characterization. Follow the original equipment manufacture (OEM) recommended maintenance and calibration schedules closely.

Test cable calibration

Equipment test cables are very important in the ATP. It is recommended 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 Local Maintenance Facility (LMF) during the optimization procedure. This method requires accurate test cable characterization in a lab environment. 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 the ATP.

- Communications Test Set
- Power Meter

Test Equipment List

The following pieces of test equipment are required during the ATP. Common assorted tools like screwdrivers and keys are not listed, but are still required. Read the owners 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.

CDMA LMF Hardware Requirements

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

- Notebook computer
- PCMCIA to Serial I/O Adapter
- 266 MHz (32 bit CPU) Pentium processor
- 4 GigaByte 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 256 colors
- 128 MB RAM minimum (98SE) or 256 (Windows 2000)
- 20X CD ROM drive
- 3–1/2 inch floppy drive
- Serial port (COM 1)
- Serial Port (COM 2)
- Parallel port (LPT 1)
- PCMCIA Ethernet interface card (for example, 3COM Etherlink III) with a 10Base–T–to–coax adapter
- Windows 98 SE or higher operating system

NOTE

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

Ethernet LAN Transceiver *(part of all LMF kits)*

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

used with

- Transition Engineering Model E–CX–TBT–03 10BaseT/10Base 2 Converter

CDMA 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 communication field personnel with the capability to support the following CDMA Base Transceiver Station (BTS) operations:

- Installation
- Maintenance
- Calibration
- Optimization

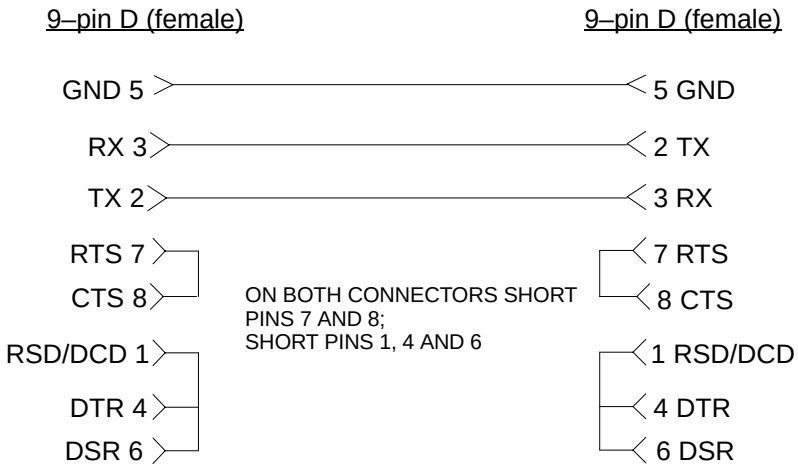
RS232 to GPIB Interface

One 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:

Figure 1-3: RS232–IEEE488 Converter Serial Cable Configuration



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
- Hewlett Packard Model HP 8921A/600 Analyzer including 83203B CDMA Interface, manual control system card, and, for 1900 MHz BTSs, 83236A/B PCS Interface

- Advantest R3465 Analyzer with R3561L signal generator

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 with Advantest R3562 Generator for IS–95 and cdma200 1X testing

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

NOTE

Advantest R3267 with Advantest R3562 Generator are capable of performing IS–95B and cdma2000 1X tests, if the required options are installed.

GPIB cables

Two Hewlett Packard 10833A or equivalent; 1 or 2 meters long used to interconnect test equipment and LMF terminal.

Power meter

Gigatronics Model 8541C with 80601A power sensor capable of measuring from –70 dBm to +23 dBm; *supported by the LMF* to perform BTS Total Power measurement.

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 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 GLI, CSA and cCLPA debug serial ports.

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*** BNC–male to BNC–male RG316 cables; 3.04 m. (10 ft.) long, ***Two*** BNC–male to BNC–male RG316 cables; 0.61 m. (2 ft.) long with ***Two*** BNC "T" connectors, used to interconnect the Communications Analyzer to CSA front panel timing references in the BTS.

RF Attenuators

- 30 dB Fixed in–line attenuators, 150 W (Narda 769–30) used in conjunction with calibration of test cables.
- 50 dB attenuator for connection to 30 dB directional coupler

Misc. Components (RF Adaptors, Loads, Cables, etc.)

- As required to interface test cables and BTS equipment and for various test set ups. Should include at least (2) 50–Ohm loads (type N) for calibration, (1) RF short, (2) RF cables, (1) GPIB Box, and (1) ethernet cable.

RF Load

- 150W 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 Electrostatic Discharge (ESD) when handling or working with modules.

Directional Coupler

- 30 dB attenuation

Optional Equipment

NOTE

Not all optional equipment specified here will be supported by the LMF in automated tests or when executing various measure type commands. It is meant to serve as a list of additional equipment that might be required during maintenance and troubleshooting operations.

Digital Multimeter

- Fluke Model 8062A with Y8134 test lead kit or equivalent; used for precision dc and ac measurements, requiring $4–{}^{1}/_{2}$ digits.

Frequency Counter

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

Spectrum Analyzer

- Spectrum Analyzer (HP8594E with CDMA personality card) or equivalent; required for ***manual*** tests other than standard Receive band spectral purity and TX cCLPA IM reduction verification 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 or 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 procedures.

Oscilloscope

- Tektronics Model 2445 or equivalent; used for waveform viewing, timing, and measurements procedures.

CDMA Subscriber Mobile or Portable Radiotelephone

- CDMA compatible with power supply and antenna; used to provide test transmission and reception during BTS maintenance. Two radios will be required for system and drive around testing *after* optimization and BTS ATP is completed.

Overview

Stand–Alone BTS

The 1X *SC*480 BTS consists of one shelf of cards and modules within a metal cabinet. Depending on configuration the BTS may be powered by:

- Converted AC to –48 VDC
- Converted AC to +27 VDC
- Battery (–48 or +27 VDC)
- +27 VDC
- –48 VDC

The BTS can support up to two carriers in a non–redundant omni configuration.

Figure 1-4 shows the two different front vies and Figure 1-5 shows the rear view of the BTS.

Exapnsion BTS

When more than two carriers are desired, up to 3 additional BTSes may be added. Up to 8 carriers can be supported in this configuration. The Starter BTS has the Compact Multi–Preselector Card (cMPC) and the expansion BTSes contain Expansion Compact Multi–Preselector Cards (EMPC) in place of the cMPC. In expansion the BTSes are identified as individual BTSes, (i.e.; BTS–100, BTS–200, BTS–300, BTS–400). LAN connections are not used. The BTSes will share TX and RX antennas. Reference Appendix E for interconnect diagrams.

Logical BTS

The BTS software implements the logical BTS capability. Previously, all BTS frames co–located at a single site had to be identified in the network with separate and distinct BTS ID numbers. In the Logical BTS feature, all BTSes located at a single BTS site are identified with unique Frame ID numbers (Frame ID Numbers 1, 101, 201, 301) under a single (site) BTS ID number. A logical BTS can consist of up to three BTSes (up to 8 carriers). When the LMF is connected to the Starter of a logical BTS, you can access all devices in all of the BTSes that make up the logical BTS. A logical BTS requires a CDF/NECF file that includes equipage information for all of the logical BTSes and their devices and a CBSC file that includes channel data for all of the logical BTSes.

In this configuration LAN connections are used. The Starter BTS has the Compact Multi–Preselector Card (cMPC) and the expansion BTSes contain Expansion Compact Multi–Preselector Cards (EMPC) in place of the cMPC. The BTSes will share TX and RX antennas. Reference Appendix F for interconnect diagrams.

CCP2 Shelf Card/Module Device ID Numbers Logical BTS

All cards/modules/boards in the BTSes 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 1-5 for specific device ID numbers. See Figure 1-6 for shelf layout.

Table 1-5: CCP2 Shelf Card/Module Device ID Numbers for Logical BTS

BTS #	PSM	CSA	GLI3	MCC			BBX		cMPC/EMPC
1	–	1	1	1	2	3	1	4	–
101	–	101	101	101	102	103	101	104	–
201	–	201	201	201	202	203	201	204	–
301	–	301	301	301	302	303	301	304	–

Figure 1-4: Front View of Compact BTS

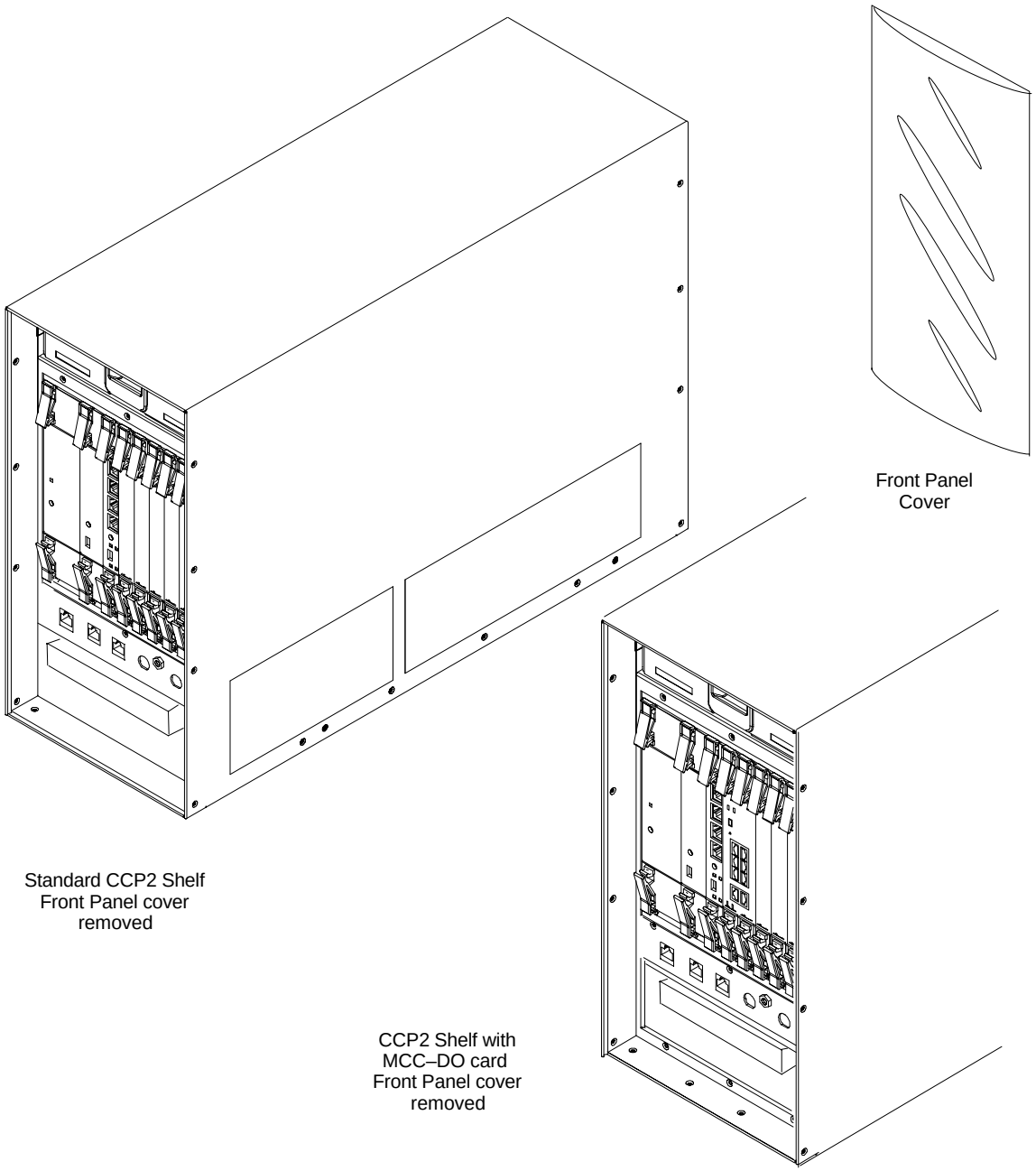
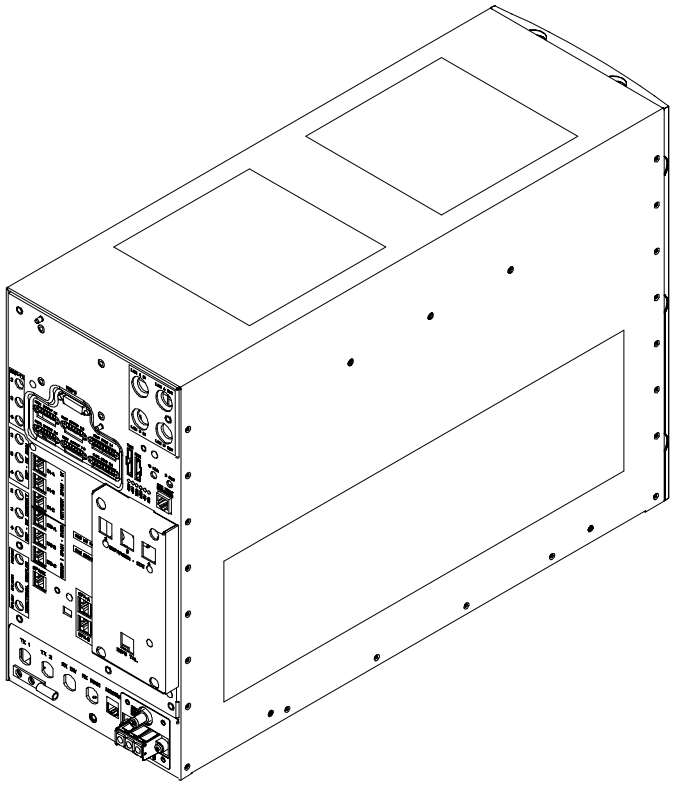


Figure 1-5: Rear View of Compact BTS

RF GPS not shown and
SDCX Module is shown.



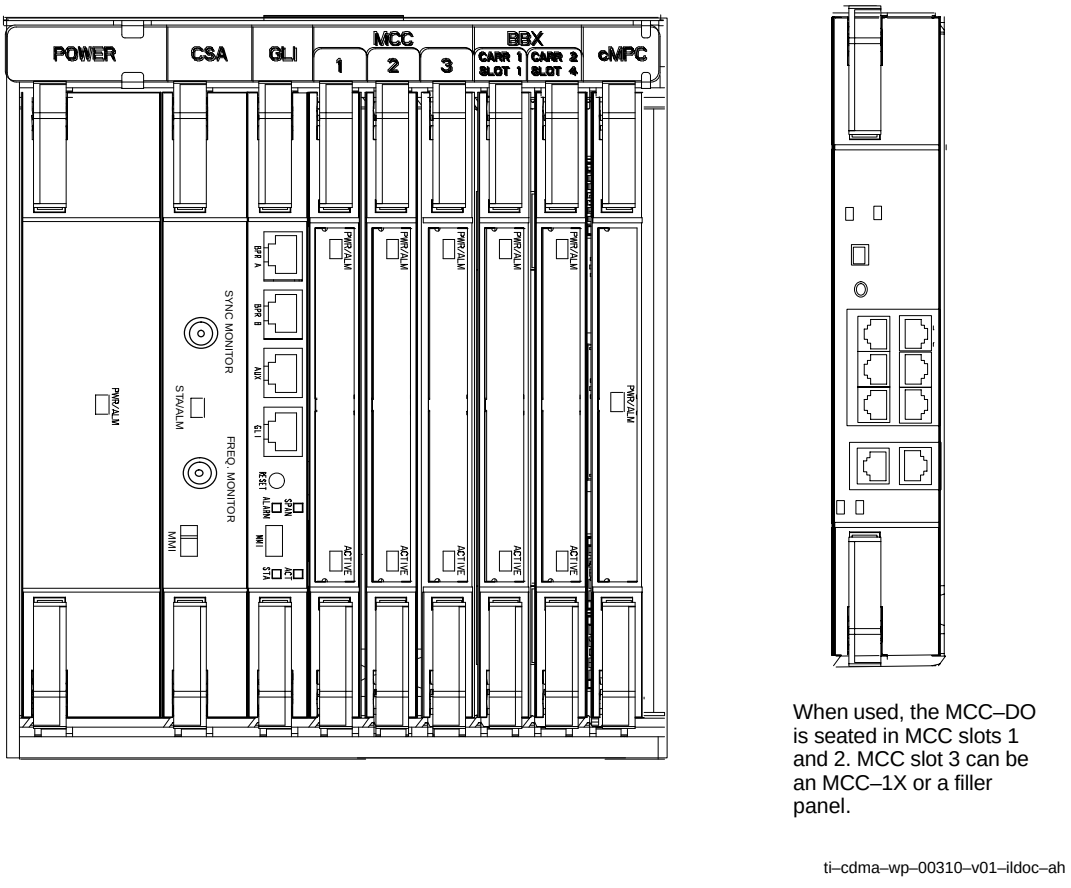
Shelf Device ID Numbers for Stand–Alone

All cards/modules/boards in the BTS at a single site assigned to a single BTS are also identified with unique Device ID numbers. Refer to Table 1-6 for the Device ID Numbers. Reference Figure 1-6 or Figure 9-2 for the layout of the shelf.

Table 1-6: Shelf Device ID Numbers

BTS #	PS1	CSA	GLI	MCC			BBX		cMPC
1	1	1	1	1	2	3	1	4	–

Figure 1-6: CCP2 Shelf Layout



ti–cdma–wp–00310–v01–ildoc–ah

The following is a list of the cards/modules in CCP 2 Shelf and a brief description.

1. Power Supply Module
2. CSA

3. GLI3
4. MCC–1X (or MCC–DO)
5. MCC–1X (or MCC–DO)
6. MCC–1X or Filler Panel
7. BBX–1X (Carrier 1)
8. BBX–1X (Carrier 2)
9. cMPC

Power Supply Module

Occupies the first slot. The same assembly used in the *SC*48XX series. Provides power to the cards on the CCP2 shelf.

CSA Card

Occupies the second slot. The Clock Synchronization Alarm card, combines the functions of the *SC*4812's CSM and AMR cards into one.

The CSA timing circuit receives a 1pps signal from the GPS. The CSA timing circuit generates the CDMA timing signal to the BBX and MCC cards.

During normal operation the CSA is set up to select the GPS as the first reference source. With an HSO or MSO as backup, the CSA is set up to select the HSO or MSO 1 pps as the backup reference source should the GPS signal fail. .

GLI3 Card

Occupies the third slot. The same card used in the *SC*48XX series. Provides interfaces, inter–card communications, operation, and maintenance functions for all the devices in the CCP2 shelf.

MCC–1X Cards and MCC–DO

Occupies the fourth through sixth slots (MCC slots 1, 2, & 3). Depending on configuration they will be MCC–1X cards (16s, 32s, 48s, or 64s). MCC–1X 64s require packet backhaul configuration. This implements the traffic and control (sync, paging, access) channels of the BTS.

If the BTS is configured for MCC–Data Only (DO), then MCC slots 1 and 2 will be used with slot 3 containing an MCC–1X card or a filler panel.

BBX–1X Cards

Occupies the seventh and eighth slots (BBX slots 1 & 4). The same BBX–1X cards used in the *SC*48XX series. Provides the RF to digital signal functions for the reverse and forward links.

cMPC

Occupies the ninth slot. Compact BTS Multicoupler Preselector Card. Provides low–noise amplification for all RX path signals. DC voltages are monitored on the RF devices and regulators and are used to generate hard and soft alarms.

HSO and MSO

The High Stability and Medium Stability Oscillator module provide a backup reference source should the Global Positioning System (GPS) fail. The HSO is capable of providing up to 24 hours and the MSO is capable of providing up to 8 hours.

Only one of either the HSO or MSO is available in the Compact BTS. The module is located in front, behind a cover, underneath the CCP2 Shelf. The unit slides into the top slot of the two that are present.

Modem

The slot underneath the HSO/MSO slot is reserved for a Modem module, however it is not supported for the *SC*480.

BTS Rear Panel

LAN connectors, RF Connectors, circuit breaker, DC Power connection, RF GPS, and SDCX are found at the rear of the BTS.

CBIO Board

Figure 1-7 shows the RF GPS, SDC, TME, PDE, cPA, Customer I/O connectors, and Status indicators.

RF GPS

The optional Radio Frequency Global Positioning System (RF–GPS) is contained in a module that plugs in to the CBIO board at the rear of the BTS. It can be used in place of the RGPS. See Figure 1-7.

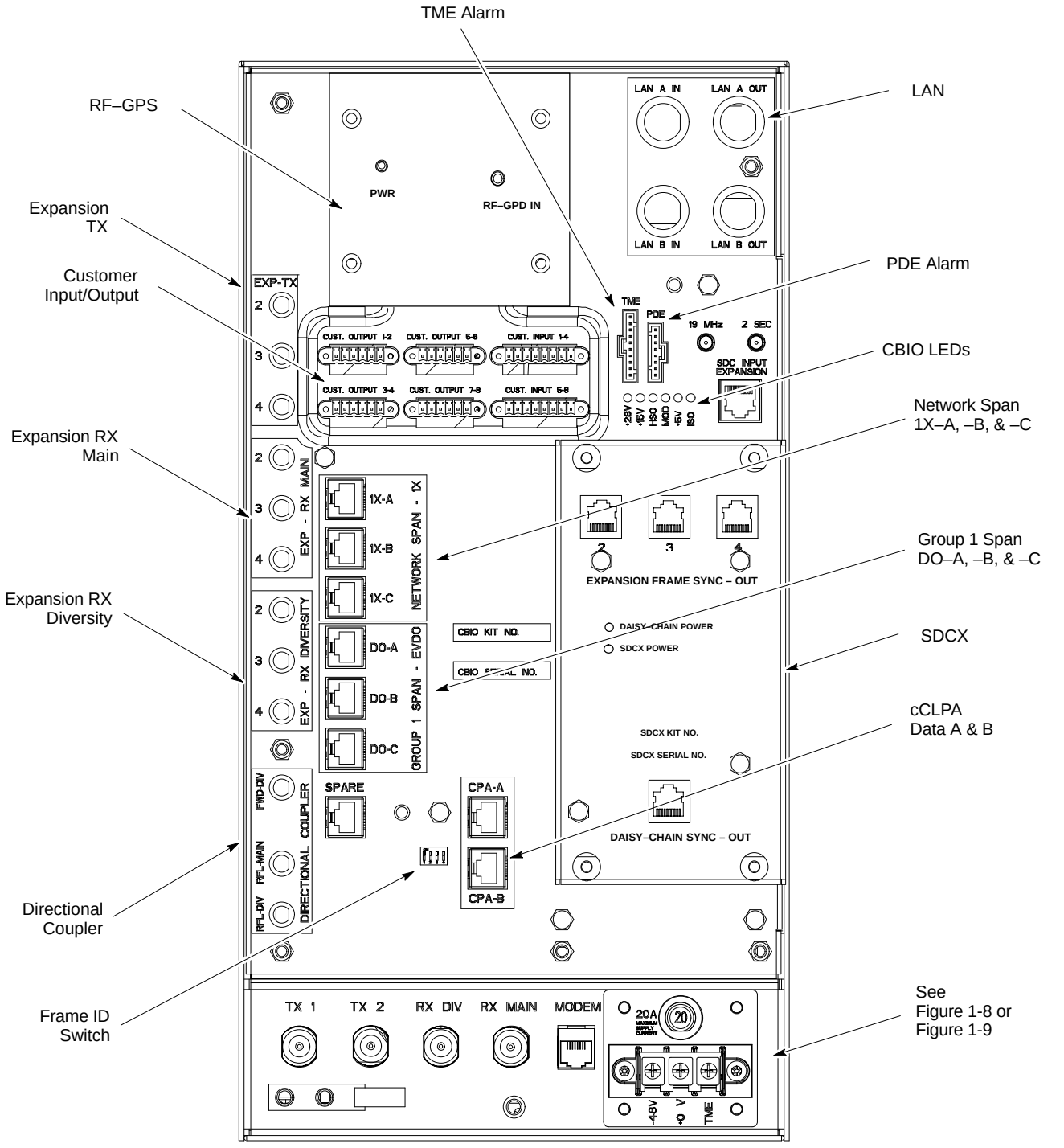
SDCX

The Synchronization Daisy–Chaining and eXpansion (SDCX) module is only used when there are expansion BTSs at the site. It supports timing distribution for up to three expansion frames, and also supports synchronization daisy–chaining feature. See Figure 1-7.

LAN Connectors

LAN input and out put connectors for 10BaseT connection are found at the upper right rear of the BTS. See Figure 1-7. There are LAN output connectors on the front panel below the CCP2 Shelf. See Figure 1-4.

Figure 1-7: CBIO Board



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RF Connectors

Figure 1-8 shows the RF connectors at the rear of the Compact BTS.

Modem Connector

Figure 1-8 shows the Modem connector at the rear of the Compact BTS (not supported in *SC*480).

Circuit Breaker

Figure 1-8 and Figure 1-9 show the location of the –48VDC 20A circuit breaker and +27VDC 25A circuit breaker, respectively.

DC Power Connection

Figure 1-8 and Figure 1-9 shows the location of the DC Power Terminal Strip.

Ground

Figure 1-8 shows the location of the two ground screw holes for the Compact BTS.

Figure 1-8: –48 VDC RF Connectors, Circuit Breaker, DC Power Terminal Strip, and Ground Studs

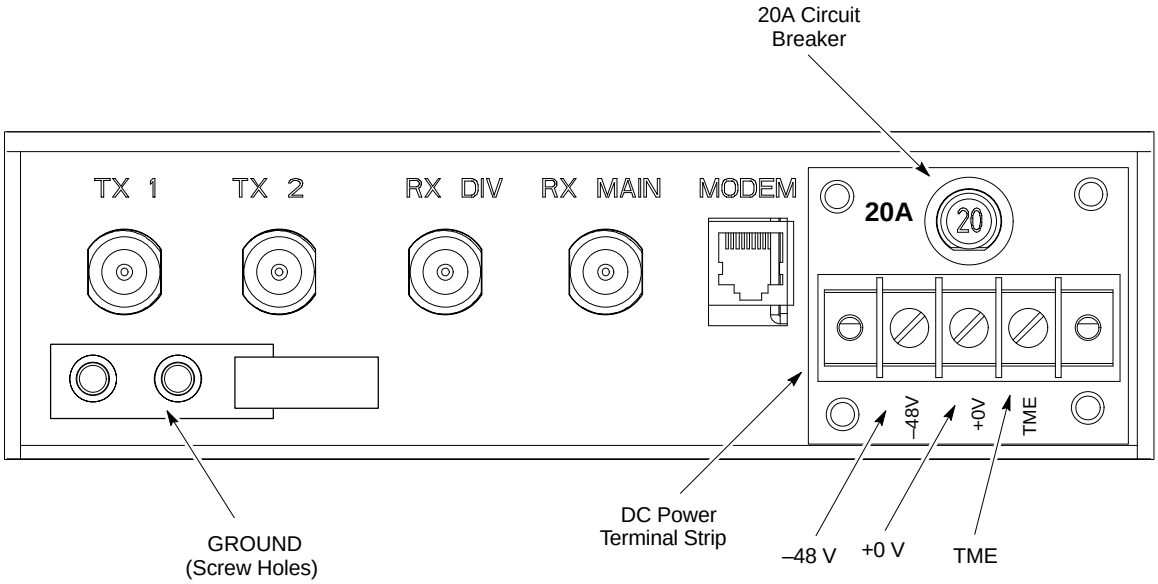
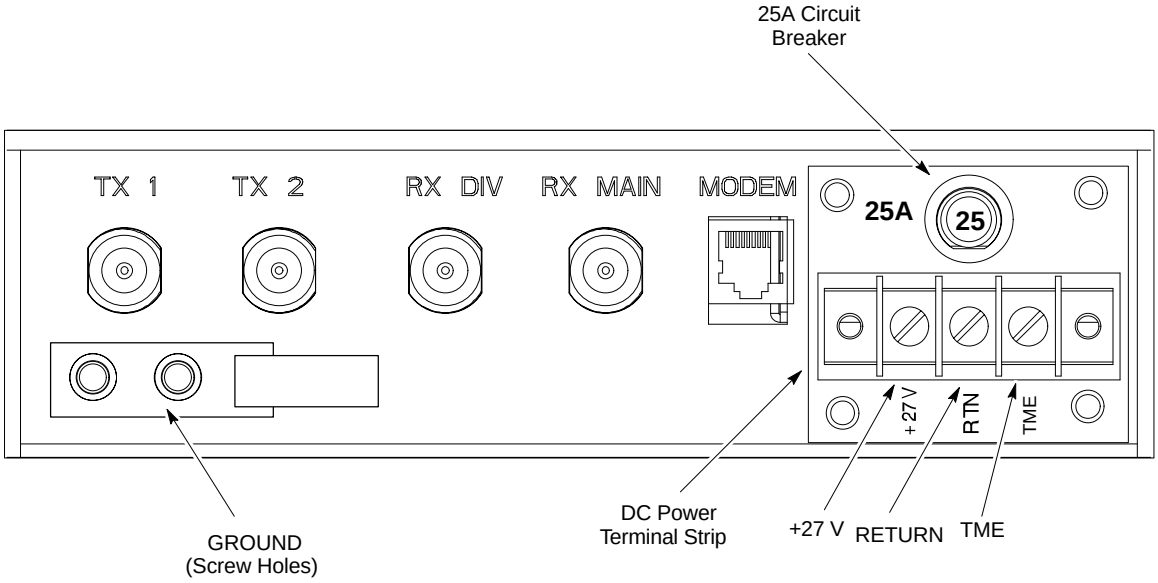


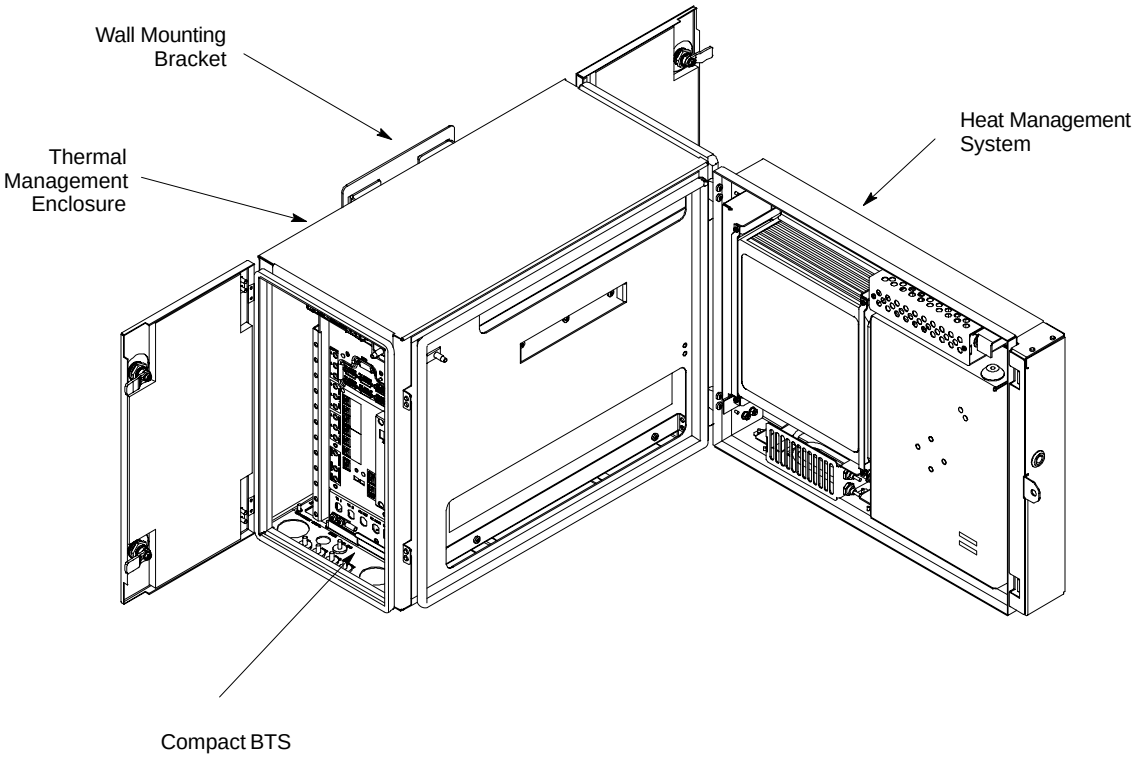
Figure 1-9: +27VDC RF Connectors, Circuit Breaker, DC Power Terminal Strip, and Ground Studs



Outdoor Enclosure Equipment Identification

Figure 1-10 shows the TME and HMS outdoor enclosures.

Figure 1-10: Thermal Managment Enclosure and Heat Manaagement System



Thermal Management Enclosure

The following are brief descriptions of the components of the TME.

TME

The Thermal Management Enclosure surrounds the Compact BTS, affording it protection against the weather. See Figure 1-10.

HMS

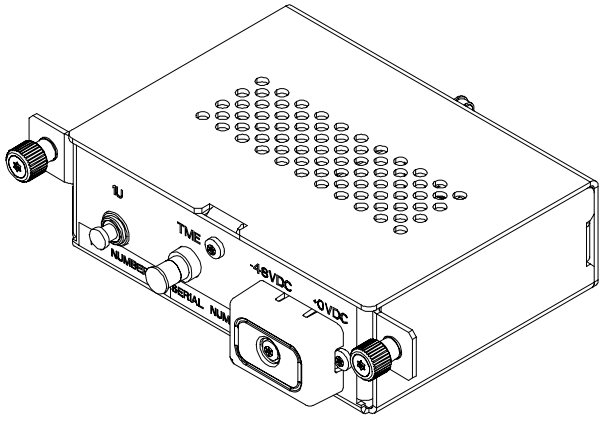
The Heat Management System attaches to the TME and provides temperature regulation of the Compact BTS. See Figure 1-10.

PDA

The Power Distribution Assembly is the connection point for the –48 and +27 VDC. Also, it contains circuit breakers for the TME and 1U (optional module). Connections to the HMS and BTS are also provided at the rear of the unit.. See Figure 1-11.

Figure 1-11: Power Distribution Assembly

(–48V version shown)



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Power Distribution Enclosure

The following are brief descriptions of the components of the PDE.

PDE

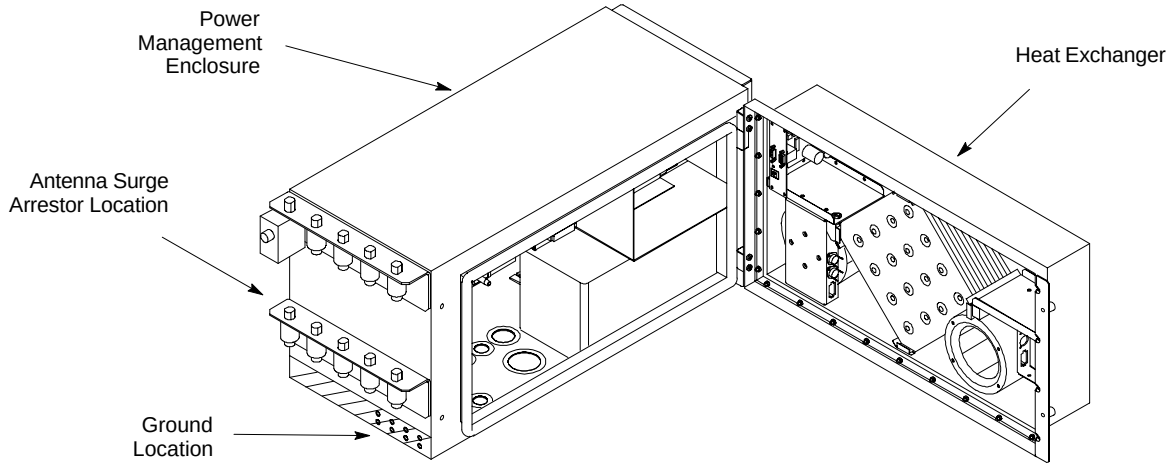
The Power Distribution Enclosure converts AC voltage to DC voltage for use by the TME and Compact Combined Linear Power Amplifier (cCLPA). Battery backup is routed through the PDE. See Figure 1-12.

- AC Load Center (ACLC) – Where the AC voltage is connected to the PDE. Also contains AC surge protection.
- Power Supply Module (PSM) – Converts the 220–240 VAC to –48 V DC for use by the TME, BTS, and cCLPA.
- Power Management Alarm Card (PMAC) – Monitors alarms for PDE and battery backup.
- Circuit Breakers (CB) – Provides DC surge and DC short circuit protection.
- Punch Block (PB) – Distribution point for incoming and outgoing data signal lines.
- Multiple ground connections at the reaar of the PDE
- Antenna surge arrestors slots

HX

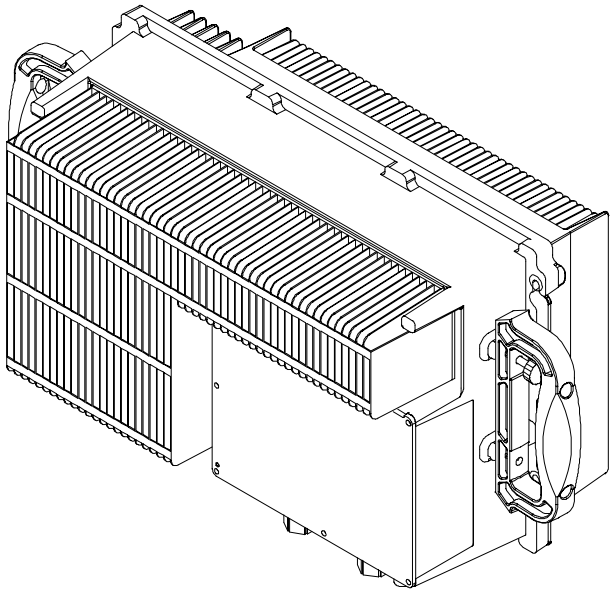
The Heat Exchanger attaches to the PDE and provides temperature regulation.

Figure 1-12: Power Distribution Enclosure and Heat Exchanger



Combined Compact Linear Power Amplifier

Figure 1-13: Compact Combined Linear Power Amplifier



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Indoor Installation Order

The pieces of the BTS should be installed in the following order.

1. Unpack and inspect hardware
2. Install mounting hardware and bracket (s)
3. Attach and secure unit to mounting bracket
4. Install GPS
5. Prepare site cabling
6. Attach all ground cabling to unit(s)
7. Attach all cables to unit(s)

Outdoor Installation Order

The pieces of the BTS should be installed in the following order.

1. Unpack and inspect hardware
2. Install mounting hardware
3. Attach and secure units to mounting bracket(s).
4. Attach all ground cabling to unit(s).
5. Prepare site cabling
6. Install GPS.
7. Install antennas
8. Attach AC power cable to PDE
9. Connect DC Power cables between PDE and TME
10. Connect DC power cables between PDE and cCLPA
11. Connect optional Battery Backup cable to PDE
12. Attach all interconnection cables to unit(s).

ATP Order

The following should already be installed on the laptop computer

- WinLMF

The ATP for the BTS is performed in the following sequence:

1. BTS preparation
2. Connecting the LMF computer to the BTS
3. Connecting test equipment to the BTS and LMF
4. Establishing an MMI communications session
5. Setting customer operating channel
6. Synchronization verification
7. Start WinLMF and log on to BTS
8. Update BTS–specific CDF file device load version
9. Download and enable MCC
10. Test equipment setup (Calibration/GPIB address & clock setup)

11. Test equipment selection
12. Power meter calibration
13. Test cable calibration
14. Create CAL file
15. RF path audit
16. TX and RX Acceptance tests
17. Generate an ATP Report
18. Copy WinLMF CAL file to Floppy Disc
19. Terminate LMF session/leave the site

Chapter 2: Site Preparation

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Site Preparation Overview

Overview

This chapter provides the procedures and information to verify that the site is ready to have the equipment installed. It also provides procedures to ensure the safety of the installation personnel, protect the equipment from damage, and verify the site layout parameters.

