ZXC10 CBTS O1

CDMA2000 Outdoor Compact BTS - O1

Installation Manual

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About this Manual

Purpose of this Manual

This manual describes ZXC10 Outdoor Compact Base Transceiver Station O1 hardware installation.

Typographical Conventions

ZTE documents employ the following typographical conventions.

TABLE 1 - TYPOGRAPHICAL CONVENTIONS

Typeface	Meaning
Italics	References to other guides and documents.
"Quotes"	Links on screens.
Bold	Menus, menu options, input fields, radio button names, check boxes, drop-down lists, dialog box names, window names
Bold, with first letter capitalized	Keys on the keyboard and buttons on screens
`Constant width`	Text that you type, program code, files and directory names, and function names
[ ]	Optional parameters
{ }	Mandatory parameters
|	Select one of the parameters that are delimited by it
	Note: Provides additional information about a certain topic.
	Checkpoint: Indicates that a particular step needs to be checked before proceeding further.
	Tip: Indicates a suggestion or hint to make things easier or more productive for the reader.

Mouse Operation Conventions

TABLE 2 - MOUSE OPERATION CONVENTIONS

Typeface	Meaning
Click	Refers to clicking the primary mouse button (usually the left mouse button) once.
Double-click	Refers to quickly clicking the primary mouse button (usually the left mouse button) twice.
Right-click	Refers to clicking the secondary mouse button (usually the right mouse button) once.
Drag	Refers to pressing and holding a mouse button and moving the mouse.

Safety Signs

TABLE 3 - SAFETY SIGNS

Safety Signs	Meaning
	Danger: Indicates an imminently hazardous situation, which if not avoided, will result in death or serious injury. This signal word should be limited to only extreme situations.
	Warning: Indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.
	Caution: Indicates a potentially hazardous situation, which if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.
	Note: Indicates a potentially hazardous situation, which if not avoided, could result in injuries, equipment damage or interruption of services.
	Erosion: Beware of erosion.
	Electric shock: There is a risk of electric shock.
	Electrostatic: The device may be sensitive to static electricity.
	Microwave: Beware of strong electromagnetic field.
	Laser: Beware of strong laser beam.
	No flammables: No flammables can be stored.
	No touching: Do not touch.
	No smoking: Smoking is forbidden.

How to Get in Touch

The following section provides information on how to obtain support for the documentation and the software.

Customer Support

If you have problems, questions, comments, or suggestions regarding your product, contact us by e-mail at support@zte.com.cn. You can also call our customer support center at (86) 755 26771900 and (86) 800-9830-9830.

Documentation Support

ZTE welcomes your comments and suggestions on the quality and usefulness of this document. For further questions, comments, or suggestions on the documentation, you can contact us by e-mail at doc@zte.com.cn; or you can fax your comments and suggestions to (86) 755 26772236. You can also explore our website at http://support.zte.com.cn, which contains various interesting subjects like documentation, knowledge base, forum and service request.

FCC STATEMENT

Before using this CDMA ZXC10 CBTS I28A and CBTS I219, read this important RF energy awareness and control information and operational instructions to ensure compliance with the FCC RF exposure guidelines.

NOTICE: Working with the equipment while in operation, may expose the technician to RF electromagnetic fields that exceed FCC rules for human exposure. Visit the FCC website at www.fcc.gov/oet/rfsafety to learn more about the effects of exposure to RF electromagnetic fields.

Changes or modifications to this unit not expressly approved by the party responsible for compliance will void the user's authority to operate the equipment. Any change to the equipment will void FCC grant.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the FCC Rules. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

Chapter 1

Installation Preparation

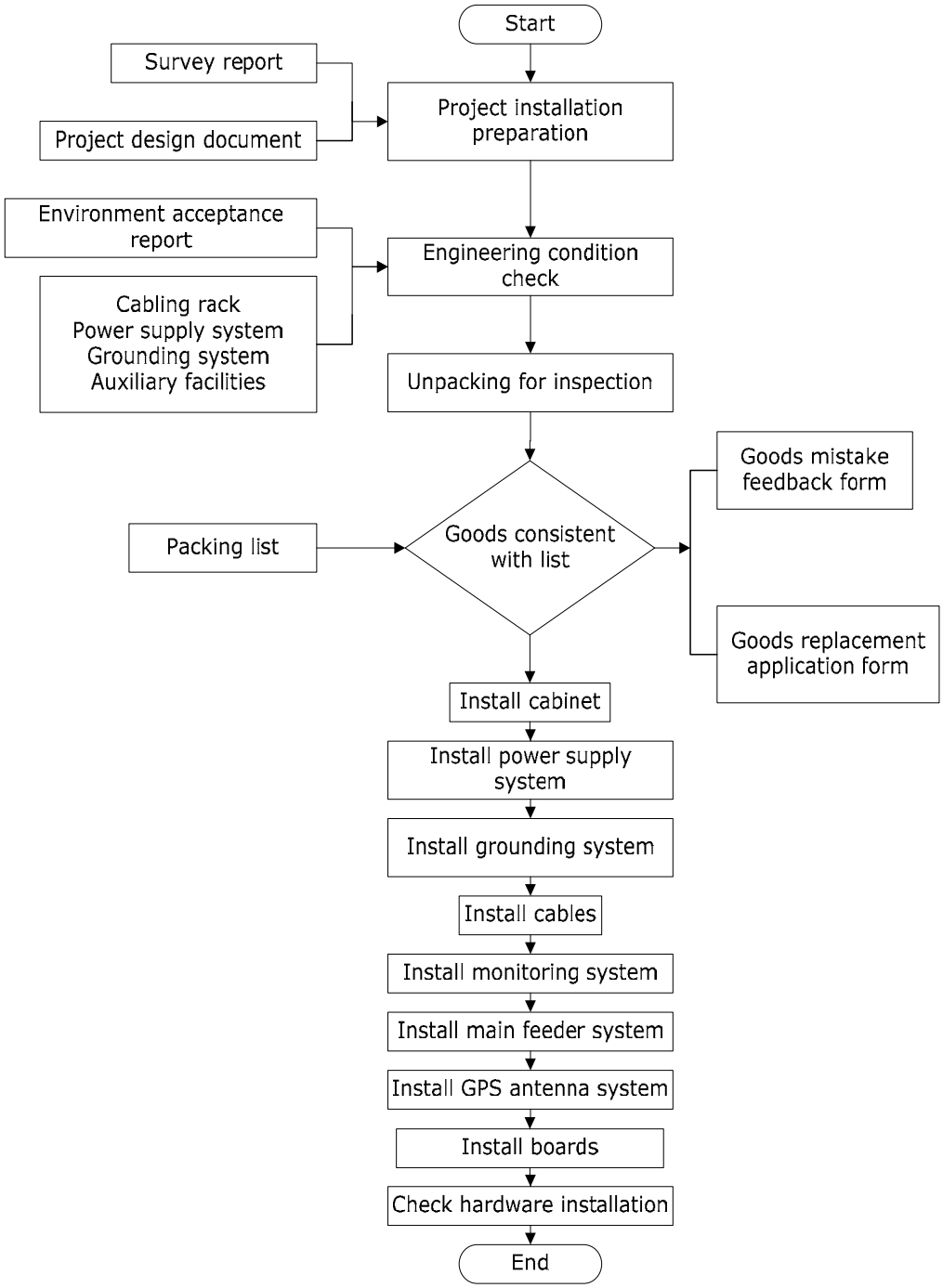
This chapter describes:

- Hardware installation flow
- CBTS O1 installation precautions
- Environment inspections
- Installation location specifications
- Temperature and humidity requirements
- Power supply requirements
- Power consumption requirements
- Electromagnetic radiation protection
- Antenna feeder system requirements
- Other requirements
- Tool and meter list for installation
- Technical documentation preparation
- Project commissioning documents
- Acceptance reports
- Reference documents

Hardware Installation Flow

Figure 1 shows ZXC10 Compact BTS (CBTS O1) hardware installation flow.

FIGURE 1 - HARDWARE INSTALLATION FLOW



CBTS O1 Installation Precautions

Take following precautions during CBTS O1 installation.

- Avoid hot swap during board installation.
- Never install antenna feeder system in case of lightning.
- Check that lightening arresters are in proper contact. Replace damaged arresters immediately.
- Wear antistatic wrist strap during installation.
- Only qualified person should do installation.
- Follow specific manual provided by ZTE for installation.

Environment Inspections

Before installation, the operator should finalize and prepare installation location, arrange power supply and grounding cables, and provide necessary facilities for installation.

Installation Location Specifications

Installation location must fulfill the engineering requirements. Table 4 lists equipment room basic requirements.

TABLE 4 - INSTALLATION LOCATION SPECIFICATIONS

Item	Requirements
Grounding	Install lightning arrester and proper grounding equipment to avoid any damage due to short circuits

Temperature and Humidity Range

Table 5 shows CBTS O1 temperature and humidity range.

TABLE 5 - TEMPERATURE AND HUMIDITY RANGE

Item	Working range	Recommended range
Temperature	-40 °C ~ +55 °C	+15 °C ~ +35 °C
Humidity	5% RH ~ 98% RH	40% RH ~ 60% RH

Power Supply Requirements

Table 6 and Table 7 illustrate ZXC10 CBTS O1 power supply and power consumption requirements respectively.

TABLE 6 - POWER SUPPLY INDICES

Indices Name		Index Requirements
DC power supply	Power system range	-48 V power supply in range of -43.2 V ~ -56.5 V
	Power noise level	Satisfies Ministry of Post and Telecom technical specifications
	Power protection	Includes Over-voltage/Over-current protection and indication
AC power supply	Power system range	220 V power supply in range of 130 V ~ 300 V
		110 V power supply in range of 90 V ~ 140 V Not included now, but under consider for future
	Power noise level	Satisfies Ministry of Post and Telecom technical specifications
	Power protection	Includes Over-voltage/Over-current protection and indication
	Frequency range	Supports frequency range from 45 Hz ~ 65 Hz. Recommended frequency is 50 Hz.

Note:

- DC power is supplied with battery group (UPS). There is no direct DC supply.

Power Consumption Requirements

TABLE 7 - POWER CONSUMPTION REQUIREMENTS

System Description	Power consumption （W）	Remarks
Main equipment with full configuration	2000	Power amplifier's power consumption is 60 W
Heater	2400	
Total	4400	

Note:

- To configure a storage battery group, calculate corresponding power consumption according to storage battery group capability. It is recommended to configure 200 AH or 400 AH storage battery group. Former can supply power continuously for 4 hours, and latter can supply 8 hours. During charging, 400 AH storage battery group power consumption is about 2000W.

Electromagnetic Radiation Protection

Ensure following Electromagnetic Radiation Protection Requirements. Table 8 shows electromagnetic radiation protection requirements.

TABLE 8 - RADIATION PROTECTION REQUIREMENTS

Item	Requirements
Public exposure	In 24 hours of a day, average value of electromagnetic power density (in six consecutive minutes) < 0.4 W/m^2 (30 MHz ~ 3000 MHz)
Professional radiation	In 8 hours of a day, average value of electromagnetic power density (in six consecutive minutes) < 2 W/m^2 (30 MHz ~ 3000 MHz)

Antenna Feeder System Requirements

Check whether following items comply with CBTS O1 requirements and project design.

- Height and dimensions of feeder window
- Height, weight bearing and grounding of outdoor cable rack
- Height, weight bearing and grounding of indoor cable rack
- Height, diameter, weight bearing, wind resisting, grounding, lightning protection, and direction of antenna installation pole of building BS
- Height, diameter, weight bearing, wind resisting, grounding, lightning protection, and direction of antenna installation pole of iron tower BS

Other Requirements

According to contract, check whether following requirements are fulfilled:

- Cables for external power supply and cabinet are available
- E1 cable connecting CBTS O1 and BSC is present
- Fire extinguisher is available
- CBTS O1 cabinet mechanical intensity meets the requirement of ETSI 300 019-2-4 class 4M3
- Atmospheric pressure is in the range of 70 kPa ~ 106 kPa
- Wind resistance should not be less than 200 km/h
- Cabinet temperature variation must be less than 1° C/min
- Cabinet must be resistant to all atmospheric conditions like: rain, dust, moisture. It must comply with IP protection level of IP55
- CBTS O1 does not have internal transmission equipments such as SDH equipments and microwave equipments which must be supplied according requirements

Tool and Meter List for Installation

Table 9 shows tools and meters list required during installation.

TABLE 9 - TOOL AND METER LIST

Category	Name
Special-purpose tools	One feeder connector knife One wire stripper for 75 Ω coaxial cables One crimping pliers for 75 Ω coaxial cables One multi-functional crimping pliers One multimeter One SiteMaster VSWR tester Earth resistance tester
Concrete drilling tools	One electric percussion drill Auxiliary and sample bits One vacuum cleaner Power socket (two-phase and three-phase socket, with current capacity greater than 15 A)
General-purpose tools	Cross screwdrivers (4”, 6” and 8” each) Flathead screwdrivers (4”, 6” and 8” each) Adjustable wrenches (6’, 8’, 10’ and 12’) Dual-purpose spanners (17” and 19” each) One set of socket wrench 11.02 lb (5 kg) nail hammer One 300 W iron One 40 W iron Solder wires
Measurement tools	One 50 m tape measure One 5 m steel tape One 400 mm level bar One angle meter One compass Plumb
Protection tools	Antistatic wrist strap Safety helmet Pair of gloves

Category	Name
Small tools	One hacksaw (with several saw blades) One pair of sharp-nose pliers (8″) One pair of diagonal pliers (8″) One pair of slip joint pliers (8") One pair of vices (8″) One needle file set (medium sized) Tweezers One paintbrush One pair of scissors One hot blower One solder sucker One pair of hydraulic pliers Crowbar
Auxiliary tools	Pulley block Rope Ladder Forklift
Meter	Spectrum analyzer SITE MASTER BS tester Qualcomm test MS Compass Multimeter Field strength tester

Note:

- Do not use meters unless they are strictly calibrated and proven qualified.

Technical Documentation Preparation

Project Commissioning Documents

Prepare following technical documents for equipment commissioning

- Project Survey Report

  Engineering staff should prepare a Project Survey Report during onsite survey.

- Engineering design documents

  Engineering design documents should be completed by designing unit that the subscriber entrusts. Its replication copy should be provided to the equipment provider before equipment delivery.

- Environment Acceptance Report

  Environment Acceptance Report is used for first environment acceptance in BSC survey, showing whether CBTS O1 installation requirements are satisfied. If installation environment is not appropriate, the customer should improve the conditions and solve the problems. Conduct second environment inspection before the engineering starts.

Acceptance Reports

Installation Acceptance Report and *Test Acceptance Report* are post commissioning acceptance documents. The equipment supplier provides these documents to the customer at delivery time. The installation staff should complete these documents in presence of the customer after CBTS O1 system commissioning.

Reference Documents

Use following manuals for reference during installation:

- *ZXC10 Outdoor Compact BTS O1 Technical Manual*
- *ZXC10 Outdoor Compact BTS O1 Hardware Manual*
- *ZXC10 Outdoor Compact BTS O1 Hardware Installation Manual*

Chapter 2

Unpacking and Handover

This chapter describes:

- Checking equipment list
- Unpacking wooden case
- Wooden case structure
- Unpacking procedure
- Checking cabinet
- Unpacking carton
- Carton structure
- Unpacking procedure
- Unpacking precautions
- Checking boards
- Acceptance and handover

Checking Equipment List

Count goods during unpacking and note following points:

- Check *Delivery Checklist* of ZTE CORPORATION.
- Check total number of goods, intactness of packing boxes, and check whether arrival place is actual installation place against packing list number attached to packing boxes.
- If goods are intact, start to unpack and inspect them.
- Contact ZTE headquarters, if any item is damaged or missing during unpacking inspection process.
- Use appropriate tools to open cartons to avoid any equipment damage.

Note:

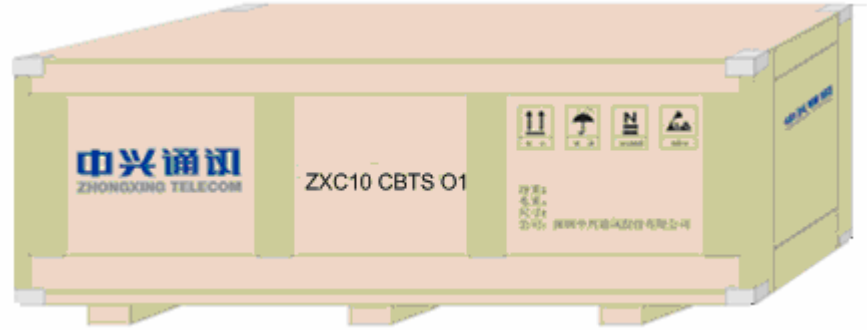
- Handle CBTS O1 equipment with care and protect it from direct sunlight and rain.
- Count goods against attached list and keep a record.

Unpacking Wooden Box

Wooden Box Structure

Figure 2 shows CBTS O1 cabinet wooden box structure.

FIGURE 2 - WOODEN BOX



Unpacking Procedure

Take following steps to unpack a wooden box:

1. Arrange appropriate tools such as nail hammer, pliers, straight screwdriver and crowbar.
2. Insert a flat-tip screwdriver into slit between case and front cover board to make it loose. Then insert a crowbar to unclench cover board.
3. Erect wooden case. Make sure that supports are at the bottom and pull cabinet out from case gently.
4. Remove packing adhesive cabinet tape.

Note:

- Handle CBTS O1 cabinet with care during movement to avoid damage.

Checking Cabinet

Check cabinet according to p*acking list and* ensure following:

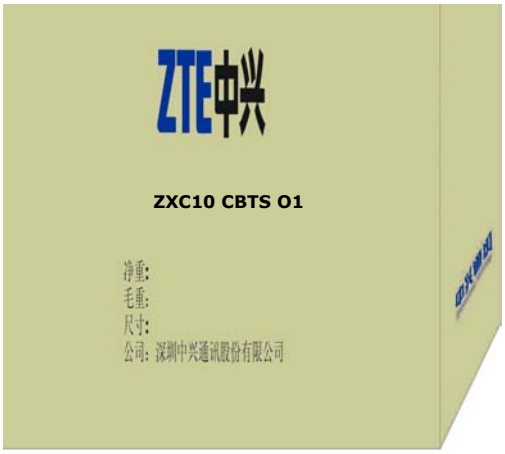
- There are no dents, bulges, scratches, peels, blithers, blisters or smudges on outer surface of cabinets.
- Busbars, fans and installation positions on cabinets are free from damage or distortion.
- Cabinet slots for plug-in frames are intact. Guide rails of plug-in slots are not damaged.
- Installation slot labels are intact.
- Fastening screws are not loosen, disconnected, or mistakenly placed.
- Accessories and fittings needed for cabinet installation are complete.

Unpacking Carton

Carton Structure

Figure 3 shows carton box structure.

FIGURE 3 - CARTON BOX



Unpacking Procedure

Take following steps to unpack a carton:

1. Use diagonal pliers to cut packing straps.
2. Use a paper knife to cut adhesive tape along slits on carton covers.

Unpacking Precautions

Take following precautions to unpack carton:

- Take anti-static measures to avoid equipment damage.
- To avoid damage to goods, do not cut too deep.
- Wait for 30 minutes before unpacking equipment, when equipment is moved from a colder and drier place to a hotter and damper place.
- Properly recycle desiccants.

Checking Boards

Check quality, quantity, type, cracks and model of all boards inside carton against packing list provided by ZTE office.

Acceptance and Handover

Upon completion of unpacking, representative of customer and project supervisor should sign *Unpacking for Inspection Report* to acknowledge acceptance. Each party should have a copy of *Unpacking for Inspection Report.*

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Chapter 3

Cabinet Installation

This chapter describes:

- Cabinet structure
- Cabinet installation precautions
- Ground installation mode
- Ground installation mode flow

Cabinet Structure

FIGURE 4 - CABINET OUTER VIEW

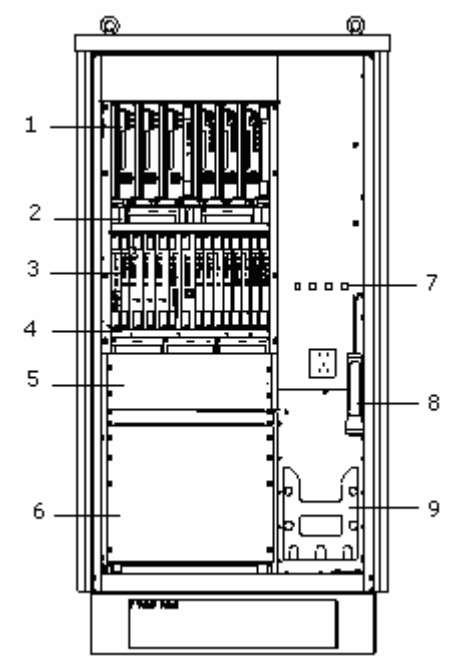
Figure 4 shows CBTS O1 cabinet outer view.

Cabinet dimensions: 900 mm (W) × 780 mm (D) × 1800 mm (H)

Cabinet dimensions: 35.43 inch (W) × 30.70 inch (D) × 70.86 inch (H)

Figure 5 shows CBTS O1 cabinet front view.

FIGURE 5 - CABINET FRONT VIEW



1. Upper shelf
2. Fan group 1
3. Lower shelf
4. Fan group 2
5. Transmission shelf
6. Power shelf
7. Test port and O_PH
8. Flashlight
9. Battery group

Table 10 illustrates CBTS O1 weights with different configurations.

TABLE 10 - CABINET WEIGHT

System Description	Weight (lb)	Weight (kg)
Cabinet (including a heat exchanger, rack and base)	562.17	255
Imbedded power module	55.11	25
4C1S modules	70.54	32
4C3S modules	134.48	61

Cabinet Installation Precautions

- Install cabinet according to engineering design specifications.
- Vertical error should be less than 0.118 inch (0.3 m).
- Screw all nuts and bolts tightly.
- Handle equipment carefully.

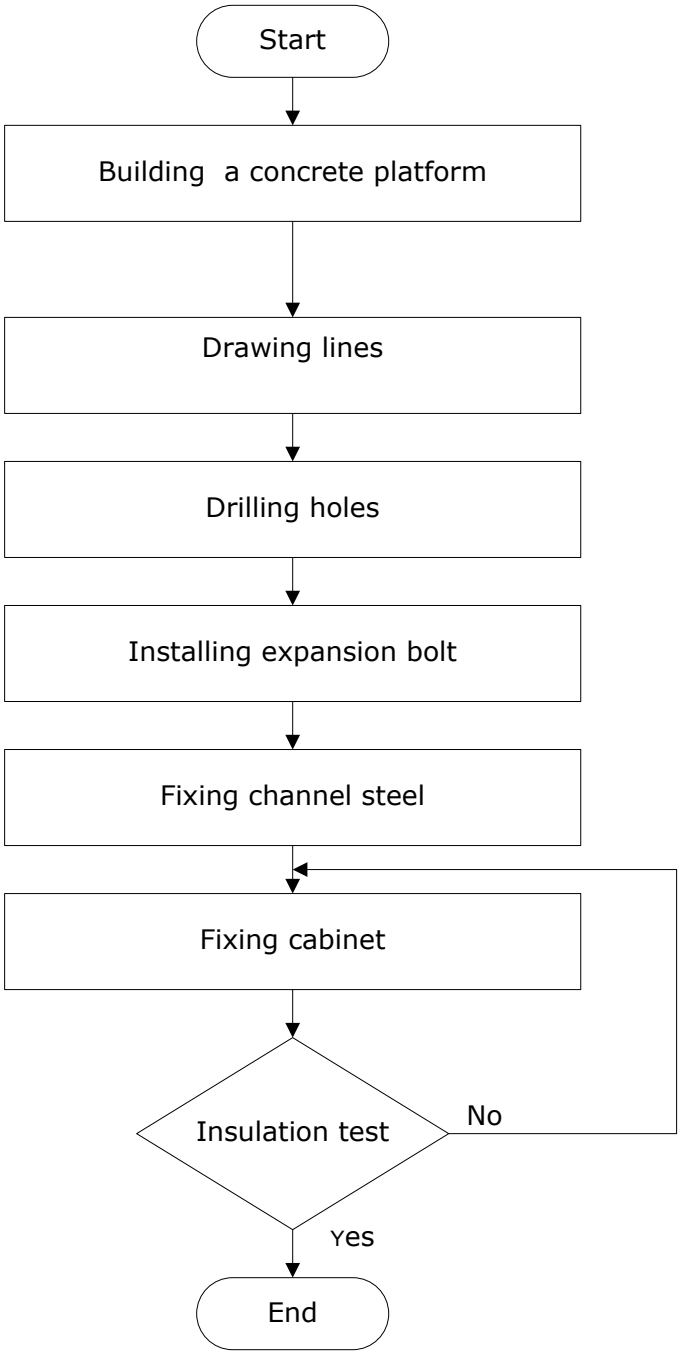
Ground Installation Mode

Ground installation modes involve CBTS O1 installation under a tower plat form or on a roof. During installation under a tower plat form build a safety wall around CBTS O1 system.

Ground Installation Mode Flow

Figure 6 illustrates ground installation mode flow chart.

FIGURE 6 - GROUND INSTALLATION MODE FLOW



Take following steps for CBTS O1 ground installation:

1. Building a concrete platform

   Build a 47.24 inch x 59.05 inch x 3.39 inch (1200 mm × 1500 mm × 100 mm) concrete platform. Figure 7 shows expansion bolt holes dimensions 29.52 inch x 18.89 inch (750 mm × 480 mm) to install two channel steel bars.

FIGURE 7 - SINGLE CABINET CONCRETE PLATFORM (UNITS MM)

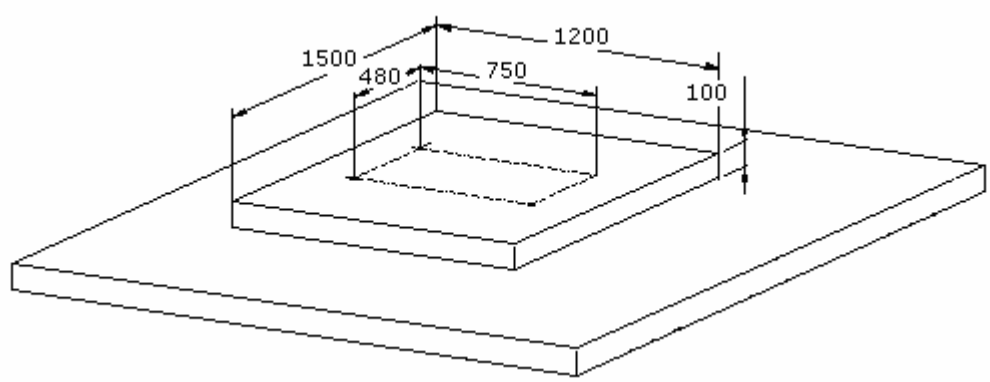
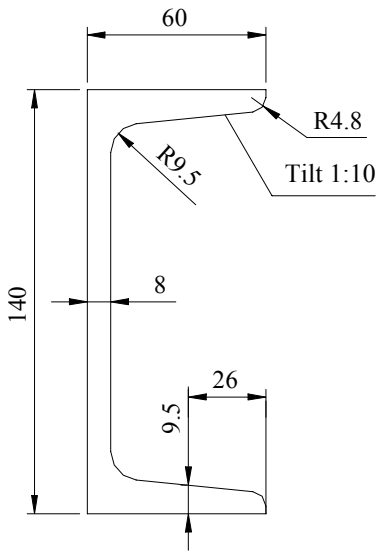


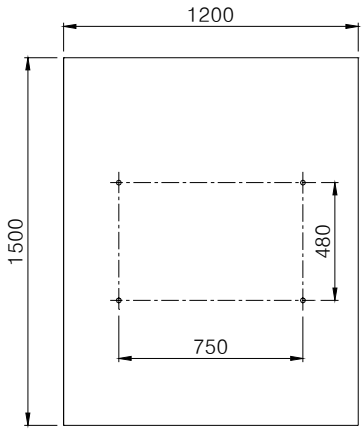
Figure 8 shows 14b (GB/T707-1998) channel steel cross section.

FIGURE 8 - CHANNEL STEEL CROSS SECTION (UNITS MM)



2. Determine positions of four holes for installing channel steel according to engineering design drawing. See Figure 9 for single.

FIGURE 9 - DRAWING LINES FOR SINGLE CABINET TOP VIEW (UNITS MM)



After drawing lines, measure lines once again to verify them.

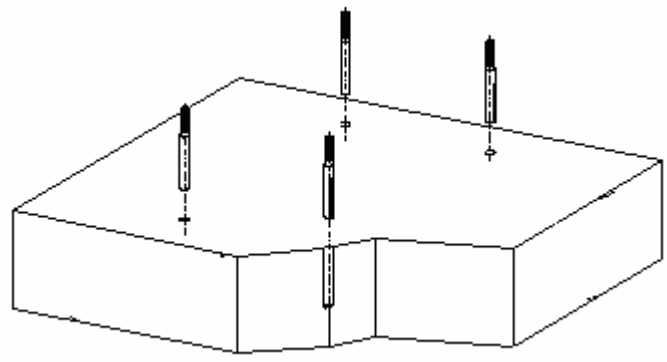
3. Drilling holes

   Drill φ14 holes, each 3.54 inch (90 mm) depth at marked positions for ground expansion bolt holes. Keep drill bit vertical while drilling holes with a percussion drill. Hold driller firmly and press downwards. Use vacuum cleaner to clean dust while drilling.

4. Expansion Bolt Installation

   Put expansion bolt with tube in drilled hole and hammer it. Fix bolt with nut using spanner and remove nut for cabinet installation. Torque should not exceed 45 N-m. Figure 10 shows this process.

FIGURE 10 - EXPANSION BOLT INSTALLATION



5. Fixing channel steel

   Figure 11 shows to fix channel steel on concrete platform using expansion bolts.

FIGURE 11 - FIXING CHANNEL STEEL

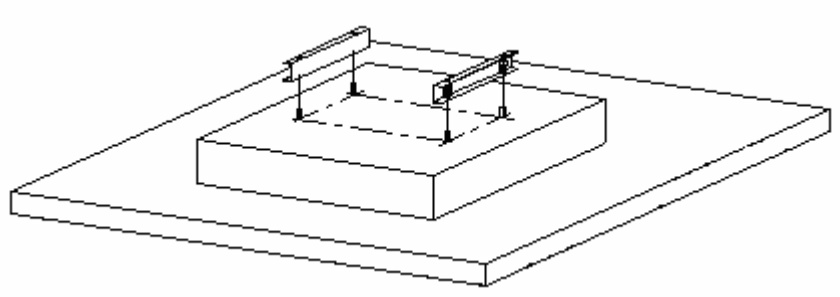
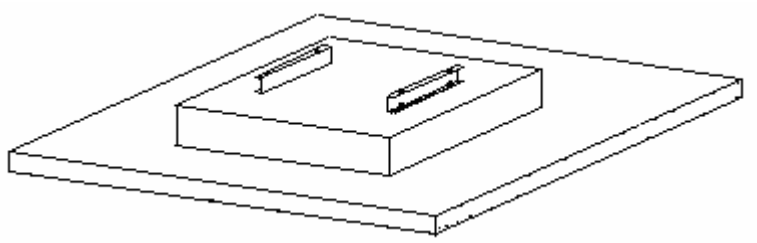


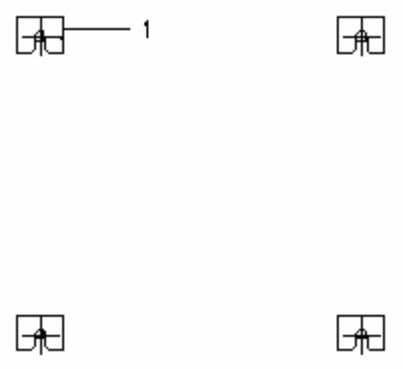
Figure 12 shows complete installation of channel steel.