Installation

This SC™ 480 BTS can be installed indoors. The site preparation depends on the type of installation and the site characteristics. Battery back up is optional and provided by the customer.

Verifications and procedures

The verifications and procedures provided in this chapter are:

- Internal site inspections
- Preparing site for the arrival of equipment
- Site layout verification

Site manager

The site manager is the person in charge of and responsible for the full site.

Verifications and inspections

Verifications typically have the installer check with the site manager that a condition has been previously checked or procedure previously performed and meets a stated specification.

Inspections typically have the installer personally checking that a condition or item meets stated specifications.

Inspection overview

Inspect the site to verify that the necessary equipment has been properly installed. Also, as part of the inspection, verify that the equipment is adequate to support the Motorola equipment. Not all inspections may apply to every site. The site characteristics determine which inspections apply.

NOTE

Installation of ancillary equipment (e.g., power supplies, terminal blocks, etc.) may be the responsibility of the installer. Refer questions to your Motorola Program Manager.

Deficiencies

Notify responsible personnel of any deficiencies as soon as possible, if the installer is not responsible for correcting the noted deficiencies. Deficiencies may need to be corrected before any installation can start.

What to Inspect

The following external items should be inspected and compared against any related site-specific documentation.

- Antennas
- External ground systems
- Clearances for units
- Mounting Structures

Additionally, for all sites the incoming power should be inspected and compared against any related site-specific documentation.

Antenna and Transmission Line Inspections

Documentation

The vendor(s) responsible for supplying other equipment have left installation documentation at the site. Review this documentation and compare it with any related site-specific documents.

Inspection

Inspect the following:

- Antenna and transmission line installation
- Grounding.

Structural Inspections and Verifications

Site power

Verify with the site manager that site power has been previously checked and meets the specifications stated in the site-specific documentation.

Cabling rack

Inspect the cable rack for proper installation. The cable racks should be at least 7 ft from the floor. The cable racks should be electrically tied together with 6 AWG wire, except cable racks that are in an isolated ground zone.

Fire protection

For indoor installations verify with the site manager that some type of fixed fire suppression equipment is installed. The possible types are:

- Halon gas system, recommended for cell sites because:
  - Halon extinguishes a fire without removing oxygen from a room.
  - Halon is clean, allowing for quick cleanup after a fire.
  - Halon will not damage the cell site equipment.
- CO^2 (carbon dioxide) system.
- Sprinkler system. “Dry pipe” sprinkler systems that remove all power to a room before filling the overhead sprinklers with water are recommended.

WARNING

In addition to the fixed fire suppression equipment, there should be at least two 5-lb ABC class portable fire extinguishers on the premises before equipment installation begins.

Fire Fighting Procedures

Cellular infrastructure equipment contains various materials which can decompose into toxic compounds during intense heat. When fire fighting conditions are severe, wear full protective clothing, including helmet, self–contained, positive pressure or pressure demand breathing apparatus, bunker coat and pants, bands around arms, waist and legs, face mask, and protective covering for exposed areas of the head.

Antenna cables and ports

Inspect the antenna cables and ports to verify that:

- All antenna cables have been properly labeled.
- Antenna ports have been properly weatherproofed.
- An adequate number of ports exist to handle all of the required antenna runs.
- Lightning arrestors have been installed at the building or shelter entry point.
- For some systems, special ports may be required (refer to the site-specific information for further details).

Grounding Inspections

Indoor installations

For indoor installations refer to the *Grounding Guideline for Cellular Radio Installations (68P81150E62)* for all grounding inspection procedures.

Verify the following:

- All ground cables have a bend radius of 20 cm (8 inches) or more.
- Metallic lines (span, phone[modem], RGPS, power and antenna) that enter or leave the site should be equipped with a 3-electrode gas tube protector. The ground side of the gas tubes should be tied to the Master Ground Bus (MGB).
- All installed cable racks (in the same ground zone) are jumpered together.

WARNING

Cable racks in an Isolated Ground Zone (IGZ) are not to be connected to a cable rack in a non-IGZ. For more information on IGZ, see *Grounding Guideline for Cellular Radio Installations*, Motorola part number *68P81150E62* or Appendix C of Standards and Guidelines for Communications Sites (Motorola part number *9882904Y01*)

Outdoor Installations

For outdoor installations refer to the *Grounding Guideline for Cellular Radio Installations (Motorola part number 68P81150E62)* or Appendix C of Standards and Guidelines for Communications Sites (Motorola part number *9882904Y01*) for all grounding inspection procedures.

Verify the following:

- All outdoor enclosures are grounded to system masrter ground.
- All enclosures have conduit attached.
- It is recommended that all metallic lines (span, RGPS, power, and antenna) that enter or leave the site are be equipped with a surge suppression device (lightning arrestor).

Prepare Site for the Arrival of the Equipment

Description

This information covers various topics not all of which are needed at every site. Based on the site characteristics execute the steps that apply to your site. Before installing the equipment, do the following to ensure the safety of installation personnel and to protect the equipment.

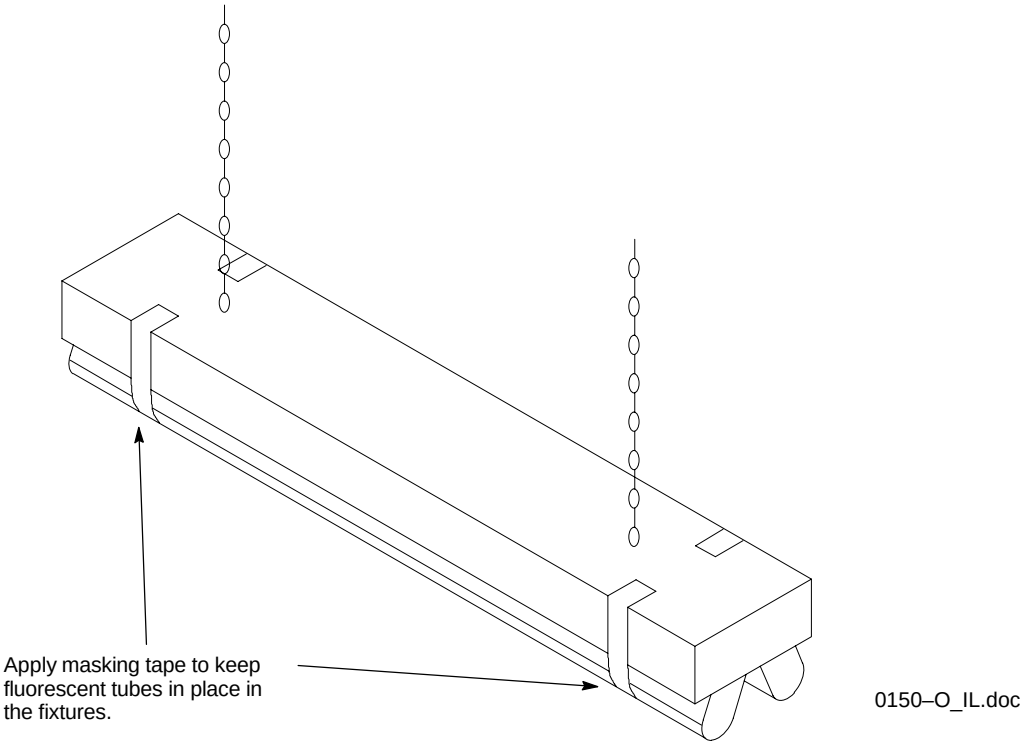
Equipment Arrival

Before the equipment arrives, indicate to the transport company an area at the site where the equipment can be unloaded and, if necessary, unpacked. The equipment should be carefully delivered to the site, along with all equipment dollies and padding required to safely move the equipment from the unloading area to the cell site. The following should also be provided, outdoor weather protection, temporary lighting and power for lighting and power tools.

Securing Fluorescent Lights

Figure 2-1 illustrates the use of tape to secure fluorescent tubes. Secure any fluorescent tubes that may be hit or damaged by any unit, cable, or personnel.

Figure 2-1: Securing Lights with Tape



Procedure to Prepare the Site for the Equipment

Table 2-1: Procedure to Prepare the Site for the BTS	
Step	**Action**
1	If some type of protective padding is available install it around any existing equipment at the site that could be damaged during installation of the unit(s).
2	Hang plastic sheets around intended work areas to prevent dust and debris from damaging co-located equipment during installation.
3	Secure any fluorescent tubes in place using masking tape. (Refer to Figure 2-1.) **NOTE** This will prevent the tubes from being inadvertently jarred from the fixtures during the installation of equipment or cables.
4	Locate the demarcation blocks for external utilities. Verify that they are shown on the Site Engineering documents, and determine the required cable routing back to the equipment frames.
5	Verify the following: • DC power is available and meets the site documentation specifications (if applicable). • Cable rack is installed per site document specifications. • Outdoor cable runs are installed and meet local building codes. • Span line termination tie points are available. • Customer input termination tie points are available. • There is clear access to move the equipment to the desired mounting area. • There is sufficient space for installation and service access to the equipment. • Customer supplied shelters are installed.

Unpacking the Equipment

Description

The Purpose of this section is to describe how the *SC*480 Compact BTS, TME, PDE, and cCLPA are packaged for shipping and how to correctly unpack the units in preparation for installation.

How Equipment is Shipped

The equipment are shipped in either cardboard or wood containers. The equipment are shipped with all internal cabling installed. For an indoor installation, the BTS is shipped in a single container. BTS accessories are shipped in their own container. If used, the cCLPA and accessories are shipped in a single container. Also, the Mounting Plate and BTS Mounting Bracket are shipped in a separate container.

For an outdoor configuration, the Thermal Management Enclosure (TME) and Wall Mounting Bracket are shipped in a single containter. The Base Transceiver Station (BTS) is shipped in a separate container. BTS accessories are packed separately and shipped in a container. The Power Distribution Enclosure (PDE), and Compact Combined Linear Power Amplifier (cCLPA) with their respective accessories, are shipped in separate containers.

Conduit piping and batteries for backup power are customer supplied.

How Equipment Arrives

Before the equipment arrives, indicate to the transport company an area at the site where the equipment can be unloaded and, if necessary, unpacked. The equipment should be carefully delivered to the site, along with all equipment dollies and padding required to safely move the equipment from the unloading area to the cell site. The following should also be provided, outdoor weather protection, temporary lighting and power for lighting and power tools.

Securing Fluorescent Lights

For indoor configuration, Figure 2-1 illustrates the use of tape to secure fluorescent tubes. Secure any fluorescent tubes that may be hit or damaged by any unit, cable, mechanical lift, or personnel.

Unpacking Process

The unpacking process requires that the following procedures be completed in the order shown:

1. Unpack the shipping container
2. Inventory the shipping container
3. Inspect equipment for damage

Recommended Tools

The tools in Table 2-2 are recommended to assist in opening the containers housing the equipment.

Table 2-2: Recommended Unpacking Tools	
Qty	**Description**
1	Tin Snips
2	Knife, Box Cutter, or Scissors

Unpacking Diagrams

The following diagrams show how to unpack the equipment.

WARNING

The steel bands surrounding the container can spring out from the container when the bands are cut. To avoid personal injury, stand safely to one side of the bands while cutting.
The approximate weights of the containers (with packaging):
TME: 50 kgs (100 lbs)
BTS: 30 kgs (150 lbs)
PDE :40 kgs (85 lbs)
cCLPA: 22 kgs (48 lbs).
Mounting Plate/BTS Mounting Bracket: 7 kgs (15 lbs).

Figure 2-2: Wood Shipping Container

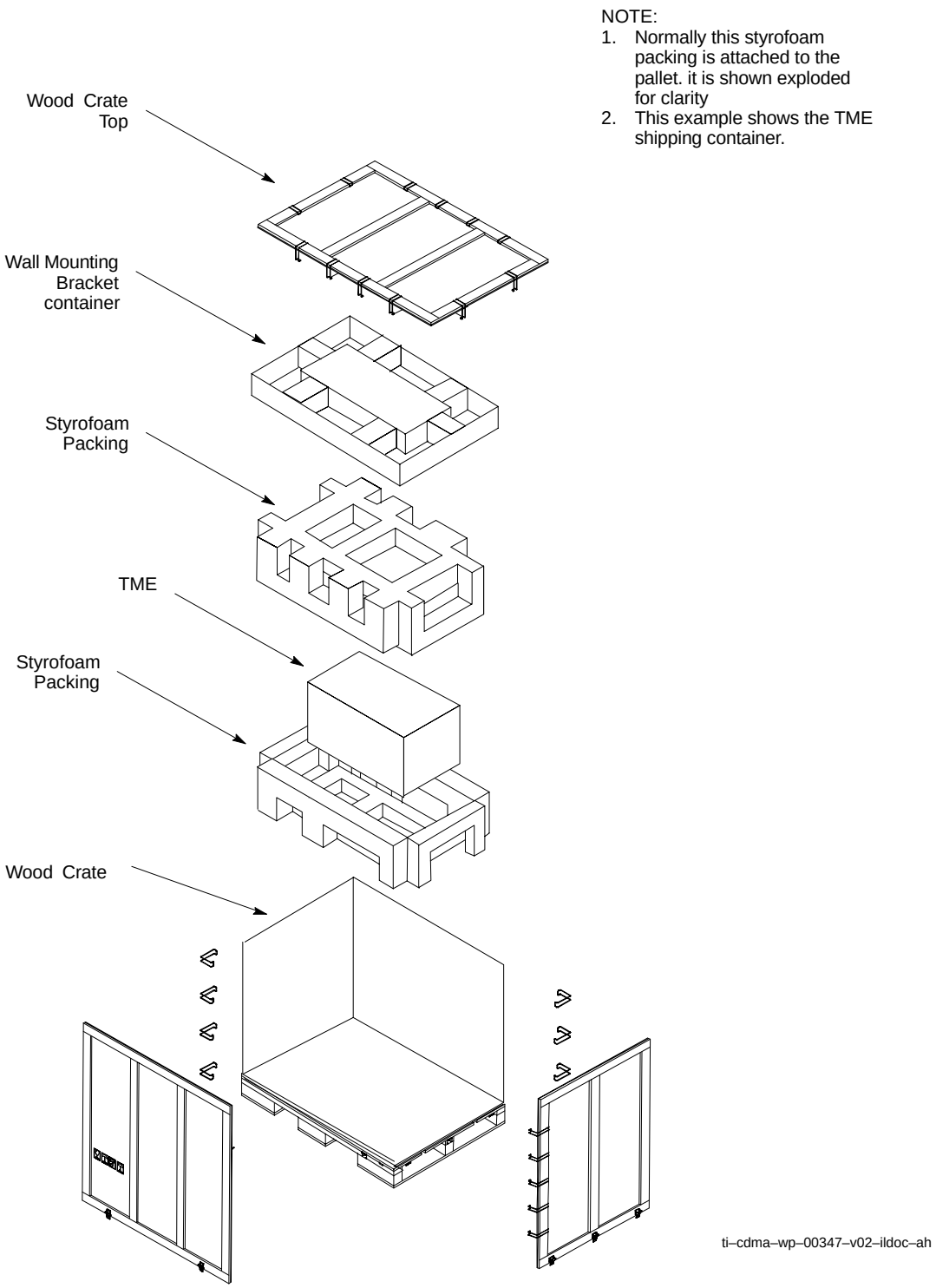
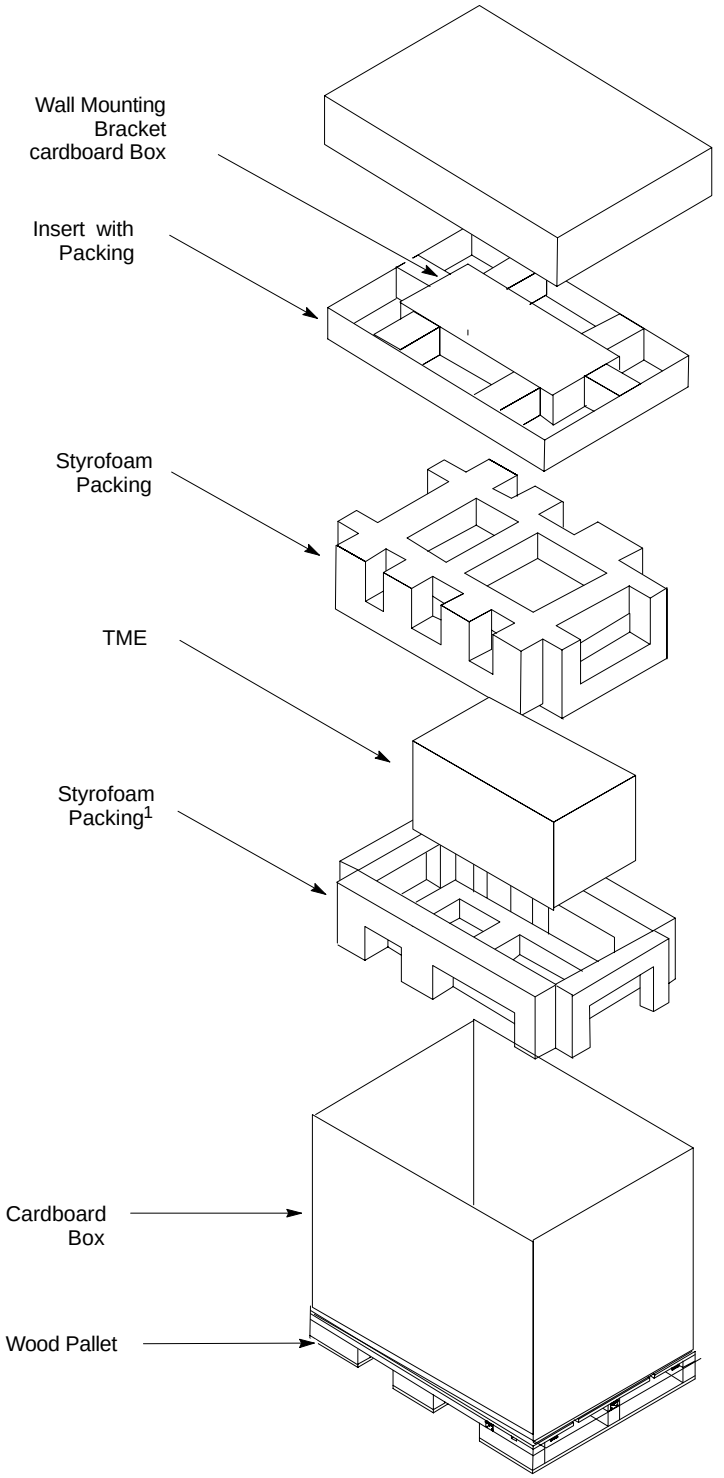


Figure 2-3: Cardboard Shipping Container



NOTE:
1. Normally this styrofoam packing is attached to the pallet. it is shown exploded for clarity
2. This example shows the TME shipping container.

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Unpacking a Cardboard or Wood Container

Follow the procedure in Table 2-3 to unpack equipment from a container.

Table 2-3: Unpacking Equipment from a Cardboard or Wood Container	
Step	**Action**
1	Inspect the container for damage.
Cardboard Container	
2	Open container using tin snips to cut each outer steel band or a knife (or equivalent) to cut the plastic wrap that surrounds the container.
3	Remove equipment door key from top of container.
4	Lift off the cardboard cover.
5	Proceed to Table 2-4 or Table 2-5.
Wood Container	
6	Perform step 1.
7	Loosen latches at the bottom of the container.
8	Remove clips holding the top pallet , and remove pallet from the container.
9	Remove equipment door key from pallet.
10	Proceed to Table 2-4 or Table 2-5.

Removing Outdoor Equipment from a Container

Follow the procedure in Table 2-4 to remove the outdoor equipment from a container. The following procedure starts with the TME removal and continues through to the Pole Mounting Assembly. The order of opening containers is not important, it is just for demonstration purposes. The procedure is written for one set. Perform procedure as many times as required to accommodate the site configuration.

Table 2-4: Procedure to Remove Outdoor Equipment from Container	
Step	**Action**
1	Open shipping container holding TME. Perform Table 2-3.
2	Remove the box containing the Wall Mounting Bracket from the insert.
3	Remove insert.
4	Remove cage style packing material surrounding the TME.
5	Using a knife or equivalent, carefuly cut through protective bag enclosing TME.

Table 2-4: Procedure to Remove Outdoor Equipment from Container	
Step	**Action**
	△ WARNING The TME and HMS are shipped as one unit. Together they weigh 39 kg (86 lbs). It is recommended that the HMS be removed first; otherwise, two people are required to remove the TME with HMS installed.
6	Use the key to unlock the HMS and open.
7	Use a wrench to remove two nuts and washers securing ground cable to HMS.
8	Disconnect signal cable from TME.
9	Remove HMS from TME hinges and place on a flat surface.
10	Remove TME and place on its backside on a flat surface.
11	Open shipping container holding PDE. Perform Table 2-3.
12	Remove box containing the Wall Mounting Bracket from insert.
13	Remove insert.
	△ WARNING The PDE and HX are shipped as one unit. Together they weigh 52 kg (115 lbs). It is recommended that a minimum of two people be required to remove the PDE with HX installed.
13a	Remove PDE and place on its backside on a flat surface.
14	Open shipping container holding cCLPA. Perform Table 2-3.
	! CAUTION Be careful not to damage the cooling fins on the cCLPA.
14a	Remove cCLPA and place on its backside on a flat surface.
15	Remove associated accessories and place on a flat surface.
16	Open shipping container holding BTS. Perform Table 2-3.
17	Remove box containing RGPS or Local GPS (RF–GPS) antenna and cabling, and place on a flat surface. **NOTE** RGPS or RF–GPS may have been shipped in a separate container.
18	Remove packing surrounding BTS.
19	Remove BTS and place on a flat surface.
20	If system is to be pole mounted proceed to step 21; otherwise, proceed to step 23.
21	Open shipping container holding Pole Mounting Assembly.
22	Remove Pole Mounting Bracket Assembly from container and set on a flat surface.
23	Take inventory of equipment received. Report the extent of any equipment damage to the transport company and to appropriate management personnel.

Removing Indoor Equipment from a Container

Follow the procedure in Table 2-5 to remove the indoor equipment from a container. The following procedure starts with the BTS removal and continues through to the Mounting Plate. The order of opening containers is not important, it is just for demonstration purposes. The procedure is written for one set. Perform procedure as many times as required to accommodate the site configuration.

Table 2-5: Procedure to Remove Indoor Equipment from Container

Step	Action
1	Inspect containers for damage. Use tin snips or knife to cut straps holding Mounting Plate container to the BTS container.
2	Open container holding Mounting Plate and accessories.
3	Remove Mounting Plate and accessories and place on a flat surface.
4	Open shipping container holding BTS.
5	Remove box containing RGPS or Local GPS (RF–GPS) antenna and cabling, and place on a flat surface.
6	Remove insert.
7	Remove packing surrounding BTS.
8	Remove BTS and place on a flat surface.
	NOTE If a cCLPA has also been shipped, proceed to step 9; otherwise, proceed to step 12.
9	Open shipping container holding cCLPA. Perform Table 2-3.
10	Remove packing surrounding cCLPA.
	! CAUTION Be careful not to damage the cooling fins on the cCLPA.
11	Remove cCLPA and place on a flat surface.
12	Take inventory of equipment received. Report the extent of any equipment damage to the transport company and to appropriate management personnel.

2

BTS Overview

This information covers the dimensions and clearances associated with the BTS for indoor configurations.

Dimensions and Clearances

Table 2-6, Table 2-7, and Figure 2-4 through Figure 2-7 show the installed dimensions and recommended clearances for each item.

Table 2-6: Installation Dimensions for the BTS

Item	Height	Width	Depth	Weight
BTS (fully installed)	425 mm (17 in.)	218 mm (9 in.)	626 mm (25 in.)	23 kg (50 lbs)

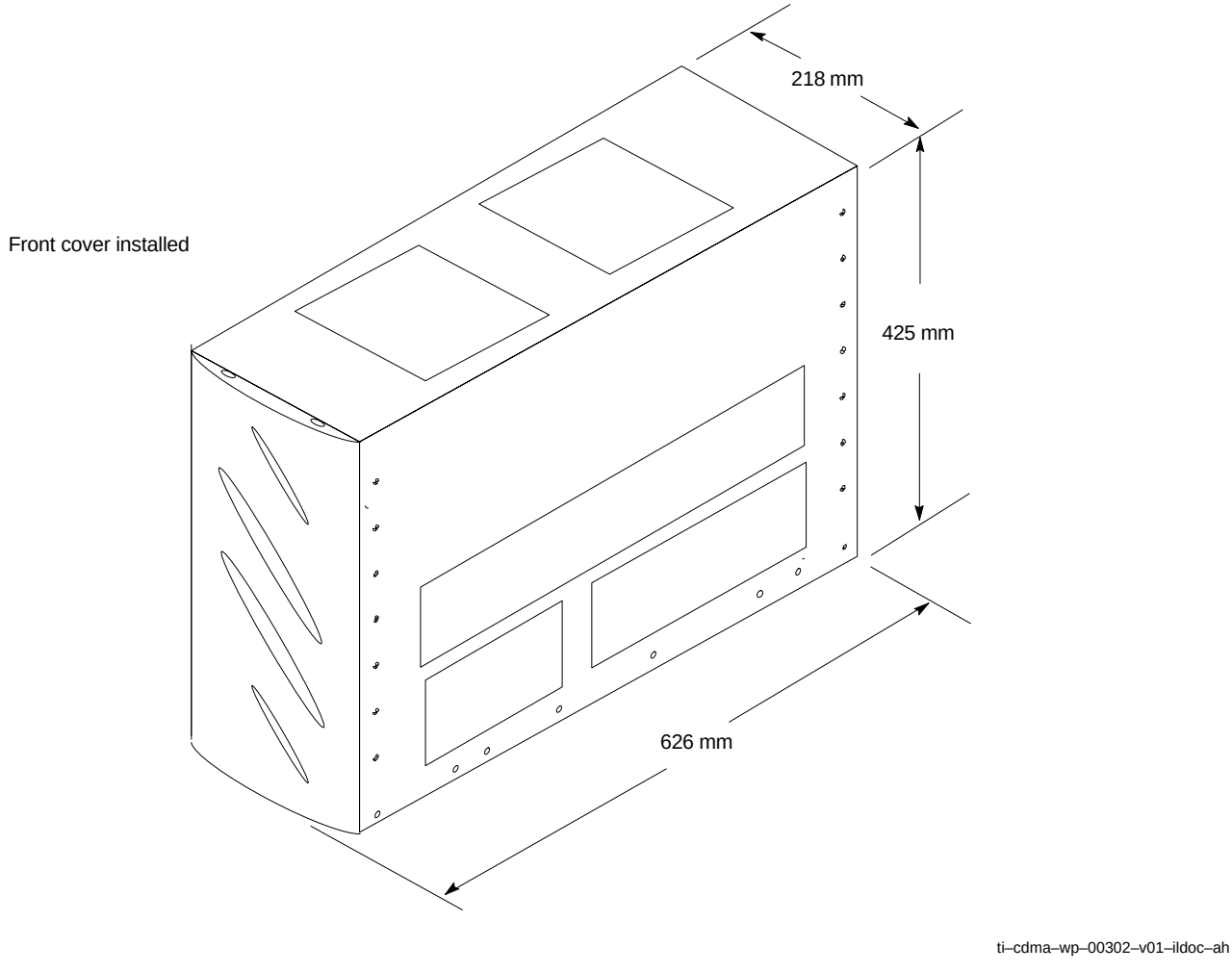
Table 2-7: Minimum Clearances for the BTS

Item	Front	Back	Left	Right	Top	Bottom
Installation and Maintenance Requirements	680 mm (27 in.)	400 mm (16 in.)	50 mm (2 in.)	50 mm (2 in.)	50 mm (2 in.)	0 mm (0 in.)
Functional Requirements	50 mm (2 in.)	50 mm (2 in.)	50 mm (2 in.)	50 mm (2 in.)	50 mm (2 in.)	0 mm (0 in.)

BTS Dimensions

The BTS dimensions are shown below.

Figure 2-4: Overall Dimensions of BTS



cCLPA Dimensions and Clearances

Table 2-8, Table 2-9, and Figure 2-5 show the installed dimensions and recommended clearances for each item.

Table 2-8: Installation Dimensions for the cCLPA

Item	Height	Length	Width	Weight
cCLPA	261 mm (10 in.)	495 mm (19 in.)	295 mm (12 in.)	20 kg (44 lbs)

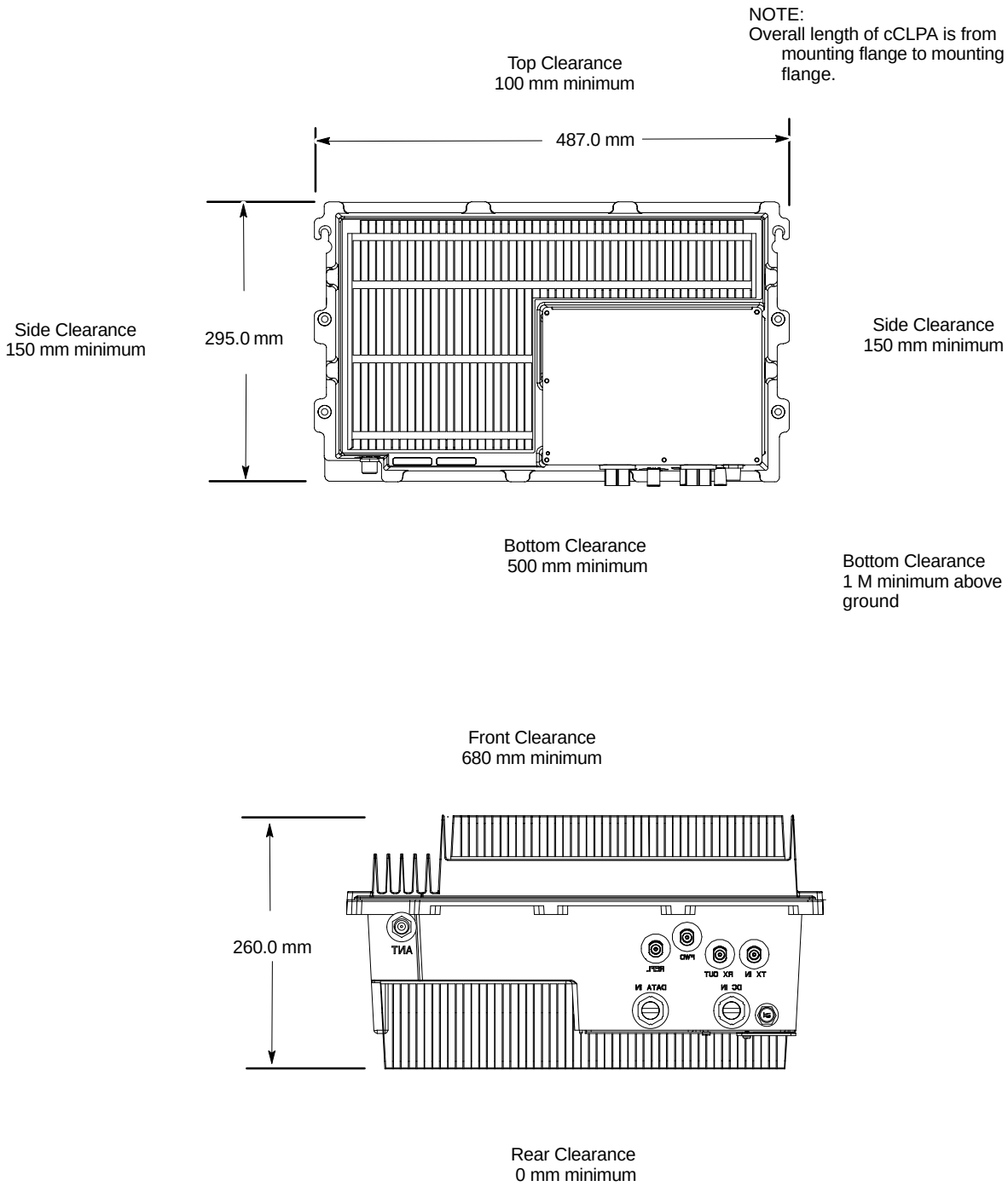
Table 2-9: Minimum Clearances for the cCLPA

Item	Front	Back	Left	Right	Top	Bottom
Installation and Maintenance Requirements	680 mm (27 in.)	0 mm (0 in.)	*150 mm (6 in.)	*150 mm (6 in.)	100 mm (4 in.)	**500 mm (20 in.)
Functional Requirements	680 mm (27 in.)	0 mm (0 in.)	150 mm (6 in.)	150 mm (6 in.)	100 mm (4 in.)	500 mm (20 in.)

* Dimension shown accommodates the handles. Without handles 0 mm is the minimum.

** Minimum of 1 M (40 in) for ground clearance.

Figure 2-5: cCLPA Dimensions and Functional Clearances



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Unit Clearances

The unit clearances are shown below.

Figure 2-6: Indoor Functional Clearances for BTS

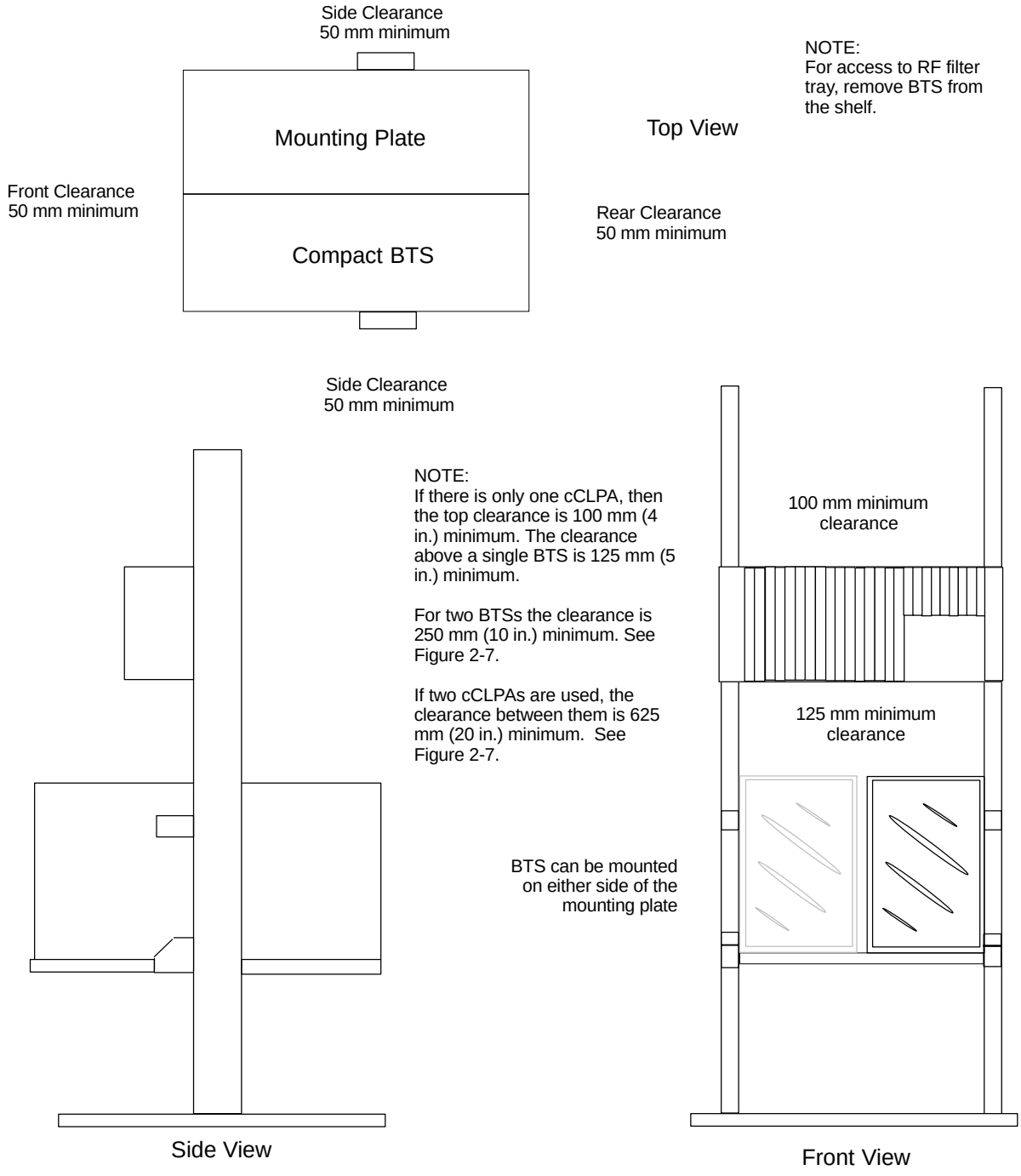
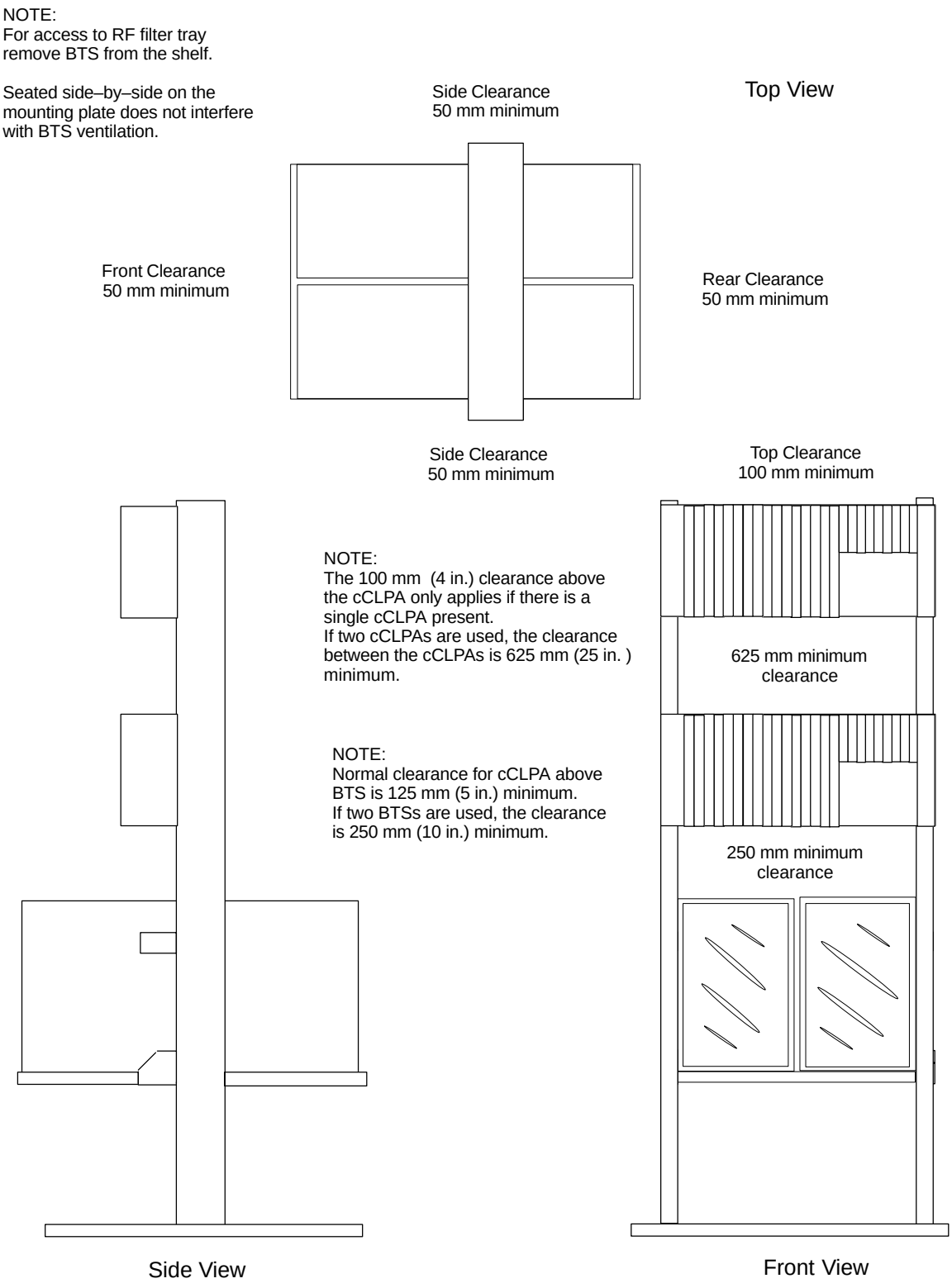


Figure 2-7: Indoor Functional Clearances for BTS Side–By–Side Configuration



TME Dimensions and Clearances

Table 2-10, Table 2-11, Figure 2-9, and Figure 2-10 show the TME installed dimensions and recommended clearances.