FIGURE 12 - CHANNEL STEEL INSTALLATION



After channel steel installation, check its level with horizontal ruler. Horizontal error should not more than 0.039 inch (1 mm). Figure 13 shows to minimize horizontal error according to ground level using washers.

FIGURE 13 - MINIMIZING ERROR WITH WASHER

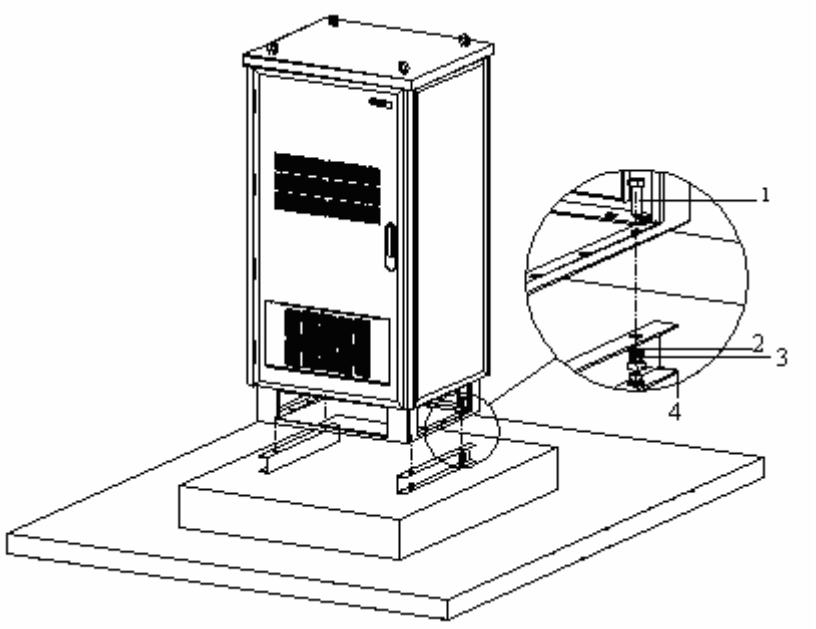


1. Adjusting Washer

6. Fixing cabinet

Move cabinet to installation position and fix it onto channel steel with 4 bolts. Figure 14 shows fixing cabinet.

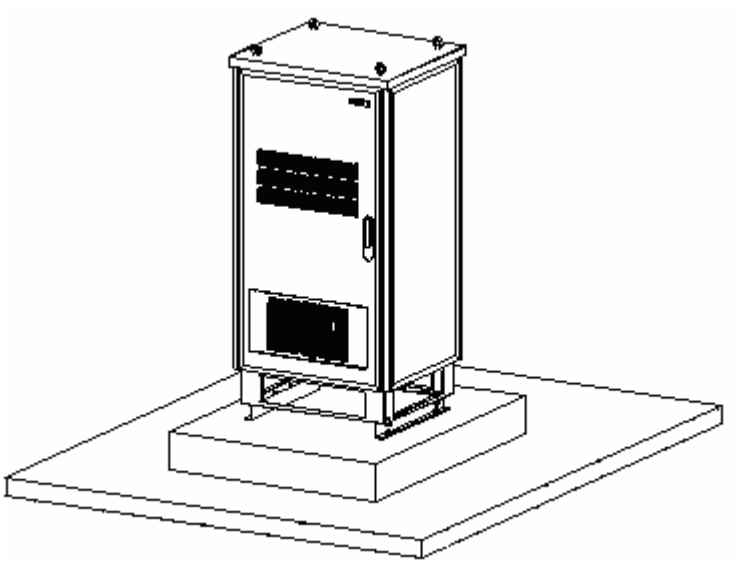
FIGURE 14 - FIXING CABINET



1. Screw
2. Flat washer
3. Spring washer
4. Nut

Figure 15 shows view of single cabinet after installation.

FIGURE 15 - SINGLE CABINET INSTALLATION



7. Insulation test

   Use multimeter to measure resistance between expansion bolts and cabinet. Open circuit indicates proper insulation. If result is otherwise, check insulation again and repeat the test.

Cabinet Accessories Installation

This section describes cabinet accessories installation. Following are cabinet accessories:

- Heat exchanger
- Shutter
- Power subrack
- Windshield cover board

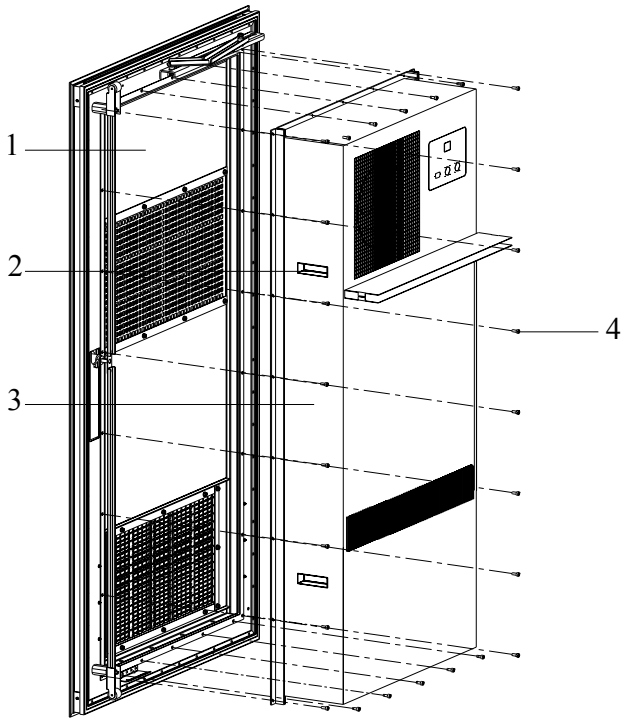
Heat Exchanger

Heat exchanger is already installed and is debugged before delivery. Following section describes heat exchanger dismantling and installation during maintenance.

1. Dismante

   After opening the front door, power off the heat exchanger and unplug all the sockets. Remove twenty-six screws at the pressed edge, and take out heat exchanger by holding the side handle. Figure 16 shows this process.

FIGURE 16 - HEAT EXCHANGER DISMANTLING



1. Front door
2. Handle
3. Heat exchanger
4. Screw

2. Installation

   Fix heat exchanger on front door with the removed twenty-six screws; make sure to fasten the screws.

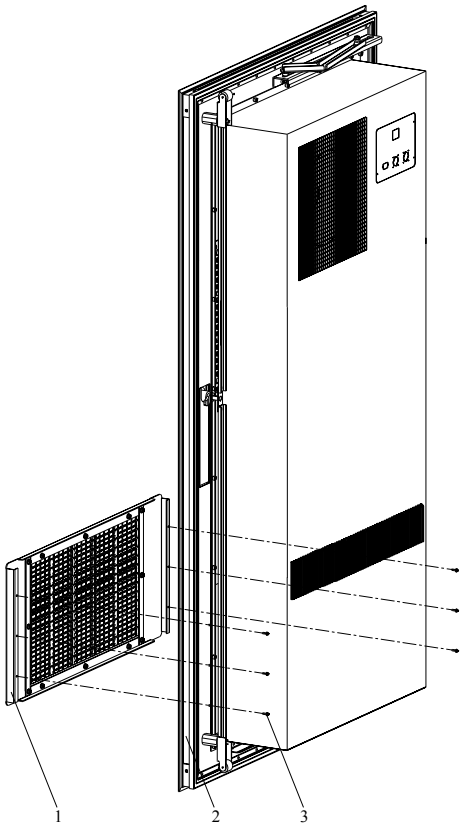
Shutter

Follow procedure below to remove and install shutter during maintenance.

1. Remove

   After opening front door, remove the six screws inside the front door. Figure 17 shows this process. Take out shutter directly through front door. Heat exchanger is removal is optional.

FIGURE 17 - SHUTTER DISMANTLING



1. Shutter
2. Front door
3. Screw

2. Installation

   Fix shutter on outside front door with the removed six screws and make sure to fasten the screws.

Power Subrack

Power subrack is already installed and is debugged before delivery. Following section describes method for rectifier module installation in subrack during maintenance.

Install power subrack with a maximum of four rectifier modules, in 3+1 backup mode and accept hot plugging.

1. Dismantle
   i. Loosen both side screws on module handle and put handle into OPEN state.
   ii. Hold handle and take out module, Figure 18 shows this process.

FIGURE 18 - TAKING OUT RECTIFIER MODULE

1. Screw 2. Handle

2. Installation

   Loosen both side screws on module handle and put handle into OPEN state, Figure 19 shows this process.

FIGURE 19 - RECTIFIER MODULE – HANDLE IN OPEN STATE

1. Handle 2. Screw

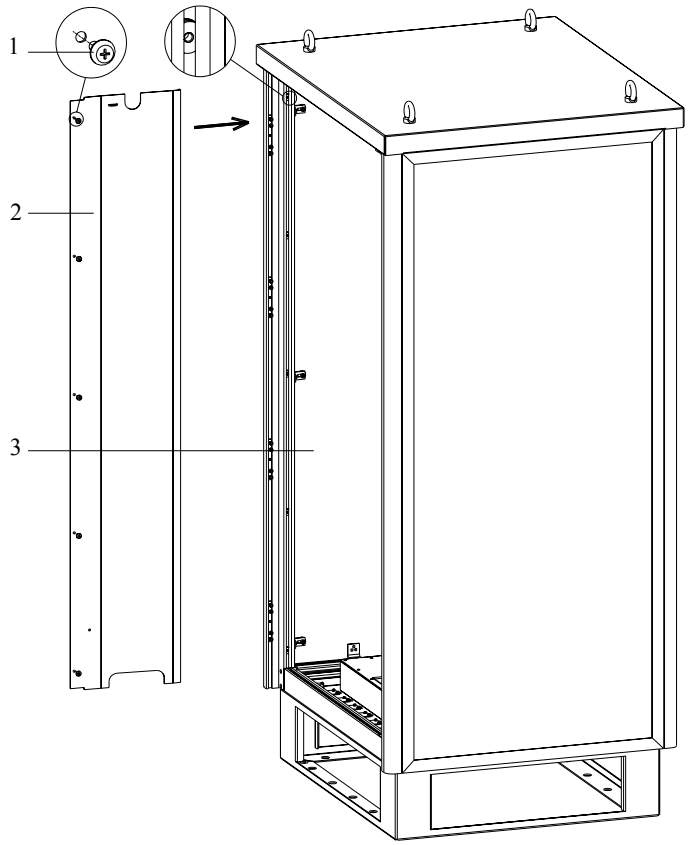
i. Insert module into the cabinet along the guide rail.

ii. After module is inserted, press handle into right position (so that it touches backplane properly), and fasten screws on both sides of handle.

Windshield Cover Board

Install windshield cover board after internal cable installation. Put cover board into cabinet according to arrow direction, and fix it onto right position with 5 screws, Figure 20 shows this process.

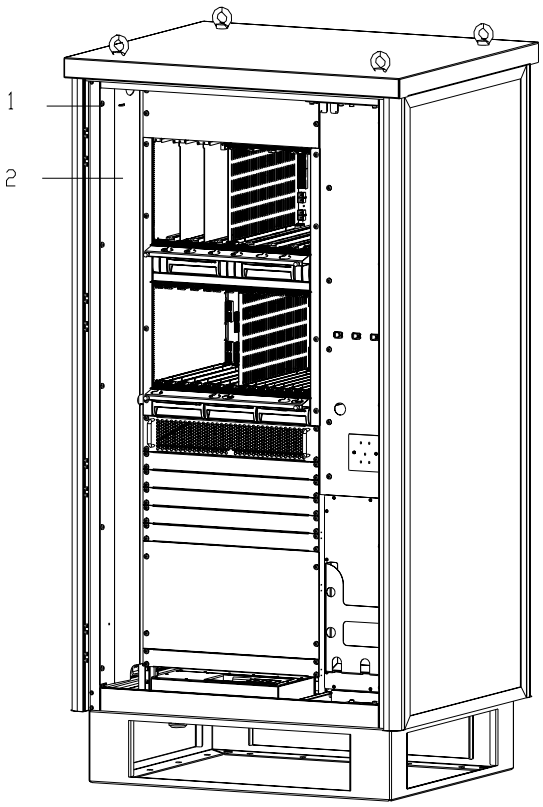
FIGURE 20 - WINDSHIELD COVER BOARD INSTALLATION



1. Screw
2. Windshield cover board
3. Cabinet

Figure 21 Completing Installation shows complete installation.

FIGURE 21 COMPLETING INSTALLATION



1. Screw 2. Windshield cover board

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Chapter 4

Cable Installation

This chapter describes cable installation:

- Power and grounding cables
- Power cable installation
- External cable installation
- Cable installation requirements

Power and Grounding Cables

ZXC10 CBTS O1 power and grounding cables are located at cabinet bottom.

- Power cable

  Power cables have cross section area of 16 mm^2 and are fed with 220V AC. Live wire is brown and neutral wire is black.

- PE protection ground cable

  Ground cable has cross section area of 35 mm^2 and is yellowish green.

Power Cable Installation

CBTS O1 internal cables are already installed in factory, install external AC power and ground cables on site according to specific engineering design drawing Connect main power cable from cabinet bottom to AC_IN interface according to marked polarities. Refer to *Cabinet External Cable Installation* section for details. Table 11 describes power cable interface signals.

TABLE 11 - AC 220 V INTERFACE

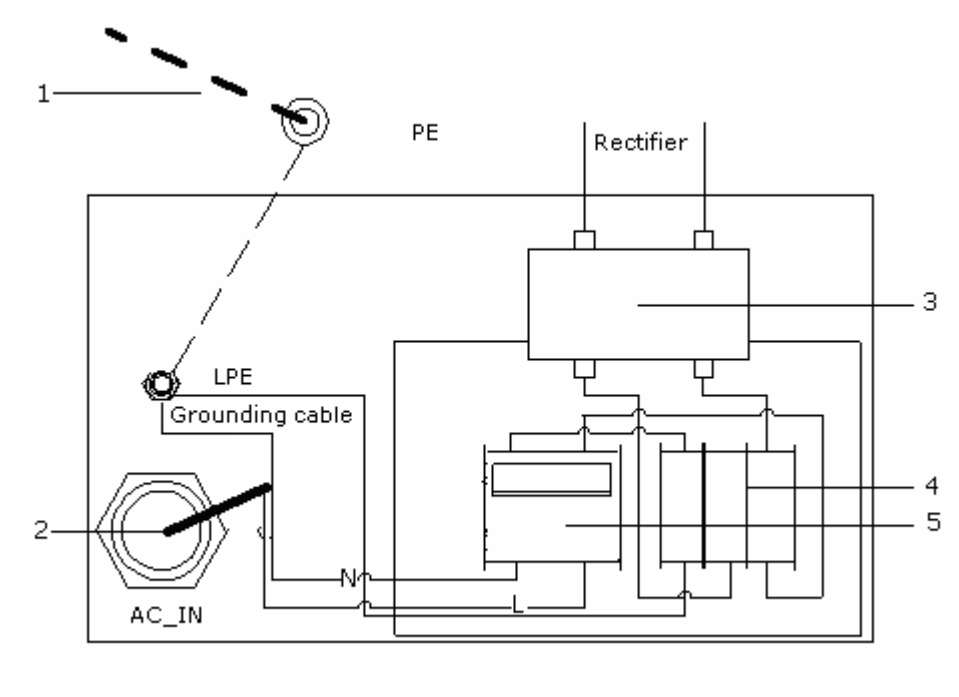
Pin	Signal Definition	Signal Description	End-A Entity	End-B Entity
1	L	AC live wire L, with maximum current of 60A	AC power distribution device	ACCU unit
2	N	AC neutral wire N, with maximum current of 60A		
3	PE	AC protection ground PE		

Caution:

- Ensure that power and grounding cables are according to engineering specifications and standards.
- Take all measures to guarantee staff and equipment safety.

Connect power and grounding cables according to engineering design drawing. Figure 22 shows power and grounding cable connections.

FIGURE 22 - POWER AND GROUNDING CABLE CONNECTIONS



1. Grounding cable
2. AC power cable
3. AC power filter
4. Lightning arrester
5. AC switch

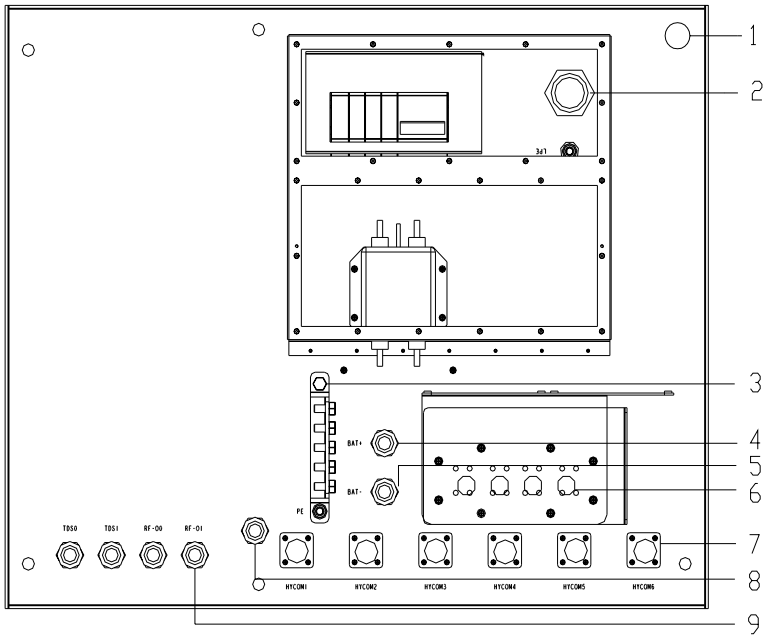
External Cable Installation

Connect all external cables through interface at cabinet bottom. Following are external cable types:

- AC_IN power cable
- Battery power cable
- E1/T1 cable
- Optical cable and microwave intermediate frequency cable
- PE ground cable
- RF cable
- GPS Antenna feeder RF cable

Figure 23 shows CBTS O1 cabinet bottom interface top view. Ensure that all external connections are waterproof and corrosion resistive.

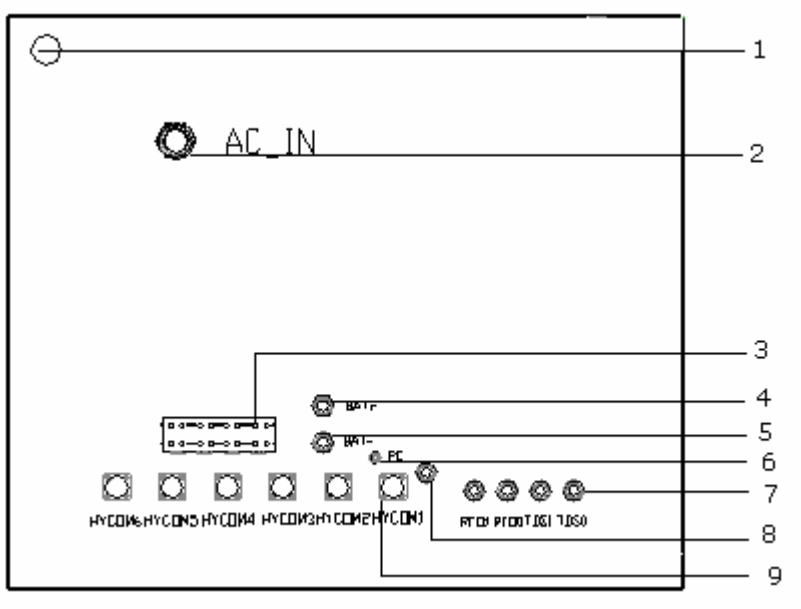
FIGURE 23 - CABINET BOTTOM INTERFACE TOP VIEW



1. GPS antenna
2. AC power cable
3. PE protection ground
4. Battery positive terminal
5. Battery negative terminal
6. E1/ T1
7. Main feeder cable
8. Ventilation hole
9. Optical fiber

Figure 24 shows cabinet bottom interfaces bottom view

FIGURE 24 - CABINET BOTTOM INTERFACE BOTTOM VIEW



1. GPS antenna
2. AC power cable
3. Protection ground
4. Battery positive terminal
5. Battery negative terminal
6. E1/ T1
7. Main feeder cable
8. Ventilation hole
9. Optical fiber

For GPS cable installation refer to corresponding chapter.

Table 12 shows cable connection relationship

TABLE 12 - CABLE CONNECTION RELATIONSHIP

S.N.	Interface Name	Socket Type	External cable name	Quantity	End A	End B
1	HYCOM1 ~ HYCOM 6	7/16-hole socket	Antenna feeder RF cable	6	RFE	Antenna
2	AC_IN	Hummel connector	AC_IN power cable	1	ACCU unit	AC power distribution device
3	PE	Ground pole	PE cabinet protection ground cable	1	Cabinet PE connecting terminal	Protection grounding busbar
4	Fiber 1 ~ 4	Cable traverser	Optical cable and microwave trunk	2	Transmission Unit	Remote transmission
5	BAT+	Hummel connector	+ Battery rack power cable	1	DCCU unit	Battery rack
6	BAT-	Hummel connector	- Battery rack power cable	1		Battery rack
7	GPS	N-F connector	GPS cable	1	GCM board	GPS antenna
8	ABIS	Cable traverser	Abis interface E1/ T1 cable	2	Master cabinet	External transmission device or BSC

Antenna Feeder RF Cable

Um interface implements radio signal transmission by employing antenna. There are 6 antenna feeder interfaces at CBTS O1 cabinet bottom: HYCOM1 ~ HYCOM6. Connect cabinet external interface to antenna feeder jumper and internal interface to ANT port of corresponding RFE board.

Antenna feeder interfaces transmits RF carrier signals between BTS and MS. Use 7/16 female socket connector. Table 13 illustrates antenna feeder interfaces.

TABLE 13 - ANTENNA FEEDER INTERFACES

Pin	Signal Definition	Signal Description	End-A Entity	End-B Entity
Internal conductor	HYCOM	TX-RF	RFE	Antenna
	HYCOM	RX-RF		
Shielding layer	GND	-		

Battery Cables

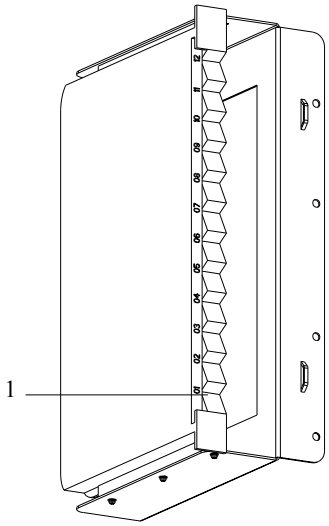
CBTS O1 cabinet has small battery setup due to volume restrictions. Use external battery for uninterrupted power supply in case of main AC failure for longer time. There are two battery terminals marked as BAT+ and BAT- on cabinet for external connection.

Optical Cable & Microwave Intermediate Frequency Cable

There are four entrance points for optical fiber cable at cabinet bottom marked as FIBER 1, FIBER 2, FIBER 3 and FIBER 4.

Fiber splice tray provides 2 pairs of FC/PC interfaces (flange) and meets requirements for fiber fusion and coiling. Use it to connect fiber end inside the cabinet and optical cable outside the cabinet. Fiber splice tray is installed on cabinet backplane left side. Figure 25 shows fiber splice tray

FIGURE 25 - FIBER SPLICE TRAY



1. Flange installation jack

Route the external optical cables into cabinet from cabling hole at cabinet bottom. Splice internal fiber cable and FC connector with fiber splicer to connect fiber to flange. Route the fiber tail from cabinet to corresponding ZXSM T150 optical interface for connections.

E1/T1 Cable

Abis interface adopts E1/T1 interface.

E1/T1 cable connects external transmission device or BSC through Abis interface. There are two types of E1 cables, 75 ohm and 120 ohm impedance cables.

Figure 26 shows 75 ohm E1 cable interface with eight ports. Route all external E1 cables through these ports.

FIGURE 26 - E1 CABLE INTERFACE

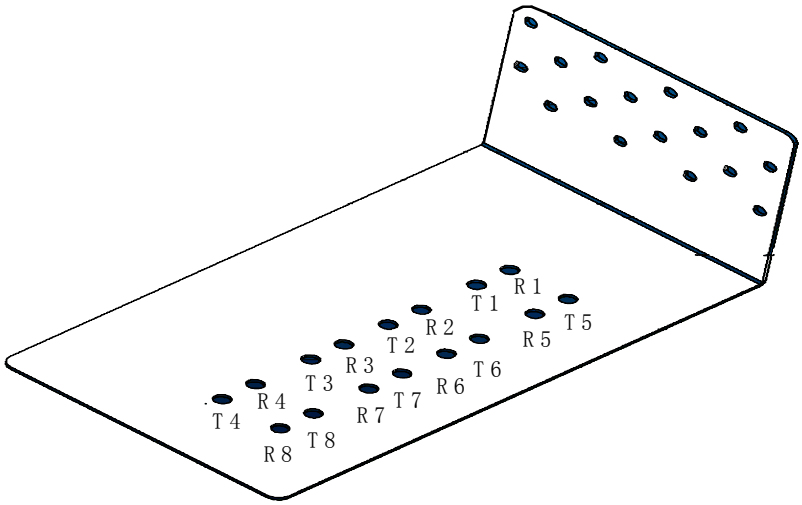
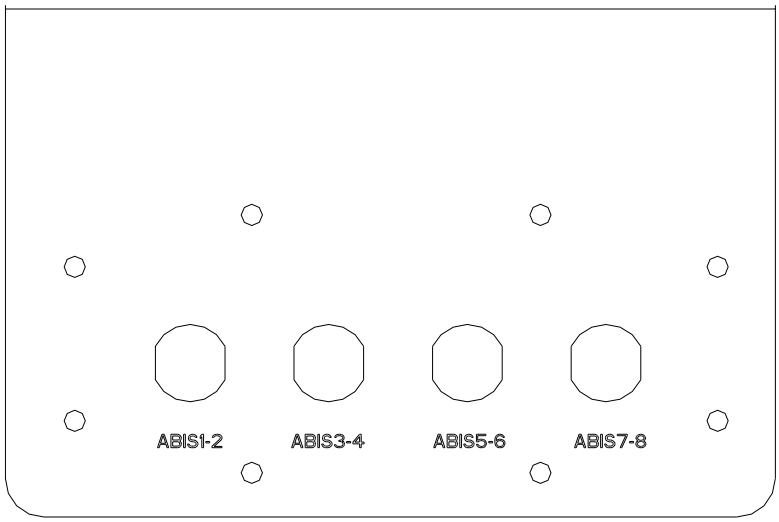


Figure 27shows 120 ohm E1 and 100 ohm T1 interface. CBTS O1 cabinet transmits signals via DB44 connectors. All internal cables are assembled in factory, only install external cables through specific route. Connect E1/T1 cables to aviation plugs on converter bottom. Figure 27 - 120 OHM E1 and 100 OHM T1 Interface shows interfaces.

FIGURE 27 - 120 OHM E1 AND 100 OHM T1 INTERFACE

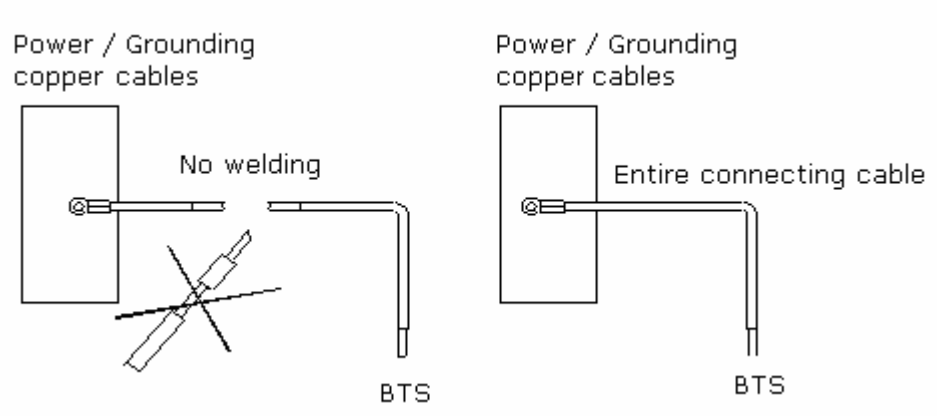


Cable Installation Requirements

Ensure following requirements during cable installation:

- Install power supply and grounding cables separately.
- Ensure that distance between cable bundles is at least 7.87 inch (200 mm).
- Cut cable ties flat after making cable bundles.
- Measure cable lengths before installation. Avoid cable connections or welding. Figure 28 illustrates this process.

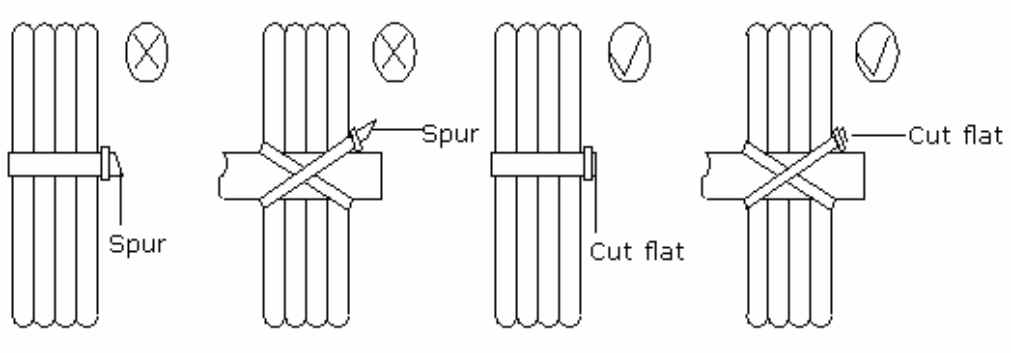
FIGURE 28 - POWER SUPPLY AND GROUNDING CABLES



- Ensure less contact resistance between cable and busbar by using plain and spring washers while fixing the lugs.
- Separately install E1 / T1 cables for each single cabinet.
- Cable type, quantity, routing, length and installation position must be according to engineering design drawings.
- Before cable installation, ensure that are not damaged and all cables have delivery logs and quality certificate to ensure product quality.
- Use cable tie or wax cable bundle during cable installation. Keep cable tie maximum length between two cables up to 39.37 inch (1 m). Ensure cable ties are not too tight.
- Use different cable strap according to circumstance, avoid using two or more cable straps for bundling. Cut cable straps flat after bundling.

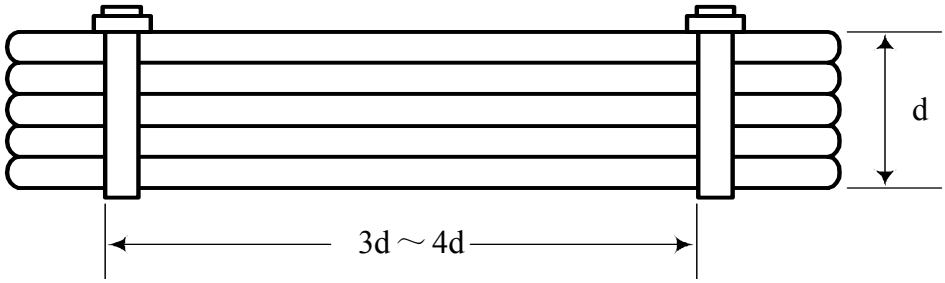
Figure 29 shows difference between correct and incorrect bundle.

FIGURE 29 - CABLE STRAPS REQUIREMENTS



- Keep space between each two cable straps up to 3~4 times longer than bundle diameter. Figure 30 shows this process.