Table 2-10: Installation Dimensions for the TME

Item	Height	Length	Width	Weight
TME	530 mm (21 in.)	738 mm (29 in.)	448 mm (18 in.)	34 kg (75 lbs)

Table 2-11: Minimum Clearances for the TME

Item	Front	Back	Left	Right	Top	Bottom
Installation and Maintenance Requirements	705 mm (30 in.)	51 mm (2 in.)	600 mm (24 in.	600 mm (24 in.)	80 mm (3 in.)	*1000 mm (39 in.)
Functional Requirements	100 mm (30 in.)	51 mm (2 in.)	300 mm (12 in.)	300 mm (12 in.)	80 mm (3 in.)	*1000 mm (39 in.)
* Minimum of 1 Meter for ground clearance.						

Figure 2-8: TME

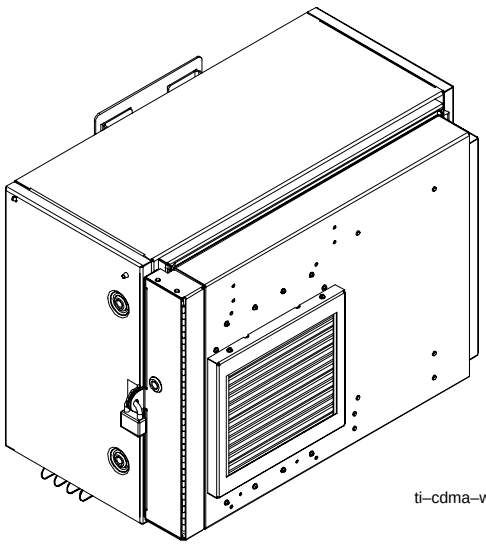
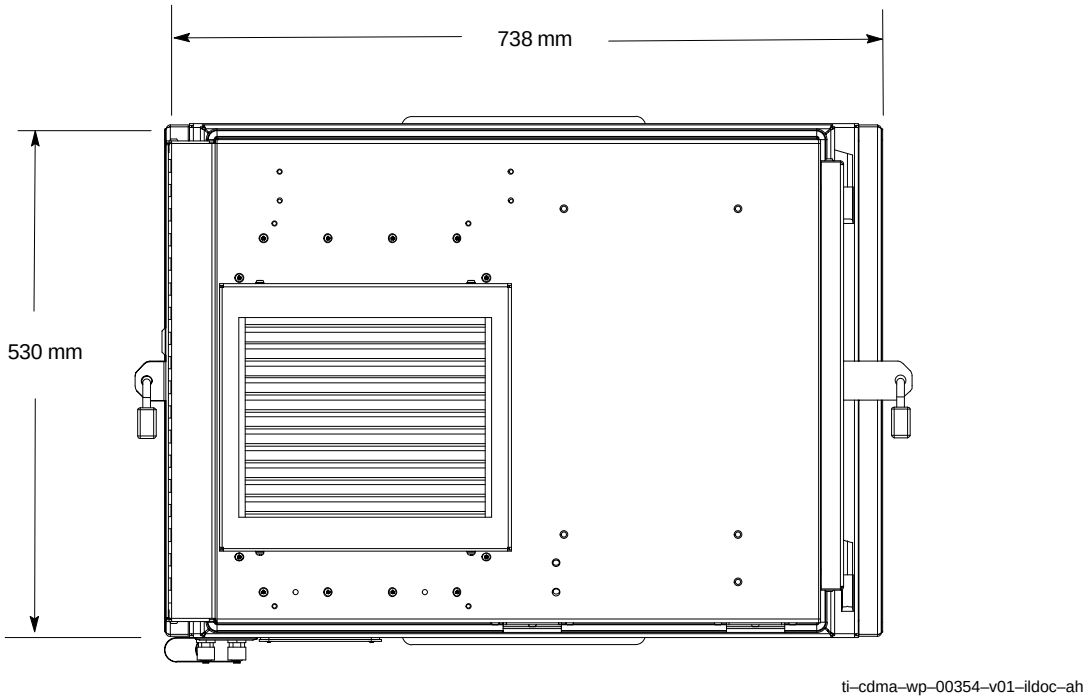
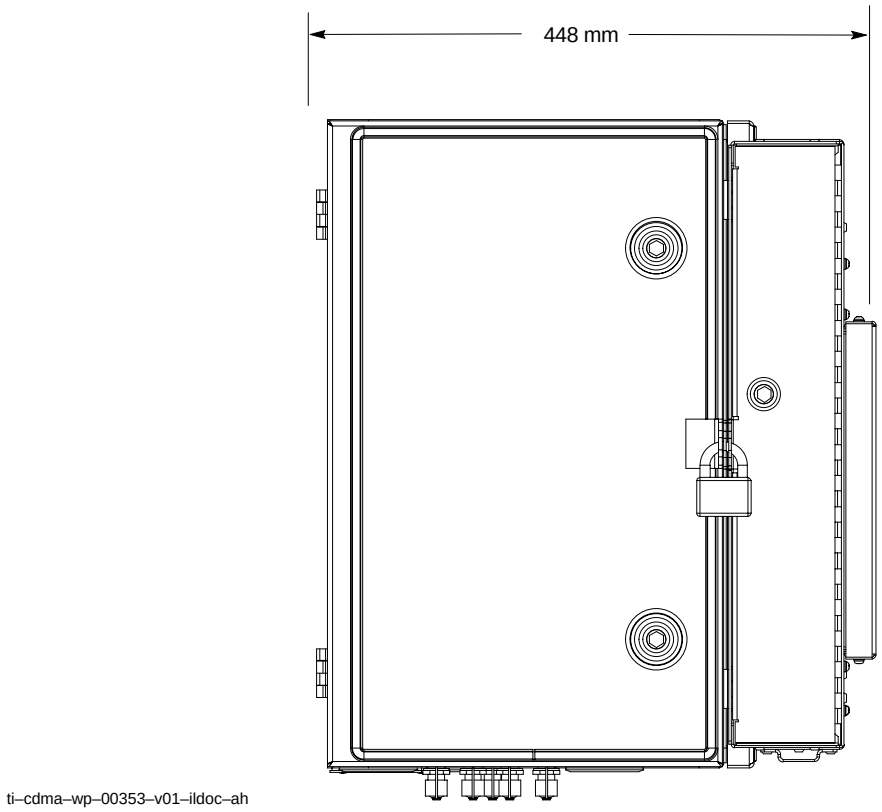


Figure 2-9: Overall Dimensions of the Thermal Management Enclosure

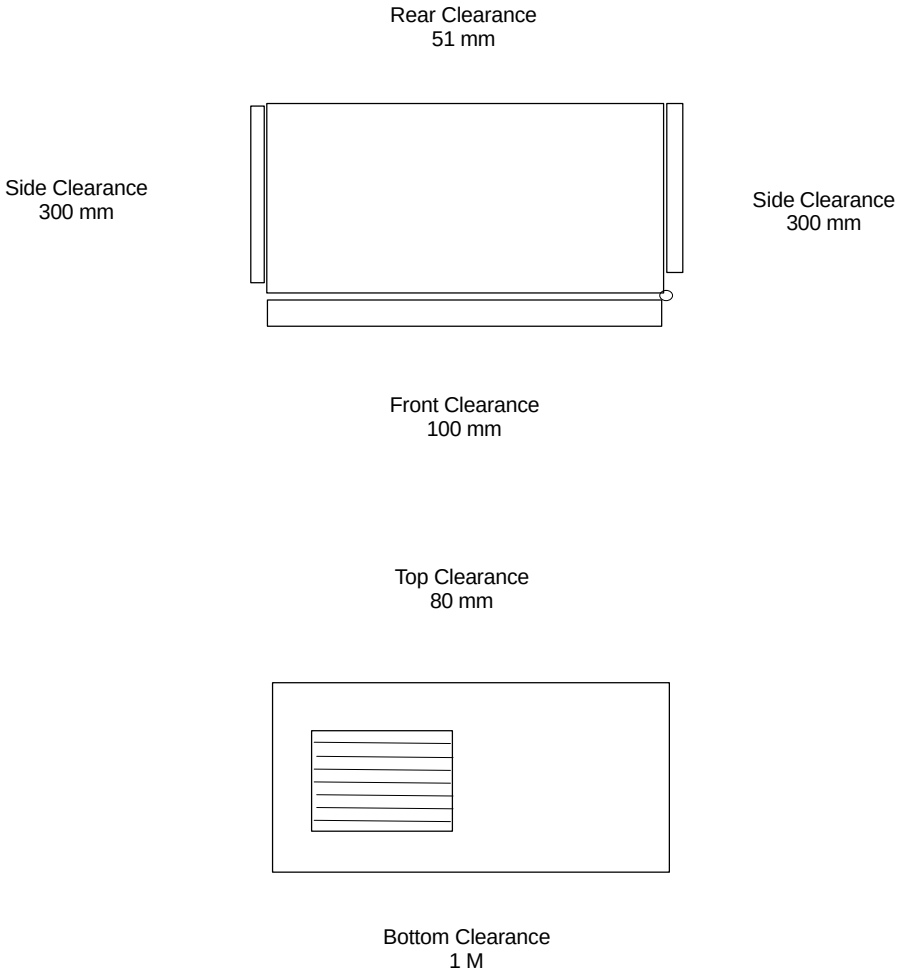




TME Clearances

Figure 2-10 shows the recommended clearances for the TME.

Figure 2-10: Functional Clearances for TME



PDE Dimensions and Clearances

Table 2-12, Table 2-13, and Figure 2-11 and Figure 2-12 show the installed dimensions and recommended clearances for each item.

Table 2-12: Installation Dimensions for the PDE

Item	Height	Length	Width	Weight
PDE	*350 mm (14 in.)	810 mm (32 in.)	473 mm (19 in.)	52 kg (115 lbs)

* Mounting Bracket extends an additional 186 mm (7 in) beyond bottom of TME.

Table 2-13: Minimum Clearances for the PDE

Item	Front	Back	Left	Right	Top	Bottom
Installation and Maintenance Requirements	760 mm (30 in.)	51 mm (2 in.)	334 mm (13 in.)	334 mm (13 in.)	150 mm (6 in.)	*150 mm (6 in.)
Functional Requirements	300 mm (12 in.)	51 mm (2 in.)	150 mm (6 in.)	150 mm (6 in.)	150 mm (6 in.)	*150 mm (6 in.)

* Minimum of 1 Meter for ground clearance.

Figure 2-11: PDE

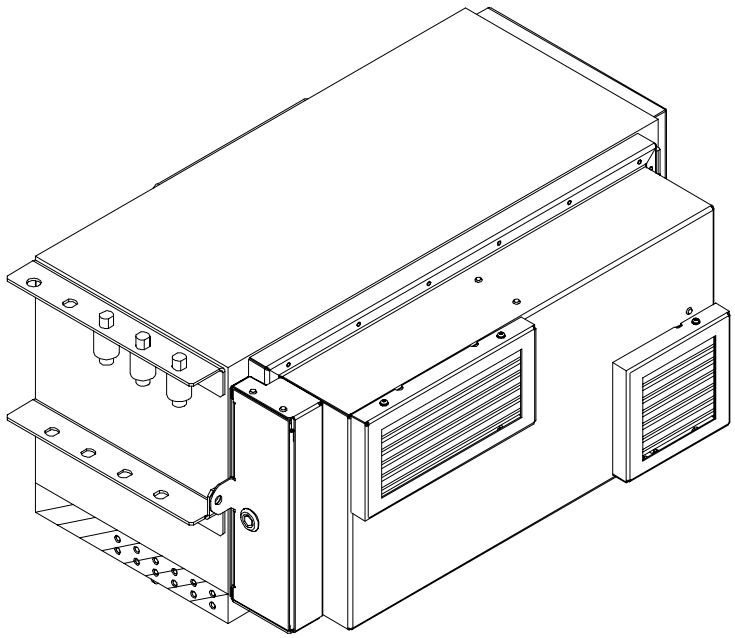


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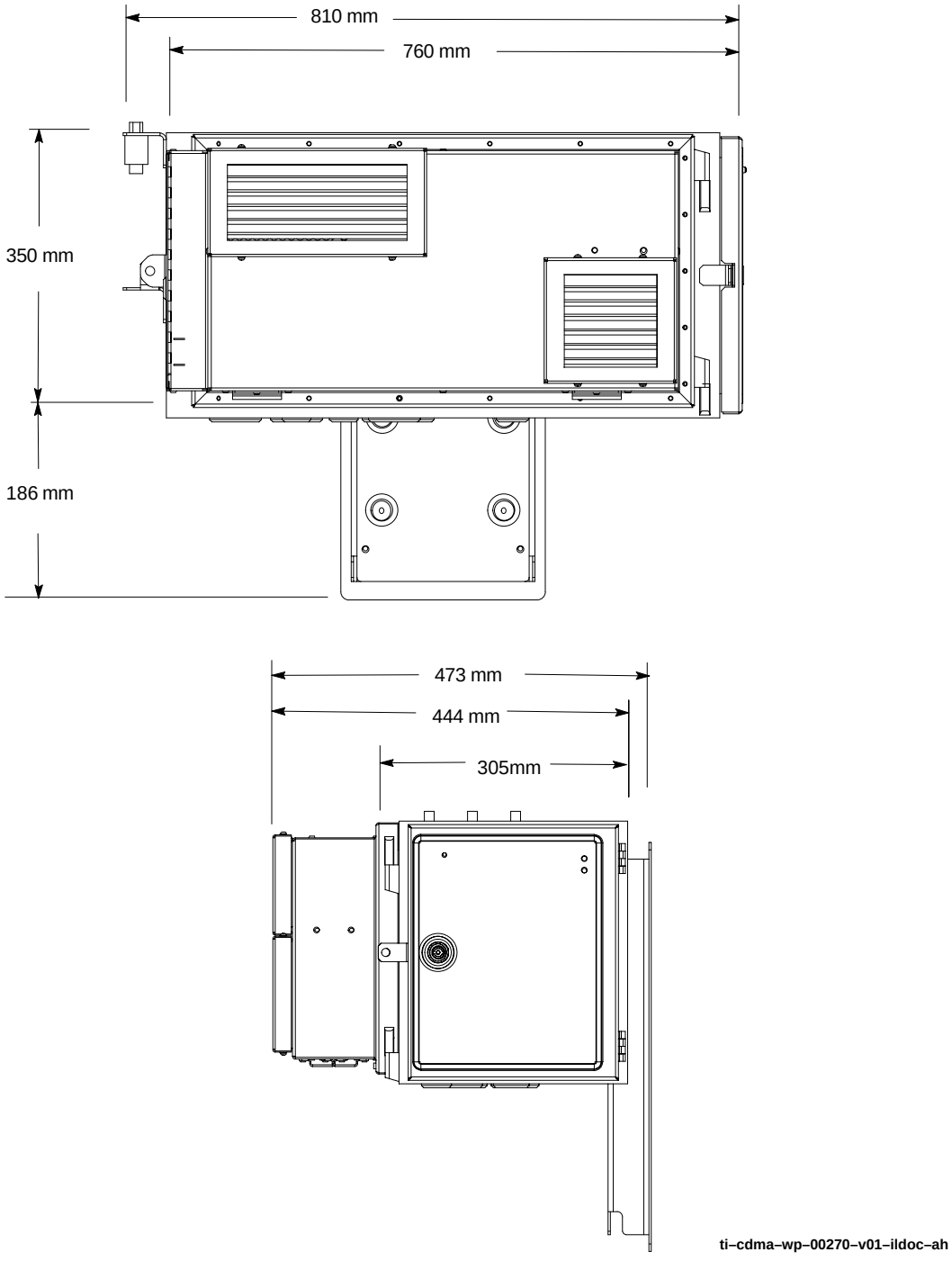
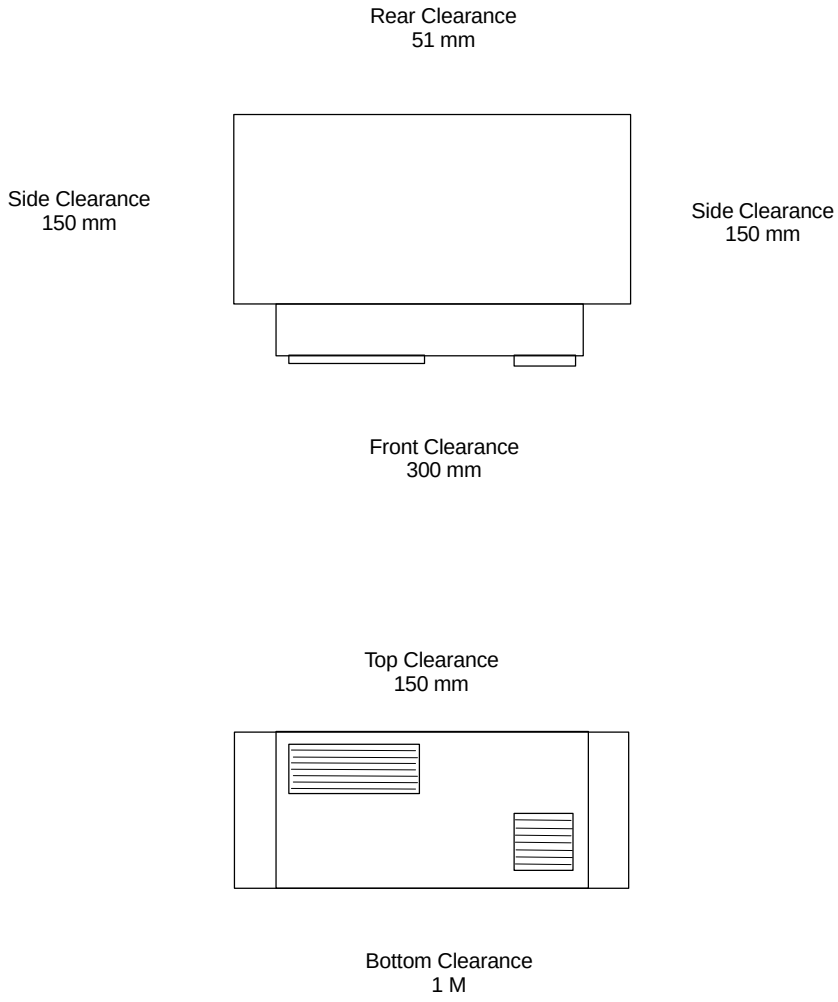
Figure 2-12: PDE Overall Dimensions



PDE Clearances

Figure 2-13 shows the recommended clearances for the PDE.

Figure 2-13: Functional Clearances for PDE



Outdoor Clearances

Figure 2-14 and Figure 2-15 show the minimum clearances for the outdoor configuration.

Figure 2-14: Mulitple Pole Installation and Functional Clearances for Enclosures and PA

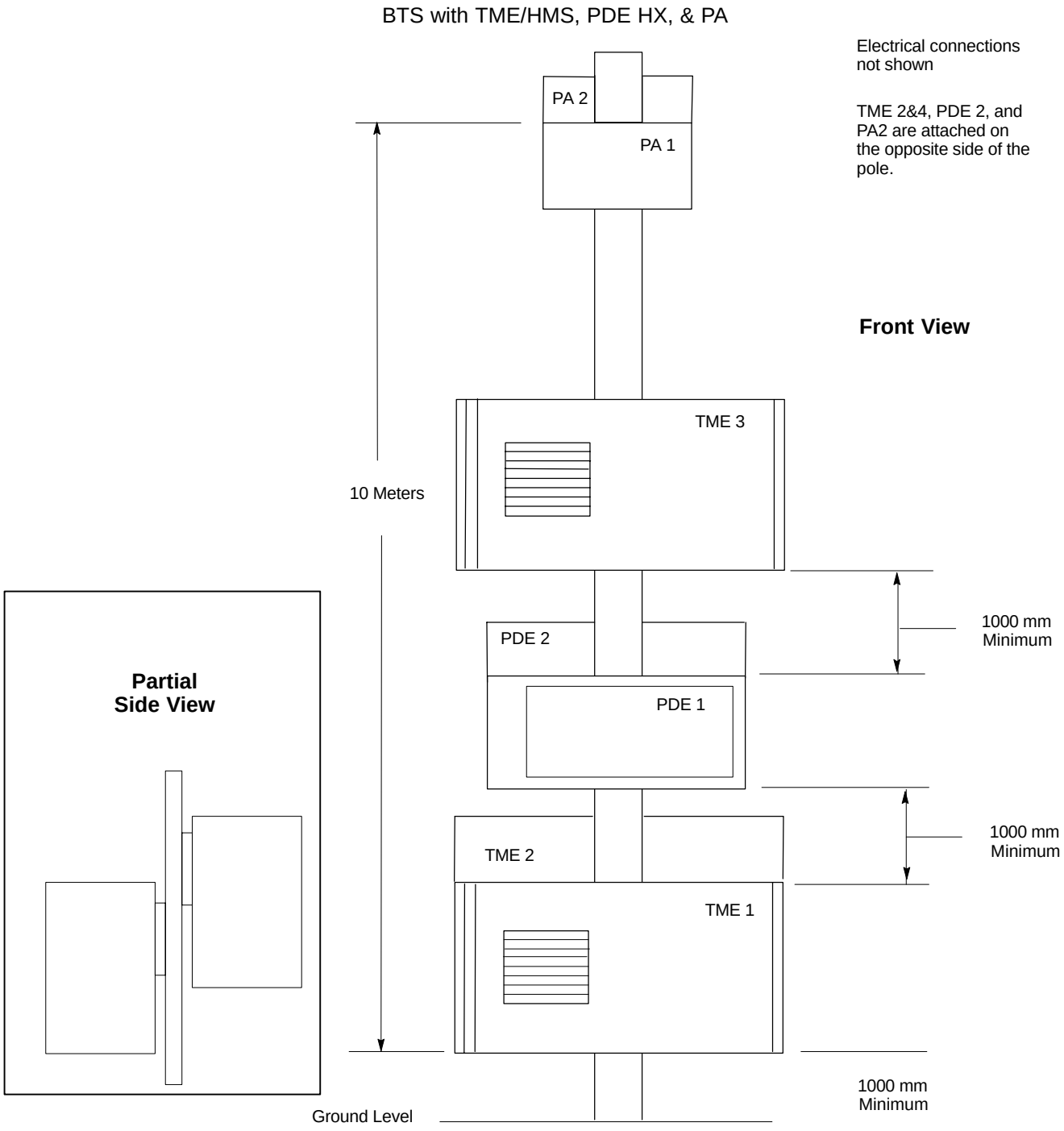
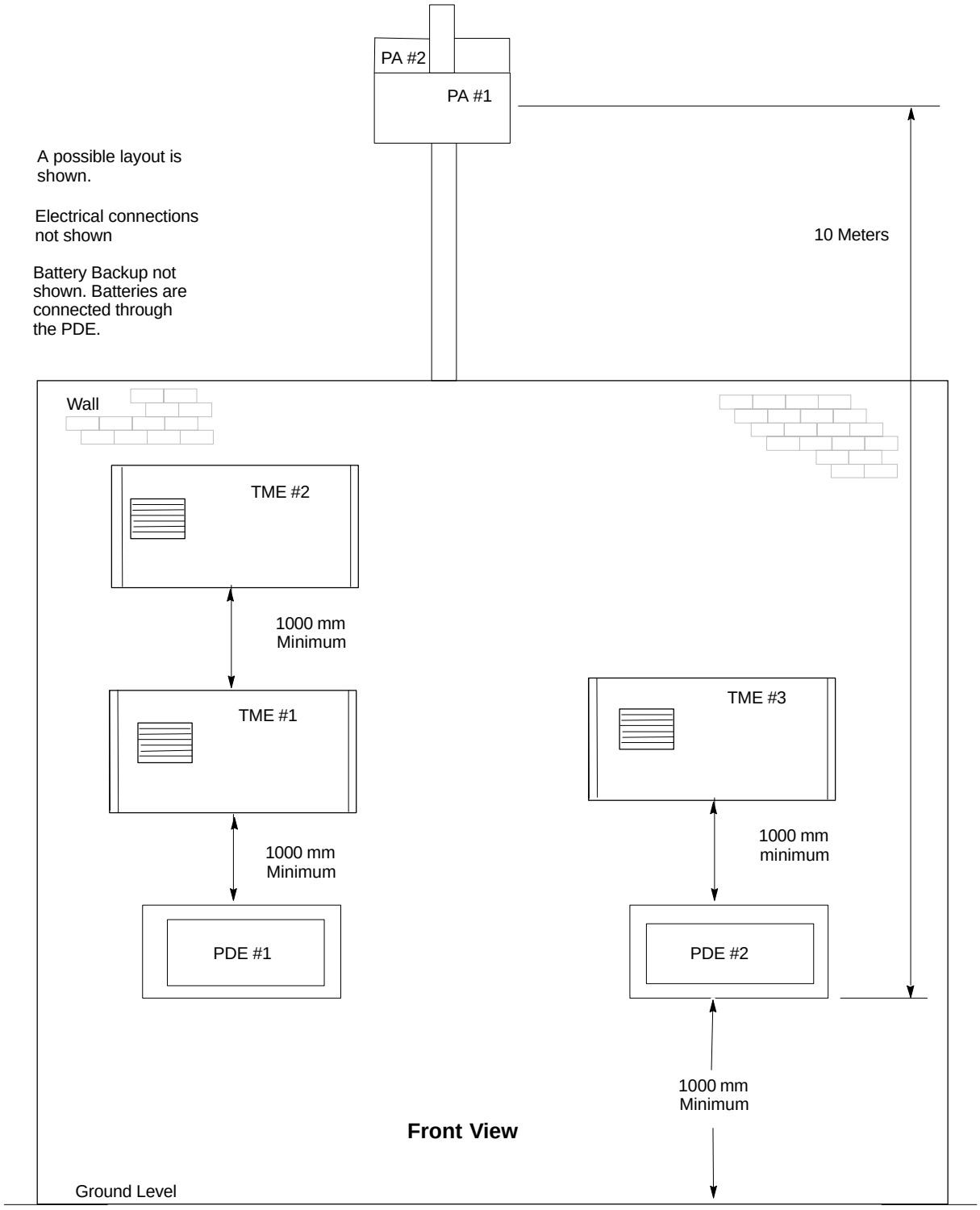


Figure 2-15: Multiple Wall Installation and Functional Clearances for TME and HMS, PDE, and cCLPA



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Chapter 3: BTS Cables

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Cable Description

Overview

This chapter provides the procedures to install the BTS site cabling, but not attach it to the BTS .

Connect the cables to the site and route them to the BTS location. Procedures for attaching the cables to the BTS is contained in Chapter 4.

NOTE

Cabling is one of the most noticeable aspects of workmanship. Straight runs and proper turns are critical for a positive evaluation of the work.

Configurations Supported

This chapter supports cable installation for single carrier omni configurations.

Cabling Installation Order

To install the cables, Motorola recommends that the following procedures be completed in the order shown:

1. Earth ground cabling
2. Power cabling
3. Antenna cabling
4. Span cabling
5. cCLPA Data cable
6. RGPS/Local GPS/HSO/MSO cabling (HSO/MSO optional)
7. Customer I/O cabling
8. EV–DO (MCC–DO) Cabling

Cable Labels

The “Cable Descriptions and Part Numbers” in Table 3-1 provides cable descriptions and part numbers. The labels used to designate the cables in that area are used throughout this chapter.

Ground Lug Specification

Ground lugs with the following specification is recommended for use with the system.

- ILSCO P/N: CRB–6L2–14–58 – Two Hole, Long Barrel lug connector, 6 AWG, 1/4–inch diameter, 5/8–inch stud hole spacing, 13/32 Tang width

Customer I/O Connector

The recommended connector for Customer Input and Output is listed below:

- Input Connector: Molex, terminla plugs, P/N 39352–0106
- Output Connector: Molex, terminla plugs, P/N 39352–0108

Cable Descriptions and Part Numbers

Table 3-1 gives the cable descriptions and part numbers for the cables used to install the BTS.

Table 3-1: Cable Descriptions and Part Numbers

Cable	Qty.	Part Number	Description
A	2	Customer Supplied	Ground cable, 6 -AWG, insulated copper wire. Requires one two–hole lug connectors.
B	1–6	Andrew LDF4–50 Customer Supplied	Antenna Cable, 800 MHz, length selections: 10 m (31 ft.)
C	1	T472AA	RGPS cable, 15 m (50 ft.)
		T472AB	RGPS cable, 38 m (125 ft.)
		T472AC	RGPS cable, 76 m (250 ft.)
		T472AD	RGPS cable, 152 m (500 ft.)
		T472AE	RGPS cable, 304 m (1000 ft.)
		T472AF	RGPS cable, 608 m (2000 ft.)
C1	1	3086433H07	Punchblock to CBIO Board, 15 pin D–connector on one end and loose wires on the other end.
D	1	Customer Supplied	Span cable, 4 or 8 conductors, 24–28 AWG stranded, twisted pair
E	1	Customer Supplied	Customer Input/Output cable, 0–8 conductors, 18–24 AWG stranded wire
F	2	Customer Supplied	DC power cable with crimped lugs, 8–10 AWG, 10 m, stranded, designed for –60 to –40 VDC power input
G	1	Customer Supplied	RJ45 cable for BTS to cCLPA
H	1–11	3086039H18	RGPS Synchronization cable (part of kit SGKN4351A)
		3086039H19	RGPS Synchronization cable (part of kit SGKN4352A)
J**	1	Supplied in Kit SGRG4030	Local GPS Cable, $^1/_2$–inch coaxial, length = 50 ft. Two male N–type connectors, one end to be terminated after routing of cable

table continued on next page

Table 3-1: Cable Descriptions and Part Numbers			
Cable	**Qty.**	**Part Number**	**Description**
K	1	Customer Supplied	AC power cable, 10 AWG, copper, designed for 200 – 240 VAC @ 25 A.
L†	2–7	Customer Supplied	DC power cables, 8–10 AWG, stranded, designed for –60 to –40 VDC power input
*Quantity of cables depends upon system configuration. Your system may require one or more Motorola kits. Refer to Motorola Kits for Multi–Unit Installations for more information ** An SMA to N adapter is required; otherwise, a cable must be made with an SMA connector on one end † Length of cables are dependent upon BTS equipment layout.			

Cabling for EV–DO

Information regarding EV–DO (MCC–DO) cabling can be found in *1xEV–DO Hardware Installation manual – 68P09257A95*

Objective

The objective of this procedure is to install the power and earth ground cabling for the BTS at the site.

WARNING

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

Grounding Considerations

This procedure covers only the grounding information for the cable that attaches to the BTS.

NOTE

Motorola recommends that you use an oxide inhibitor such as Burndy PENETROX™ or Ilsco DE–OX™ on all the external ground connections on the unit and on the site I/O interface for all outdoor installations. This includes the ground connections on the mounting bracket, the Site I/O, and the lugs on the customer–supplied site I/O interface.

Above Ground

For ground rings and the interconnection of internal and external ground rings, #2 AWG or larger is required. For grounding of equipment and miscellaneous metallic objects, #6 AWG miminum is required.

Exceptions – Connection from an isolated ground bar (IGB) to master ground bar (MGB) is accomplished using #2 AWG as a minimum. The external ground bar (EGB) is grounded through a 2–inch wide, 16–gauge copper strap, if available; otherwise, 2–#2 AWG wires can be used. If the #2AWG wires are used, then they must be connected at opposite ends of the EGB and have a minimum separation of 12–inches between them.

Below Ground

All wire must be #2 AWG as a minimum. Ground rods are to be a minimum of 8 feet long and 5/8–inch in diameter. In the case of a deep basement next to the rod, the rod must be long enough to extend 3 feet below the basement floor.

Indoor Power Considerations

The BTS is designed for –60 to –40 VDC power input.

The power for the Indoor BTS configuration is:

- DC power

Outdoor Power Considerations

The TME/BTS and cCLPA are designed for –60 to –40 VDC power input from the PDE.

The PDE is designed for 200–240 VAC input.

The power for the Outdoor BTS configuration is:

- AC power
- DC power (converted from AC)
- DC power (Battery Backup if used)

NOTE

Neither the "+" or "–" terminal of the DC Input is connected to the BTS ground. If a negative supply input is provided, the "+" terminal of the DC input must be connected to the Master Ground Bar. By connecting the "+" terminal of the DC input to the MGB, a –48VDC (nominal) system is created.

The system configuration determines which power cables are installed. The ground cable is always installed first. Based on the system configuration perform the appropriate procedures described in Chapter 4.

Cable Labels

The cable designations are referenced to Table 3-1 in the “Cable Description” area of this chapter.

Required Cables

Table 3-2 provides the quantities and descriptions of the cables.

Table 3-2: Cables Needed for Antenna Connections

Cable	Qty.	Part Number	Description
B	1 to 4*	Andrew LDF4–50 Customer Supplied	Antenna Cable, 800 MHz, 10 m (31 ft.)

* Four cables are required if a cCLPA is used, otherwise, two are needed for the BTS only.

Antenna Cable Pin and Signal Information

The antenna cabling uses a 50–Ohm coaxial cable. The inner conductor provides signaling and the outer conductor provides shielding and ground.

Figure 3-1: Antenna Cabling Details

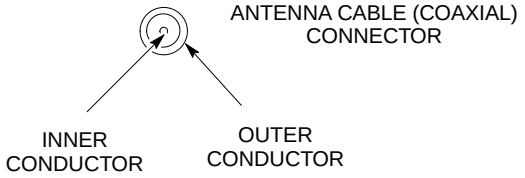

Table 3-3: Pin and Signal Information for Cable B (Antenna Cable)

Antenna	Inner Conductor	Outer Conductor
B	TX/RX	Ground
A	RX	Ground

Cable Labels

The cable designations are referenced to Table 3-1 in the “Cable Description” area of this chapter.

Required Tools and Materials

Table 3-4 provides the quantities and descriptions of the cables.

Table 3-4: Cables Needed for Span/RGPS Connections

Cable	Qty.	Part Number	Description
C	1	T472AA	RGPS cable, 15 m (50 ft.)
		T472AB	RGPS cable, 38 m (125 ft.)
		T472AC	RGPS cable, 76 m (250 ft.)
		T472AD	RGPS cable, 152 m (500 ft.)
		T472AE	RGPS cable, 304 m (1000 ft.)
		T472AF	RGPS cable, 608 m (2000 ft.)
C1	1	3086433H07	Punchblock to CBIO Board, 15 pin D–connector on one end and loose wires on the other end.
D	1–3	Customer Supplied	Span cable, 4 or 8 conductors, 24–28 AWG stranded, twisted pair
	1 –4*	7687717T02	Ferrite, clip–on core
* One Ferrite bead per cable.			

Cable Pin and Signal Information for Span Cabling

Table 3-5 gives the pin and signal information for the Span cable.

Table 3-5: Pin/Signal Information for Span Cable			
BTS Interface	**Pin**	**Wire/Stripe Color**	**Description**
Span Line Cable	1	White/Orange	RX RING
	2	Orange	RX TIP
	3	White/Green	NC
	4	Blue	TX RING
	5	White/Blue	TX TIP
	6	Green	NC
	7	White/Brown	NC
	8	Brown	NC

Cable Pin and Signal Information for RGPS Cabling

Table 3-6 gives the pin and signal information for the RGPS cable. Connector must be a 15 pin, D–Sub, female.

Table 3-6: RGPS Pin/Signal Name Information	
Pin	**Signal Name**
1	DATA + (From Head)
2	SYNC + (From Head)
3	SYNC + (Not used for RGPS connection, daisy chain use between BTSs only)
4	DATA + (To Head)
5	NC
6	NC
7	RGPS +28V Supply
8	RGPS +28V Supply
9	DATA – (From Head)
10	SYNC – (From Head)
11	SYNC – (To Head)
12	DATA – (To Head)
13	NC
14	RGPS Return
15	RGPS Return

Remote GPS Head

Objective

The objective of this procedure is to show how to install the Remote Global Positioning System (RGPS) head.

Required Tools and Materials

One RGPS Head (Motorola Part Number 0186012H03 or 0186012H04) is required to do this procedure.

RGPS Mounting Considerations

The RGPS Head requires specific mounting considerations in order to properly observe the GPS satellites.

- The mounting pipe for the RGPS head should be mounted vertically with less than five degrees (5°) of tilt.
- The RGPS head mounting hardware which comes with the RGPS head should be used in all installations. This mounting hardware properly isolates the painted metal base of the RGPS head from other conductive surfaces. If the metal base comes in contact with another conductive surface, the electrical surge resistance of the RGPS head can be significantly reduced leading to RGPS head failure.
  - If the supplier of the RGPS mounting hardware cannot be used, the installer MUST make certain that the metal base of the RGPS head does not make contact with any conductive surface.
- Position the RGPS head to have an unobstructed view of the sky and to minimize the chance of debris (leaves, dirt, etc.) accumulating on the radome of the RGPS head.
- The RGPS head must have a clear view of the sky, preferably to within ten degrees (10°) of the horizon in all directions. The total blockage of the sky (due to buildings, mountains, etc.) should be less than 50%.
- Place the RGPS head as far away from the BTS transmit antenna as possible to avoid RF interference issues.
- Place the RGPS head at least 15 m away from lightning rods, towers, or structures that attract lightning. RGPS head damage is usually not the result of a direct lightning strike, but of a lightning strike on a nearby structure. Also, since a lightning rod is connected to an earth ground, it can act as a shield and create a shadow that may block or reduce the signal from a satellite.
- After the BTS is powered up, check the RGPS signal strengths with the “gps_status” command on the CSA MMI port.
  - An optimal installation will have at least one satellite (SV) with an RSSI value ≥ 50, and at least four (4) satellites with RSSI values ≥ 45.
  - A minimal installation should have at least four (4) satellites with RSSI values ≥ 40.

- The RGPS head is rated for ambient air temperatures from –40°C (–40°F) to 80°C (176°F), and has ratings for humidity, shock, waterproof, UV light resistance, vibrations, salt fog, ESD, EMI, and altitude.
- The RGPS system used for the SC™480 BTS will support up to 604 m (2000 ft.) of overall cable length from the RGPS head to the last connected BTS. If a long cable run needs to be broken into pieces, minimize the number of breaks in the cable.
- A Compact BTS equipped with an SDCX is capable of providing up to three other BTSs with timing signals.

Local GPS (RF–GPS) Antenna Cabling

Objective

The objective of this procedure is to install the Radio Frequency Global Positioning System receiver (RF–GPS) antenna cabling. More commonly referred to as Local GPS.

Cable labels

The cable designations referenced to Table 3-1 in the "Overall Cabling and Descriptions" area.

Cabling diagram

Figure 4-48 shows the Local GPS antenna connections.

Equipment needed

Table 3-7 contains a detailed description of the Local GPS Cabling. Table 1-4 lists the tools needed.

Table 3-7: Cabling for Local GPS

Cable	Qty.	Part Number	Description
J*	1	Supplied in Kit SGRG4030	RF–GPS Cable, $^1/_2$–inch coaxial, length = 50 ft. Two male N–type connectors, one end loose. If lengths greater than 50 ft. are required, cable style and length should be determined by site configurations. Maximum loss <4.5 dB @ 1575 MHz for all cabling and connections between the Local GPS antenna and the frame.
*An SMA to N adapter is required; otherwise, a smaller diameter cable must be made with an SMA connector on one end, with a maximum loss of <4.5 dB.			

Mounting Considerations

Table 3-8 lists the Local GPS Head requires specific mounting considerations in order to properly observe the GPS satellites.

Table 3-8: Local GPS Antenna Mounting Considerations

✓		Consideration
	1	The mounting pipe for the Local GPS Head should be mounted vertically with less than five (5) degrees of tilt.
	2	The Local GPS Head requires a clear view of the sky, preferably to within ten (10) degrees of the horizon in all directions. The more sky that is observed increases the number of potential satellites that can be tracked, resulting in better Local GPS performance.
	3	During normal operation, the Local GPS Head continuously tracks a minimum of four (4) GPS satellites. However, it is theoretically possible to operate the BTS by tracking only one (1) GPS satellite. Motorola does not recommend tracking only one (1) GPS satellite unless there has been an accurate site survey.
	4	Place the Local GPS Head where RF obstructions of the sky are minimal. The “sky” includes everything to within ten (10) degrees of the horizon in all directions. RF obstructions include buildings, towers, natural rock formations, snow, foliage, and debris.
	5	Separate the Local GPS Head from other radiating sources. Excessive RF energy can degrade the Local GPS Head’s ability to observe the GPS satellites. The Local GPS Head receives on the GPS L1 frequency of 1575.42 MHz and incorporates filters to minimize the effects of potential RF interference, however, strong radiants can overwhelm the filters, thus degrading the units reception capability.
	6	The Local GPS Head is rated for ambient air temperatures in the range –40 to + 50°C, and has ratings for humidity, shock, waterproofing, UV light resistance, vibrations, salt, fog, ESD, EMI, and altitude.
	7	If the overall length of the Local GPS Head to the BTS is greater than 50 feet, the cable style and length should be determined by the site configurations. The maximum loss should be less than 4.5 dBm @ 1575 MHz for all cabling and connections between the Local GPS Head and the frame.

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Notes

Installation Overview

Overview

This chapter provides the procedures for BTS installation and cabling.

The site cabling has been installed and routed to the location of the BTS. In this chapter, the cables will be attached to the unit(s). Cabling installation will be repeated as necessary for each unit at the BTS.

This chapter provides the information and procedures to:

- Assembling the BTS mounting hardware
- Attach cables to the BTS
- Power to BTS
- Complete the installation completion checklist

Procedure order

Indoor

The process of installing the indoor unit requires that the following procedures be completed in the order shown:

1. Mount and secure Mounting Plate to rack
2. Attach angle bracket to BTS
3. Secure BTS to the Mounting Plate
4. Attach Earth ground cable to BTS
5. Connect DC Power cable to BTS
6. Attach antenna cable
7. Mount and secure cCLPA mounting bracket to rack (if used)
8. Mount and secure cCLPA to mounting bracket (if used).
9. Attach Earth ground cable to cCLPA
10. Connect DC Power cable to cCLPA
11. Connect data cable between cCLPA and BTS
12. Terminate unused connectors
13. Perform Pre–Power checks
14. Power on the units
15. Clean up site
16. Fill out the installation completion checklist

Outdoor

The process of installing the outdoor unit requires that the following procedures be completed in the order shown:

1. Attach the mounting brackets to wall or pole mounting bracket assemblies
2. Detach HMS from TME
3. Mount TME onto mounting bracket

4. Mount BTS inside TME
5. Attach HMS to TME
6. Detach Heat Exchanger from PDE
7. Mount PDE onto mounting bracket
8. Attach Heat Exchanger to PDE
9. Mount PA onto mounting bracket
10. Attach earth ground cables
11. Attach the DC input power cable
12. Attach DC output power cables
13. Attach antenna cable
14. Attach PA data cables
15. Terminate unused connectors
16. Power on the unit
17. Clean up site
18. Fill out the installation completion checklist

Installation of EV–DO

Information regarding the installation of a BTS equipped with EV–DO (MCC–DO) can be found in *1xEV–DO Hardware Installation manual – 68P09257A95*

Connector Locations

Figure 4-1 shows the location of the cable connectors on the BTS. The system configuration determines which connectors are used. Figure 4-2 is a detail of the connectors on the rear of the BTS.

Figure 4-1: Rear View of BTS

RGPS Connector and SDCX Module are shown.

Note:
1. The LAN Connections should be terminated with 50–Ohm loads.

2. The Expansion TX and RX ports should be terminated with SMA 50–Ohm loads.

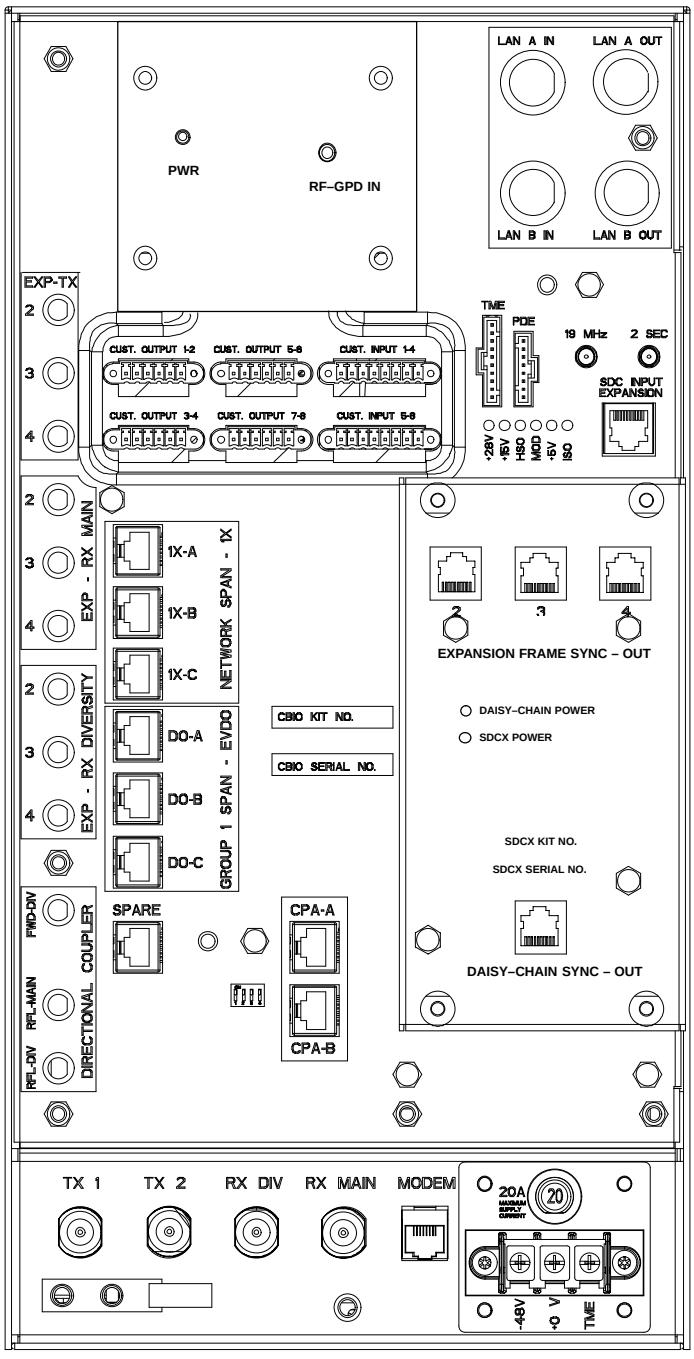

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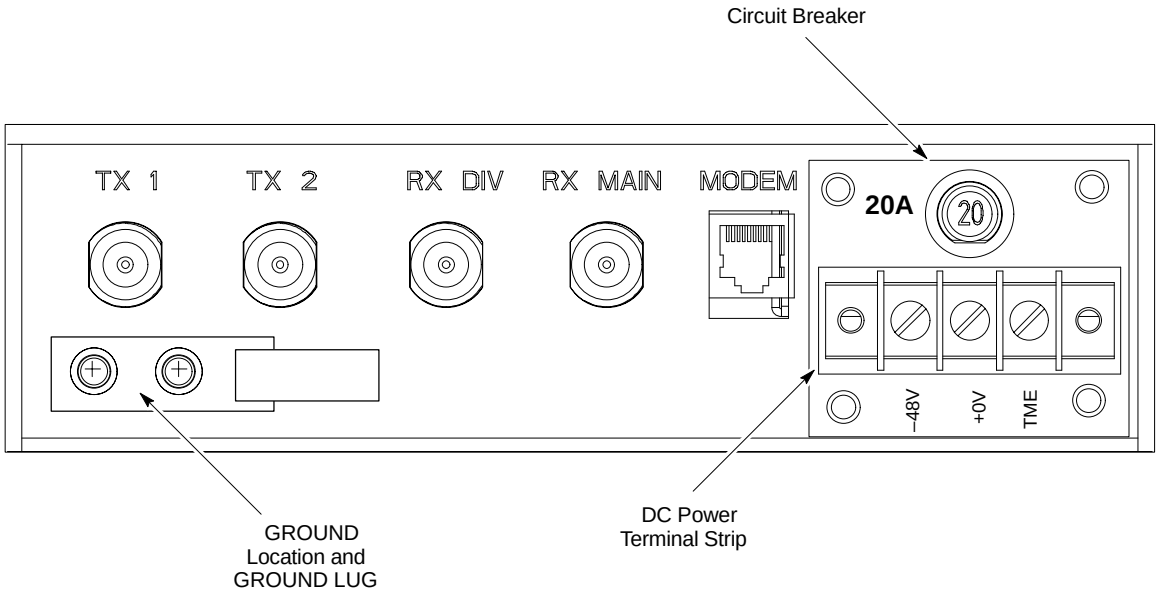
Figure 4-2: Detail of Antenna Connectors and DC Power (Rear of BTS)



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Indoor/Outdoor Configuration Connectors

cCLPA Connectors and Conduit Locations

Refer to Figure 4-7 for connectors and conduit locations

Outdoor Configuration Connectors

TME Connectors and Conduit Locations

Refer to Figure 4-16 for connectors and conduit locations

PDE Conduit Locations

Refer to Figure 4-23 for conduit locations

Attaching BTS to Mounting Rack

Objective

The objective of this procedure is to attach the BTS to the Rack.

Background

The mounting plate is attached to the Rack, then a mounting bracket is attached to the BTS. Finally, the BTS is attached to the Mounting Plate.

Required Tools and Materials

The following tools and materials are required to attach the BTS to the Mounting Plate.

- Torque driver wrench, 1/4–in. hex female drive, 0–10 N–M
- T30 Star tamper bit
- Three (3) M6X16 screws (Motorola Part No. 0310907D03)
- Three (3) isolation washers (Motorola Part No. 4309874U03)
- Six (6) customer supplied rack screws (Check manufacturer's specifications)

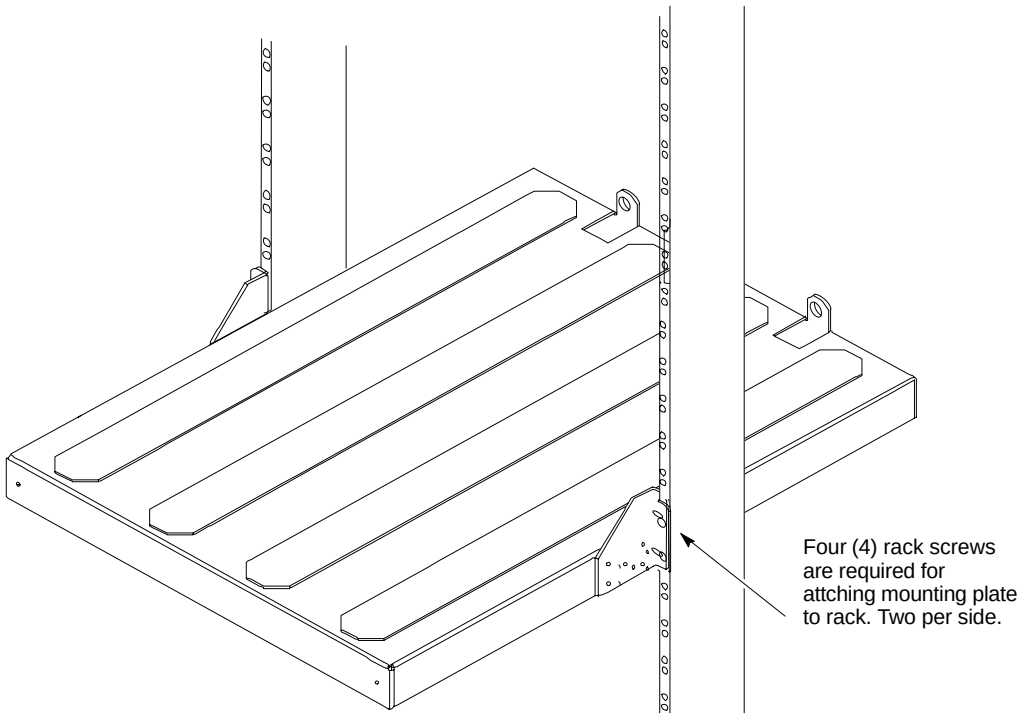
Procedure to Attach Mounting Plate to Rack

Follow the procedure in Table 4-1 to attach the Mounting Plate to the Rack. Refer to Figure 4-3.

Table 4-1: Procedure to Attach Mounting Plate to Rack

Step	Action
1	Determine where in the rack the Mounting Plate is to be attached.
2	Ensure that the mounting plate is level.
3	Set Mounting Plate similar to what is shown in Figure 4-3. Attach Mounting Plate to Rack using four (4) customer supplied rack screws. Torque screws to manufacturer's specifications.

Figure 4-3: Attaching Mounting Plate to Rack

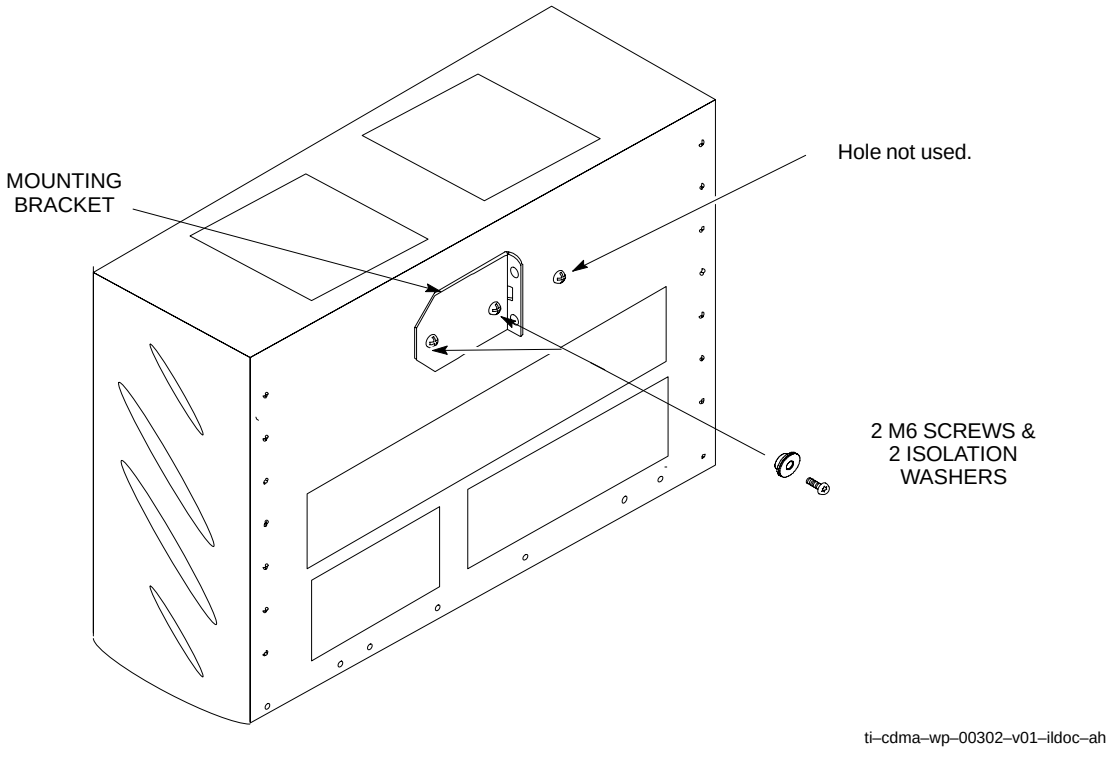


BTS Mounting Bracket

Perform the procedure in Table 4-2 to attach the bracket to the BTS.

Table 4-2: Procedure to Attach BTS Mounting Bracket	
Step	**Action**
1	Atttach mounting bracket as indicated in Figure 4-4.
2	Using two (2) isolation washers and 2 M6 screws securely attach the mounting bracket to the forward most holes on the BTS. Torque screws to 5 N–M (44 in–lbs).

Figure 4-4: Attaching Mounting Bracket to BTS



BTS to Mounting Plate

Perform the procedure in Table 4-3 to attach the BTS to the Mounting Plate.

Table 4-3: Procedure to Attach BTS to Mounting Plate

Step	Action
	NOTE The Compact BTS weighs 12 Kg (22 lbs).
1	Place BTS on Mounting Plate as indicated in Figure 4-5. BTS bracket holes align with rack holes.
2	Secure BTS bracket to rack using two (2) customer supplied screws. Torque screws to manufacturer's specification.
3	At the rear of the BTS, use one M6 screw and isolation washer to secure the BTS to the mounting plate. Torque screw to 5 N–M (44 in–lbs).

4

Figure 4-5: Attaching BTS to Mounting Plate

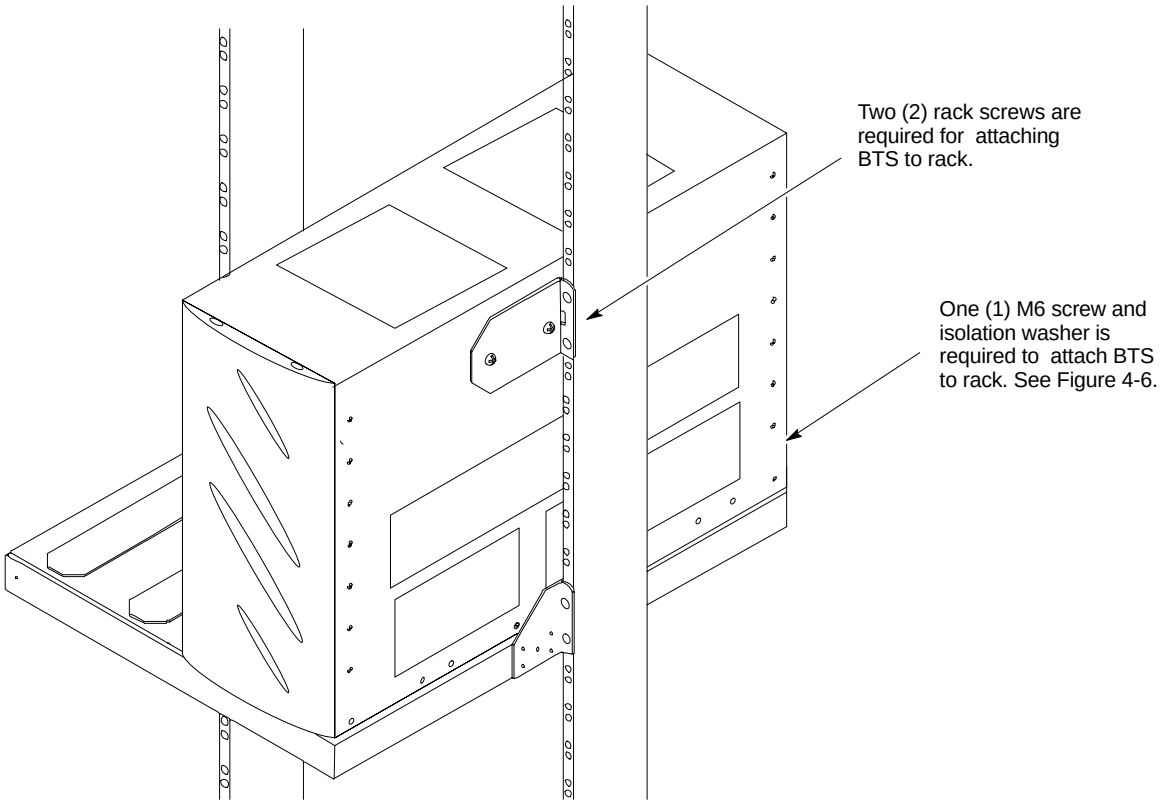
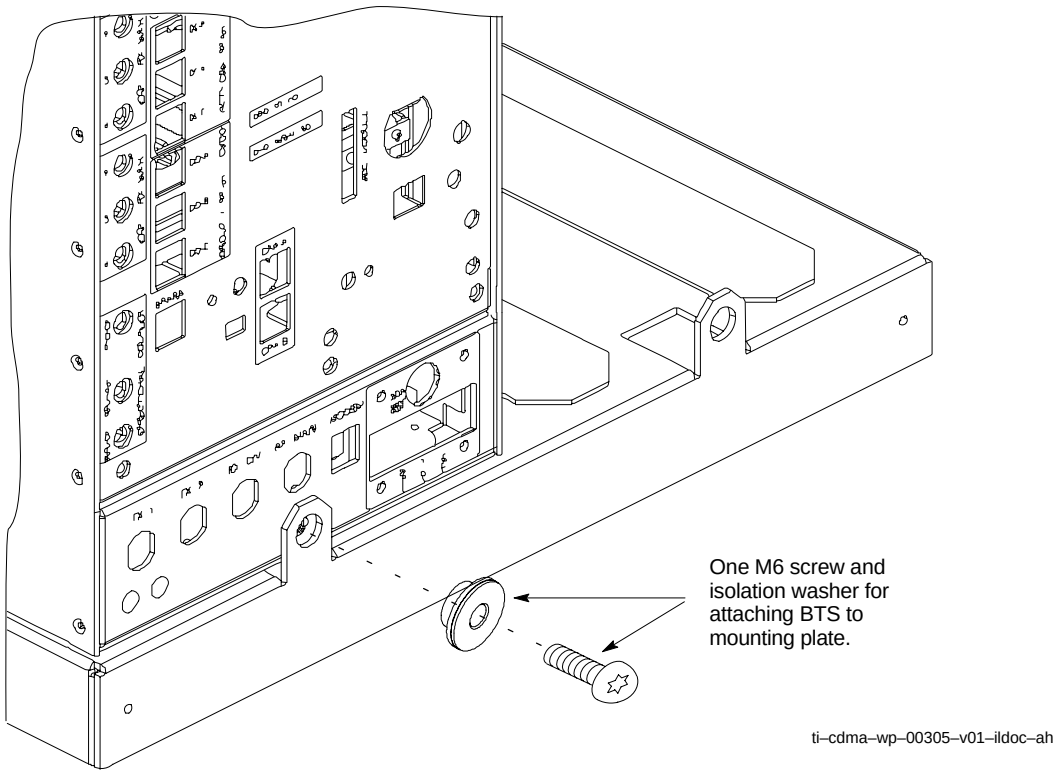


Figure 4-6: BTS Rear Attachment



Objective

This section contains general information for installing a Compact Combined Linear Power Amplifier (cCLPA).

Cable Description

The following cable in Table 4-4 is necessary to do this procedure.

Table 4-4: DC Input Cable Description and Part Number

Cable	Qty.	Part Number	Description
F	1	Customer Supplied	DC input cable with crimped lugs, 8–10 AWG, 10 m, designed for –60 to –40 VDC power input.

Required Tools

The following are the tools required :

- Torque driver wrench, 1/4–in. hex female drive, 0–10 N–m
- T20 Torx Tamper Bit, 1/4–in. hex
- T30 Torx Tamper Bit, 1/4–in. hex
- Wire Crimping Tool

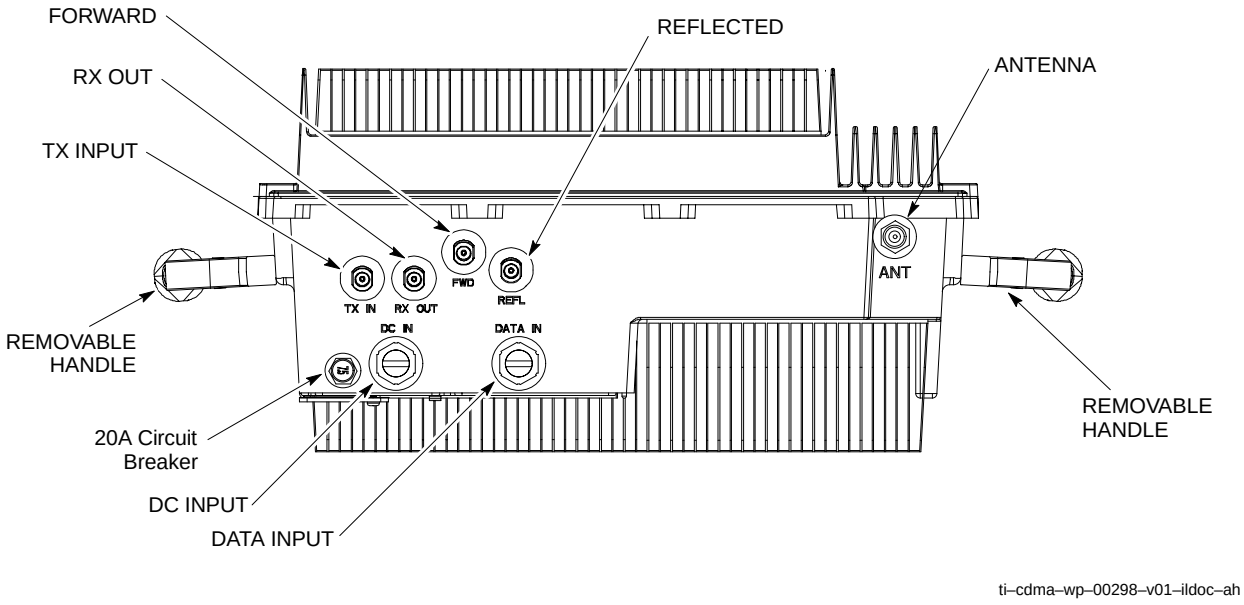
Indoor cCLPA Installation

The cCLPA is mounted directly to a 19–inch rack. Placement of cCLPA is up to the customer. The maximum allowable TX cable loss (including surge arrestor) from the cCLPA to the BTS is 2.0 dB. The maximum allowable RX cable loss (including surge arrestor) from the cCLPA to the BTS is 3.0 dB. The cCLPA receives –60 to –40 VDC. from the Power Distribution Enclosure (PDE).

cCLPA Connectors

Figure 4-7 shows the location of the cCLPA connectors.

Figure 4-7: Bottom View of cCLPA



IMPORTANT

The cCLPA requires its own DC power source that is different than the power source assigned to the Compact BTS.

cCLPA Mounting Procedure

Follow the procedure in Table 4-5 to attach the cCLPA to the rack.

Table 4-5: Procedure to Mount the Power Amplifier

Step	Action
1	Place two screws (one each on each side of the rack). See Figure 4-8.
2	Holding onto handles, mount the cCLPA onto the two screws. Secure cCLPA to rack using 4 screws. See Figure 4-8. Torque screws to to10 N–M (88 in–lbs).
	NOTE Handles of cCLPA may be removed if mounting space is limited.
3	Remove 2 screws each securing handles to cCLPA prior to mounting.

cCLPA Grounding

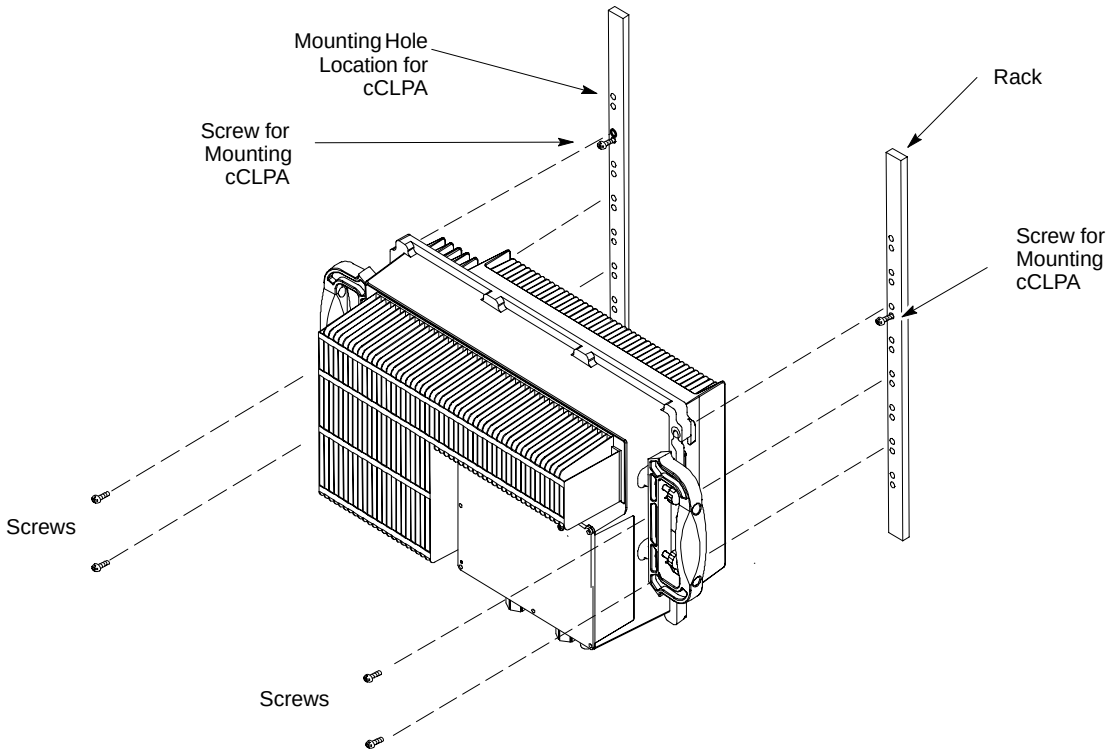
Cable Description

Since the length of this cable varies from site to site, no specific length is assigned. Table 4-6 lists the components required to build a ground cable.

Table 4-6: Ground Cable and Lug Description and Part Number

Cable	Qty.	Part Number	Description
A	1	Customer Supplied	Ground cable, 6 -AWG, insulated copper wire.
	1	Customer Supplied	Two Hole, Long Barrel lug connector, 6 AWG, 1/4–inch diameter, 5/8–inch stud hole spacing, 13/32 Tang width.

Figure 4-8: cCLPA Mounting to Rack

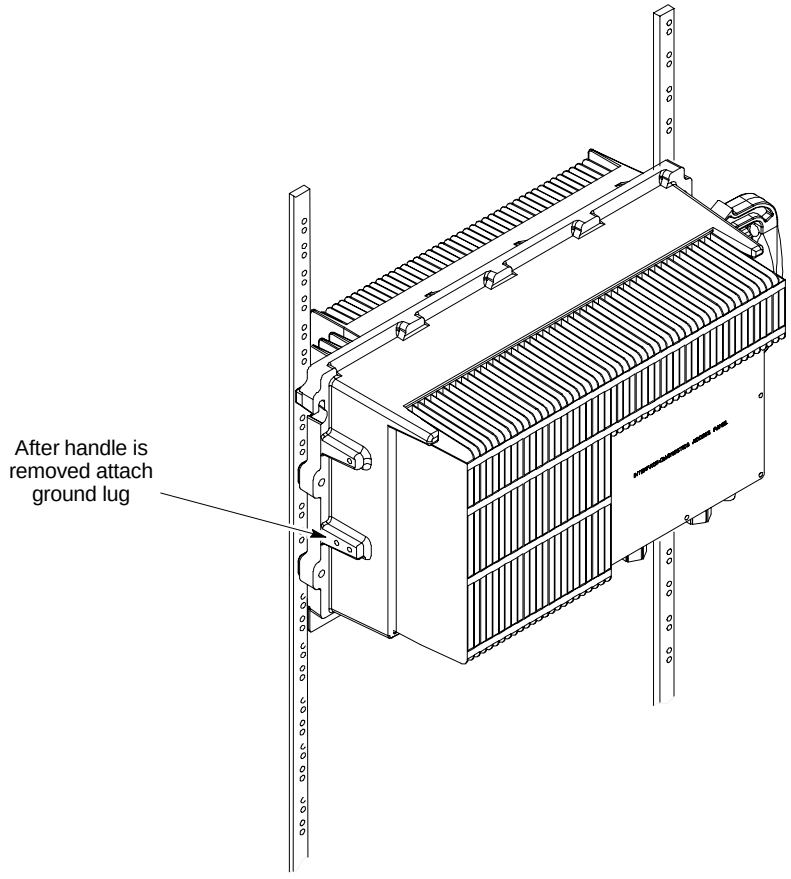


Follow the procedure in Table 4-7 to attach the ground cable to the cCLPA.

Table 4-7: Procedure to Ground the cCLPA

Step	Action
1	If not already done, remove handles from cCLPA.
2	Retrieve ground lug and cabling.
2a	Using a wire stripper, trim back 1/2–inch of the ground cable insulation from each end.
2b	Using a crimp tool crimp the lug onto one end of the cable.
2c	Attach the ground clamp to the opposite end of the ground cable.
3	Using one screw attach the ground cable and lug to one of the holes left vacant by the removal of the handles. See Figure 4-9.
4	Slide ground clamp over ground anchor and secure using a lockwasher. Use a 13mm socket to tighten the hex nut. Use a torque wrench to tighten hex nut to 10.0 N–M (88 in–lbs).
5	Use tie–wraps as required to dress the ground cable.

Figure 4-9: cCLPA Grounding



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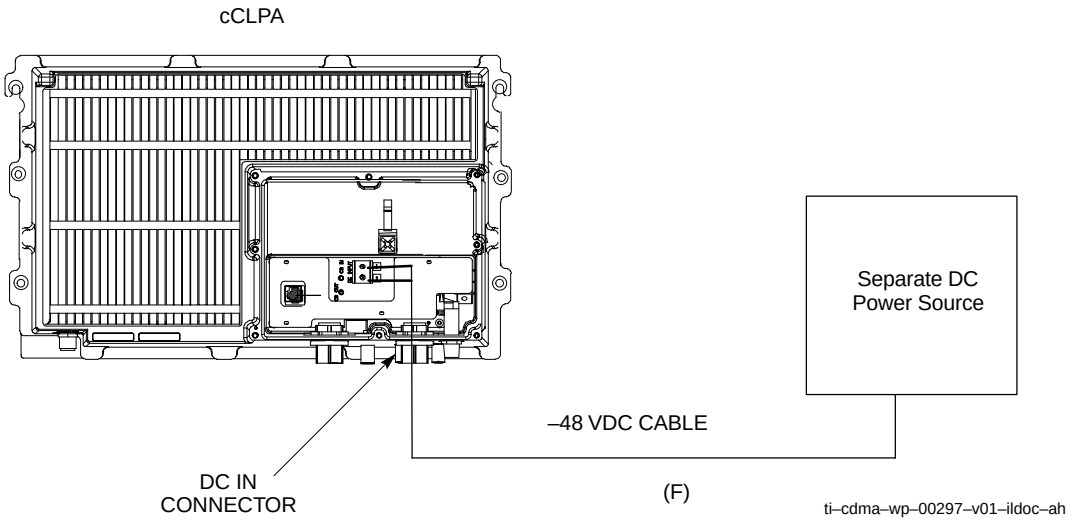
DC Power Connection Procedure

A –48 VDC power source is required to supply the cCLPA. Follow the procedure in Table 4-8 to attach the DC Power cable to the cCLPA.

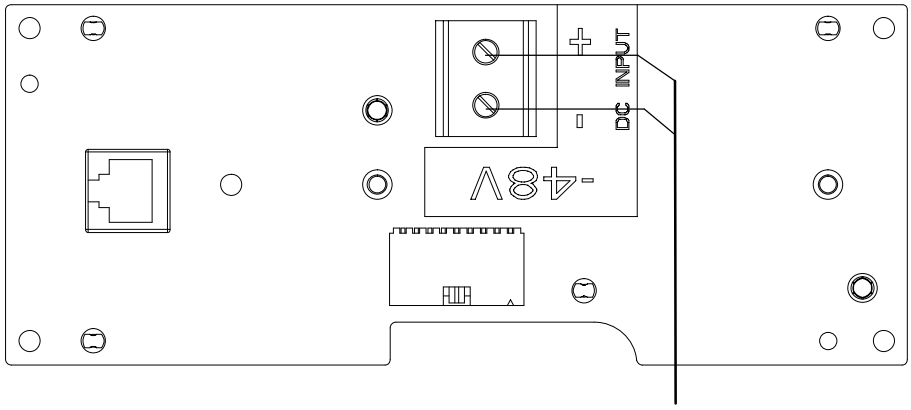
Table 4-8: Procedure to Attach DC Power Cable to the cCLPA

Step	Action
1	Set DC Power source circuit breaker to OFF.
2	Route cable (F) from DC Power source to the cCLPA. See Figure 4-10
3	Remove 8 screws securing I/O Panel cover and remove.
4	Route cable through connector to DC Power Terminal Block. See Figure 4-10.
5	If not already loosened, loosen DC Power Terminal Block screws.
6	Strip approximately 12 mm (1/2–inch) of sheathing from the end of each wire.
7	Insert the ”+” wire (red) into the “+” opening of the DC Power Terminal Block, then secure it by tightening the screw. Torque screw to 2.3 N–M (20 in–lbs).
8	Perform step 6 for the “–” wire.
9	Insert the “–” wire (blue) into the “–” opening of the DC Power Terminal Block, then secure it by tightening the screw. Torque screw to 2.3 N–M (20 in–lbs).
10	If the Data Cable is not installed, proceed to Table 4-11; otherwise, proceed to Table 5-6 for Pre–Power up Test.

Figure 4-10: DC Power Connection to cCLPA



Close In View of cCLPA I/O Board DC Power Connection



Data Cable Description and Part Number

Table 4-9 lists the cable required to perform this procedure. Since the cable length will vary from site to site, it will be left to the customer to build the data cable desired.

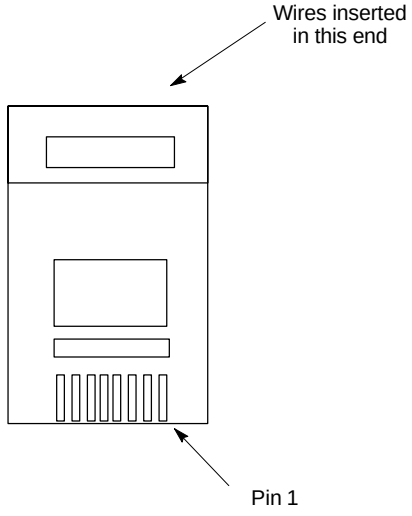
Table 4-9: Data Cable Description and Part Number			
Cable	**Qty.**	**Part Number**	**Description**
G	1	Customer Supplied	RJ45 cable for BTS to cCLPA
	1	7687717T02	Ferrite, clip–on core

Data Cable Wiring Information

Table 4-10 lists the wiring information required to manufacture the CBIO–to–cCLPA Data Cable. Figure 4-11 shows the location of Pin 1 on the RJ45 connector.