FIGURE 30 - CABLE STRAPS



Chapter 5

Main Antenna Feeder System Installation

This chapter describes main antenna feeder system installation:

- Main antenna feeder system installation
- Antenna installation preparation
- Antenna installation precautions
- Main antenna feeder system structure
- Antenna types
- Super flexible jumper
- Main feeder cable
- Grounding kit
- Lightning arrester
- Antenna feeder system connectors
- Antenna installation technical parameters
- Antenna installation flow chart
- Selecting installation position
- Moving and hoisting antenna
- Uni-directional antenna installation
- Omni-directional antenna installation
- Main feeder installation
- Antenna jumper installation
- Feeder cable installation
- Lightning arrester installation
- Grounding kit installation
- Cabinet jumper installation
- Testing antenna feeder system
- Waterproofing connectors

Main Antenna Feeder System Installation

Antenna Installation Preparation

Proper antenna installation ensures BSS system reliable operation. Install antenna according to specific network planning engineering design. Install antenna in correct direction, elevation, gain and diversity reception modes including correct tilt and azimuth for each sector. Ensure antennas wind resistance capability maximum up to 150 km/h.

Before antenna system installation, ensure that installation personnel working at tower height are qualified. Inspect installation tools and feeder equipment.

Antenna Installation Precautions

- Take necessary measures for personal and equipment safety.
- Operator on tower must wear safety belt.
- Personnel under tower must wear safety helmets.
- Never climb tower with loose clothes and wet/slippery shoes.
- While active antenna adjustment, wear radiation-shielding clothing and turn off high power amplifier to avoid radiation effects.

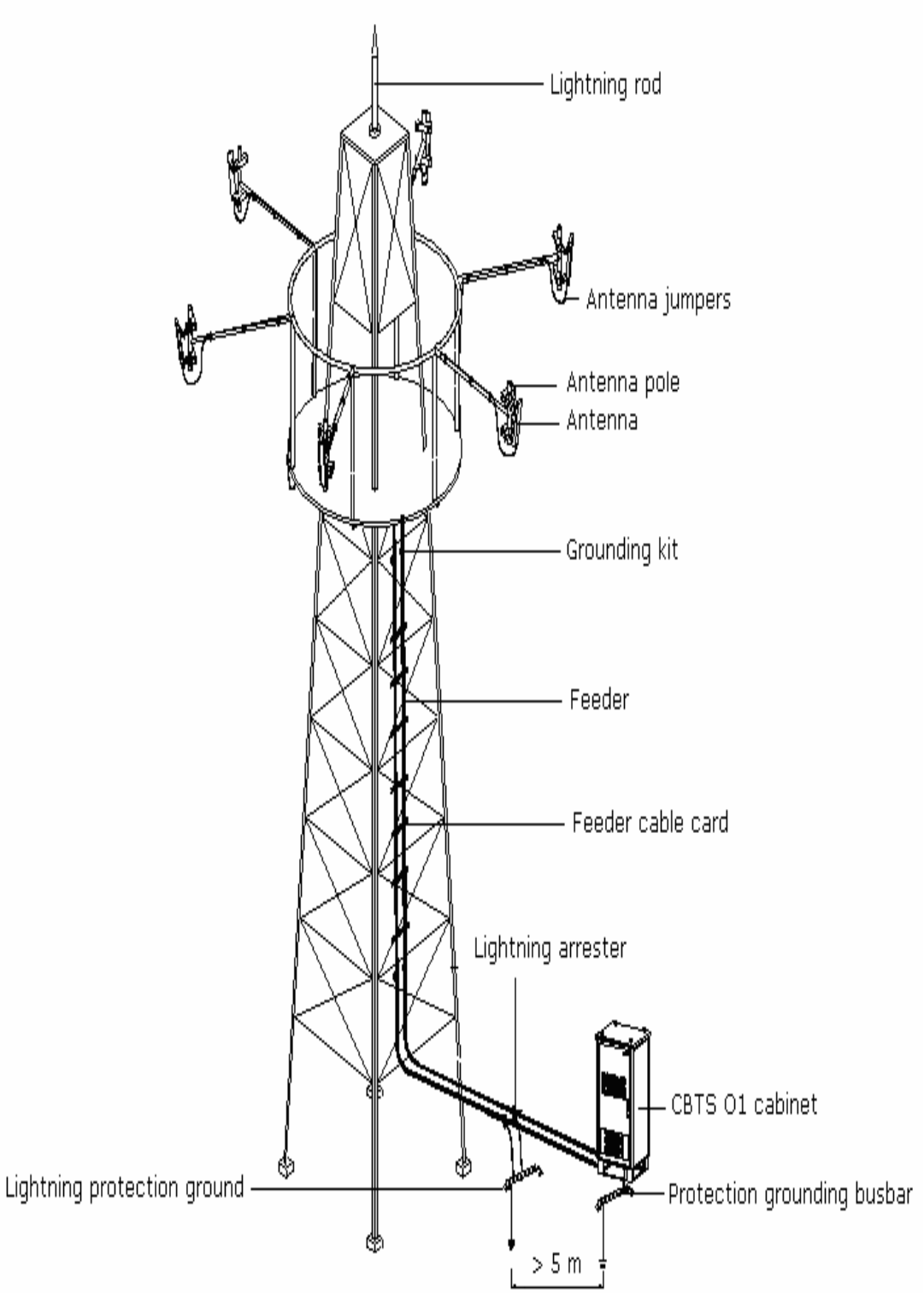
Main Antenna Feeder System Structure

The main antenna feeder system consists of:

- Lightening rod
- Antenna jumpers
- Antenna pole
- Antennas
- Grounding kit
- Feeder
- Feeder cable card
- Grounding kit
- Lightning rod
- Lightning protection ground
- CBTS O1 cabinet
- Protection grounding busbar

Figure 31 shows 3-sector antenna feeder system structure.

FIGURE 31 - 3-SECTOR ANTENNA FEEDER SYSTEM



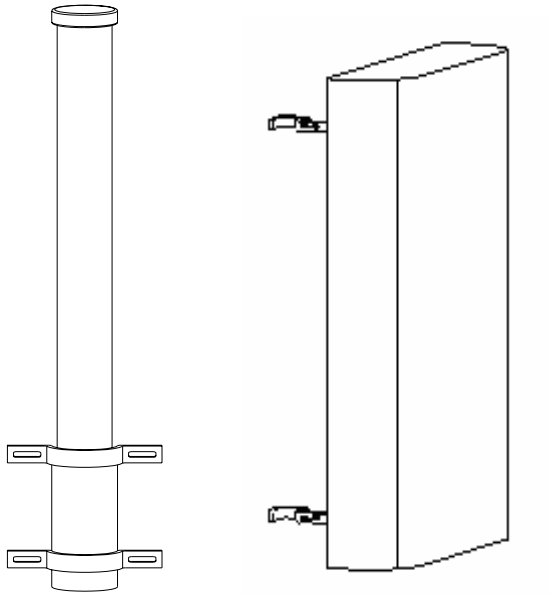
Antennas Types

There are two main CBTS O1 antenna types:

- Uni-directional
- Omni-directional

Figure 32 shows directional antenna on right side and omni-directional antenna on left side.

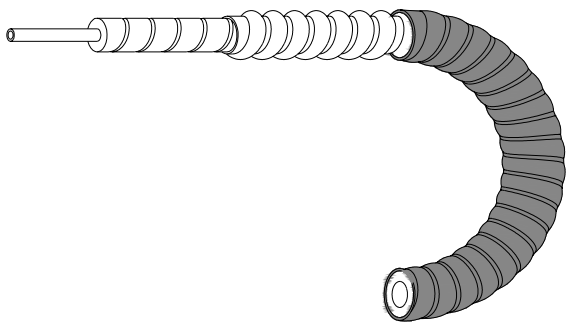
FIGURE 32 - OMNI AND UNI-DIRECTIONAL ANTENNAS



Super Flexible Jumper

Use super-flexible jumper where a small bending radius is required. Threads on its surface make it highly flexible and able to resist pressure. Use 1/2" super-flexible jumpers to connect antenna to main feeder cable and main feeder to cabinet. Figure 33 shows super flexible cable.

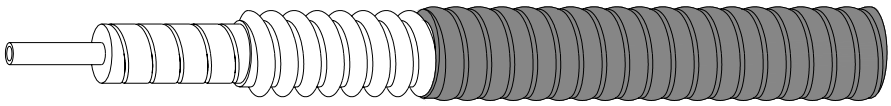
FIGURE 33 - SUPER FLEXIBLE JUMPER



Main Feeder Cable

Use 7/8" feeder cable between antenna jumper and cabinet top jumper. Figure 34 shows main feeder cable, common foam insulating feeder cable consists of internal and external conductors. Internal conductor is wrapped with low-loss foam insulator. Feeder cable is covered with a fire and smoke proof sheath.

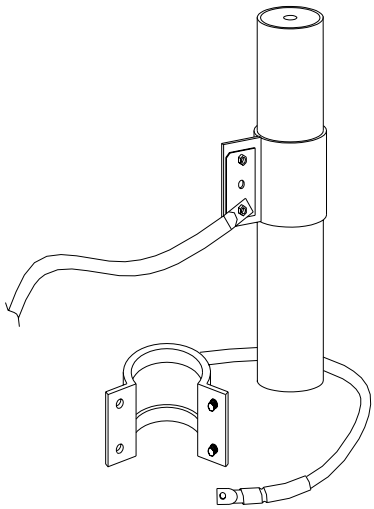
FIGURE 34 - MAIN FEEDER CABLE



Grounding Kit

Use grounding kit to protect antenna feeder cables and other devices against lightning. Mount grounding kit according to conditions such as: on tower top, tower bottom and at transceiver entrance for grounding. Figure 35 shows grounding kit.

FIGURE 35 - GROUNDING KIT



Lightning Arrester

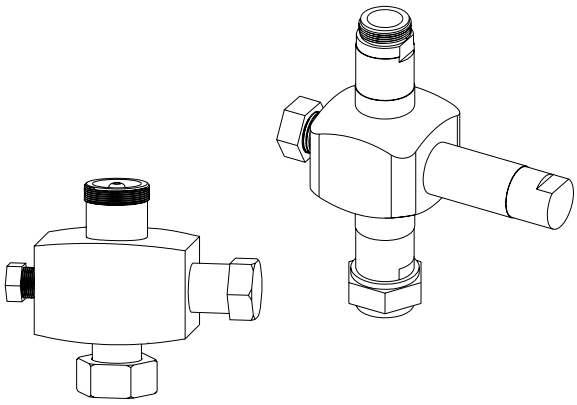
Use lightning arrester to protect cable against lightning.

There are two types of common lightning arresters:

- λ/4 stub lightning arrester

  Figure 36 shows λ/4 stubs, it is a tri-port passive coaxial component. Length of each third port is one quarter of wavelength and its external and internal conductors are short-circuited. Its working principle is similar to that of band pass filter.

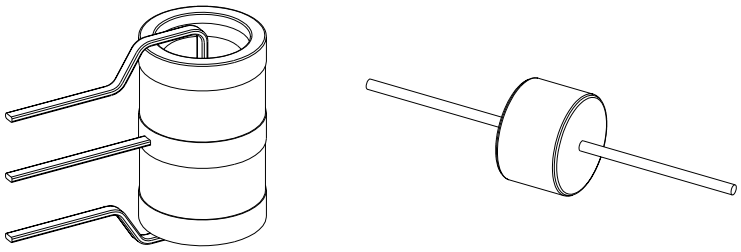
FIGURE 36 - λ/4 STUB LIGHTNING ARRESTER



- Graviton lightning arrester

  Graviton is a short-circuited protection part encapsulated in ceramics or glass and filled with low-pressure inert gas. Figure 37 shows two types of graviton lightning arresters: three electrode on left and dual electrode graviton on right side.

FIGURE 37 - GRAVITON LIGHTNING ARRESTERS

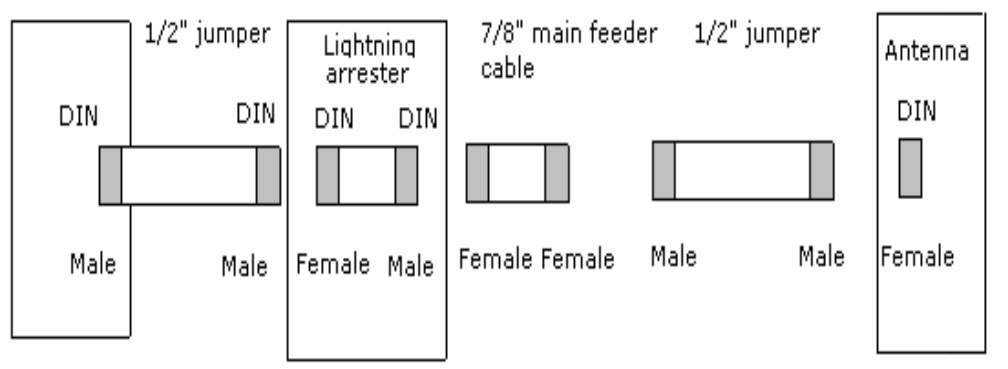


The basic working principle of the graviton is gas discharge. Do not use graviton in case of excessive currents more 10 kA. Usually, a graviton has a life of 5 years.

Antenna Feeder System Connectors

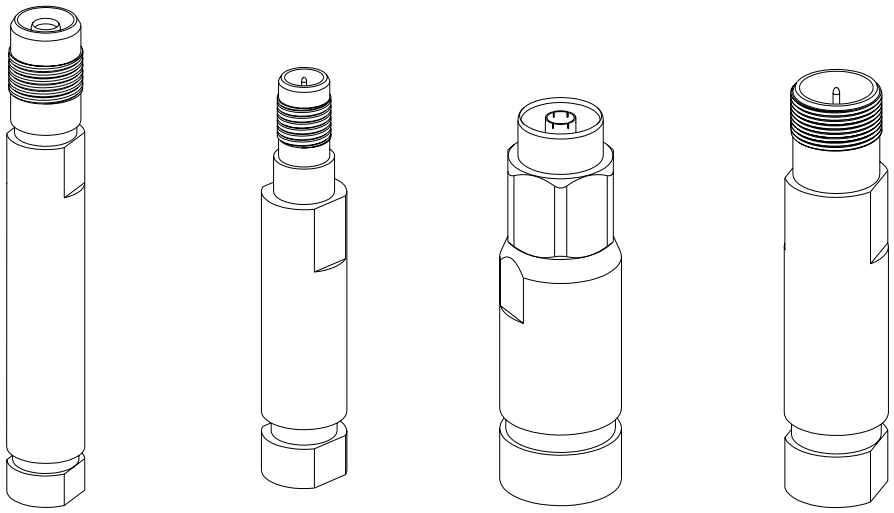
Figure 38 shows all connectors in antenna feeder system. Following sections describes antenna feeder system connectors.

FIGURE 38 - CONNECTORS IN ANTENNA FEEDER SYSTEM



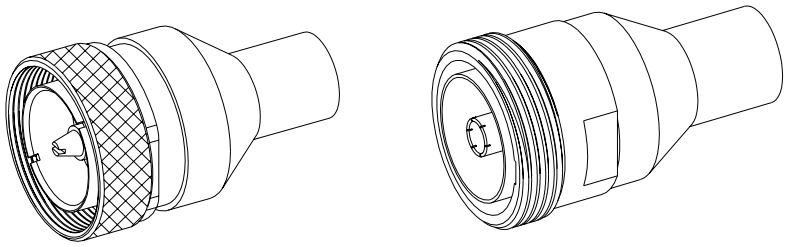
- DIN series connectors are medium and large power connectors with threads. Use DIN series connectors to connect RF coaxial cables in vibration and adverse environments. Figure 39 shows 1/2" connector on left and 7/8" connector on right side.

FIGURE 39 - DIN CONNECTORS



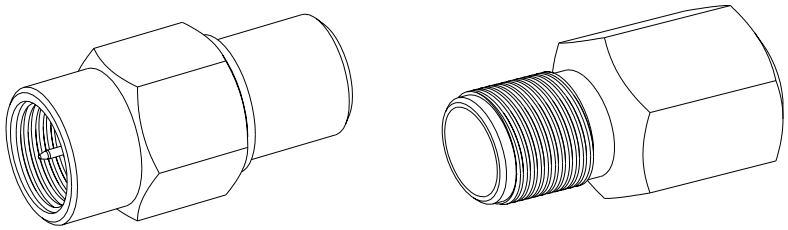
- Figure 40 shows 7/16 type series big threaded water proof coaxial connectors, male connector on left and female connector on right side. Use 7/16 type connectors as outdoor connectors for transmitting medium and high energy.

FIGURE 40 - 7/16 CONNECTORS



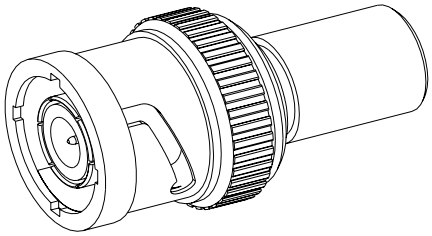
- Figure 41 shows SMA series threaded connectors with a characteristic impedance of 50 Ω. Male connector is on left and female connector on right side. External conductor inner diameter is 162.59 inch (4130 mm). Use SMA series RF coaxial connectors with semi-rigid and flexible RF cables to situations requiring high performance microwave.

FIGURE 41 - SMA CONNECTORS



- Figure 42 shows BNC connectors, which are bayonet socket RF coaxial cable connectors manufactured according to MIL-C-39012 and IEC 169-8 specifications. Use BNC connectors as trunk connectors.

FIGURE 42 - BNC CONNECTOR (M)



Antenna Installation Technical Parameters

- Height

  It depends upon network planning.

- Azimuth

  It depends upon network planning.

- Tilt

  It depends upon network planning and ranges from 0° ~ 10°.

- Antenna direction

  It depends upon antenna azimuth. Two antennas in same sector should point to same direction.

- Spacing between diversity antennas

  Two antennas in same sector act as diversity receiving antennas for each other, and have same vertical height. Maximum horizontal distance (d) between antennas satisfies engineering requirements. Following formula determines value of horizontal distance (d):

  $d \geq 10\lambda - 20\lambda$ (or H/d = 11). Unit of measurement: m

  Where:

  d is horizontal distance between diversity antennas.

  H is vertical height from antenna to ground.

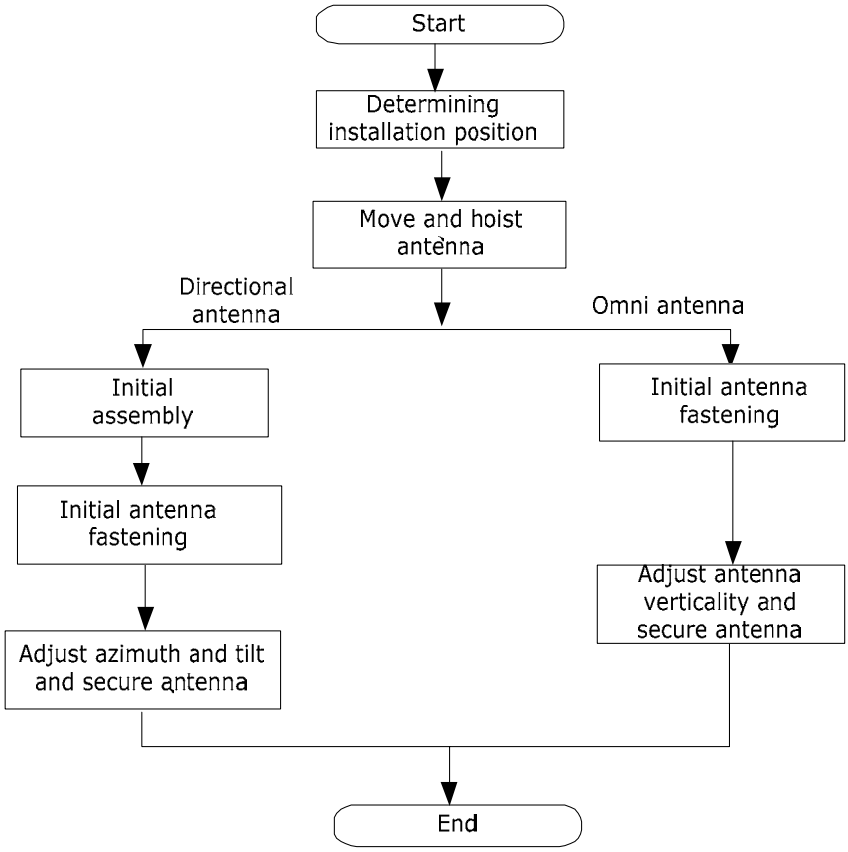
  λ is carrier wavelength.

  For example, diversity distance of 1900 MHz carrier must be more than 59.055 inch (1.5 m) while that of 800 MHz carrier must be more than 137.79 inch (3.5 m).

Antenna Installation Flow Chart

Figure 43 shows antenna installation flow chart.

FIGURE 43 - ANTENNA INSTALLATION FLOW CHART



Selecting Installation Position

Select installation position according to engineering design. Incase of failure prepare a secondary engineering design, negotiating with customer and design institute, based on: local coverage requirements, spatial diversity requirements, antenna azimuth and tilt.

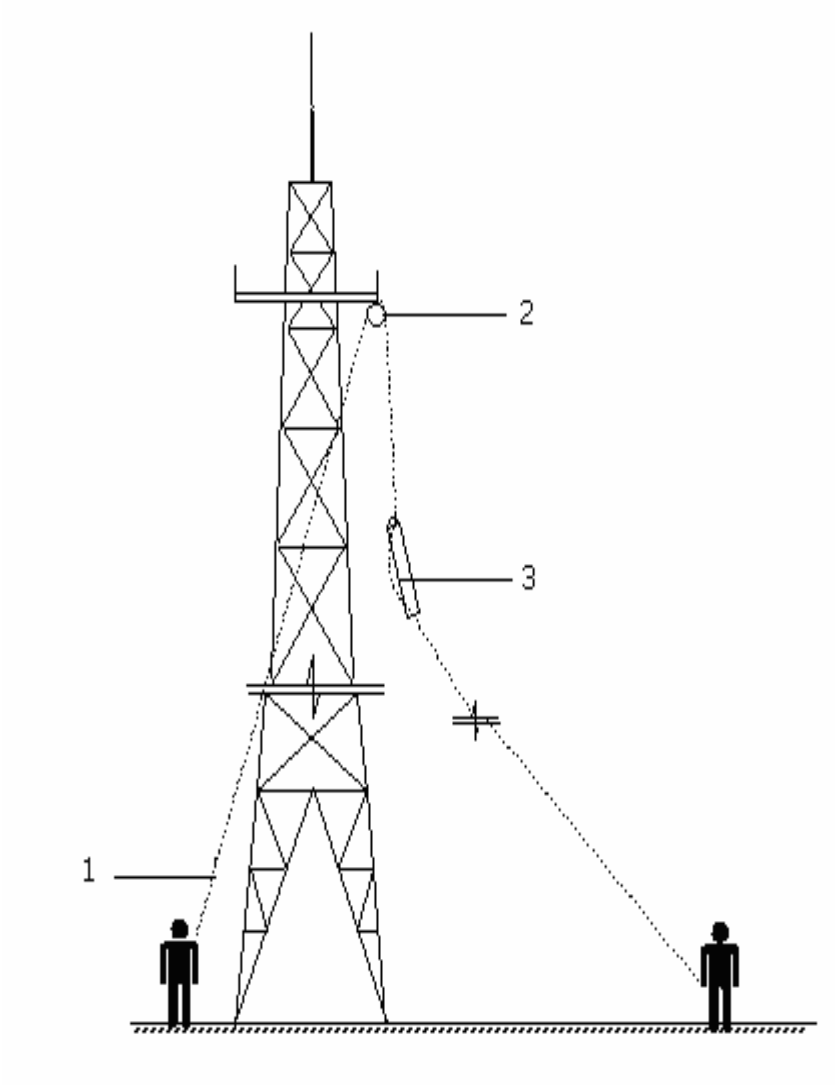
Moving and Hoisting Antenna

To mount an antenna on a tower, use rope and pulley block to hoist antenna. Carry antenna jumper and all accessories such as measuring tools, safety belts, adhesive tapes and straps to tower top platform and keep them in a safe place.

Put small metal articles like antenna fixing parts and wrenches in a sealed canvas tool bag before hoisting. Knot rope at both ends of antenna for easy coordination of staff both on and under the tower.

Figure 44 illustrates hoisting process.

FIGURE 44 - HOISTING AN ANTENNA



1. Rope
2. Pulley block
3. Knot rope at both ends of antenna

To mount an antenna on roof, move antenna and installation materials to installation position manually.

Caution:

- Personnel on and under the tower should coordinate in hoisting an antenna. Personnel under the tower should pull antenna away from tower body to avoid damage.

Uni-Directional Antenna Installation

This section describes Kathrein antenna installation procedure. Follow installation instructions provided with antenna.

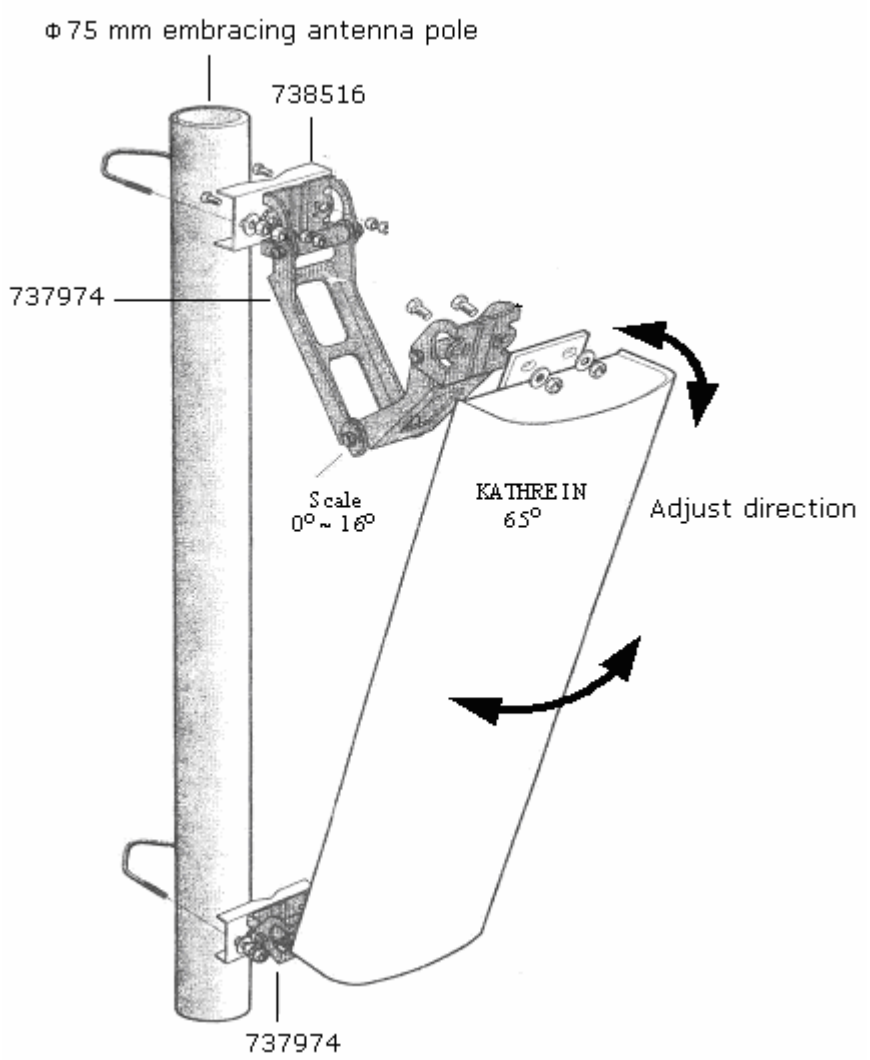
Take following steps to install uni-directional antenna:

1. Assembling antenna accessories

   Directional antenna has a number of installation fasteners. Follow instructions provided along with antenna. For example, Kathrein antenna has two types of fasteners: 738516 and 737974. Before fixing antenna, assemble fastener 737974 to antenna ends and then connect fasteners 737974 and 738516. Install all accessories with spring and flat washers. Fix antenna angle adjustment accessories to antenna under the tower.

   Figure 45 illustrates Kathrein antenna installation process.

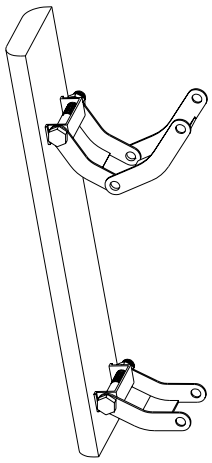
FIGURE 45 - KATHREIN ANTENNA INSTALLATION



2. Fastening antenna onto the pole

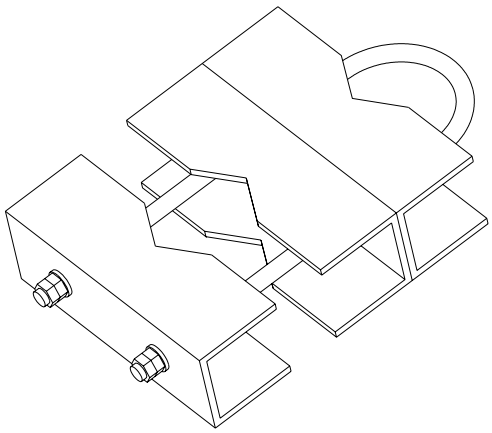
   Fix uni-directional antenna with accessories installed onto antenna pole. Do not tighten screws to facilitate possible azimuth adjustment and tilt. Figure 46 shows antenna fixing supports.

FIGURE 46 - ANTENNA FIXING SUPPORT



Adjust antennas to appropriate height, Figure 47 shows use U-shaped bolts to fix antenna tilt angle, so that input and output ports of antennas face downwards.

FIGURE 47 - U-SHAPED BOLT



3. Adjusting antenna azimuth

   Take following steps to adjust antenna azimuth.

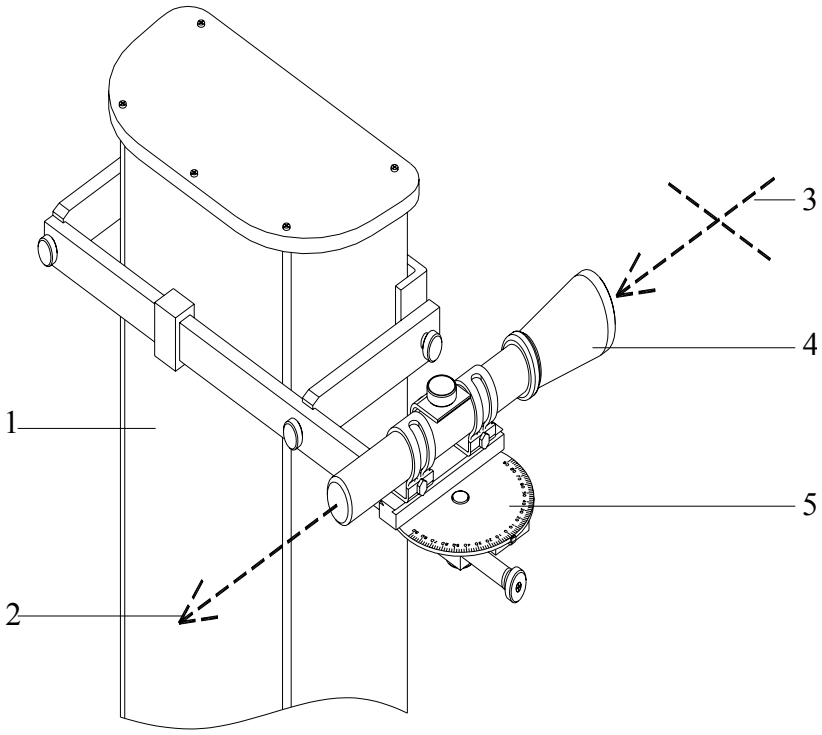
   i. Determine antenna azimuth using a compass and installation direction according to engineering design drawing.

   ii. Turn antenna slightly to adjust direction. At the same time measure antenna direction with a compass to minimize error (generally not more than 5°).

   iii. Put special adjusting tool on antenna, aiming at target through telescope, and turn antenna to acquire designed angle. Figure 48 shows this process.

   iv. Tighten fastener 738516, after adjusting antenna azimuth.