Table 4-10: Data Cable Wiring Scheme			
CBIO Signal Name	**Wire Color**	**RJ45 Pin Outs**	**cCLPA Signal Name**
Txx_ACT_P	White/Orange	1	CLPA_485_TX_ACT_P
Txx_ACT_N	Orange	2	CLPA_485_TX_ACT_N
CLPA_x_ADDR	White/Green	3	CLPA_485_ADD_0
RxD_x_P	Blue	4	CLPA_485_TX_A_P
RxD_x_N	White/Blue	5	CLPA_485_TX_A_N
GROUND	Green	6	GROUND
TxD_P	White/Brown	7	CLPA_485_RX_A_P
TxD_N	Brown	8	CLPA_485_RX_A_N

Figure 4-11: CBIO–to–cCLPA Data Cable RJ45 Connector



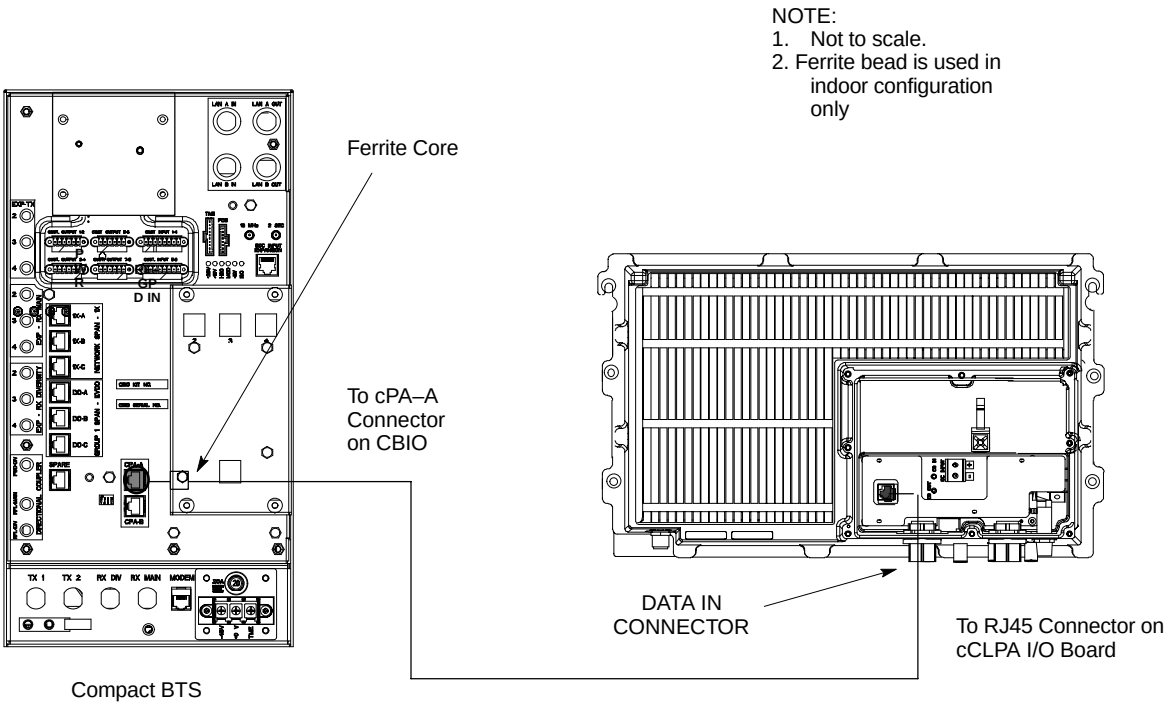
BTS Data Cable Connection Procedure

Once the Data Cable has been built, follow the procedure in Table 4-11 to connect the BTS Data cable to the cCLPA.

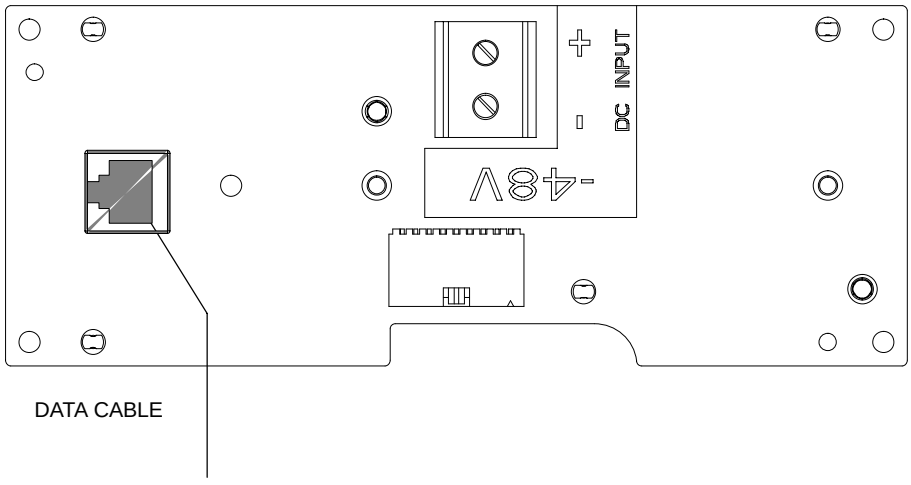
Table 4-11: Procedure to Attach BTS Data Cable to cCLPA

Step	Action
1	***If not already performed***, remove 8 screws securing I/O Panel cover.
2	Route BTS Data cable to the cCLPA. See Figure 4-12.
3	Mate Data cable RJ45 plug to I/O Board RJ45 socket. See Figure 4-12. Table 4-10 identifies the data cable wiring.
4	If there are two cCLPAs in use, bundle cables together and place ferrite core around cables. Ensure that the cables are not being pinched before closing and latching the ferrite core.
5	Slide ferrite core as close to the BTS connectors as possible without causing stress. Use a tie–wrap on the ferrite core side away from the connector. The tie–wrap holds the ferrite core in place
6	Install I/O Panel Cover and secure using 8 screws. Torque screws to 2.3 N–M (20 in–lbs).

Figure 4-12: Data Cable Connection Diagram for Compact BTS to cCLPA



Close In View of cCLPA I/O Board Data Cable Connection



Outdoor cCLPA Installation

The cCLPA is mounted on a bracket assembly and secured to a pole. Placement of cCLPA is up to the customer. The cCLPA is already weatherproofed, so there are no special weather related precautions required for outdoor installation. The maximum allowable TX cable loss (including surge arrestor) from the cCLPA to the BTS is 2.0 dB. The maximum allowable RX cable loss (including surge arrestor) from the cCLPA to the BTS is 3.0 dB. The cCLPA operates on –60 t0 –40 VDC supplied by the Power Distribution Enclosure (PDE).

Pole or Wall Mounting cCLPA

Follow the procedure in Table 4-12 to pole or wall mount the cCLPA.

Table 4-12: Procedure to Pole or Wall Mount the cCLPA

Step	Action
1	Determine where on the pole or structure the cCLPA will be mounted. Consult site configuration documentation as required.
2	For wall or other such structure, proceed to step 2a. For pole mount, proceed to step 2c.
2a	Using the Wall Mounting Bracket as a template, drill starter holes, using the wider of the two sets present. Screw in one each M6 anchor bolt in the upper holes.
2b	Hang Wall Mounting Bracket on anchor bolts. Install remaining anchor bolts and secure bracket by tightening the 4 M6 anchor bolts. Torque anchor bolts to 10 N–M (88 in–lbs). Proceed to step 3.
2c	Center the Wall Mounting Bracket on Pole Mounting Bracket Assembly and install the 4 M6 screws in the narrower of the two sets of holes present. Secure bracket by tightening the 4 M6 screws. Torque screws to 10 N–M (88 in–lbs). Proceed to step 3. See Figure Figure 4-13.
3	Install two M6 screws in the top holes of the Wall Mounting Bracket.
4	**△ WARNING** It is recommended that two people hang the cCLPA onto the Wall Mounting Bracket. Hang cCLPA and install remaining 4 M6 screws. Secure cCLPA to bracket by tightening screws. Torque screws to 10 N–M (88 in–lbs).
5	*If not already done*, remove handles from cCLPA.
6	Perform Table 4-7 to install the ground cable.

Figure 4-13: Pole Mounting BracketAssembly

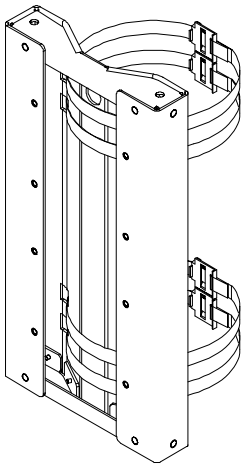
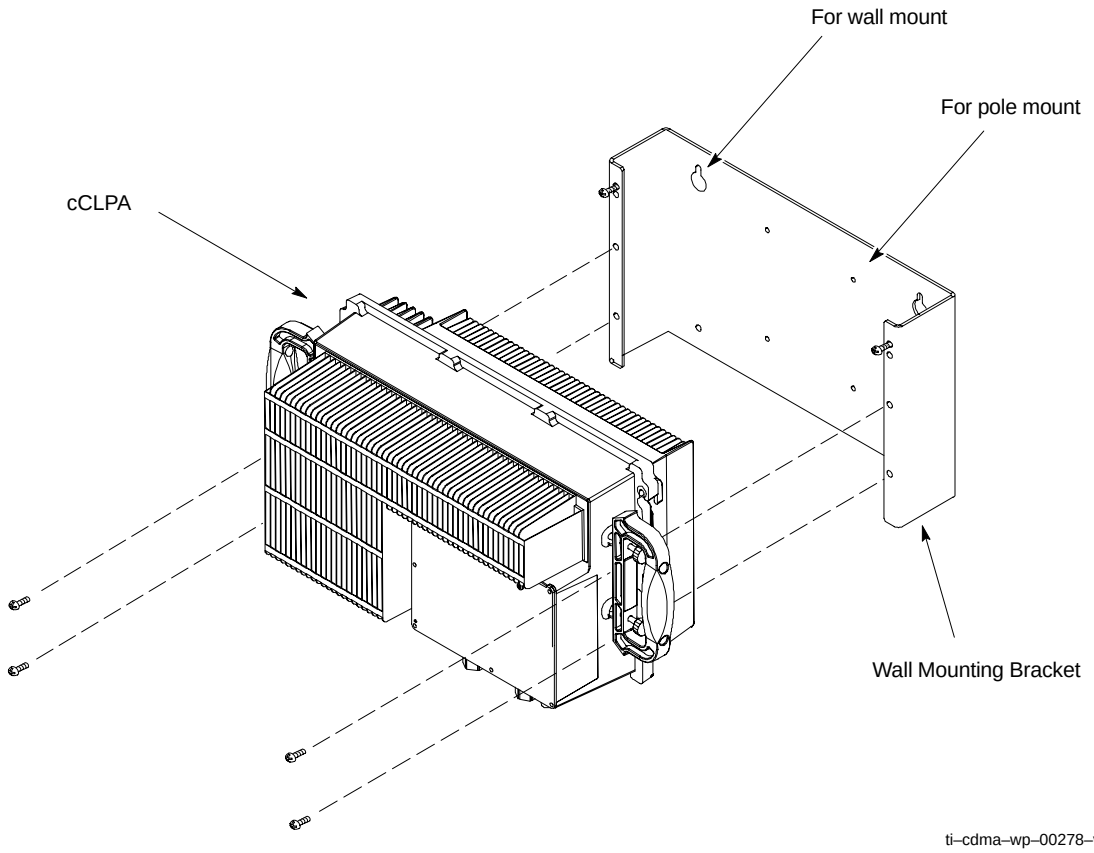


Figure 4-14 shows the cCLPA being attached to the Wall Mounting Bracket. Reference Figure 4-13 for the Pole Mounting Bracket Assembly.

Figure 4-14: Wall Mounting Bracket and cCLPA



Objective

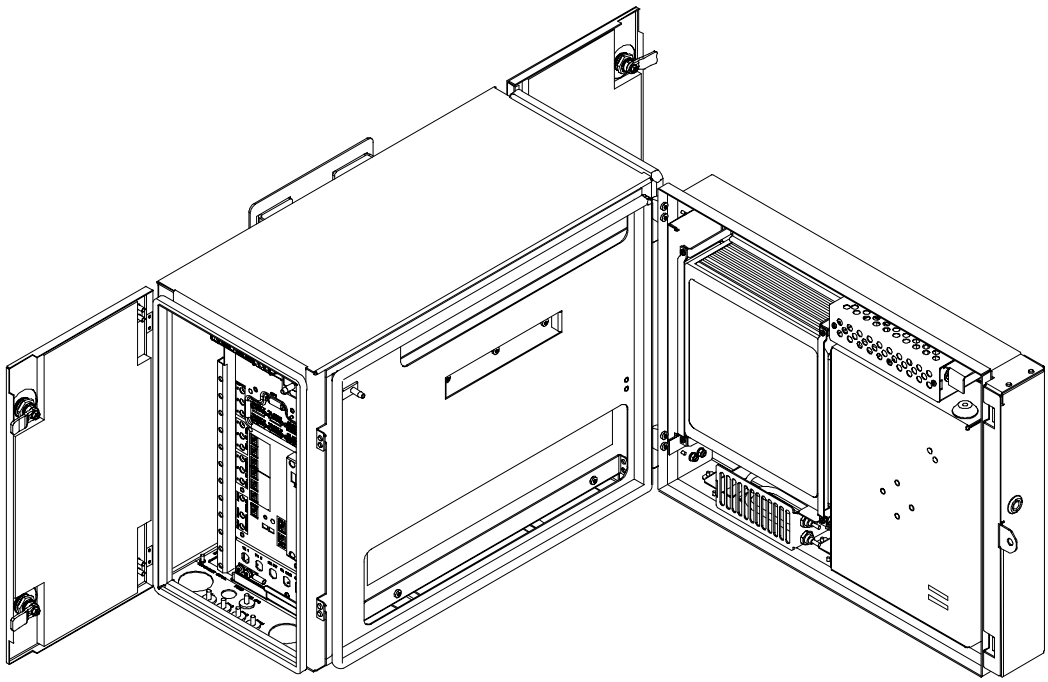
This section contains general information for installing a Thermal Management Enclosure (TME). These procedures are utilized if the BTS site is configured for outdoor use.

The purpose of the TME (Figure 4-15) is to protect the BTS from the weather. The Compact BTS is installed in the TME and some cables are connected to interior TME connectors, while others are routed out through access holes. Figure 4-17 shows the Wall Mounting Bracket and Pole Mounting Bracket Assembly.

The TME can be pole or wall mounted. The Heat Management System (HMS) is attached to the TME and is used to regulate temperature within the TME.

The TME is replaced as a whole should damage to the exterior no longer allow protection from the environment or if damage should occur to the TME connectors .

Figure 4-15: Thermal Management Enclosure and Heat Management System



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Electrical Requirements

The TME is powered by DC voltage that has been converted from an AC power source by the PDE or from battery backup routed through the PDE. Power required is –48VDC nominal, range is –60 to –40 VDC.

Environmental Requirements

The following lists the environmental requirements of the TME:

- Operate Temperature: –50° to +75°C
- Storage Temperature: –40° to +60°C
- Operating/Storage Humidity: 10 to 95%, non–condensing
- Cold Start: –40° to 0°C
- Seismic: Per Telecordia GR–63–CORE Zone 4

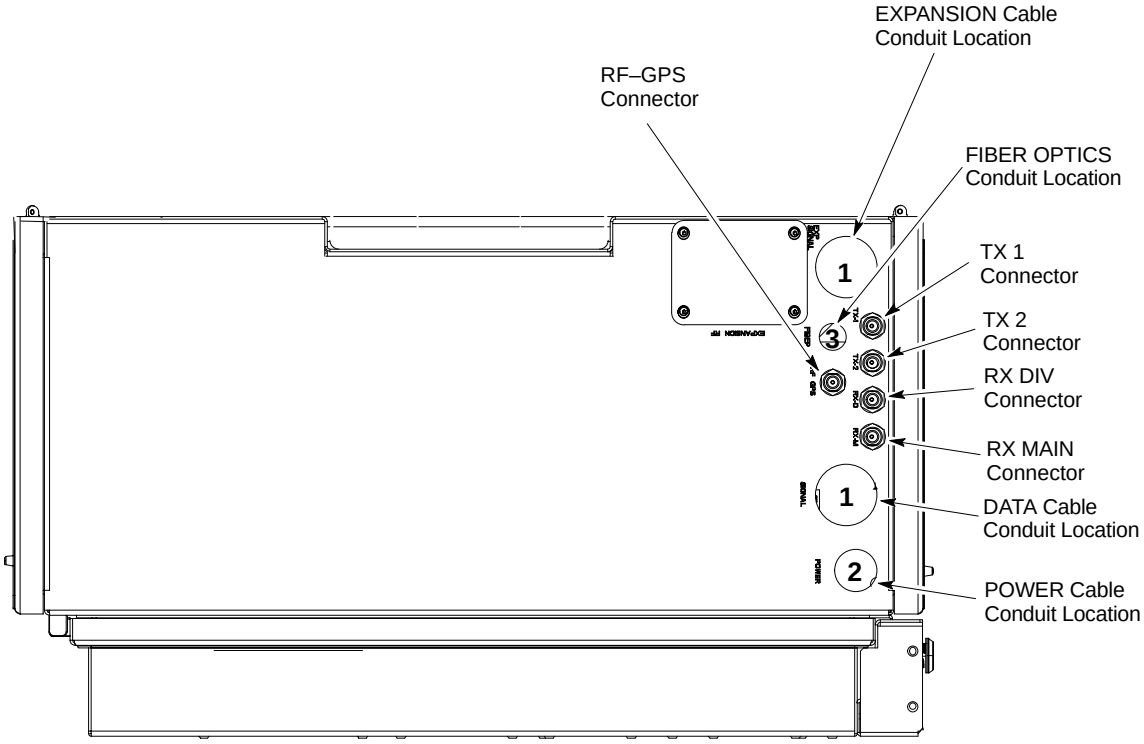
Weight Requirement

- TME: 18 kg (40 lbs)
- Heat Management System: 11.5 kg (26 lbs)
- Wall Mounting Bracket: 2.5 kg (5.5 lbs)

TME Connectors and Conduit Locations

Figure 4-16 shows the connectors and conduit locations

Figure 4-16: Bottom View of TME



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TME Conduit Sizes

The following are the conduit sizes required for connecting to the TME. Reference Figure 4-16.

Table 4-13: TME Conduit Sizes

No.	Designation	Required Size (Inches)
1	Data and Expansion	1–1/2
2	TME Power Input	1
3	Fiber Optic	1/2

Materials

Tools

The following tools are required to install the TME:

- Torque Screwdriver
- Drill, 3/8–inch or 1/2–inch drive
- Appropriate concrete or wood drill Bits
- Tie–Wraps
- Appropriate size conduit (Metallic sealtight)
- Bucklestrap Cutting Tool (Motorola P/N 6604809N01)
- Safety Glasses
- Heavy Gloves
- Electrical Tape
- Tape Measure
- Hammer, ball–peen

TME Installation

Pole Mount

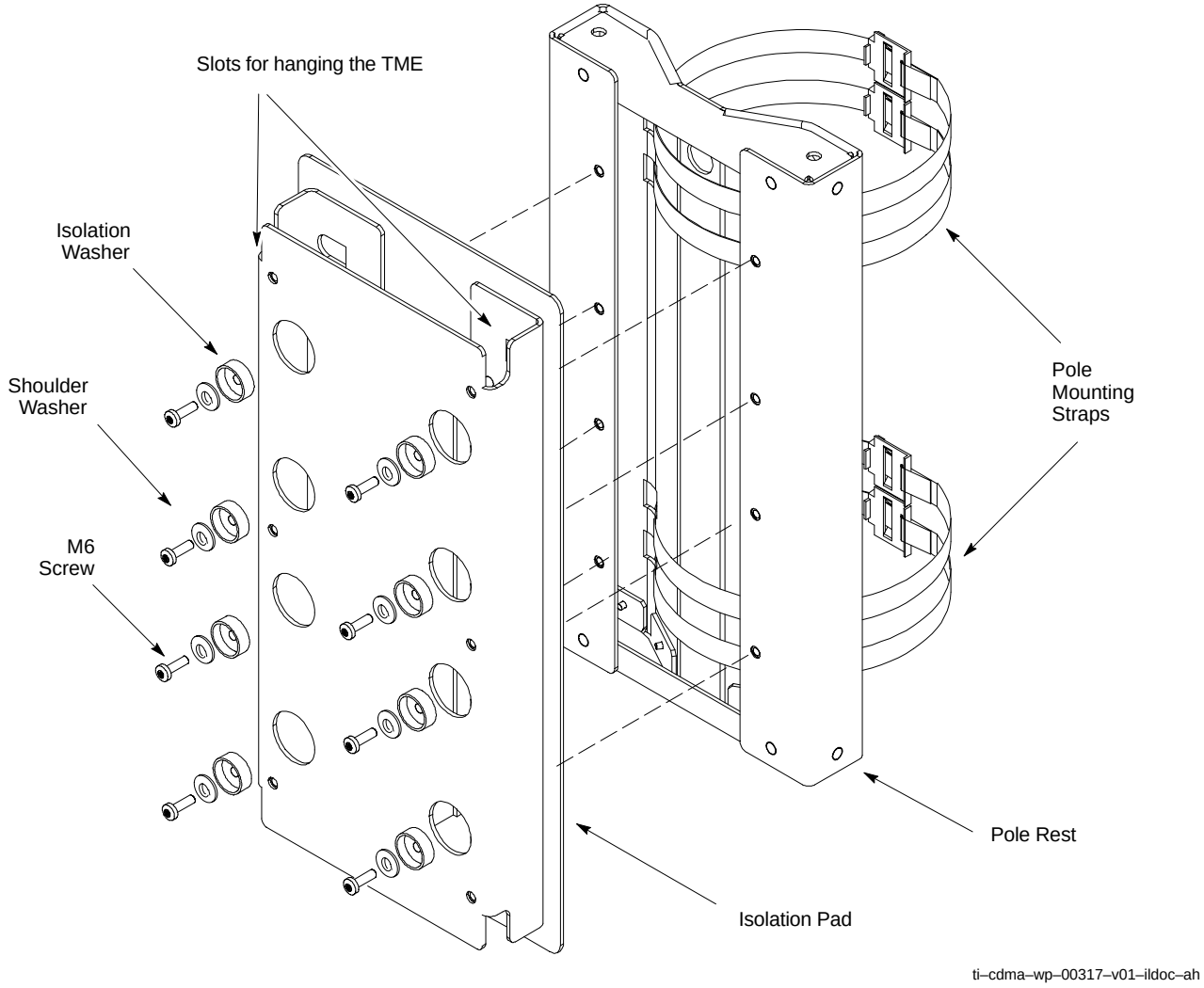
Follow the procedure in Table 4-14 to pole mount the TME. Figure 4-17 shows the Mounting Bracket Assembly and Wall Mounting Bracket. Check site documents to verify that pole and supporting hardware are capable of handling the load created by mounting the BTS system.

WARNING

Once TME is installed, ***DO NOT*** use it as a step ladder. It will not support a person standing on top or hanging from it.

Table 4-14: Procedure to Pole Mount the TME	
Step	**Action**
1	Slide non–buckle end of strap through openings in Pole Mounting Bracket Assembly.
2	Set Pole Mounting Bracket Assembly with straps at the desired height. **NOTE** Initial height is determined by customer. The bottom of the TME is a minimum of 1 meter from the ground. Adjust Pole Mounting Bracket Assembly to account for this minimum distance.
3	Wrap strap around the pole, slide non–buckle end through strap loop and pull snug.
4	Attach Bucklestrap Cutting Tool (slide strap through openings in tool, pull gripper lever to slide strap into spindle head), slide tool towards buckle. Place cutting tool end of tool as close to the buckle as possible. **NOTE** The strap can be cut to a more manageable length prior to using the tool. Bucklestrap Cutting Tool is a ratchet spindle and cutter in one.
5	Turn spindle clockwise until strap is tight.
6	Use cutter lever to cut strap.
7	Using the tool bend the strap over towards the buckle .
8	Remove tool and use a hammer to bend the strap more.
9	Use the hammer to bend buckle tabs over strap.
10	Use electrical tape to cover over the buckle and straps.
11	Perform step 3 through step 10, for the remaining straps.
12	Secure Wall Mounting Bracket to Pole Mounting Bracket Assembly using 8 M6 screws. Torque screws to 3.4 N–M (30 in–lbs). See Figure 4-17.
	△ **WARNING** The TME weighs 22 kg (48 lbs). One person is able to mount the TME on the Wall Mounting Bracket. It is recommended that two people or one person using a mechanical lift to mount the TME onto mounting bracket. ***Do not*** place the Compact BTS inside the TME prior to placing it on the mounting bracket. ***Remove*** the HMS prior to mounting the TME.
13	Set the TME onto the Wall Mounting Bracket. Ensure that it rests in the slots of the Wall Mounting Bracket. See Figure 4-17.
14	Secure the TME to the mounting bracket using 6 M6 screws. Torque screws to 3.4 N–M (30 in–lbs). See Figure 4-18.

Figure 4-17: Wall Mounting Bracket and Pole Mounting Bracket Assembly



Wall Mount

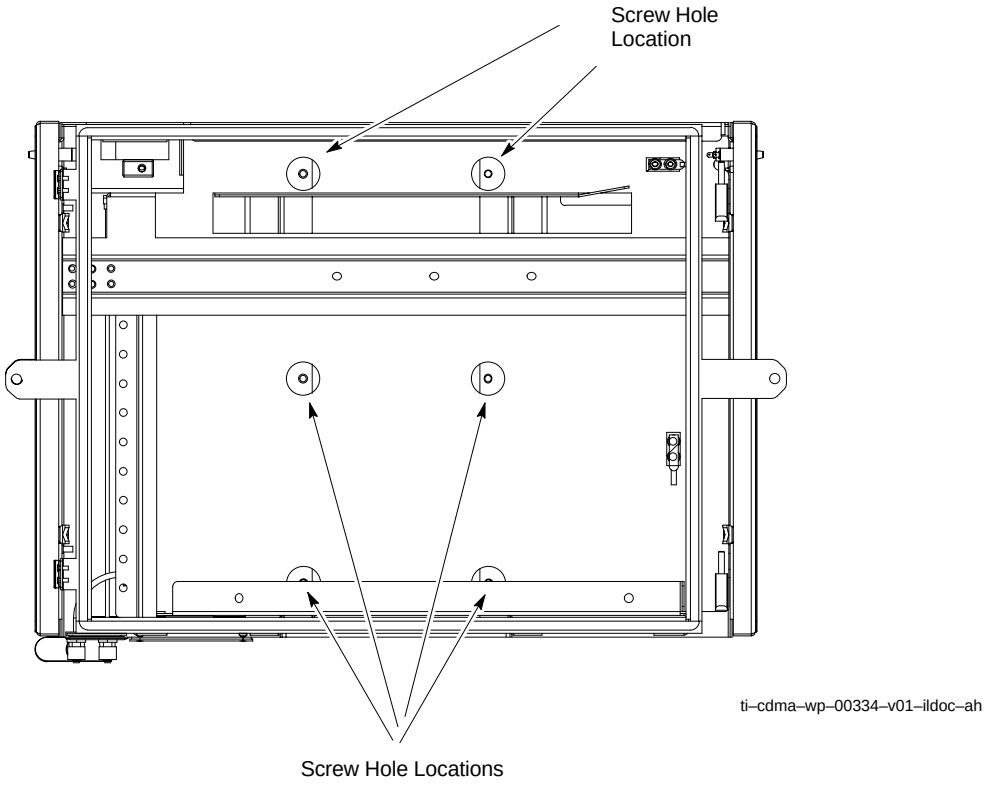
Follow the procedure in Table 4-15 to wall mount the TME. Refer to Figure 4-17 for the Wall Mounting Bracket. Check site documents to verify that wall structure and supporting hardware are capable of handling the load created by mounting the BTS system.

WARNING

Once TME is installed, ***DO NOT*** use it as a step ladder. It will not support a person standing on top or hanging from it. ***DO NOT*** mount HMS and leave it in the open position.

Table 4-15: Procedure to Install Mounting Bracket on a Wall	
Step	**Action**
1	Select a suitable wall position such that the bottom of the TME is a minimum of 1 meter above the ground. **NOTE** Check site documentation for further information.
2	Position Wall Mounting Bracket on wall and mark hole locations.
3	Drill starter holes for the anchor bolts.
4	Secure Wall Mounting Bracket to wall using 8 M6 anchor bolts. Torque anchor bolts to 3.4 N–M (30 in–lbs). △ **WARNING** The TME weighs 18 kg (40 lbs). One person is able to mount the TME on the Wall Mounting Bracket. It is recommended that two people or one person using a mechanical lift mount the TME onto mounting bracket. ***Do not*** place the Compact BTS inside the TME prior to placing it on the mounting bracket. ***Do not*** attach HMS to the TME prior to mounting the TME.
5	Hang TME on Wall Mounting Bracket. Mounting bar on the rear of the TME is set into the cutouts on the Wall Mounting Bracket.
6	Secure the TME to the Wall Mounting Bracket using 6 M6 screws. Torque screws to 3.4 N–M (30 in–lbs). See Figure 4-18.

Figure 4-18: TME Screw Mounting Location



Objective

This section contains general information for installing a Compact BTS in a Thermal Management Enclosure (TME).

WARNING

Once the outdoor enclosures are installed, ***they are not to be used as steps or other types of climbing aids***. They were not designed to support a person.

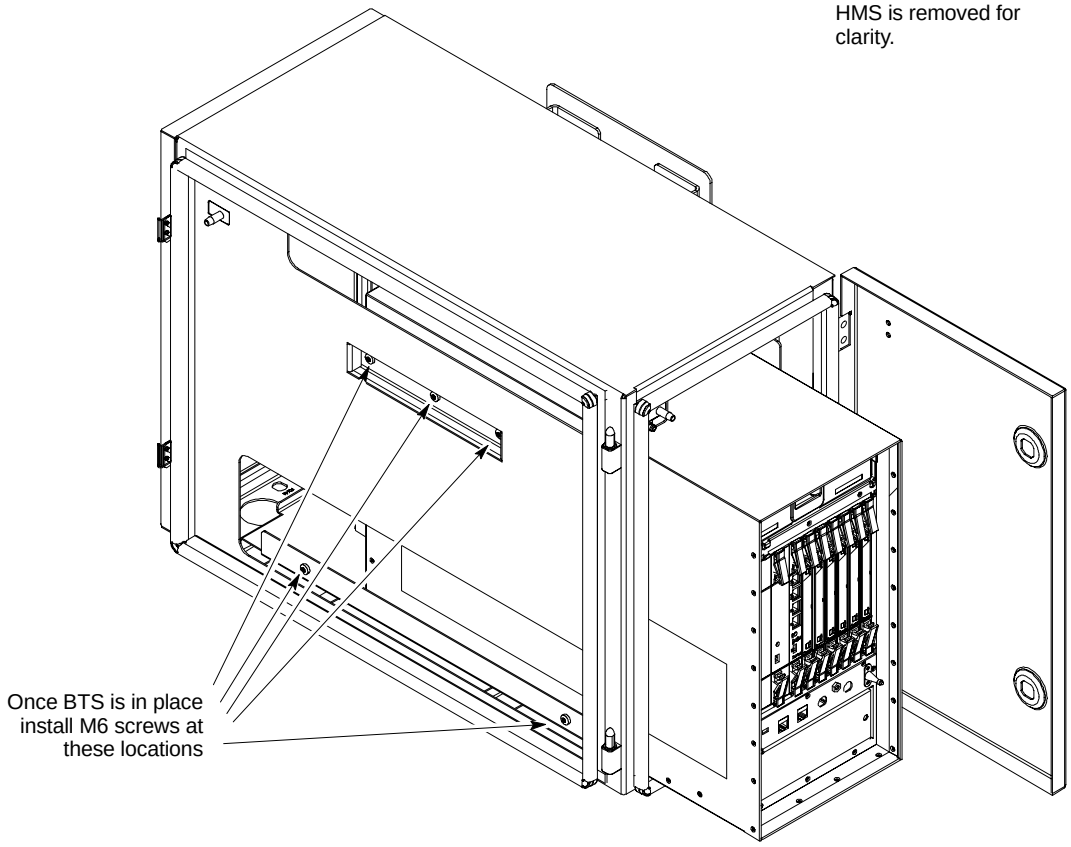
Compact BTS Installation

Follow the procedure in Table 4-16 to install the BTS inside the TME.

Table 4-16: Procedure to Install Compact BTS in a TME

Step	Action
1	Verify that the TME is securely fastened to the mounting bracket.
2	Lift and slide the Compact BTS into the TME (See Figure 4-19). △ **WARNING** The Compact BTS weighs 25 kg (55 lbs). One person is able to mount the BTS inside the TME. It is recommended that two people or one person using a mechanical lift mount the BTS inside the TME.
3	Once placed in the proper position, slide the Compact BTS inside the TME.
4	Secure the Compact BTS to the TME with 5 M6 screws. (See Figure 4-19). Torque screws to 3.4 N–M (30 in–lbs).
5	*If not already open,* unlock and open the left–hand door to the TME.
6	**! CAUTION** Ensure that DC power to TME/BTS is disengaged. Attach ground lug (part of TME) to BTS using two M6 screws.
7	Remove protective cover from BTS DC Power connector and connect DC power cable from TME Power Distribution Assembly.
8	Connect the "+" wire (red, marked +0V) to the +0 V terminal.
9	Connect the "–" wire (blue, marked –48V) to the –48V terminal.
10	Connect the other blue wire (marked TME) to the TME terminal.
11	Connect the TX and RX cables to the appropriate TME connectors.
12	Connect RGPS or Local GPS (RF–GPS) cable to CBIO.

Figure 4-19: Thermal Management Enclosure and BTS



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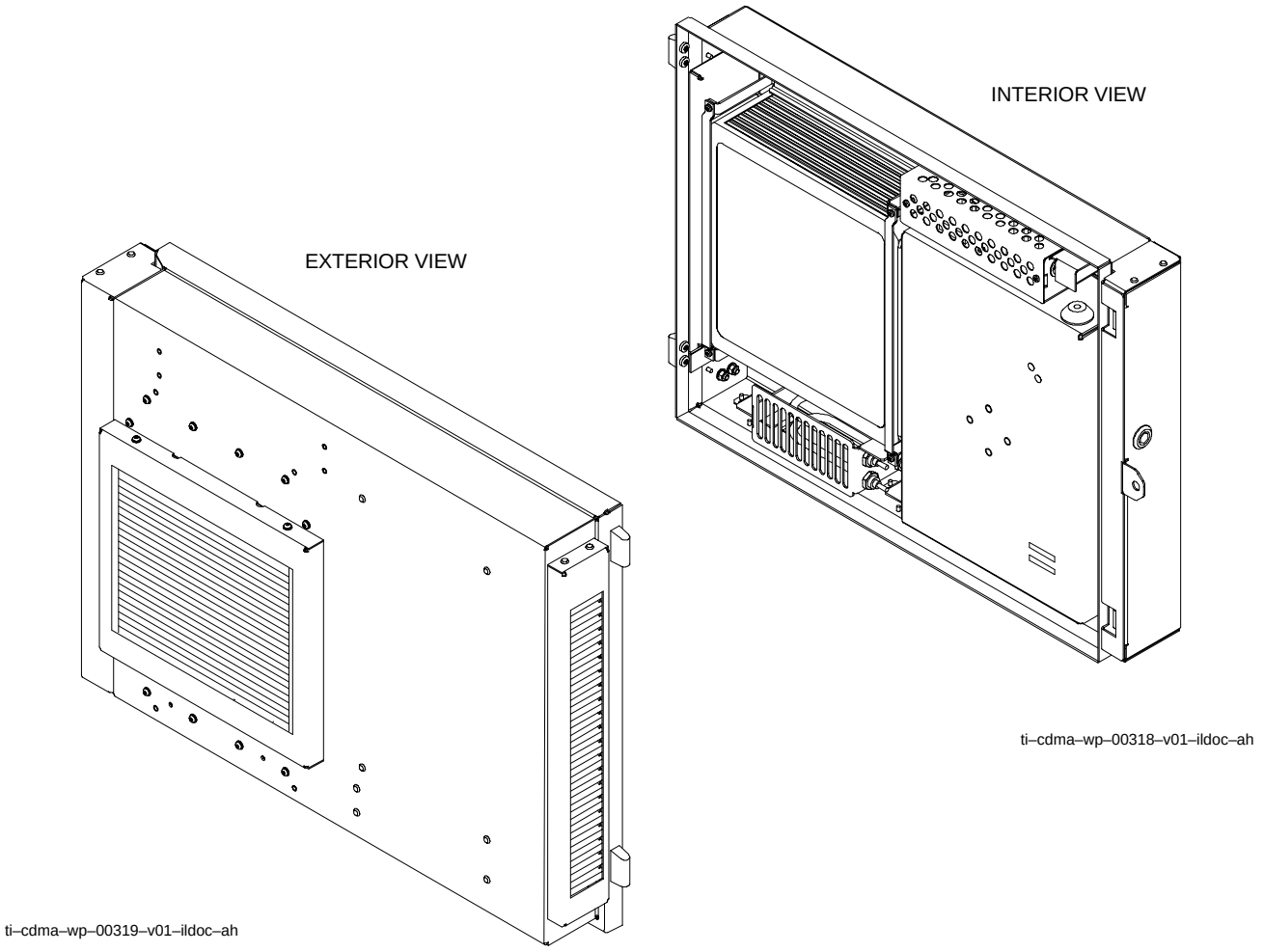
HMS Installation

In an outdoor configuration, the HMS module is part of the Thermal Management Enclosure (TME). It is external to the TME and its purpose is to regulate the heating and cooling of the Compact BTS within the TME. See Figure 4-20.

Figure 4-20: Heat Management System (HMS)



Follow the procedure in Table 4-17 to install the Heat Management System (HMS).

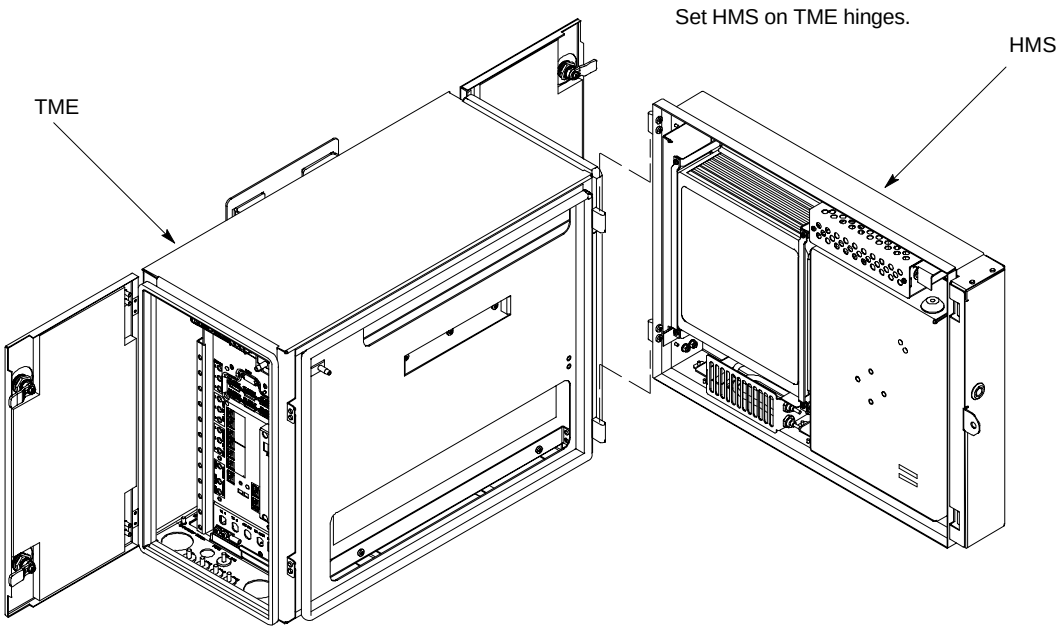
Table 4-17: Procedure to Install the HMS

Step	Action
1	Once the TME and BTS are installed, attach the HMS to the TME. **NOTE** HMS weighs 11.5 kg (26 lbs).

table continued on next page

Table 4-17: Procedure to Install the HMS	
Step	**Action**
2	Set the HMS on the hinges located on the TME (See Figure 4-21).
3	Use a driver wrench with socket to attach ground lug to HMS ground connection.
4	Connect the Data/DC PowerCable to HMS controller.
5	Dress cables as necessary.
6	Ensure that door swings freely and does not pinch any cables.
7	Close HMS and secure using the two draw latches. Fold draw latch handles down. Verify that HMS is fully closed and seated.
8	Close draw latch door and lock using key.