FIGURE 48 - AZIMUTH ADJUSTING TOOL



1. Antenna
2. Target direction
3. Observation direction
4. Telescope
5. Dial

4. Adjusting antenna tilt

   Take following steps to adjust antenna tilt

   i. Adjust tilt meter angle required by the engineering design.

   ii. Turn antenna top slightly and hold antenna from its top. Adjust tilt, till the bead is centered and adjusted tilt meter is next to antenna. Figure 49 shows angle gauge.

FIGURE 49 - AZIMUTH GAUGE

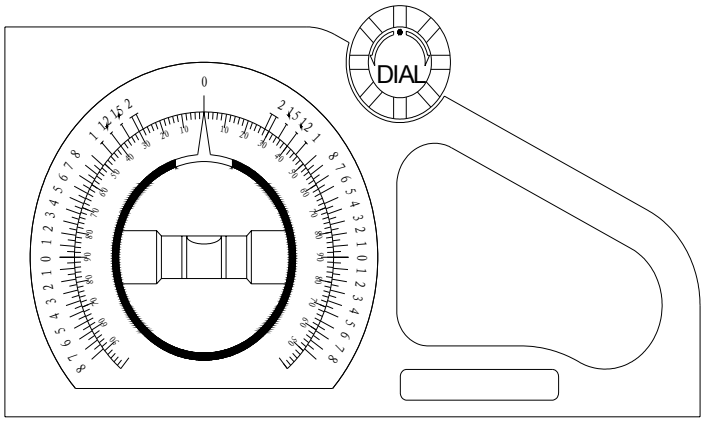
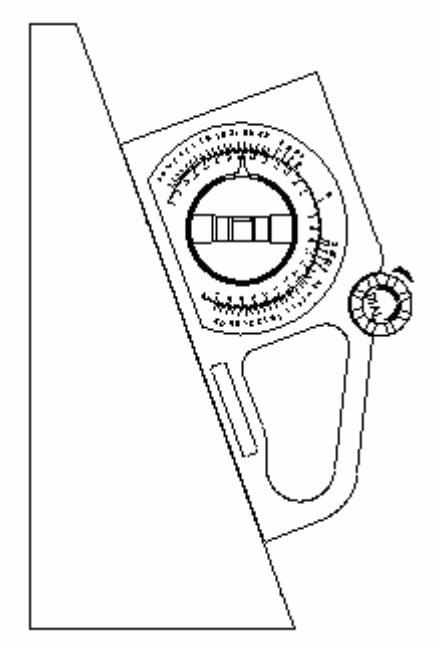


Figure 50 shows detailed procedure:

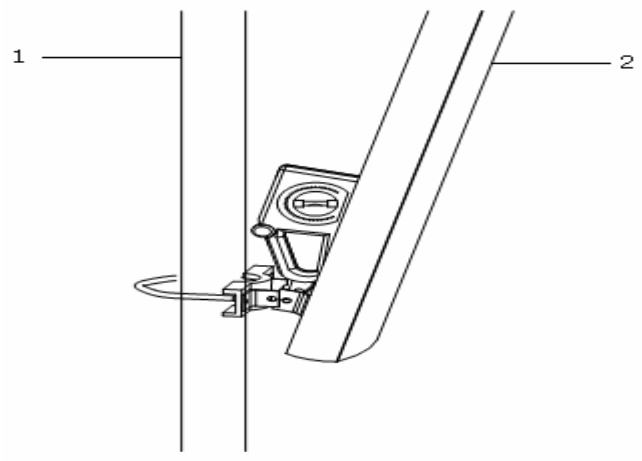
- Rotate dial to required set angle.
- Press object to be measured against the dial chassis firmly, and move them together until bubble in air bleeder stays in middle of two indication rings.

FIGURE 50 - ADJUSTING TILT ANGLE



iii. After adjusting tilt, tighten the fastener 737974. Figure 51 shows to adjust antenna tilt.

FIGURE 51 - ADJUSTING ANTENNA TILT



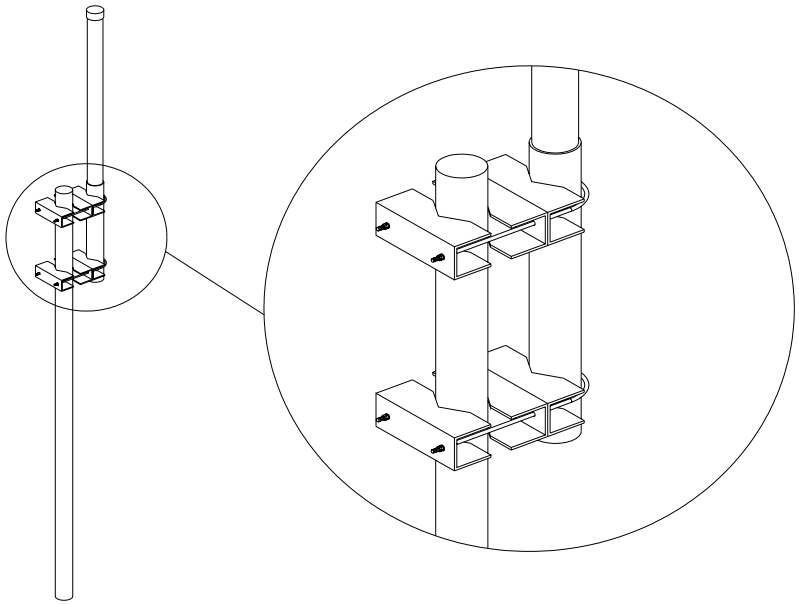
1. Antenna pole 2. Kathrein antenna

Omni-Directional Antenna Installation

Take following steps to install an omni-directional antenna:

1. Adjust antennas to appropriate height. Figure 52 shows to use U-shaped bolts to fix antenna onto the antenna pole. Ensure that antennas input and output ports face downwards.

FIGURE 52 - OMNI-DIRECTIONAL ANTENNA INSTALLATION



2. Measure verticality of antenna and ensure that antenna is vertical.
3. Fasten screws with a spanner.

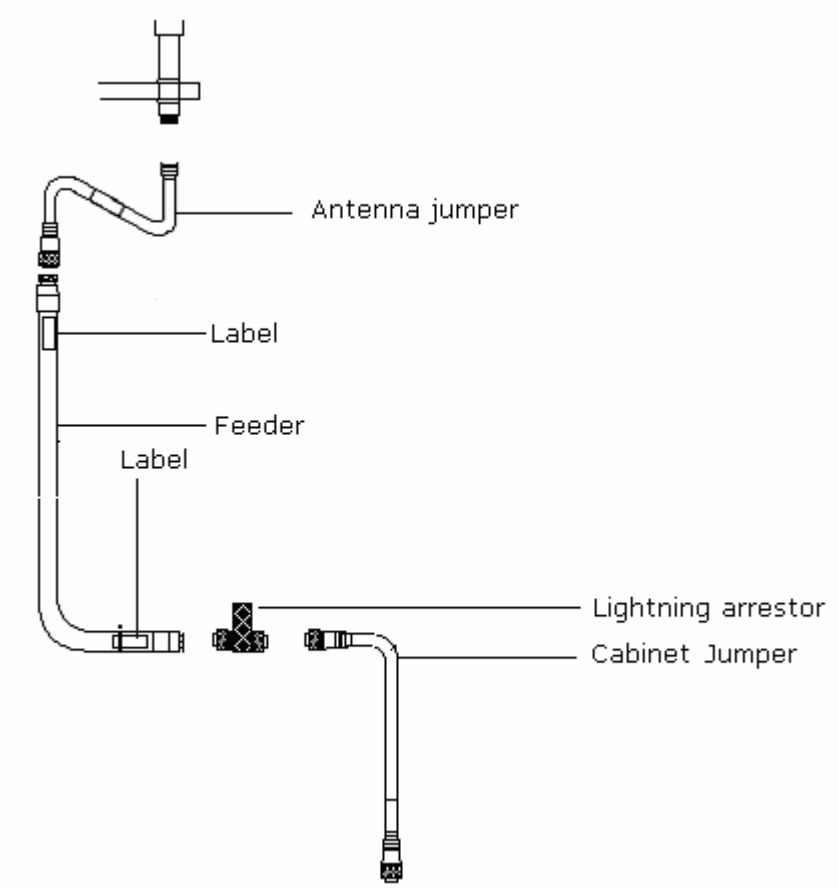
Note:

- To reduce working time at heights and to improve joint connection and waterproof quality. Connect jumper and antenna, and conduct waterproof treatment on the joint before fixing antenna on the pole.

Main Feeder Installation

Install the main feeder properly to minimize signal loss and for reliable function. Figure 53 shows CBTS O1 main feeder overall structure.

FIGURE 53 - CBTS O1 MAIN FEEDER



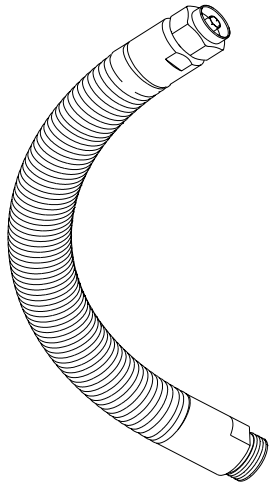
Antenna Jumpers Installation

Antenna jumper is a super-flexible jumper connecting antenna and main feeder cable. Use 1/2" super-flexible jumper for BTS system. Jumper connectors depend on antenna and main feeder cable. Usually, two connectors are male DIN connectors.

Following section describes antenna jumper installation:

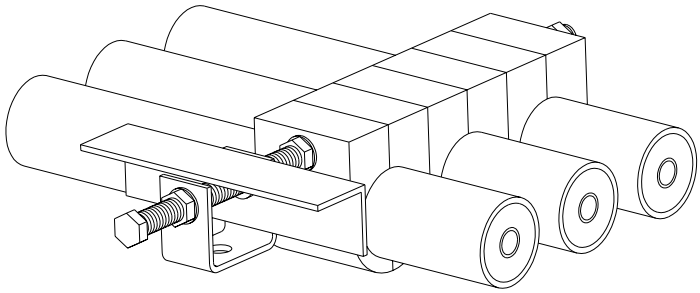
1. Select an appropriate path for jumper by taking into consideration factors as: reliability, convenience, proper length and proper water drainage.
2. Fix antenna connector and jumper with appropriate torque (typical value for DIN connector is 1.7 N m ~ 2.3 N m). Figure 54 shows connecting jumper.

FIGURE 54 - CONNECTING JUMPER



3. Similarly fix main feeder cable connector and jumper with an appropriate torque.
4. Figure 55 shows to fix jumper with feeder cable clips with maximum space of 29.921 inch (760 mm). Ensure minimum space between feeder cable clips when wind speed is over 160 km/h.

FIGURE 55 - FIXING JUMPERS WITH FEEDER CABLE CLIPS

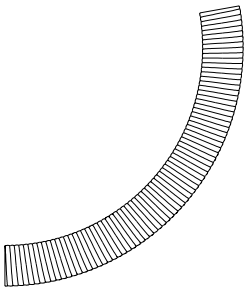


5. Ensure antenna and feeder cable performance and seal connectors with waterproof self-adhesive tape and PVC tape.

   While installing 1/2" super-flexible jumper, ensure following:

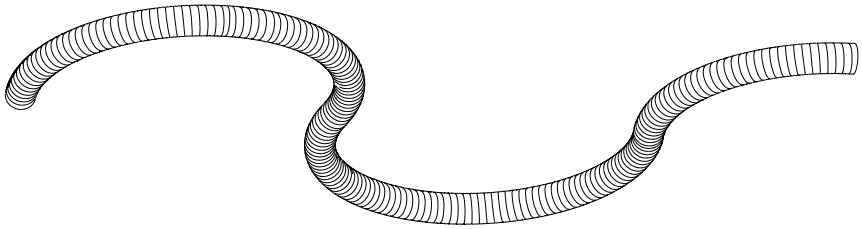
- Minimum bending radius of one-time bend is 4.921 inch (125 mm). Figure 56 shows one bend jumper.

FIGURE 56 - ONE BEND



- Minimum bending radius of repeated bend is 7.87 inch (200 mm). Figure 57 shows multiple bend jumpers.

FIGURE 57 - MULTIPLE BEND



Feeder Cable Installation

Connect main feeder cable to two jumpers, one to antenna and other to cabinet using 7/8" foamed feeder cable. Both connectors are female DIN connectors.

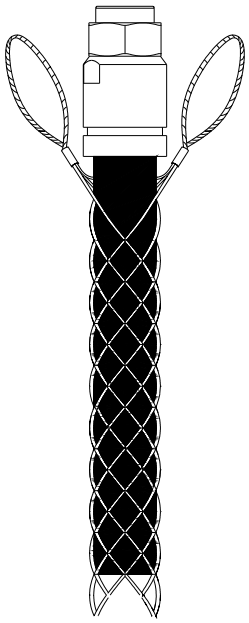
Ensure following mechanical properties while feeder cable installation:

- Minimum bending radius of one-time bend is 15.74 inch (400 mm).
- Minimum bending radius of repeated bend is 17.71 inch (450 mm).
- Maximum hoisting length for feeder cable by the hoisting trawl is 2362.20 inch (60 m).

Take following steps for feeder cable installation:

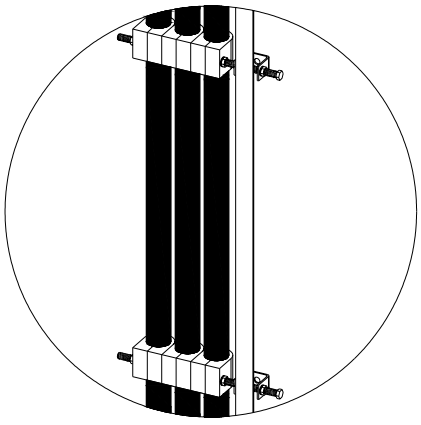
1. Ensure cable required length and cut off extra cable.
2. Prepare main feeder DIN connector at antenna side.
3. Use a pulley or hoisting trawl to hoist feeder cables to tower. Figure 58 shows hoisting trawl.

FIGURE 58 - CABLE HOISTING TRAWL



4. Make main feeder DIN connector at the other side.
5. Use feeder cable clips at every 47.24 inch (1.2 m), and add more according to requirement, so that feeder lies closely against installation pole. Figure 59 shows to fix feeder cable.

FIGURE 59 - FIXING FEEDER CABLE



6. For floor mounted BTS tower, ensure feeder cable is properly grounded at 19.68 inch ~ 39.37 inch a (500 mm ~ 1000 mm) above the bend where it connects antenna and leaves tower body, and outside the entrance to the equipment room. For feeder cable longer than 2362.20 inch (60 m), ground it in the middle and connect its metallic outer layer to grounding busbar through grounding kit. Lead a tin plated copper wire with a cross section area more than 95 mm^2 or zinc-plated flat steel out of busbar to connect corresponding grounding tower point.

   Ensure following while connector installation:

- Keep feeder cable always straight.
- Use special-purpose tools for cutting feeder cables.
- Measure cable length precisely.
- Use knife to strip the sheath of feeder cable avoid scratching external conductor.
- Keep plug-in components firm while tightening connector with spanner. Turn connector fastener so that connector is fastened firmly.
- Attach labels on both ends of main feeder cable before it is placed onto the tower.