Figure 4-21: HMS Installation



Objective

This section contains general information for installing a Power Distribution Enclosure (PDE) with Heat Exchanger (HX). See Figure 4-22.

The optional PDE is a stand–alone unit external to the TME.

When in use, the PDE provides Primary surge for input power, customer alarms, GPS, external antenna(s) and span lines; in addition to AC/DC power conversion for the *SC*480 base unit and optional external PAs.

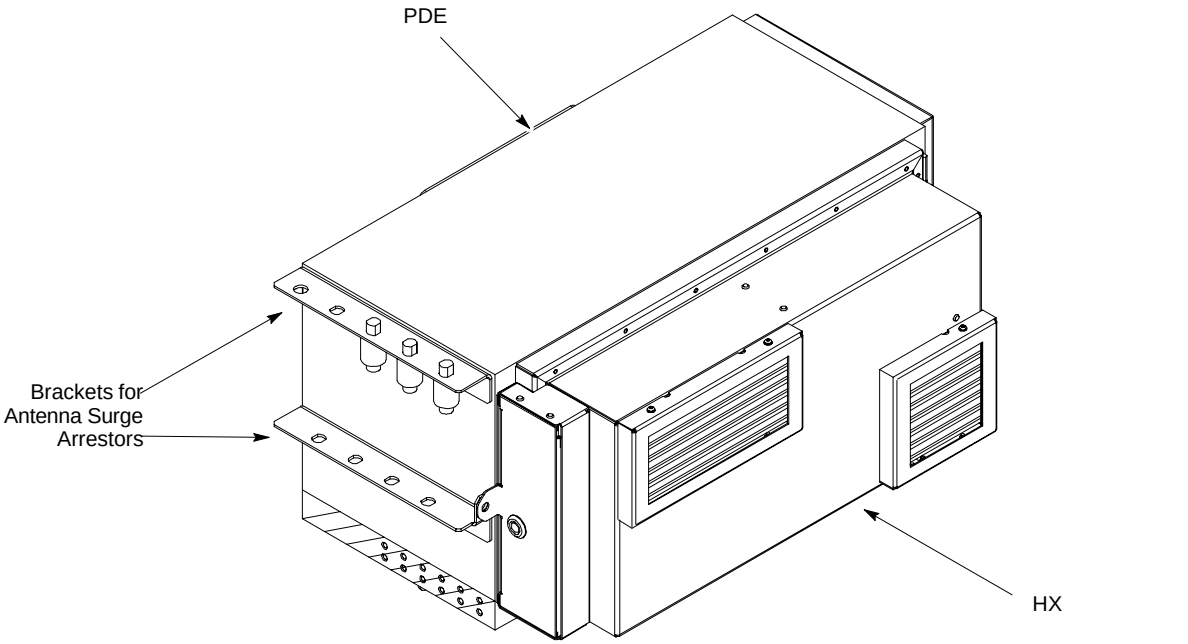
If battteries are used as backup, their cabling is routed to the PDE.

The present manual contains high level information on only one of two manufacturer's of the PDE.

IMPORTANT

Motorola ***does not*** recommend the PDE be used to support indoor configuration The PDE is not configurable for indoor sites, and in general, it does not locate surge protection functions appropriately for indoor cellsites. For indoor, power and surge protection functions should be implemented according to *Standards and Guidelines for Communication Sites* using telecom–grade third party equipment that is available through the ancillary group.

Figure 4-22: PDE and Heat Exchanger



Electrical

The PDE is powered by AC voltage (customer supplied) in the range 154–286 VRMS at 47–63 Hz at 3100 Watts.

The PDE outputs –54 Vdc at 2000 Watts (China).

The PDE outputs +30 VDC at 2000 Watts (Domestic)

Batteries if used, are located in a customer supplied external cabinet.

Environmental

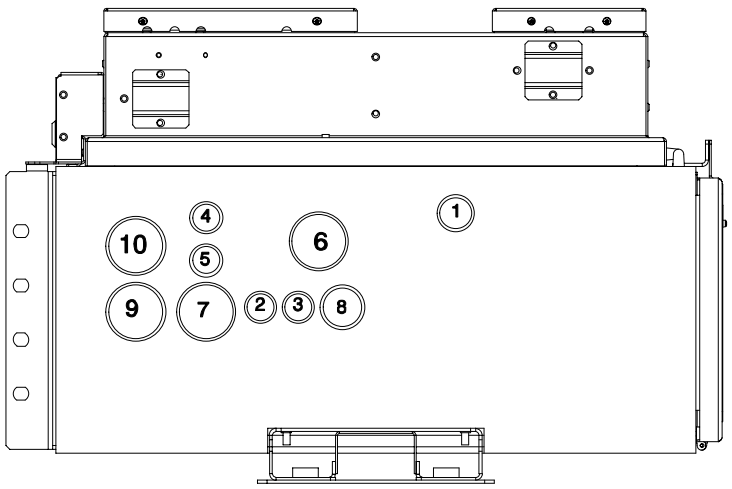
The following lists the environmental requirements of the PDE:

- Operate Temperature: –40° to +50°C
- Storage Temperature: –40° to +60°C
- Operating/Storage Humidity: 10 to 95%, non–condensing
- Cold Start: –40° to 0°C
- Seismic: Per Telecordia GR–63–CORE Zone 4

Weight

- PDE: 52 kg (115 lbs)
  - PDE cabinet: 25 kg (55 lbs)
  - Heat Exchanger: 12 kg (26 lbs)
  - Power Supply Module (PSM): 5 kg (11 lbs)
  - Miscellaneous: 10 kg (22 lbs)

Figure 4-23: PDE Conduit Location



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1 – PDE Power Input (AC)
2 – Compact PA #1 Power (DC)
3 – Compact PA #2 Power (DC)
4 – Compact PA #1 Signal (TP)
5 – Compact PA #2 Signal (TP)
6 – Battery Power (DC & TP)
7 – Expansion PDE (TP)
8 – TME Power (DC)
9 – PDE Signal (TP)
10 – Customer I/O (TP)

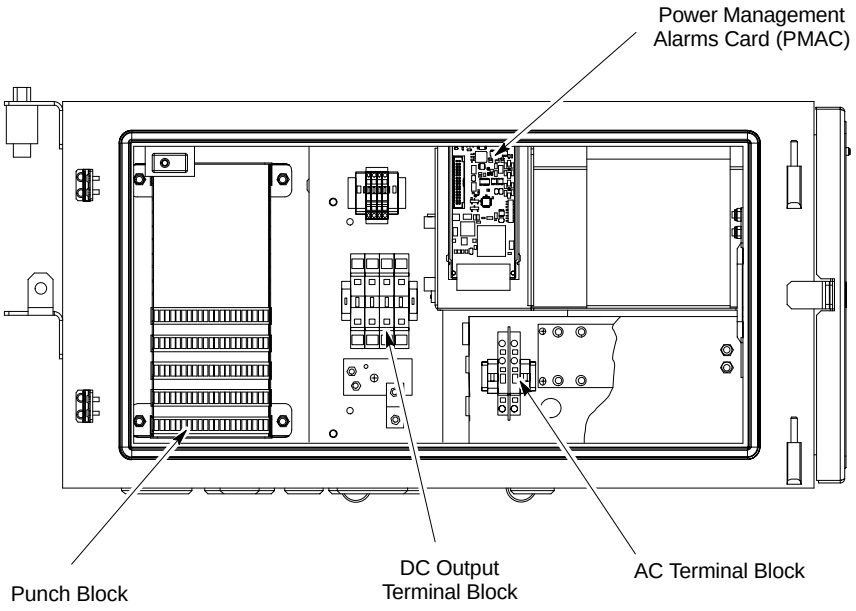
PDE Conduit Sizes

The following are the conduit sizes required for connecting to the PDE. Reference Figure 4-23.

Table 4-18: Conduit Sizes

No.	Designation	Required Size (Inches)
1	PDE Power Input	3/4
2	Compact PA #1 Power	1/2
3	Compact PA #2 Power	1/2
4	Compact PA #1 Signal	1/2
5	Compact PA #2 Signal	1/2
6	Battery Power	1–1/2
7	Expansion PDE	1–1/2
8	TME Power	1
9	TME Signal	1–1/2
10	Customer I/O	1–1/2

Figure 4-24: PDE Detail



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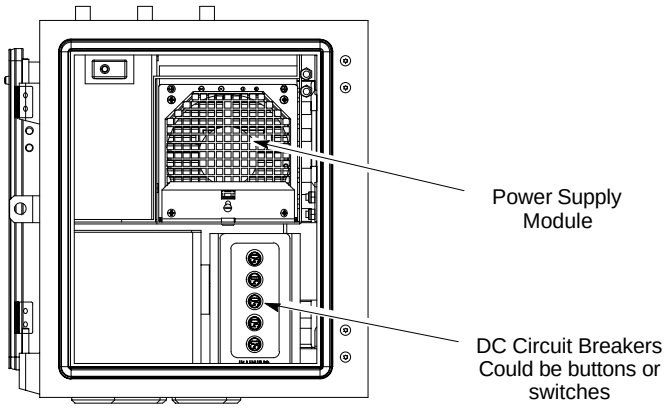

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Materials

Tools

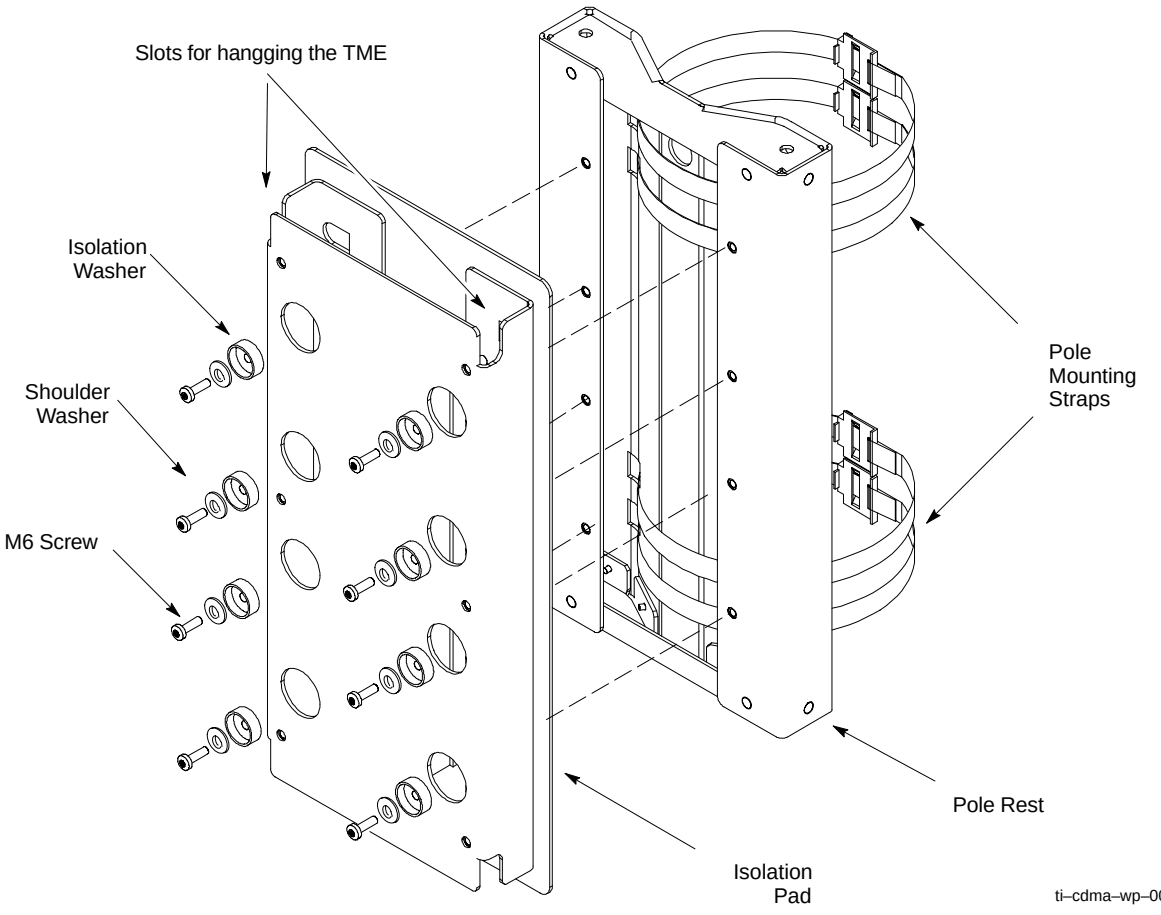
The following tools are required to install the PDE:

- Torque Screwdriver
- Drill, 3/8–inch or 1/2–inch drive
- Appropriate concrete or wood drill Bits
- Tie–wraps
- Alarms connector, 8–pin in–line, (Tyco, part number 103958–7) customer supplied
- Bucklestrap Cutting Tool (Motorola P/N 6604809N01) for pole mounting bracket assembly

PDE Installation

Figure 4-25 shows the Wall Mounting Bracket. and Mounting Bracket Assembly.

Figure 4-25: Wall Mounting Bracket and Pole Mounting Bracket Assembly



Mounting Bracket Assembly Procedure

Pole Mount

Follow the procedure in Table 4-19 to install the pole mounting bracket assembly and wall mounting bracket for pole mounting the PDE.

WARNING

Once PDE is installed, ***DO NOT*** use it as a step ladder. It will not support a person standing on top or hanging from it.

Table 4-19: Procedure to Install Mounting Bracket Assembly on a Pole

Step	Action
1	Wrap the mounting bracket straps around the pole to gauge the proper length.
2	Cut straps to proper length.
3	Slide straps through slots in mounting bracket assembly.
4	Secure mounting bracket to pole using the straps.
5	Secure Wall Mounting Bracket to Pole Mounting Bracket Assembly using 8 M6 bolts. Torque bolts to 3.4 N–M (30 in–lbs).
	△ **WARNING** The PDE weighs 15 kg (30 lbs). One person can mount the PDE. It is recommended that a minimum of two people or one person using a mechanical lift mount the PDE. ***Remove*** the Heat Exchanger prior to mounting the PDE. **NOTE** Initial height is determined by customer. Minimum height from the ground is 1 meter.
6	Hang PDE on Wall Mounting Bracket and secure using 4 M6 screws. Torque screws to 3.4 N–M (30 in–lbs).

Wall Mount

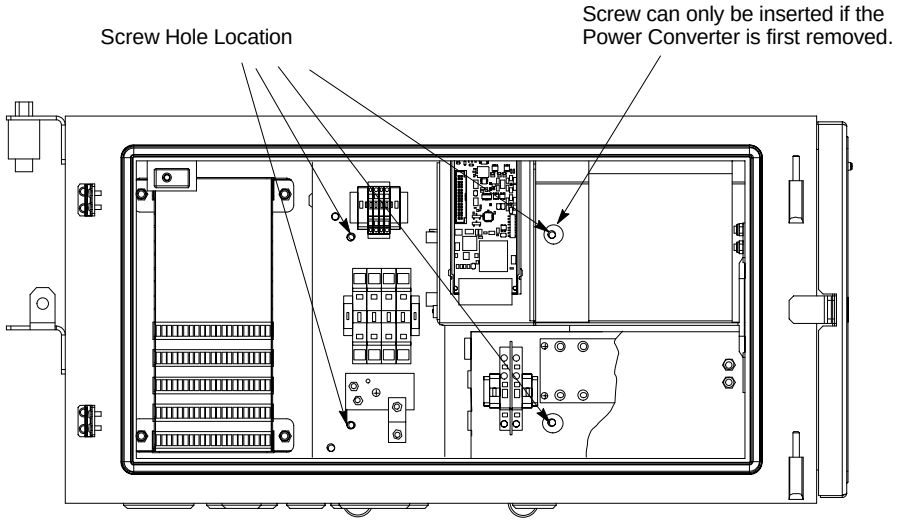
Follow the procedure in Table 4-20 to install the Wall Mounting Bracket on a wall for the PDE.

WARNING

Once PDE is installed, ***DO NOT*** use it as a step ladder. It will not support a person standing on top or hanging from it.

Table 4-20: Procedure to Install the Wall Mounting Bracket on a Wall	
Step	**Action**
1	Select a suitable wall position such that the bottom of the PDE is a minimum of 1 meter above the ground. **NOTE** Check site documentation for further information.
2	Position Wall Mounting Bracket on wall and mark hole locations.
3	Drill starter holes for the anchor bolts.
4	Secure Wall Mounting Bracket to wall using 8 M6 anchor bolts. Torque anchor bolts to 3.4 N–M (30 in–lbs).
5	Unlock and open PDE side door and remove Power Converter. **NOTE** Screw to secure PDE to Wall Mounting Bracket can only be seen with Power Converter removed.
	△ **WARNING** The PDE (less HX) weighs 25 kg (55 lbs) . It is recommended that a minimum of two people or one person using a mechanical lift mount the PDE. ***Remove*** Heat Exchanger prior to mounting the PDE.
6	Hang PDE on Wall Mounting Bracket.
7	Secure PDE to Wall Mounting Bracket using 4 M6 screws. Torque screws to 3.4 N–M (30 in–lbs). See Figure 4-26.
8	Install Power Converter after PDE is secure to Wall Mounting Bracket.

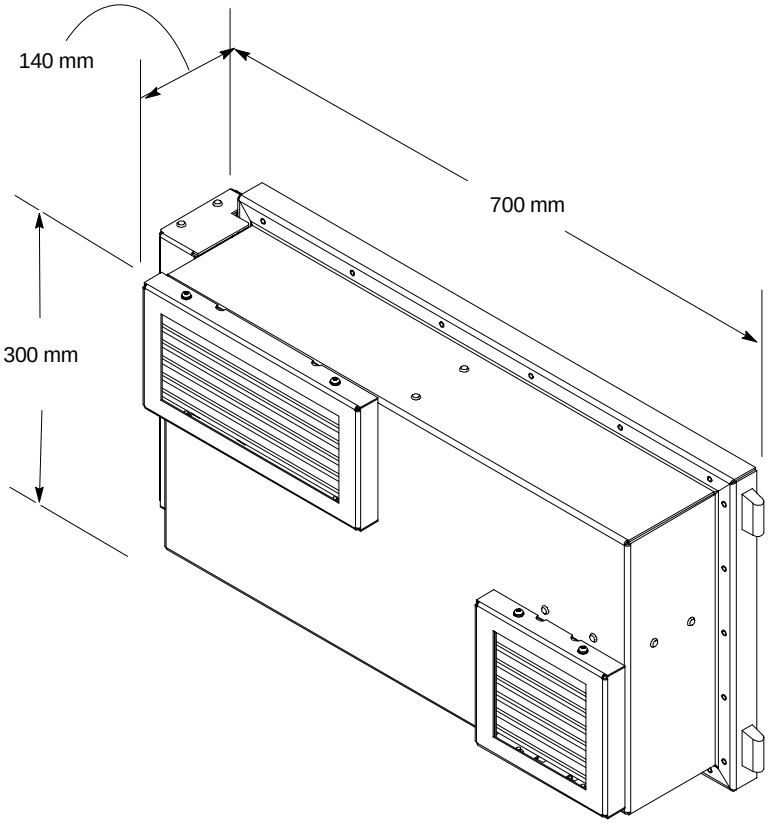
Figure 4-26: PDE Mounting Screw Locations



Heat Exchanger

The Heat Exchanger (HX) is attached to the PDE and provides temperature regulation. Figure 4-27 shows the HX.

Figure 4-27: PDE Heat Exchanger Dimensions



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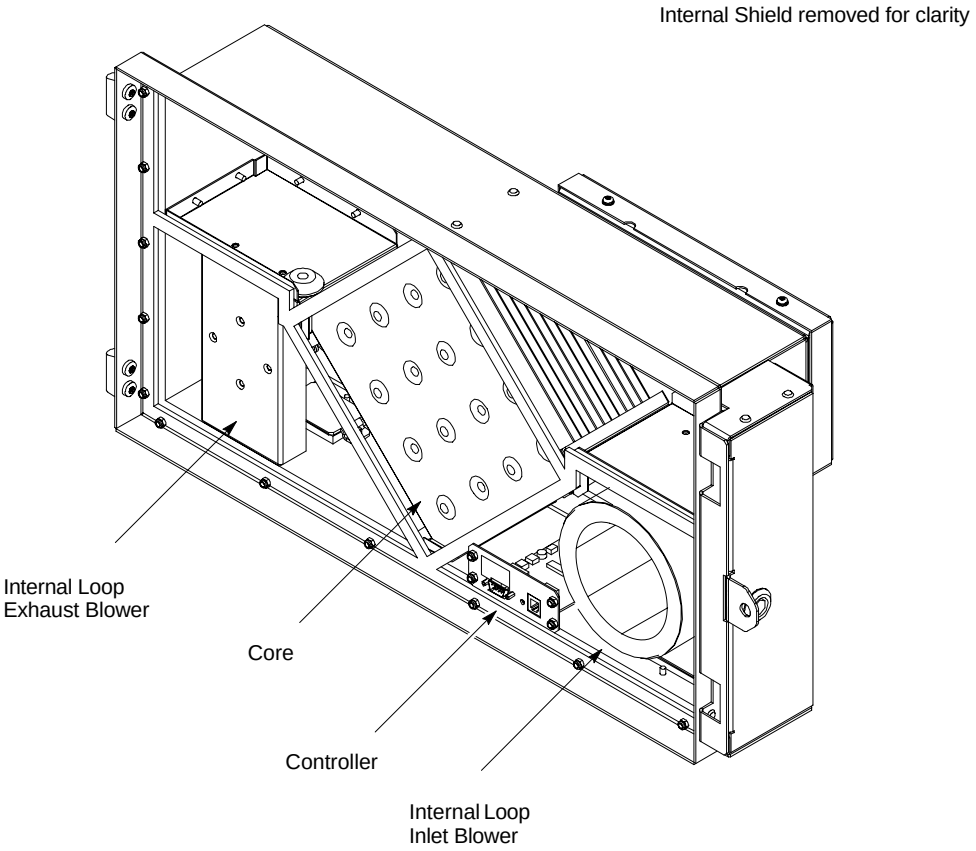
Heat Exchanger Details

Figure 4-28 shows the main components of the HX.

Figure 4-28: PDE Heat Exchanger Detail



Heat Exchanger Installation

Follow the procedure in Table 4-21 to install the Heat Exchanger.

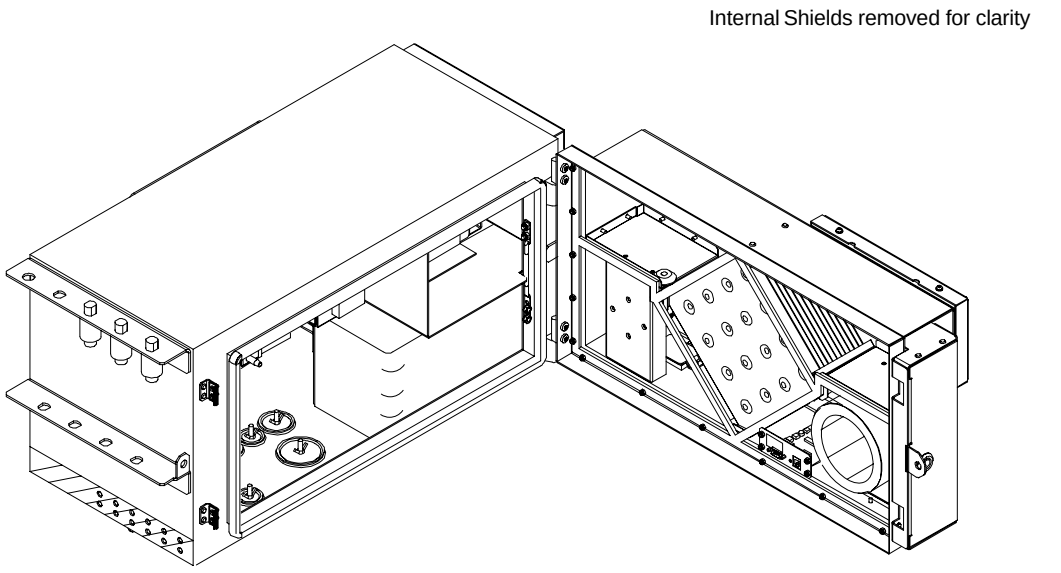
Table 4-21: Procedure to Install the Heat Exchanger

Step	Action
	NOTE The HX weighs 12 kgs (26 lbs). One person is able to lift the HX and place it on the PDE.
1	Once PDE is securely attached, place HX on hinges on the PDE.
2	Connect Ground and DC/Alarm power, and RS232 Alarm cables. The Test connector should be connected to a load.

table continued on next page

Table 4-21: Procedure to Install the Heat Exchanger	
Step	**Action**
3	Use tie–wraps to dress cables as necessary.
4	Ensure that HX swings freely on the hinges and does not pinch and cables.

Figure 4-29: PDE and Heat Exchanger



PDE Cabling

Table 4-22 shows the cabling pin–outs of the multiple layout punchblock for the PDE. Consult manufacturer's installation specification for connecting wires to the punch block.

Use punchdown tool provided or an equivalent 110 punchdown tool.

Table 4-22: PDE Punchblock Wiring Descriptions				
Unit Interface	**Signal**	**Wire Color**	**PB Pin**	**Output Pin**
Customer Input	CDI_1		101T	
	CDI_1_RTN		101R	
	CDI_2		102T	
	CDI_2_RTN		102R	

table continued next page

Table 4-22: PDE Punchblock Wiring Descriptions

Unit Interface	Signal	Wire Color	PB Pin	Output Pin
	CDI_3		103T	
	CDI_3_RTN		103R	
	CDI_4		104T	
	CDI_4_RTN		104R	
	CDI_5		105T	
	CDI_5_RTN		105R	
	CDI_6		106T	
	CDI_6_RTN		106R	
	CDI_7		107T	
	CDI_7_RTN		107R	
	CDI_8		108T	
	CDI_8_RTN		108R	
Customer Output	CDO NC_0		109T	
	CDO COM_0		109R	
	CDO NO_0		110T	
	CDO NC_1		110R	
	CDO COM_1		201T	
	CDO NO_1		201R	
	CDO NC_2		202T	
	CDO COM_2		202R	
	CDO NO_2		203T	
	CDO NC_3		203R	
	CDO COM_3		204T	
	CDO NO_3		204R	
	CDO NC_4		205T	
	CDO COM_4		205R	
	CDO NO_4		206T	
	CDO NC_5		206R	
	CDO COM_5		207T	
	CDO NO_5		207R	
	CDO NC_6		208T	

table continued next page

Table 4-22: PDE Punchblock Wiring Descriptions

Unit Interface	Signal	Wire Color	PB Pin	Output Pin
	CDO COM_6		208R	
	CDO NO_6		209T	
	CDO NC_7		209R	
	CDO COM_7		210T	
	CDO NO_7		210R	
RGPS	DATA_FROM_HEAD_POS		301T	
	SYNC_FROM_HEAD_POS		301R	
	SYNC_TO_HEAD_POS		302T	
	DATA_TO_HEAD_POS		302R	
	RGPS_+28V		303T	
	RGPS_+28V		303R	
	DATA_FROM_HEAD_NEG		304T	
	SYNC_TO_HEAD_NEG		304R	
	SYNC_TO_HEAD_NEG		305T	
	DATA_TO_HEAD_NEG		305R	
	RGPS RTN		306T	
	RGPS RTN		306R	
Combined Compact Linear Power Amplifier 1	CLPA_485_TX_ACT_P		307T	
	CLPA_485_TX_ACT_P		307R	
	CLPA_485_ADD_0		308T	
	CLPA_485_TX_A_P		308R	
	CLPA_485_TX_A_N		309T	
	GROUND		309R	
	CLPA_485_RX_A_P		320T	
	CLPA_485_RX_A_N		310R	
Power Management Enclosure	PDE_AC_FAILURE		401T	
	PDE_DOOR_ALARM		401R	
	PDE_HARD_FAILURE		402T	
	PDE_SOFT_FAILURE		402R	
	PDE_PRESENCE		403T	
	PDE_ALARM_RTN		403R	

table continued next page

Table 4-22: PDE Punchblock Wiring Descriptions

Unit Interface	Signal	Wire Color	PB Pin	Output Pin
1X Span Line	RX_RING_NET_A		404T	
	RX_TIP_NET_A		404R	
	TX_RING_NET_A		405T	
	TX_TIP_NET_A		405R	
	RX_RING_NET_B		406T	
	RX_TIP_NET_B		406R	
	TX_RING_NET_B		407T	
	TX_TIP_NET_B		407R	
	RX_RING_NET_C		408T	
	RX_TIP_NET_C		408R	
	TX_RING_NET_C		409T	
	TX_TIP_NET_C		409R	
	UNUSED		410T	
	UNUSED		410R	
Battery Backup	BAT_TP1_PRESENCE_DET		502T	
	BATT_TP1_PRESENCE_RTN		502R	
	BATT_TP2_+VE		503T	
	BATT_TP2_–VE		503R	
	BATT_TP2_PRESENCE_DET		504T	
	BAT_TP2_PRESENCE_RTN		504R	
Combined Compact Linear Power Amplifier 2	CLPA_485_TX_ACT_P		505T	
	CLPA_485_TX_ACT_P		505R	
	CLPA_485_ADD_0		506T	
	CLPA_485_TX_A_P		506R	
	CLPA_485_TX_A_N		507T	
	GROUND		507R	
	CLPA_485_RX_A_P		508T	
	CLPA_485_RX_A_N		508R	
DO Span Line	RX_RING_NET_1		509T	
	RX_TIP_NET_1		509R	
	TX_RING_NET_1		510T	

table continued next page

Table 4-22: PDE Punchblock Wiring Descriptions				
Unit Interface	**Signal**	**Wire Color**	**PB Pin**	**Output Pin**
	TX_TIP_NET_1		510R	
	RX_RING_NET_2		601T	
	RX_TIP_NET_2		601R	
	TX_RING_NET_2		602T	
	TX_TIP_NET_2		603R	
	RX_RING_NET_3		603T	
	RX_TIP_NET_3		603R	
	TX_RING_NET_3		604T	
	TX_TIP_NET_3		604R	

Objective

The objective of this procedure is to attach the earth ground cabling to the BTS.

Indoor Grounding Considerations

Refer to the site documentation for other grounding considerations.

Rack Electrical Isolation on Concrete Slab – The onluy BTS and cCLPA grounding permitted is through the power cable and chassis ground connection. If the rack is installed on a concrete slab, it must be electrically isolated from the slab. The rack should be placed on a dielectric pad and the seismic mounting bolts should be installed through the rack with dielectric isolating washers as is done with the BTS frame. If this method cannot be used, the BTS must be electrically isolated from the equipment rack.

Cable Description

The following cables in Table 4-23 are necessary to do this procedure.

Table 4-23: Ground Cable and Lug Description and Part Number

Cable	Qty.	Part Number	Description
A	1	Customer Supplied	Ground cable, 6 -AWG, insulated copper wire.
	1	Customer Supplied	Two Hole, Long Barrel lug connector, 6 AWG, 1/4–inch diameter, 5/8–inch stud hole spacing, 13/32 Tang width (ILSCO P/N CRB–6L2–14–58)
		Customer Supplied	1–inch, 1–1/2–inch, 1/2–inch, and 3/4–inch metallic sealtight type conduit or RF Solid Shielded cable – Sufficient quantity to meet the outdoor site and local code requirements

Required Tools and Materials

The following tools are required to attach ground cabling to the BTS.

- Torque wrench set to 5.0 N–M (44 in–lbs) and 13 mm socket
- Flathead screwdriver bit
- 2 M6x10 screws for ground lug
- Crimping tool
- Anti–Oxidant grease, copper/aluminium mix (Penetrox, part number P8A)

BTS Ground Procedure

Follow the procedure in Table 4-24 to attach the ground cable.

Table 4-24: Procedure to Attach the Earth Ground Cable

Step	Action
	NOTE Due to variability in rack placement, the rack is isolated from ground to reduce the chances of creating ground loops.
1	Retrieve ground lug and cabling.
1a	Using a wire stripper, trim back 1/2–inch of the ground cable insulation from each end.
1b	Using a crimp tool crimp the lug onto one end of the cable.
1c	Attach the ground clamp to the opposite end of the ground cable.
2	Using two screws attach the ground cable and lug to the BTS. See Figure 4-31.
3	Slide ground clamp over ground anchor and secure using a lockwasher. Use a 13mm socket to tighten the hex nut. Use a torque wrench to tighten hex nut to 5.0 N–M (44 in–lbs).
4	Use tie–wraps as required to dress the ground cable, unless conduit is used.

Figure 4-30: Detail Location of Ground Studs

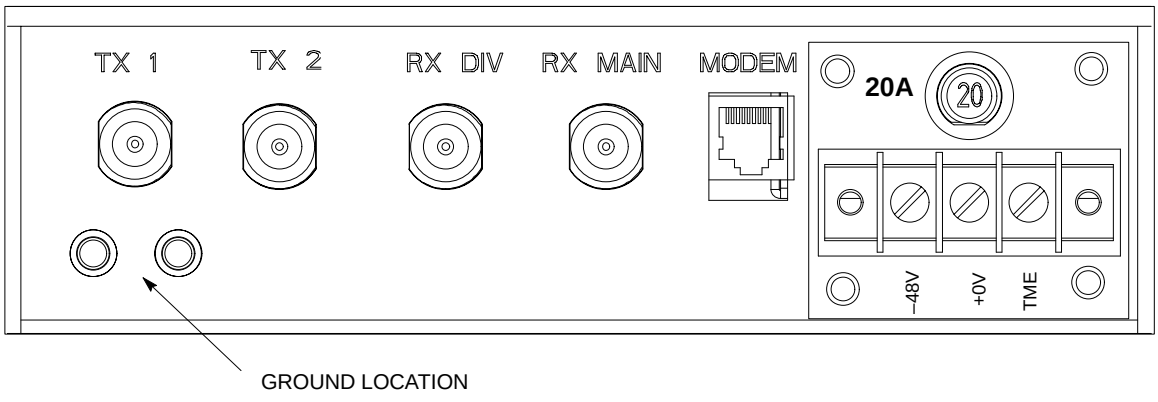
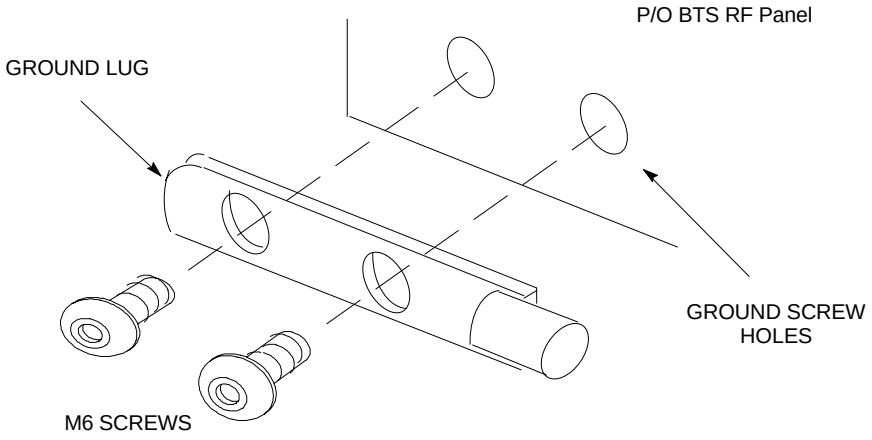


Figure 4-31: Grounding Location on BTS



Outdoor Grounding Considerations

cCLPA

The cCLPAs are designed to mount directly to the antenna tower. They have primary lightning protection on all terminations. There is a ground stud provided to connect the unit to the tower. If the cCLPAs are not mounted on the tower, they should be mounted as close as possible to an antenna ground system connection. All interconnect cables should be in conduit or solid shield RF cables.

PDE

The Primary PDE is the master ground point for all the outdoor equipment. This Primary PDE should be mounted within 2 meters of the master ground connection of the antenna ground system. The secondary PDE should be mounted within 1 meter of the primary PDE and single point grounded to the same master ground point.

Compact BTS and TME

The Compact BTS and TME and all other outdoor expansion hardware should be located within 5 meters of the primary PDE. They are all to be single point grounded to the system master ground. All these expansion enclosures are insulated from ground through their respective mounting brackets. All interconnect cables should be in conduit or solid shield RF cables. It is recommended that these cables be run in raceways to reduce the loop dimensions of the cable runs. This minimizes the effect of inducted currents caused by the intense electromagnetic field of lightning current.

Antennas

The Compact BTS is being installed at an antenna site that has a proper ground system for the antenna. Proper ground connection points are also available for the cCLPA and PDE units.

Site Requirements

The enclosures are mounted according to the site documentation. Refer to Figure 2-10, Figure 2-13 through Figure 2-15 for dimensions and clearances and spacing information.

Figure 4-32 shows an example of a mounted single system outdoor grounding diagram. Figure 4-33 shows an example of a mounted multiple unit system outdoor grounding diagram.

Outdoor Grounding Procedure

Follow the procedure in Table 4-25 to set up a site for grounding.

Table 4-25: Procedure to Ground an Outdoor Site

Step	Action
1	If not already known, consult site documentation for location to mount system.
2	Verify that all master ground for the system is in place.
3	Follow the procedures as described in Chapter 4 for installing the PDE, TME, and cCLPA.
4	Once installation is complete, ground the Primary PDE to the system master ground.
5	Route grounding cables from the other enclosures to the Primary PDE. Apply anti–oxidant grease to ground lugs and connections. *** IMPORTANT** In order to route the TME to PDE Earth ground cable through the power conduit, a jumper cable must be spliced from the conduit ground bushing to the earth cable.
6	Ground the cCLPA to the system master ground. Apply anti–oxidant grease to ground lug and connection.
7	Ground the antennas to the system master ground.
8	Once grounding is completed, layout conduit or solid shield RF (SSRF) cables.
9	Route wires from PDE through conduit or route SSRF cables to the TME.
10	Route Data cabes from the TME to the cCLPAs.
11	Route AC power and battery backup (if used) to PDE.
12	Route DC power from PDE to cCLPA and TME.
13	Perform the procedures described in the remainder of this Chapter.

Figure 4-32: Typical Outdoor Grounding Configuration

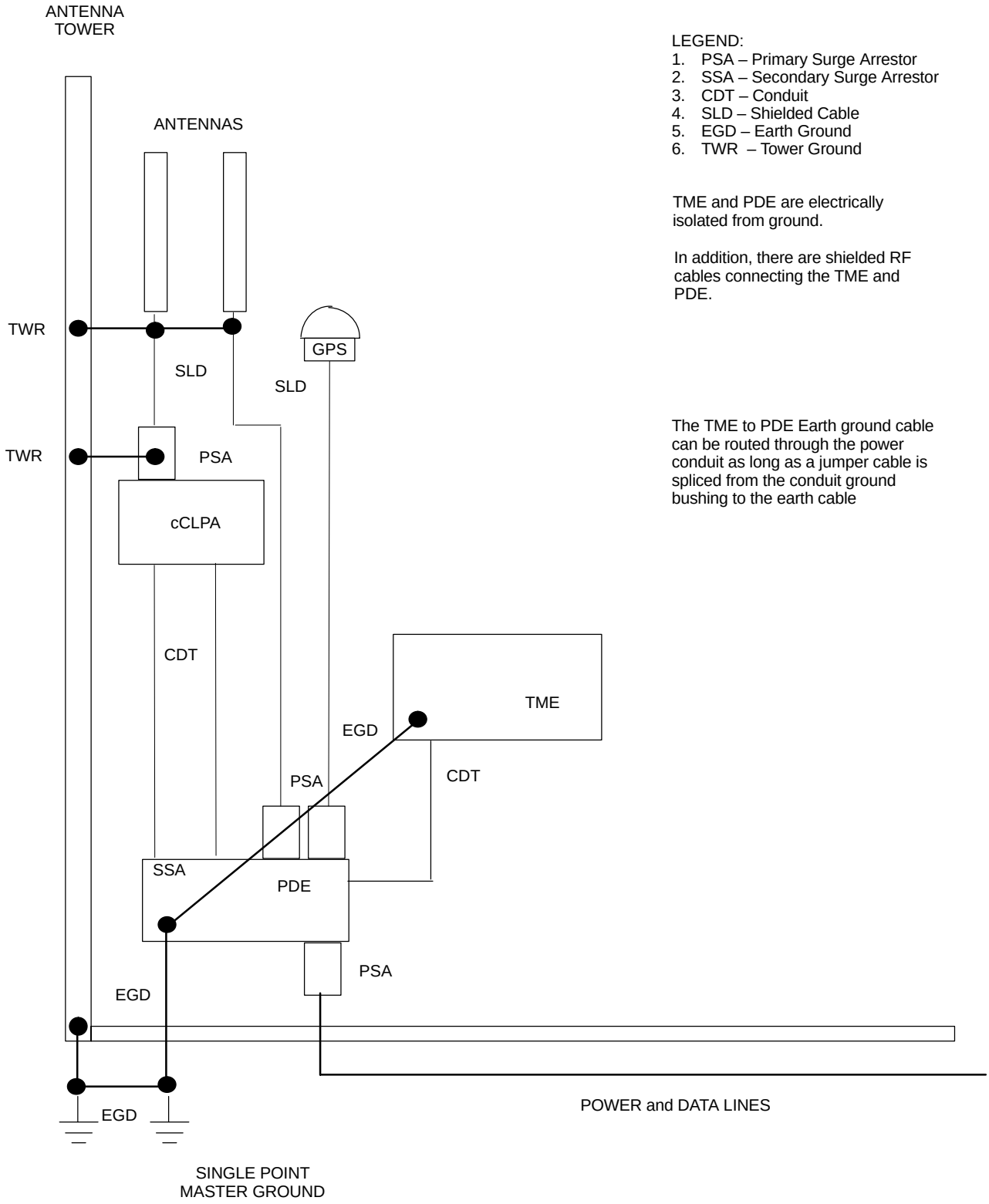
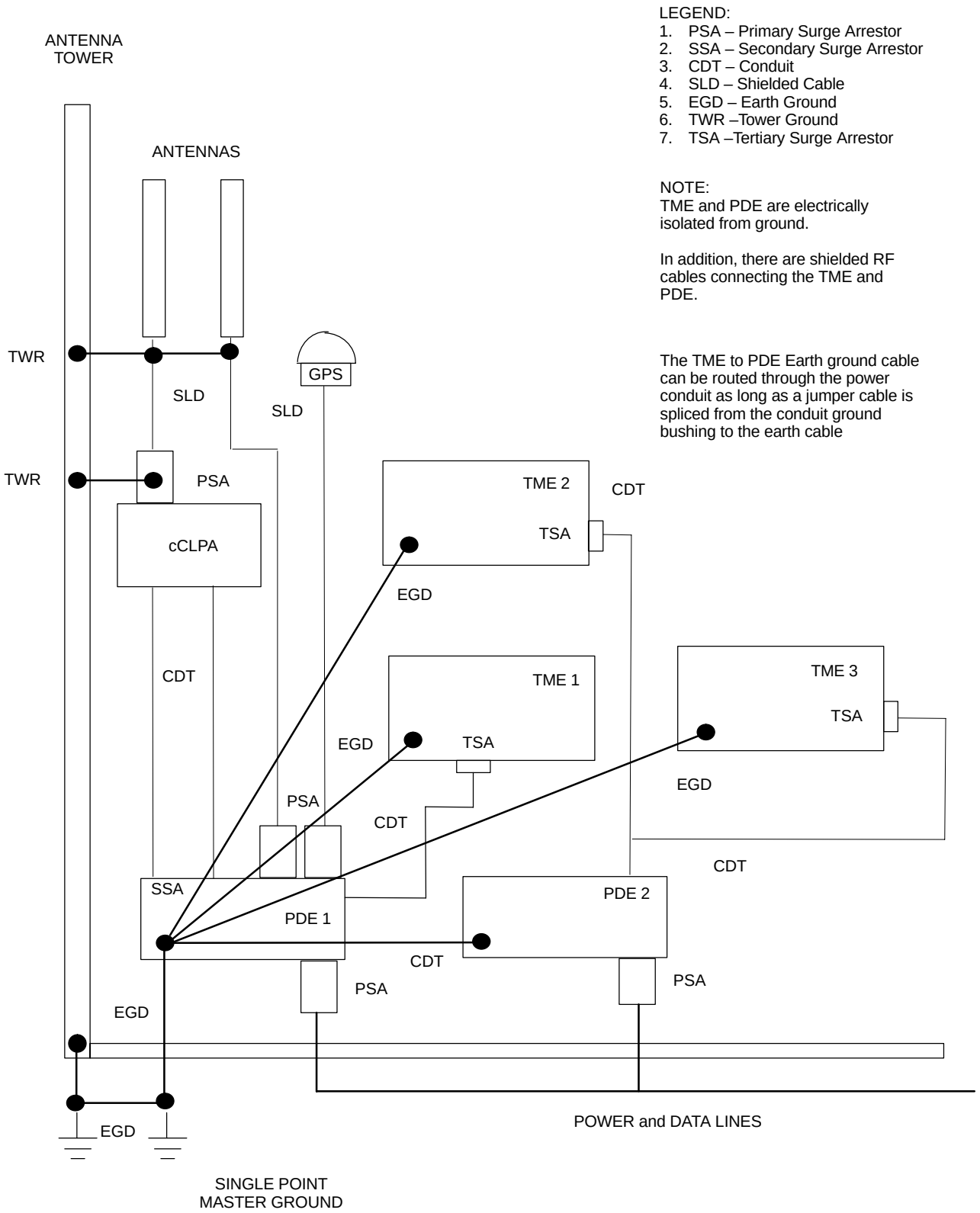


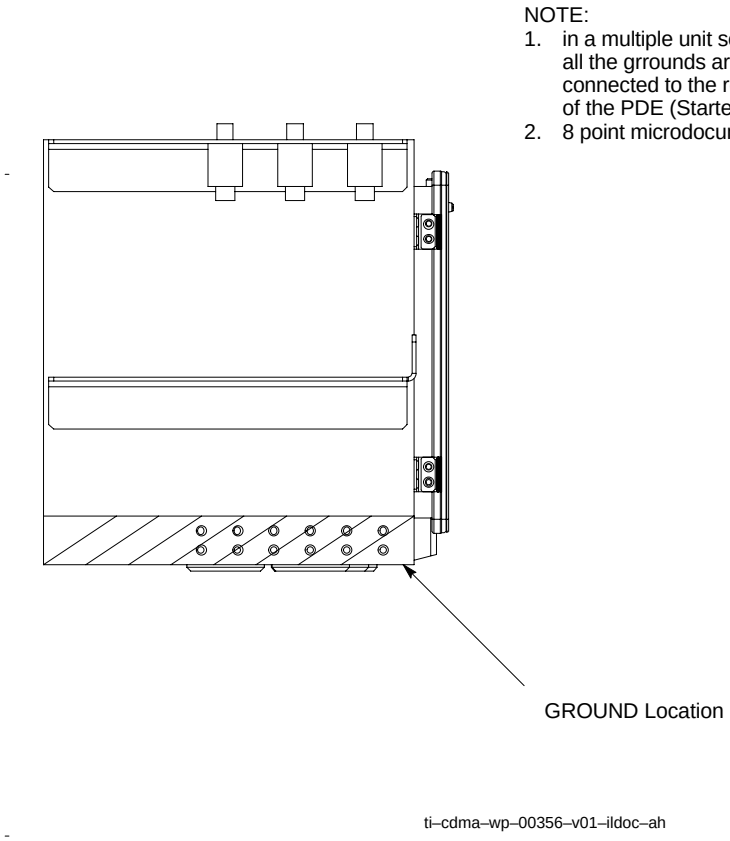
Figure 4-33: Typical Multiple Outdoor Grounding Configuration



PDE Ground Connection

Figure 4-34 shows the ground location for the starter PDE and the other outdoor enclosures.

Figure 4-34: Rear View of PDE



Objective

The objective of this procedure is to attach the DC input cable to the BTS for indoor configuration.

WARNING

This equipment uses dangerous voltages and is capable of causing death. Use extreme caution when handling and testing this equipment.

DC Cable Description

The following cable in Table 4-26 is necessary to do this procedure.

Table 4-26: DC Input Cable Description and Part Number

Cable	Qty.	Part Number	Description
F	1	Customer Supplied	DC input cable with crimped lugs, 10 AWG, 10 m, designed to handle either –60 to –40 VDC or +20 to +34 VDC power input.
	1	7687717T02	Ferrite, Clip–on core

Power Cable and Connector Signal Information

The DC input connector is located on the bottom, right side rear of the BTS. The BTS is designed for –60 to –40 VDC.

The TME DC power connection is for outdoor configuration and only in use if the Thermal Management Enclosure (TME) is used.

IMPORTANT

Motorola ***does not*** recommend the PDE be used to support indoor configuration The PDE is not configurable for indoor sites, and in general, it does not locate surge protection functions appropriately for indoor cellsites. For indoor, power and surge protection functions should be implemented according to *Standards and Guidelines for Communication Sites* using telecom–grade third party equipment that is available through the ancillary group.

Procedure

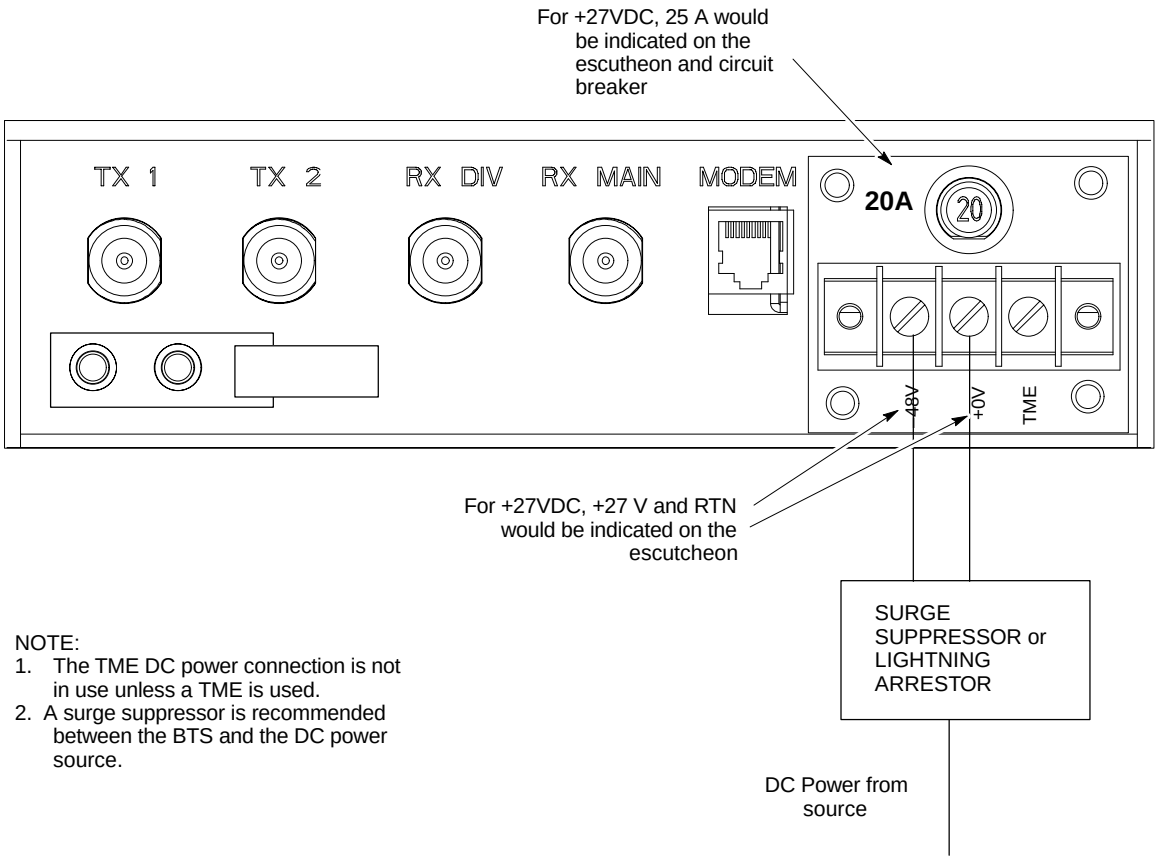
Use the following procedure in Table 4-27 to connect the DC voltage input cable to the BTS. Refer to Figure 4-35.

Table 4-27: Procedure to Connect DC Power to the BTS

Step	Action
1	Ensure that DC power source circuit breaker is disengaged (OFF).
2	Route DC power cables to the rear of the BTS.

Table 4-27: Procedure to Connect DC Power to the BTS	
Step	**Action**
3	For the –48 VDC version, proceed to step 3a. For the +27 VDC version, proceed to step 3c.
3a	Connect the "+" wire (red) to the +0 V terminal.
3b	Connect the "–" wire (blue) to the –48V terminal. Proceed to step 4.
3c	Connect the "–" wire (black) to the RTN terminal.
3d	Connect the "+" wire (red) to the +27 V terminal. Proceed to step 4.
4	Bundle wires together and place ferrite core around wires. Ensure that the wires are not being pinched before closing and latching the ferrite core.
5	Slide ferrite core as close to the BTS connection as possible without causing stress. Use a tie–wrap on the ferrite core side away from the connection. The tie–wrap holds the ferrite core in place.

Figure 4-35: DC Power Terminal Strip



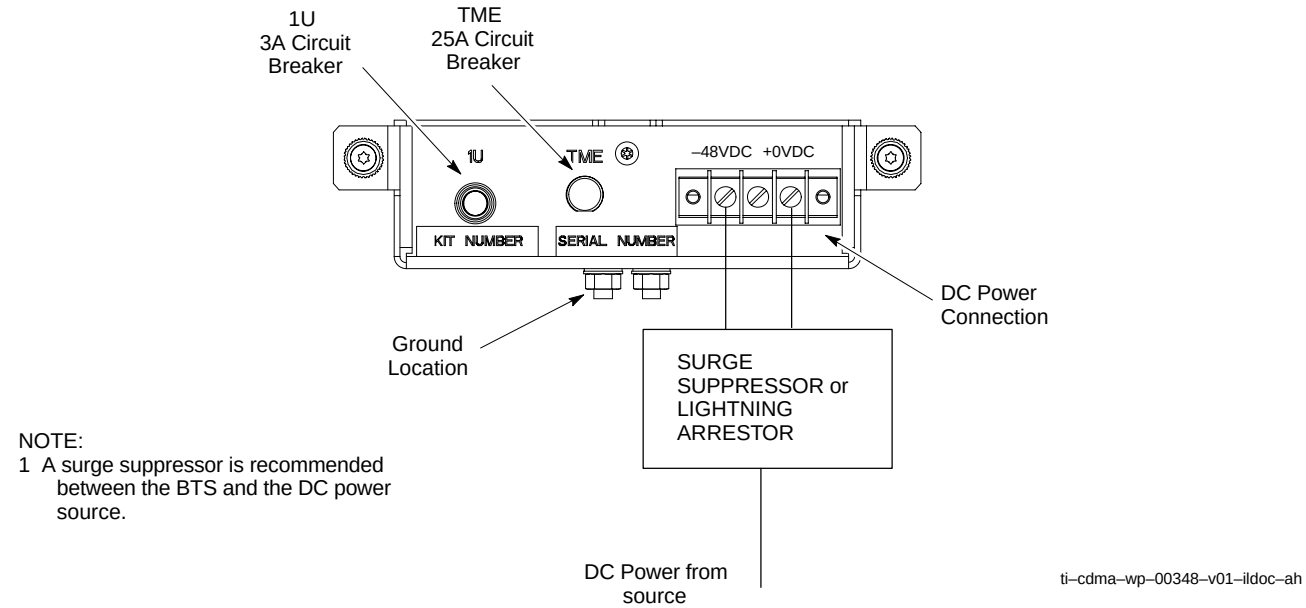
Connect DC Power to TME Procedure

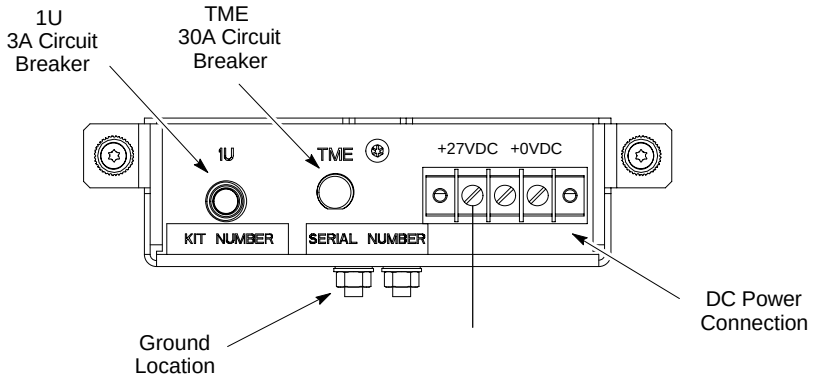
Use the following procedure in Table 4-28 to connect the DC voltage input cable to the TME. Refer to Figure 4-36 or Figure 4-37.

Table 4-28: Procedure to Connect DC Power to the BTS

Step	Action
1	Ensure that DC power from PDE is disengaged (ciruit breaker set to OFF).
2	Route DC power cable through conduit to TME POWER Cable hole location.
3	Ensure that 1U and TME circuit breakers are disengaged (pulled out).
4	Remove protective cover from PDA DC power connector.
5	*If not already done,* trim insulation back about 15 mm (1/2–in) on each wire.
6	Connect the "+" wire (red) to the +0 VDC terminal on PDA.
7	Connect the "–" wire (blue) to the –48VDC terminal on PDA.
8	Replace protective cover.

Figure 4-36: TME Power Distribution Assembly for –48VDC





NOTE:
1 A surge suppressor is recommended between the BTS and the DC power source.

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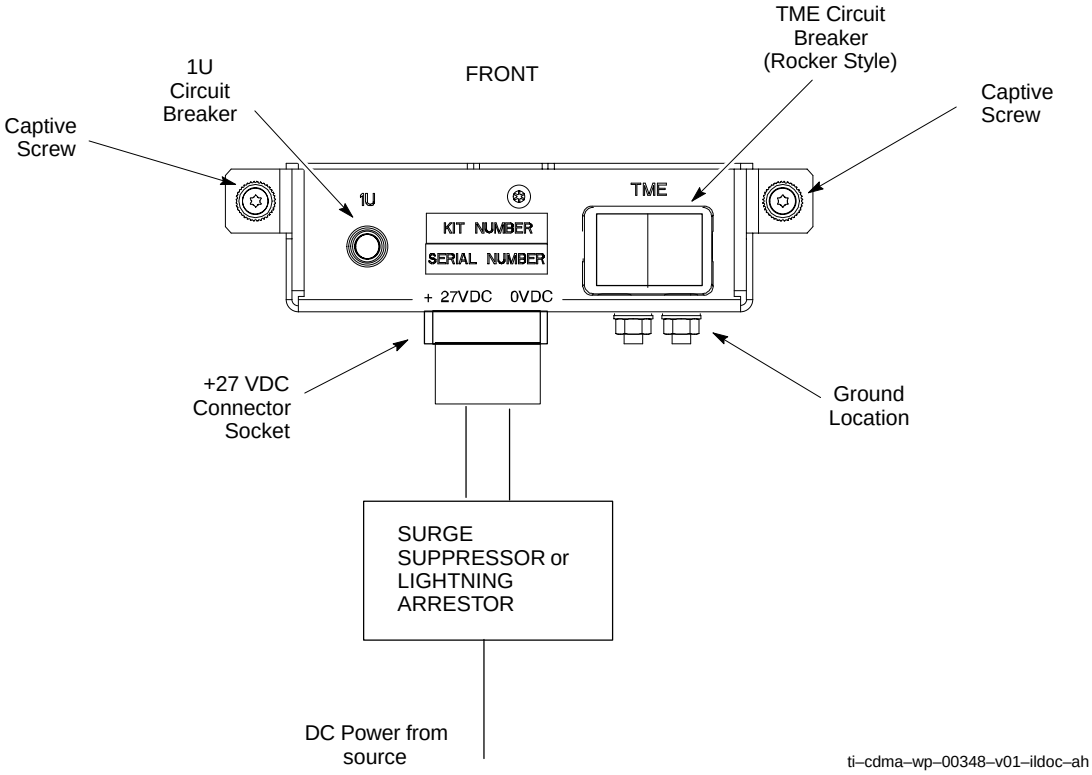
Figure 4-37: TME Power Distribution Assembly for +27VDC



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Objective

The objective of this procedure is to install the AC power cabling and Battery Backup input cables to the Power Distribution Enclosure (PDE).

CAUTION

This equipment uses dangerous voltages and is capable of causing death. Use extreme caution when handling and testing this equipment.
Earth connection is essential before connecting the power due to the presence of high earth leakage current.

AC Cable Description

NOTE

The Power Distribution Enclosure (PDE) is UL rated at 14 Amperes, in the range 200–240 VAC. The Customer Site installation must provide a disconnect device and over current protection device. A breaker size of 25 Amperes is recommended or as appropriate by local electrical code. The frame can accommodate an AC conductor range of 6 AWG to 12 AWG, as limited by the internal AC terminal block. Cable sizing should be determined by Local Electrical Codes, using 90C min rated conductors, with derating for 50C operation. Motorola recommends not less than 10AWG copper for buried/raceway cables.

The cables listed in Table 4-29 are recommended for this installation. However, consult the manufacturer's installation guide for further information.

Table 4-29: AC Input Cable Description and Part Number

Cable	Qty.	Part Number	Description
K	1	Customer Supplied	AC power cable with crimped lugs, 10 AWG, copper, designed for 200 to 240 VAC @ 25 A.
†L	2–7	Customer Supplied	DC power cables, 10 AWG, stranded, designed for –60 to –40 VDC power input
† Length of cables are dependent upon BTS equipment site layout.			

AC and DC Power Cabling Procedure

After PDE is installed, connect the AC and DC power cables according to the manufacturer's installation specification.

Battery Backup Power Cabling Procedure

After PDE is installed, connect the Battery Backup DC power cable to the PDE according to the manufacturer's installation specification.

PDE to TME and cCLPA DC Power Cabling Procedure

After PDE is installed, connect the DC power cables from the TME and cCLPA according to the manufacturer's installation specification.

Objective

The objective of this procedure is to install the cabling for the antenna(s). This cabling is installed between the unit and the customer–supplied lightning arrestor(s). If lightning arrestor(s) are not required, the cabling connects directly to the antenna(s).

Cable Descriptions

The following cables in Table 4-30 are necessary to do this procedure.

Table 4-30: Cable Descriptions and Part Numbers

Cable	Qty.	Part Number	Description
B	1–6*	Andrew LDF4–50 Customer Supplied	RF Cable, 800 MHz, length selections: 10 m (31 ft.)
* Four antenna cables are required if one cCLPA is used. Six are required if two cCLPAs are used.			

Procedure

Install the cabling between the BTS, external lightning arrestors, and the cCLPA. If lightning arrestors are not present, the cables connect to the antenna.

Cable the BTS as shown in Figure 4-38. Torque the connectors to 4.3 N–M (38 in–lbs).

Perform the procedure in Table 4-31 to install the antenna cables.

Table 4-31: Procedure to Install Antenna Cables

Step	Action
1	Check with site documentation to determine proper location for mounting antennas.
2	If used, connect lightning arrestors.
3	With cCLPA configuration, proceed to step 4. Without cCLPA configuration, proceed to step 6.
4	Route antenna cables to cCLPAand Compact BTS. See Figure 4-38 or Figure 4-39. Proceed to step 7.
5	Route antenna cables between cCLPA and Compact BTS. See Figure 4-38 or Figure 4-39. Proceed to step 7.
5a	If a TME is used (outdoor configuration), route antenna cables to appropriate TME connectors.
6	Route antenna cables to Compact BTS. See Figure 4-40. Proceed to step 7.
7	Dress cables as necessary, unless conduit is used.

Figure 4-38: Antenna Cabling (With cCLPA)

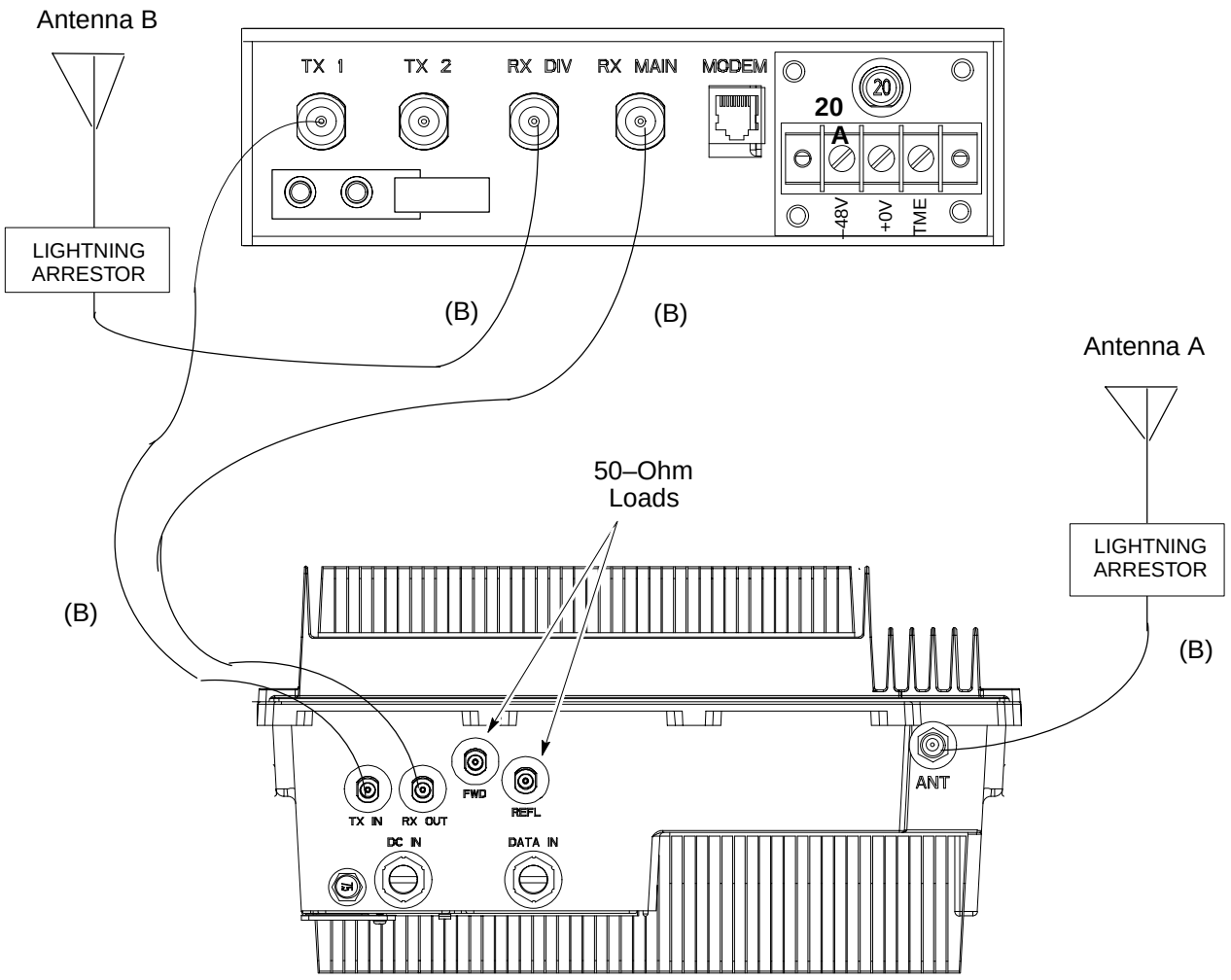


Figure 4-39: Antenna Cabling with 2 cCLPAs

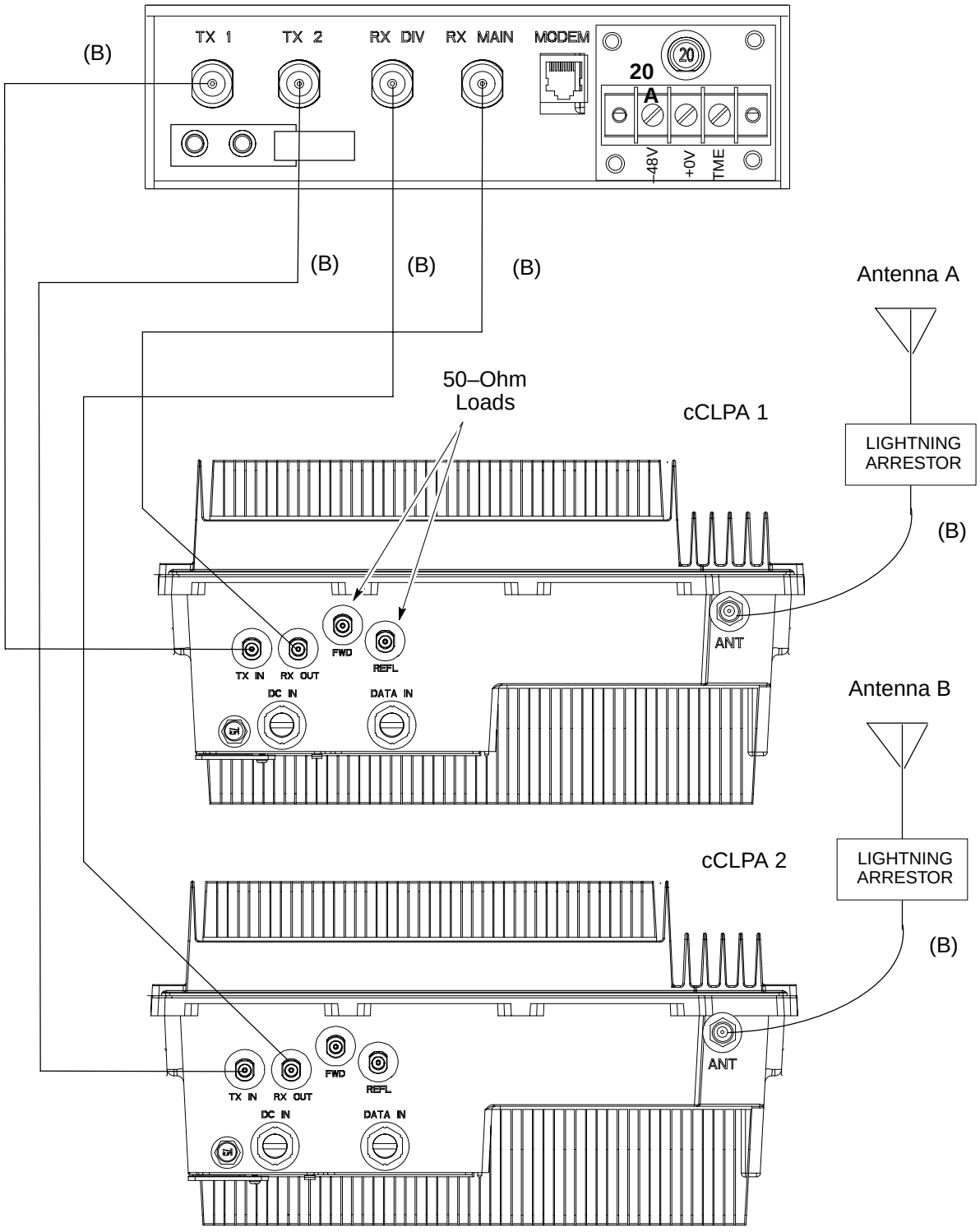
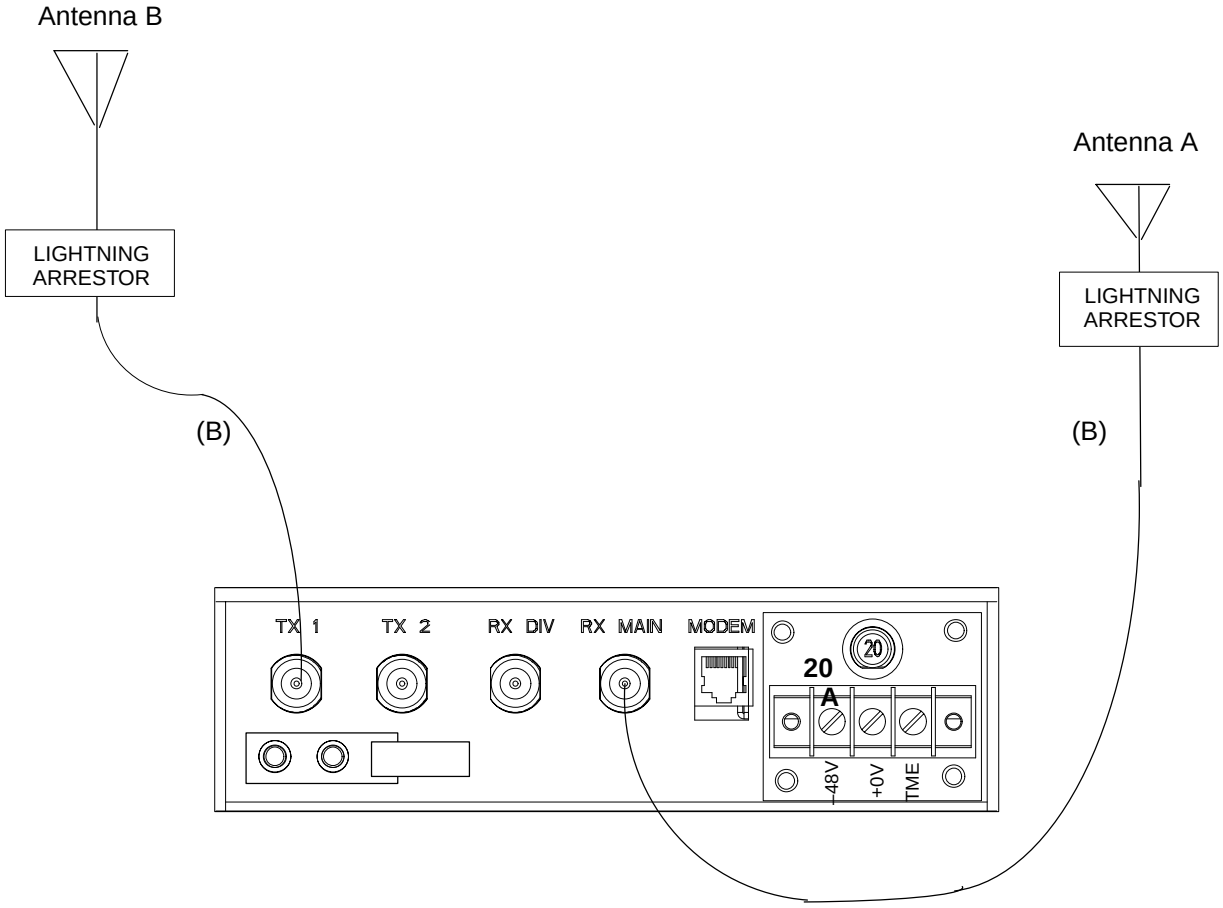


Figure 4-40: Antenna Cabling (Without cCLPA)



Objective

The objective of this procedure is to install the span line and RGPS cabling.

Cable Labels

The cable designations are referenced to Table 3-1 in the “Cable Description” area of this chapter.

Required Tools and Materials

Table 4-32 provides the quantities and descriptions of the cables.

Table 4-32: List of Required Cables

Cable	Qty.	Part Number	Description
C	1	T472AA	RGPS cable, 15 m (50 ft.)
		T472AB	RGPS cable, 38 m (125 ft.)
		T472AC	RGPS cable, 76 m (250 ft.)
		T472AD	RGPS cable, 152 m (500 ft.)
		T472AE	RGPS cable, 304 m (1000 ft.)
		T472AF	RGPS cable, 608 m (2000 ft.)
C1	1	3086433H07	Punchblock to CBIO Board, 15 pin D–connector on one end and loose wires on the other end.
D	6	Customer Supplied	Span cable, 4 or 8 conductors, 24–28 AWG stranded, twisted pair
J*	1	SGRG4030	RF–GPS Cable, $^1/_2$–inch coaxial, length = 50 ft. Two male N–type connectors, one end to be terminated after routing of cable
	1–2**	7687717T02	Ferrite, clip–on core

* An SMA to N adapter is required; otherwise a cable must be made with an SMA connector on one end.

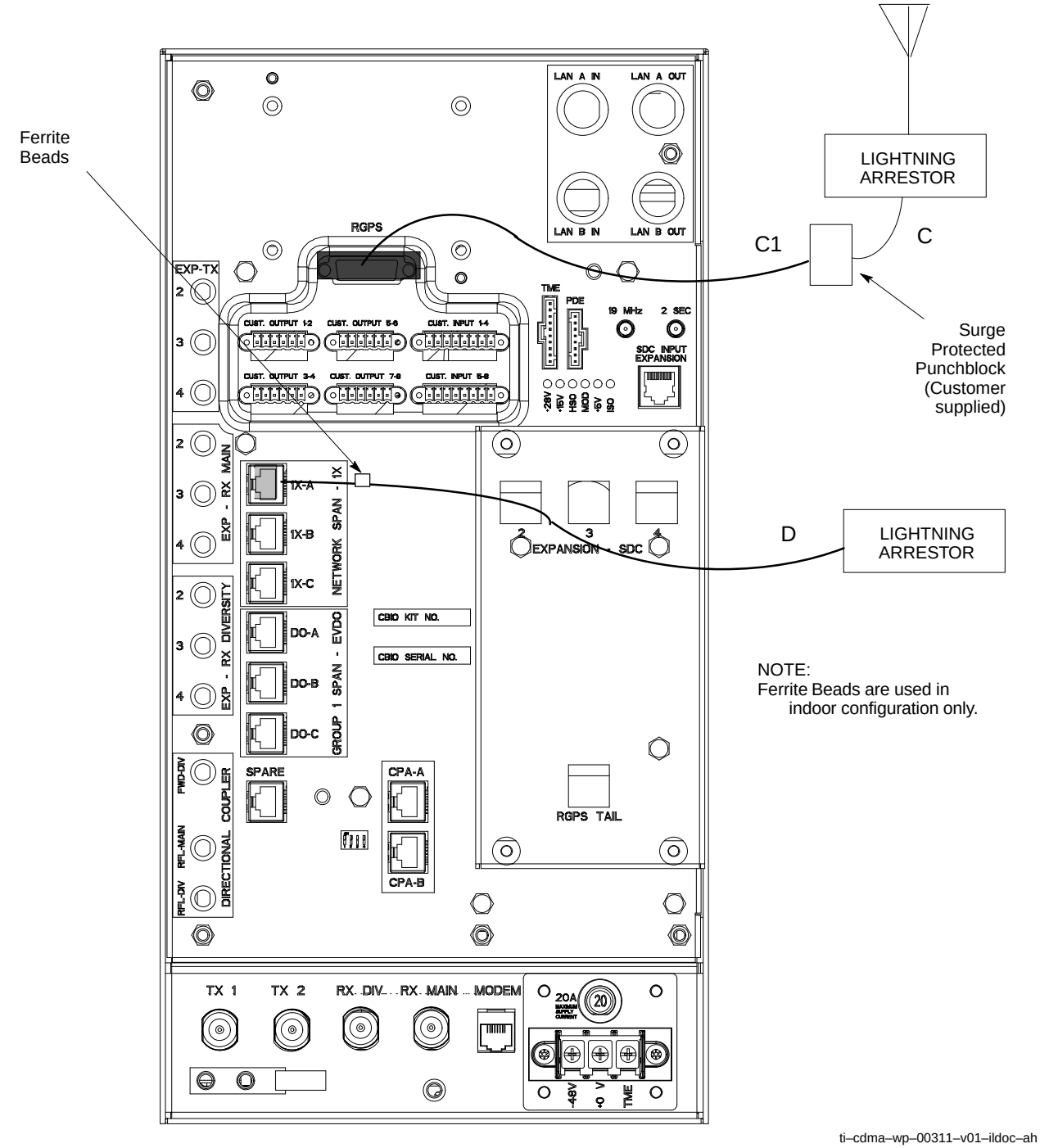
** Attach one ferrite bead per bundle of 3 (or less) span lines and one for RGPS cable. Ferrite core is not required for RF–GPS cable.

Connecting the Span Line Cable

The BTS provides for three 1X T1/E1 span lines and three MCC–Data Only (MCC–DO) span lines (See Figure 4-41). Each interface is made up of Transmit Tip/Ring and Receive Tip/Ring connections.

The Transmit and Receive data flow is given from the perspective of the BTS.

Figure 4-41: Span and RGPS Cabling Details



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Cable Pin and Signal Information for Span Cabling

Table 4-33 gives the pin and signal information for the Span cable.

Table 4-33: Pin/Signal Information for Span Cable

BTS Interface	Pin	Wire/Stripe Color	Description
Span Line Cable	1	White/Orange	RX RING
	2	Orange	RX TIP
	3	White/Green	NC
	4	Blue	TX RING
	5	White/Blue	TX TIP
	6	Green	NC
	7	White/Brown	NC
	8	Brown	NC

Span Cable Procedure

Follow the procedure in Table 4-34 to connect the span cable.

Table 4-34: Procedure to Install 1X or DO Span Cable

Step	Action
1	If BTS is configured for 1X operation, proceed to step 1a. If BTS is confgiured for DO operation, proceed to step 1b.
1a	Route 1X span line (Cable D) from site interface panel and connect to Network Span Group 1X (1X–A) connector at the rear of the BTS.
1b	Route DO span line (Cable D) from DO site interface panel and connect to Network Span Group 1 DO (DO–A) connector at the rear of the BTS.
2	If cable must be made, insert wires into RJ48 connector per Table 3-5.
3	If more than one span cable is used, bundle them together and place ferrite core around cables. Ensure that the cables are not being pinched before closing and latching the ferrite core.
4	Slide ferrite core as close to the connectors as possible without causing stress. Use a tie–wrap on the ferrite core side away from the connectors. The tie–wrap holds the ferrite core in place
5	Secure cable to rack using tie–wraps, be sure to leave some slack.

Connecting Customer–Defined Inputs to the CBIO

The unit provides eight customer–defined inputs for connection to external contacts. Each input (a signal/ground pair) is monitored for an "OPEN" (>50 k Ohms) or "CLOSED" (<3 Ohms) condition.

RGPS or RF–GPS Installation

If RGPS is being installed, proceed to Table 4-36. If RF–GPS is being installed, proceed to Table 3-6.

Cable Pinout

Figure 4-42 shows the connector pins on cables C and C1. Table 4-35 gives the pinout for cable C and C1.

Figure 4-42: Connector Pins Numbering for Cables C and C1

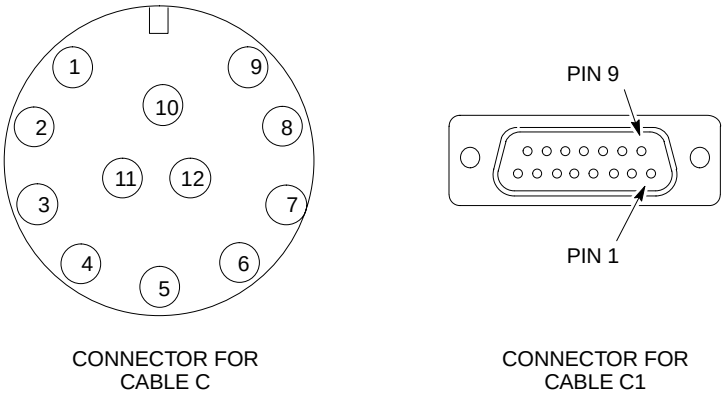


Table 4-35: Pinout for Cables C and C1

Cable C		Wire Color	Cable C1
Pin	Signal		Pin
9	DC Ground 1	Blue–Black	15
1	Power 1	Blue	8
8	DC Ground 2	Yellow–Black	14
10	Power 2	Yellow	7
4	Transmit Port (–)	Green–Black	9
5	Transmit Port (+)	Green	1
2	Receive Port (–)	White–Black	12
3	Receive Port (+)	White	4
7	No Connect	Red–Black	No Connect

table continued on next page

Table 4-35: Pinout for Cables C and C1			
Cable C		Wire Color	Cable C1
Pin	Signal		Pin
6	No Connect	Red	No Connect
12	PPS Timing (–)	Brown–Black	10
11	PPS Timing (+)	Brown	2
Wire colors are the same for both cables.			

Procedure to Install the RGPS Head

The RGPS is connected to the BTS via the RGPS connector on the CBIO Board. See Figure 4-41.

Site specific characteristics determine the GPS cabling that is installed. Install each cable by referring to the cabling diagram in Figure 4-41, and the procedure in Table 4-36. The lightning arrestor connections are shown in Figure 4-46.

Figure 4-43 and Figure 4-44 show the RGPS head. Be sure to factor in mounting considerations as described in Chapter 3.

CAUTION

The RGPS head must not make contact with any metal surface other than the provided hardware. Use only the equipment provided to mount the RGPS head. Failure to do so could damage the RGPS head.

Table 4-36: Procedure for Installing the RGPS Head and Cabling	
Step	Action
1	Determine the mounting location.
2	△ **WARNING** The structure of the wall should be verified by a qualified structural engineer. Mounting the RGPS head and hardware to an inadequate wall structure and/or using inadequate installment methods can result in serious personal injury. Use the appropriate mounting bolts for the mounting surface and install the two wall mounting brackets. Refer to Figure 4-43.
3	Remove RF–GPS cover plate from CBIO Board. Remove protective connector cover.
4	Connect cables C and C1 into the punch block, as if they were part of the same cable, cut in the middle maintaining color code and signal integrity. Connect the same corresponding color on both sides of the punchblock (see Figure 4-41 and Table 4-35).

Table 4-36: Procedure for Installing the RGPS Head and Cabling	
Step	**Action**
5	Connect RGPS cable (cable C1) to D–connector. Attach ferrite bead on the cable close to the BTS connector.
6	Route RGPS cable C (12–pin Deutsch connector) into the pipe.
7	Mate the 12–pin Deutsch connector of the RGPS Head cable and cable C. Refer to Figure 4-43. Tighten the spinning flange on the connector a quarter turn to secure the connection.
8	Insert the pipe into the threaded mount in the RGPS Head and carefully hand–tighten.
9	Place the assembly into the mounting brackets. Refer to Figure 4-43. Tighten the U–bolt clamps to secure the assembly.

Figure 4-43: Installing the Remote GPS Head

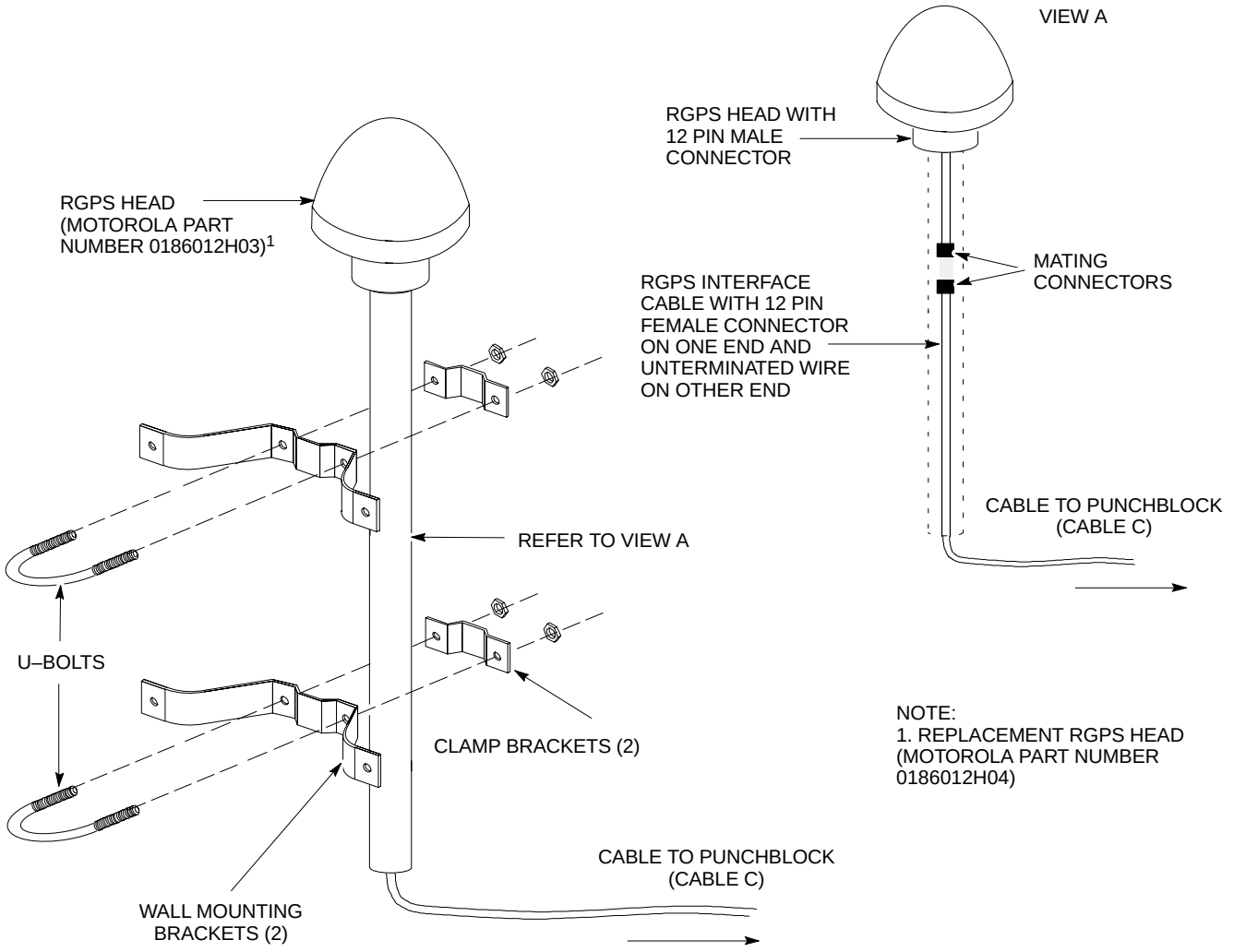
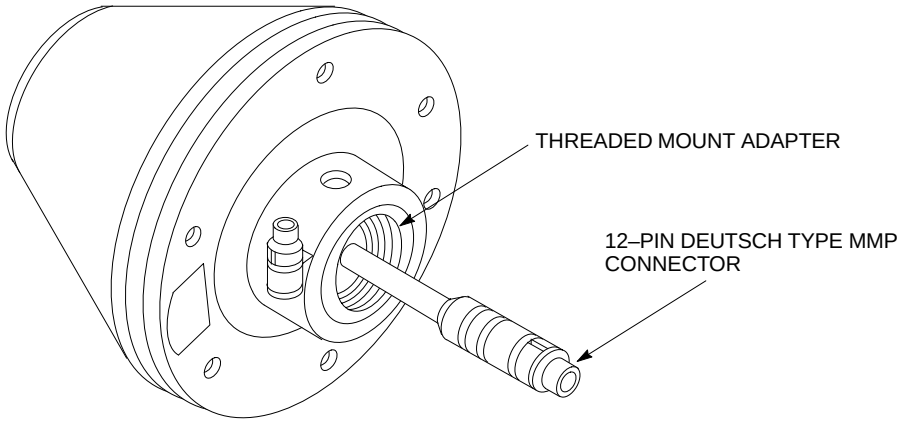


Figure 4-44: RGPS Head



Connecting the RGPS Cable to Lightning Arrestor

Figure 4-45 is a detail of the RGPS connections. Figure 4-46 is a detail of the Lightning Arrestor connections.

Figure 4-45: RGPS to *SC*480 Connection Diagram

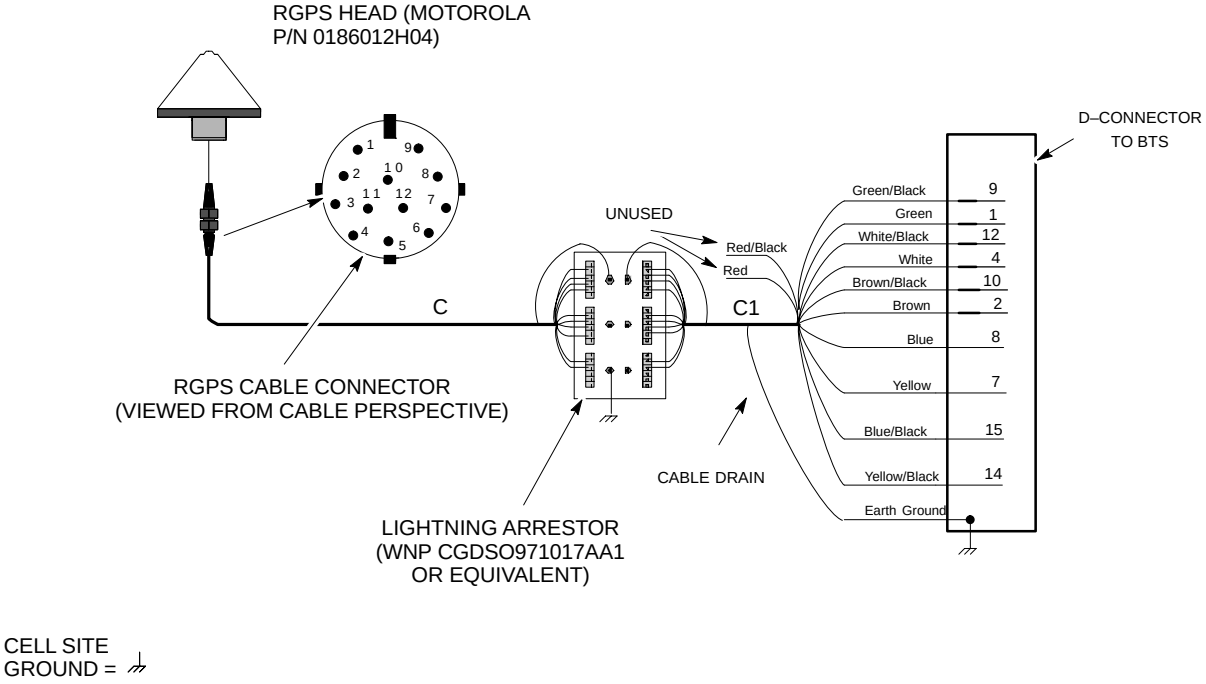
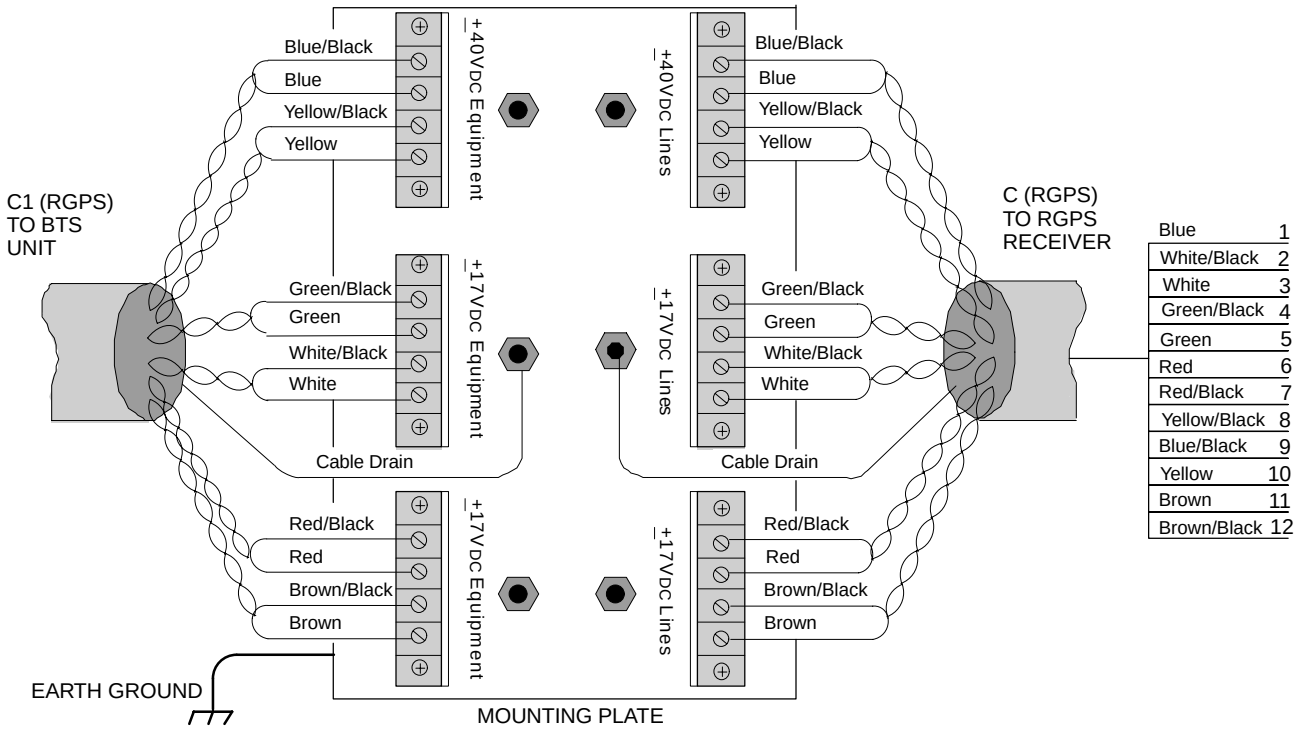


Figure 4-46: RGPS Lightning Arrestor Wiring



Connecting the RF–GPS Cable

Figure 4-47 shows the components of the RF–GPS. The RF–GPS is connected to the BTS via the RF–GPS module through the RGPS connector on the CBIO Board. See Figure 4-48.

Procedure

Use the procedure in Table 4-37 to install the RF–GPS system.

Table 4-37: Procedure for Installing RF–GPS Antenna and Cabling

Step	Action
1	Determine the mounting location (see RF–GPS Mounting Considerations, Table 3-8).
2	Install the mounting kit at the RF–GPS location of choice. Use the appropriate mounting bolts for mounting surface.
3	△ **WARNING** The roof structure on which the mounting pole is attached should be verified by a qualified structural engineer for the weight of the RF–GPS engine and mounting hardware or under adverse conditions for the installation area Mounting the RF–GPS antenna and hardware to an inadequate roof surface and/or using inadequate installation methods can result in serious injury.
4	Attach the RF–GPS head assembly to the post mounting assembly and secure the assembly to the assembly to the mounting kit using the screws and nuts supplied (see Figure 4-47).

Table 4-37: Procedure for Installing RF–GPS Antenna and Cabling	
Step	**Action**
5	Attach the grounding kit to the mounting pole.
6	Connect one (1) N connector of the 50–feet superflex cable to the N jack of the RF–GPS antenna cable and route the other end of the cable down to the frame.
7	If not already done, attach RF–GPS Module to CBIO Board and secure using 4 M4 screws.
8	Route the cable to the RF–GPS connector at the rear of the BTS.
9	Connect cable to RF–GPS connector. See Figure 4-48.

Figure 4-47: RF–GPS Installation and Components

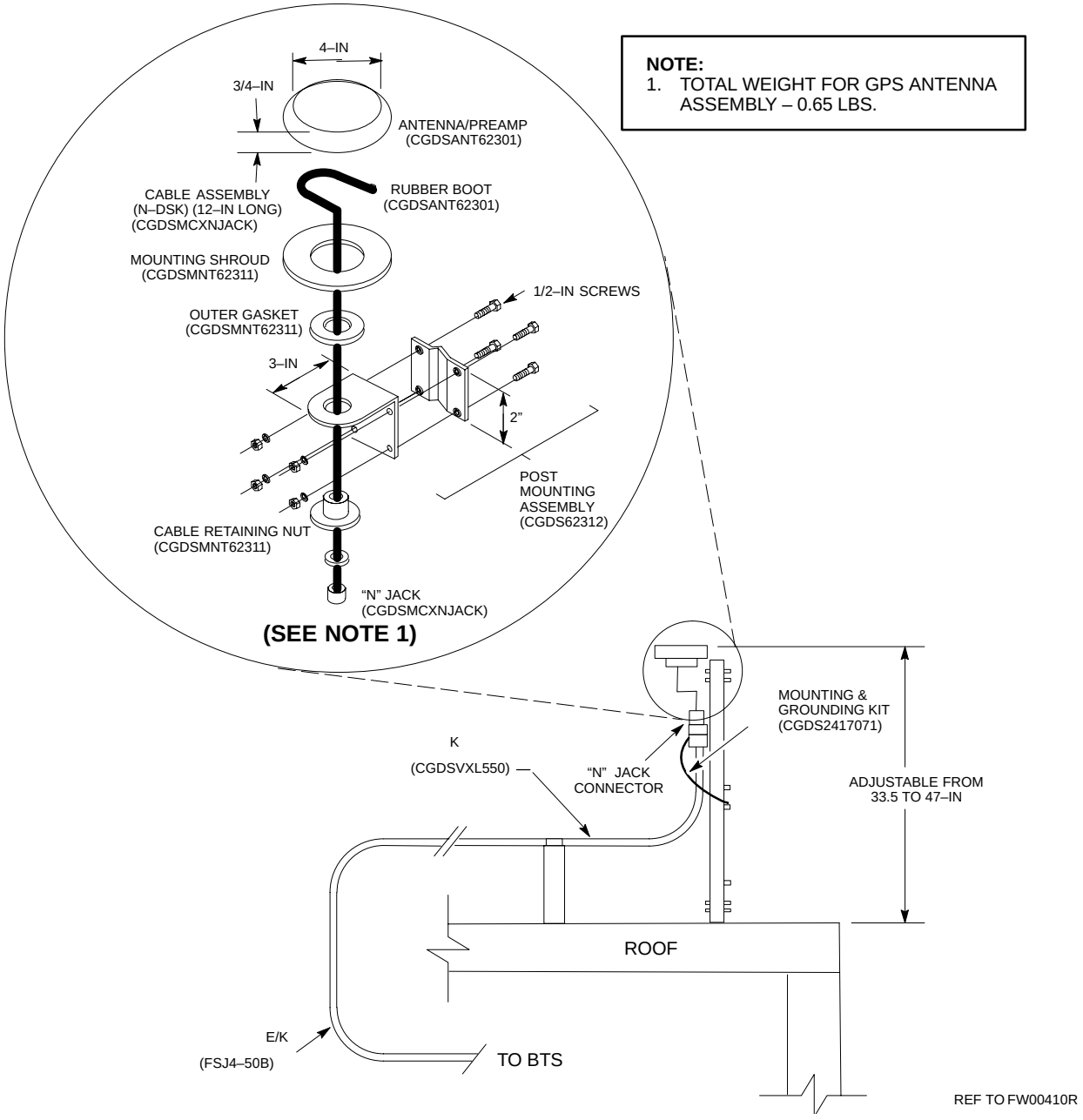
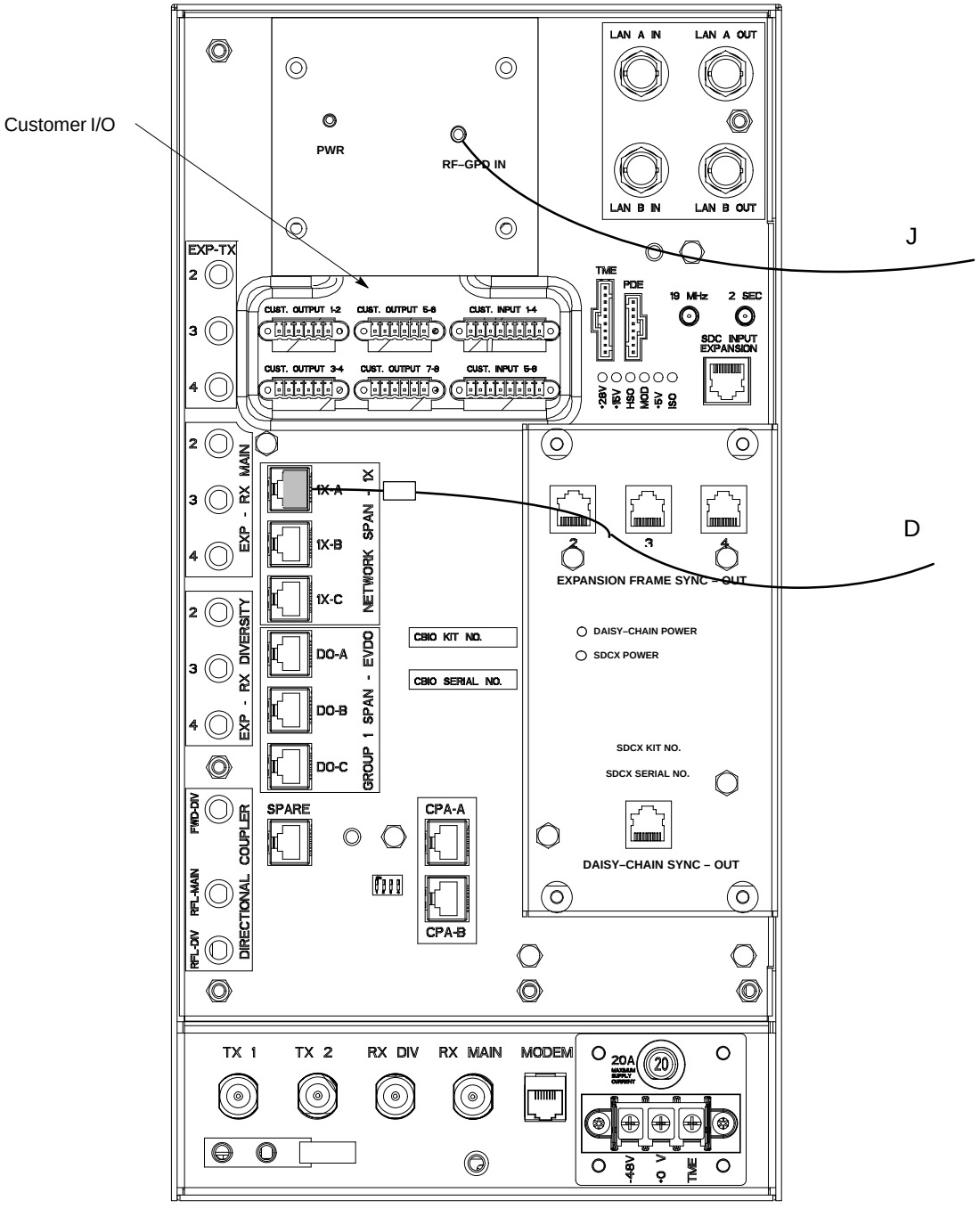


Figure 4-48: Span and RF–GPS Cabling Details



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Introduction

The objective of this procedure is to attach the ferrite core onto the customer input and output cables.

Cable Descriptions and Part Numbers

Table 4-38 gives the cable descriptions and part numbers used to install the Customer I/O connectors.

Table 4-38: Cable Descriptions and Part Numbers

Cable	Qty.	Part Number	Description
E	1	Customer Supplied	Customer Input/Output cable, 0–8 conductor, 18–24 AWG, stranded wire
	4	Molex, terminal plugs, P/N 39352–0106	Connector, 6 pin
	2	Molex, terminal plugs, P/N 39352–0108	Connector, 8 pin
	3	Motorola P/N 7687717T02	Core, Ferrite
	1–3	Customer Supplied	Tie–wrap

Customer Input and Output Connector Pinouts

Input Pinouts

Table 4-39 lists the pinouts for the Customer Input connectors.

Table 4-39: Customer Input Connector Pinouts

Pin Number	Description
1	Customer Input 1/5
2	Customer Input 1/5 Return
3	Customer Input 2/6
4	Customer Input 2/6 Return
5	Customer Input 3/7
6	Customer Input 3/7 Return

table continued on next page

Table 4-39: Customer Input Connector Pinouts	
Pin Number	**Description**
7	Customer Input 4/8
8	Customer Input 4/8 Return

Output Pinouts

Table 4-40 lists the pinouts for the Customer Output connectors.

Table 4-40: Customer Input Connector Pinouts	
Pin Number	**Description**
1	Customer Output 1/3/5/7 NC
2	Customer Output 1/3/5/7 C
3	Customer Output 1/3/5/7 NO
4	Customer Output 2/4/6/8 NC
5	Customer Output 2/4/6/8 C
6	Customer Output 2/4/6/8 NO

Procedure

Follow the procedure in Table 4-41 to attach a ferrite core.

Table 4-41: Procedure for Using Ferrite Core on Customer Input and Output Wires	
Step	**Action**
1	Route Customer I/O cables from termination equipment to rear of BTS and connect.
2	At the rear of the BTS, just below the top, are three pairs of connectors for customer defined inputs and outputs. See Figure 4-48.
3	Connect the cable for Customer Outputs 1 and 2 to BTS connector **CUST. OUTPUT 1–2**. Perform the same for the remaining connectors.
4	After connections are made, bundle the wires of **CUST. OUTPUT 1–2** and **CUST. OUTPUT 3–4** together and place a ferrite core around them. Ensure that the wires will not be pinched prior to closing and latching the ferrite core.
5	Slide ferrite core as close to the BTS connectors as possible without causing stress. Use a tie–wrap on the ferrite core side away from the BTS connectors to hold the ferrite core in place.
6	Perform step 4 and step 5 for **CUST. OUTPUT 5–6** and **CUST. OUTPUT 7–8** and **CUST. INPUT 1–4** and **CUST. INPUT 5–8**.

Site Cleanup

Remove Protective Covering

Remove any anti–static plastic or cloth sheeting that was used to cover the equipment.

Lighting Fixtures

Remove the masking tape from the fluorescent light fixtures.

Tools

Place all hand and power tools in the installation tool kit or other appropriate place. Note any tools that need replacement, cleaning, or adjustment.

Materials

Place any leftover materials in a location specified by the site manager.

Remove Debris

Remove any packing material.

Ensure that all scrap materials have been removed from any tables or stands.

Clean/sweep the area. Ensure that all alignment marks have been removed.

Environment

Remove any temporary weather protection used for installation.

Check that the power connections are tight.

Organize any items (manuals, materials, etc.) left on site and place them in a location specified by the site manager.

Check that the unit lock is secure and key is removed.

Verify that cabling is properly secured between unit and enclosures.

Installation Completion Checklist

Directions

Fill out the installation completion checklist and make any necessary copies. You may copy this check sheet as needed.

Indoor Installation Completion Checklist

Date Hardware Installation Completed: _____

Site:_____

Serial Number(s):_____

_____

Checklist Completed By:_____

Checklist Reviewed By:_____

Table 4-42: Indoor Installation Completion Checklist

Status	No.	Item	Notes
	1	Equipment is not damaged.	
	2	Air flow clearance requirements are met.	
	3	Mounting plate is level and secure. (Indoor)	
	4	BTS is securely mounted to plate and rack. (Indoor)	
	5	TME is securely mounted to wall or pole. (Outdoor)	
	6	PDM is installed and cabled within TME. (Outdoor)	
	7	BTS is securely mounted within the TME. (Outdoor)	
	8	BTS is correctly cabled to TME.	
	9	1U Module is installed and cabled to TME (If used).	
	10	HMS is securely mounted to TME. (Outdoor)	
	11	HMS is cabled to TME. (Outdoor)	
	12	PDE is securely mounted to wall or pole. (outdoor)	
	13	HX is securely mounted to PDE. (Outdoor)	
	14	HX is cabled to PDE. (Outdoor)	
	15	TME, PDE, and cCLPA are grounded. (Outdoor)	

table continued next page

Table 4-42: Indoor Installation Completion Checklist			
Status	**No.**	**Item**	**Notes**
	16	TME is cabled to PDE and cCLPA through conduit and conduit hubs on TME are tight.	
	17	PDE is cabled to TME through conduit and conduit hubs on PDE are tight.	
	18	cCLPA is cable to TME through conduit and and conduit hubs on cCLPA are tight.	
	19	Conduit is sufficiently grounded.	
	20	200–240 VAC is connected to PDE.	
	21	Battery backups (if used) are connected to the PDE.	
	22	TME DC power cable is connected (through conduit) to PDE (Outdoor)	
	23	cCLPA DC power cable is connected through conduit) to PDE	
	24	RGPS head and mast are secure.	
	25	RGPS head has a clear view of the sky and is not in a location which accumulates debris. Make sure the RGPS is located away from the BTS transmit antenna.	
	26	Local GPS antenna is secure. (If used)	
	27	Local GPS cabling is installed (If used).	
	28	Mounting rack is isolated from the Master ground. (Indoor)	
	29	cCLPA is securely mounted to rack (if in use). (Indoor)	
	30	Compact BTS connection to the DC source is secure. (Indoor)	
	31	cCLPA connection to its DC source is secure. (Indoor)	
	32	The antenna connections are secure.	
	33	The antenna cables are protected by lightning arrestors (if applicable).	
	34	Span and RGPS connections are protected by lightning arrestors (if applicable).	
	35	The RGPS ground lead is connected to the BTS digital ground reference.	

table continued next page

Table 4-42: Indoor Installation Completion Checklist			
Status	**No.**	**Item**	**Notes**
	36	Installation hardware is removed.	
	37	The earth ground connections are secure between the earth ground and the Compact BTS. (Indoor)	
	38	The DC input cable is securely attached to the DC input connector. (Indoor)	
	39	The BTS–to–cCLPA cabling is secure (if applicable) (Indoor)	
	40	cCLPA connection to earth ground is secure (if cCLPA in use). (Indoor)	
	41	The antenna N–type connectors are securely attached to the antenna A and B connectors (if applicable). (Indoor)	
	42	All unused ports on BTS and/or cCLPA are properly terminated. (Indoor)	
	43	All cables are dressed and tied. (Indoor)	
	44	Power, Span, Customer I/O, PA, RGPS, and DO cables to the BTS have a ferrite core attached and tie–wrapped in place.	
	45	The external power source (DC) is active. (Indoor)	
	46	AC power source is active. (Outdoor)	
	47	The circuit breaker on the BTS is disengaged (Pulled out).	
	48	Circuit breakers are disengaged (Pulled out) on TME PDM. (Outdoor)	
	49	Circuit breakers are disengaged (Pulled out) on PDE. (Outdoor)	
	50	Circuit breaker is disengaged (Pulled out) on cCLPA.	
	51	The site is cleaned, swept and trash removed.	
	52	The site specific documentation is present at the site.	

Notes

Chapter 5: Power Installation

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Notes

Frame Configuration DIP Switch

Introduction

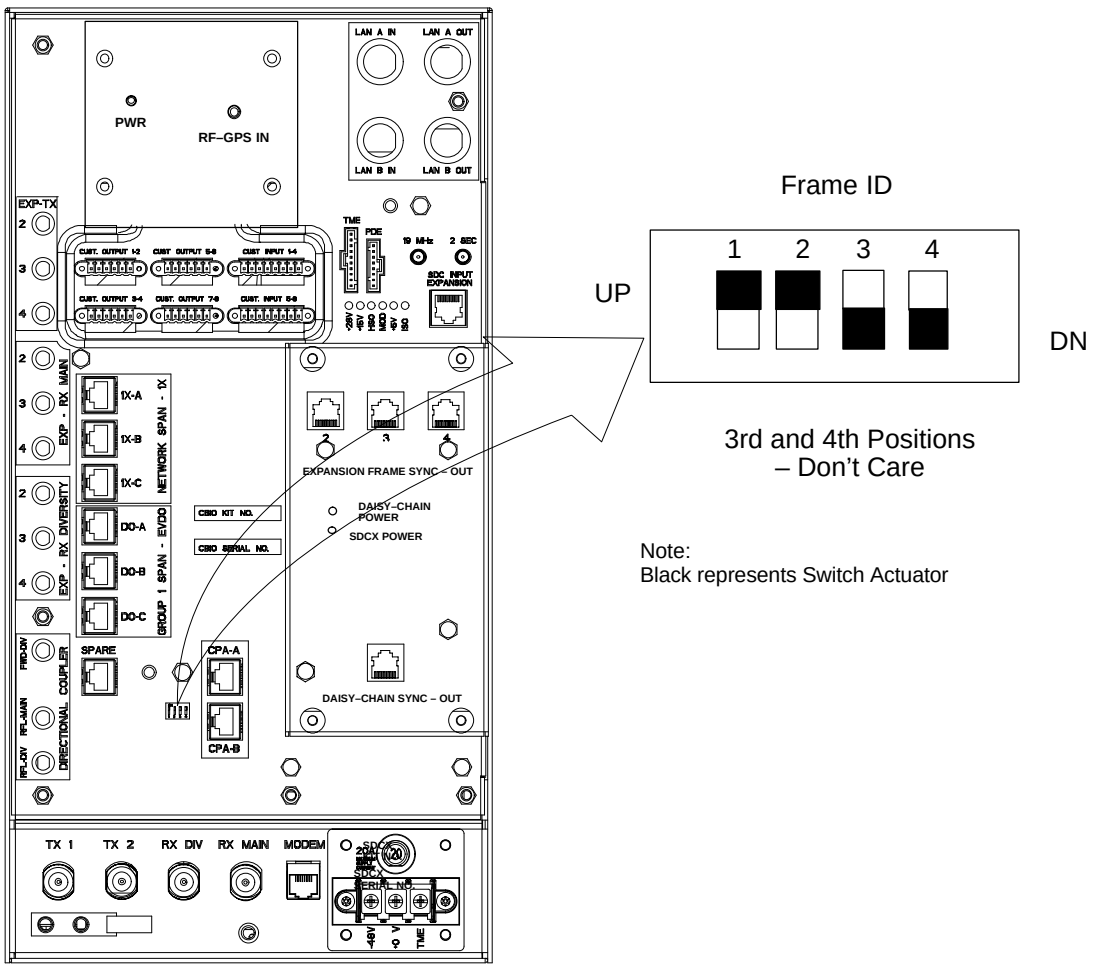
This section describes setting the DIP switch positions for starter/single frame and exapansion frames. The following sections describe BTS preparation before applying DC power.

Setting Frame Configuration DIP Switch

The frame configuration switch is located on the Compact BTS Input/Output (CBIO) Card of the BTS. Figure 5-1 shows the switch position for a starter /single frame configuration. If there are expansion frames, then each would have the DIP switch positions set to reflect that frames identification. See Figure 5-2.

The switch settings must be verified and set before power is applied to the BTS. Refer to Figure 5-1 or Table 5-1 for a starter or single frame.

Figure 5-1: DIP Switch Configuration



PRELIMINARY

Table 5-1: Frame ID Switch Position – Single/Starter Frame			
1	**2**	**3**	**4**
UP	UP	—	—
— = Don't Care. These switch positions do not affect the BTS.			

Expansion Frame DIP Switch Settings

Figure 5-2 shows the switch position for the expansion frames.

Figure 5-2: Expansion Frames DIP Switch Configuration