Lightning Arrester Installation

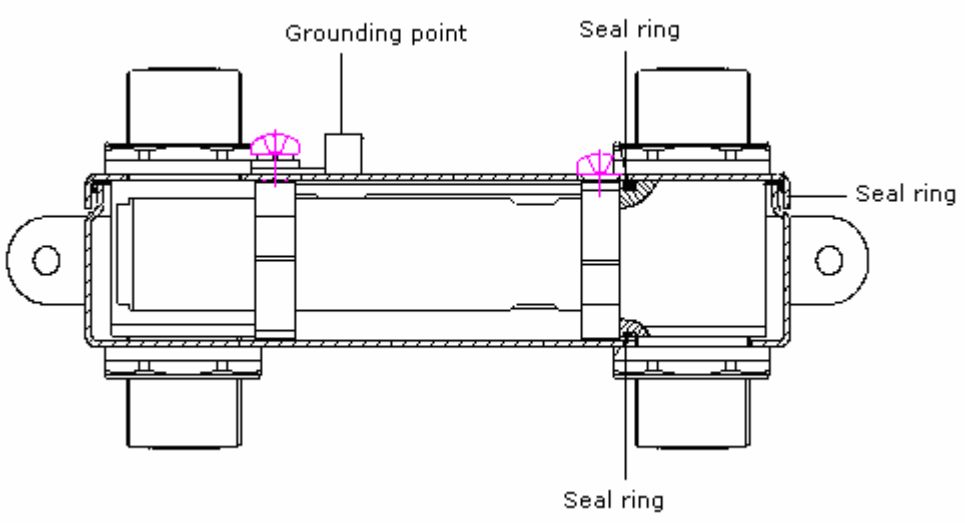
Connect all cables coming out of BTS antenna equipment room to lightning arrester, which are connected to ground cable. There are various lightning arresters, this section describes λ/4 stub as an example.

Take following steps to install lightening arrester:

1. Install lightning arrester between 7/8" main feeder cable and 1/2" cabinet-top jumper after main feeder cable enters equipment room. Lightening arrester has two DIN connectors, one is positive and other is negative. Keep maximum installation torque for lightning arrester with DIN connectors up to 25 N m, and with N connectors up to 1.7 N m. Use adjustable torque spanner to adjust torque to specified value.
2. Lightning arrester has four RF ports, which connects to 7/8" main feeder cable and 1/2" cabinet-top jumper. RF ports can be connected either to antenna or to BTS, which provides protection against lightning.

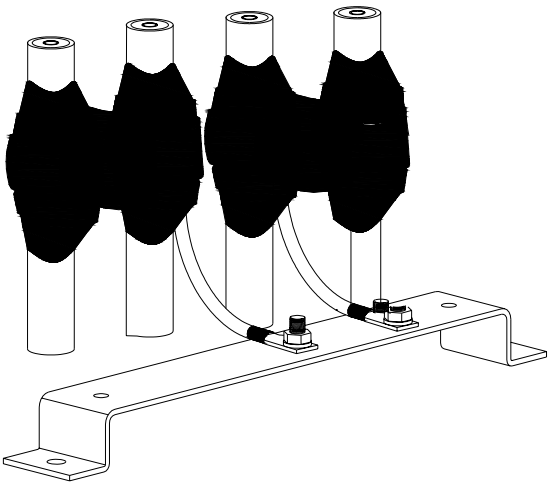
Figure 60 shows lightning arrester side view.

FIGURE 60 - LIGHTNING ARRESTER SIDE VIEW



3. Connect lightning arrester grounding pole to main grounding pole or system grounding ring, with a minimum possible grounding resistance.
4. Do not seal connectors before feeder cable performance test. Seal connectors with self-adhesive tape if test result is satisfactory. Figure 61 shows this process.

FIGURE 61 - SEALING LIGHTNING ARRESTER



Lightning arrester installation precautions:

- Do not expose RF ports outdoors.
- During installation, make sure that all grounding contact surfaces are clean, dry and not oxidized.

- Make sure that grounding port of the lightning arrester is connected to main grounding pole or grounding ring of system to ensure minimum grounding resistance.
- Install lightning arrester properly.
- Make sure that working frequency marked on lightning arrester is complies working frequency of BTS system.

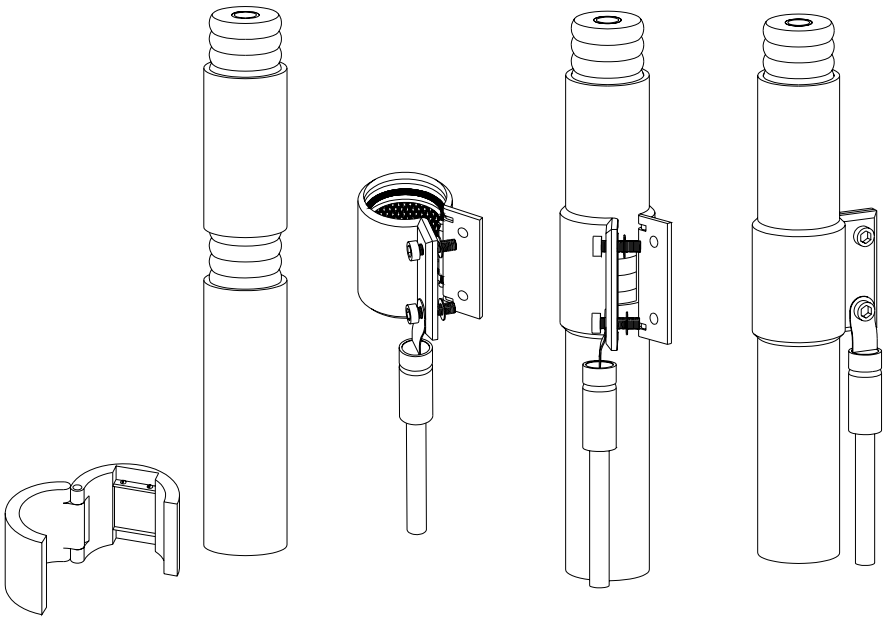
Grounding Kit Installation

Grounding kit serves to connect feeder cable external conductor and tower frame. Install grounding kit at feeder cable top near antenna and at feeder cable end near tower bottom. For a feeder cable longer than 2362.20 inch, connect a grounding clip in the middle.

Take following steps to install grounding kit:

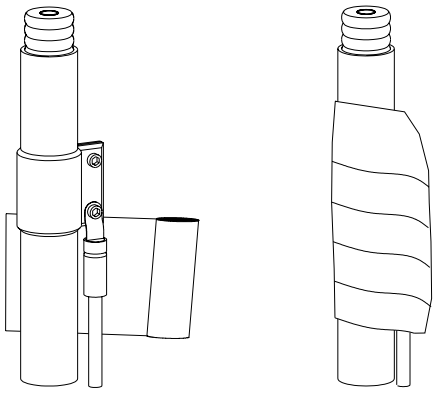
1. Fix grounding kit grounding end. Mark corresponding position on 7/8" feeder cable where grounding kit is installed, and strip 7/8" feeder cable sheath at installation position.
2. Put grounding kit grip ring around feeder cable external conductor, and then buckle the ring. Figure 62 shows this process.

FIGURE 62 - BUCKLING GRIP RING



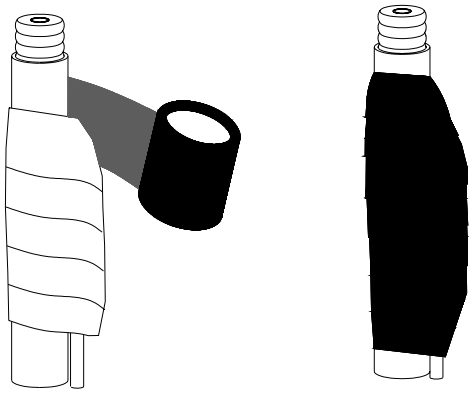
3. Use waterproof self-adhesive tape to wrap entire connecting place. Overlap each layer as half of the previous layer each time. Figure 63 shows this process. Keep wrapping direction same as buckling direction of grip ring to make connection secure. Press adhesive tape along grounding kit edge to make tape fit in closely with grip ring of grounding kit.

FIGURE 63 - WINDING WATERPROOF ADHESIVE TAPE



4. Use electrically insulated tapes to wrap entire connecting place. Wind in semi-overlapping mode so that one layer is 0.984 inch higher than previous layer. Figure 64 shows this process. Overlap electrically insulated adhesive taps by half that of previous for each loop. Pull tape to a proper length to avoid folding. Press tape with both hands to make sure that layers are in good contact.

FIGURE 64 - WINDING ELECTRICALLY INSULATED ADHESIVE TAPE



5. Connect grounding kit grounded end to tower body or special wiring pole. Remove paint and oxide around connection place with a 0.511 inch radius (13 mm). Apply antioxidant grease to clean area to ensure proper electrical contact.

Warning:

- Never install grounding kit during lightning to avoid personal injury.

Cabinet Jumper Installation

Connect cabinet and main feeder cable by a 1/2" super-flexible feeder cable. Jumper connector depends on cabinet and main feeder cable. Usually both connectors are positive DIN connectors.

Connect antenna feeder jumper to one of fixed antenna feeder bases (HYCOM1 ~ HYCOM6) on cabinet bottom.

Testing Antenna Feeder System

Test antenna feeder to check whether antenna matches feeder cable and works properly. This test involves receiver and transmitter indexes. Main tests are voltage standing wave ratio (VSWR) and RF transmit power test.

Ensure that following conditions are satisfied before antenna feeder system test:

- Antennas and feeder cables are installed and interfaces connected to antennas are disconnected.
- Feeder cable and connectors are in good condition and not damaged, and connectors are connected properly, and antennas point to right directions.
- Connectors are not sealed with adhesive tapes.

Warning:

- Avoid high-intensity microwave radiations during high-intensity RF signal device operation.
- Do not screw off connectors of transmitter output feeder or antenna feeder cable during operation.

- VSWR Test

VSWR test refers to voltage standing wave ratio (VSWR) test of TX antenna. BTS tester SITE MASTER 332B is recommended for test. VSWR must be smaller than 1.5 otherwise check antenna feeder system again. BTS system generates primary and secondary alarms for VWSR more than 1.5.

- RF Transmit Power Test

RF transmit power refers to average RF carrier power. Carry out RF transmit power test to determine power at input end of combiner and verify average transmit RF carrier power. Use site test instrument for test. BTS tester MASTER 332B is recommended. Conduct test at input end of combiner (output end of power amplification module).

Waterproofing Connectors

Seal the connectors of each cable after ensuring that antenna feeder system test is complete and result is OK. Use two types of adhesive tapes for sealing: waterproof self-adhesive insulated tape and electrically insulated adhesive tape. First wrap connectors with electrically insulated adhesive tapes and then with waterproof adhesive tapes, and finally with electrically insulated tapes again.

Electrically insulated adhesive tapes must be fire and cold-resistant and corrosion-proof, and must be able to work under a voltage of 600 V. Ensure maximum working temperature does not exceed 80°C.

Chapter 6

GPS Antenna Feeder System Installation

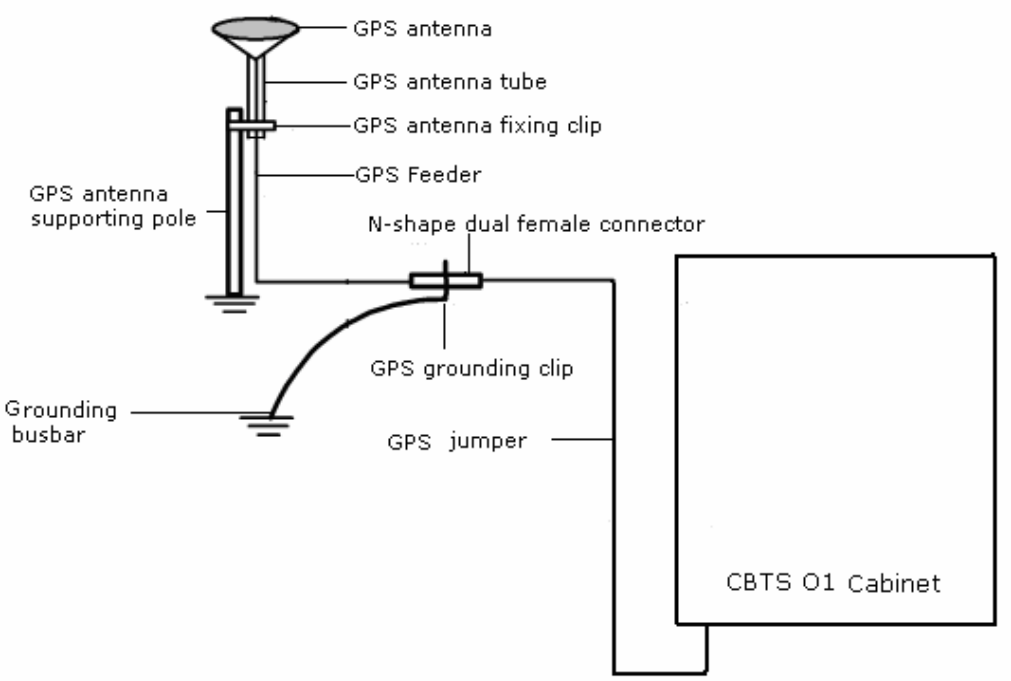
This chapter describes GPS antenna feeder system installation:

- GPS antenna feeder system structure
- Installation position and requirements
- Installation requirements
- Lightning protection requirements
- GPS connector preparation
- NJ-9 GPS connector
- GPS connector preparation procedure
- GPS connector installation check

GPS Antenna Feeder System Structure

Figure 65 shows GPS antenna feeder system composition.

FIGURE 65 - GPS ANTENNA FEEDER SYSTEM



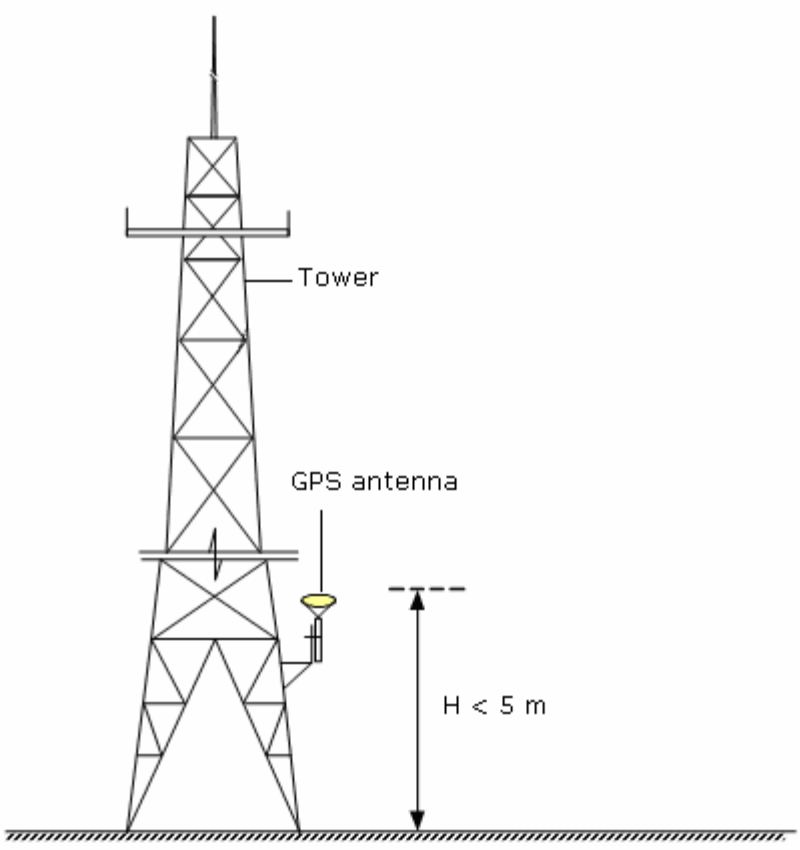
Installation Position and Requirements

There are two types of GPS antenna installation positions:

- Tower Mounted

  Figure 66 shows position of a tower mounted GPS antenna.

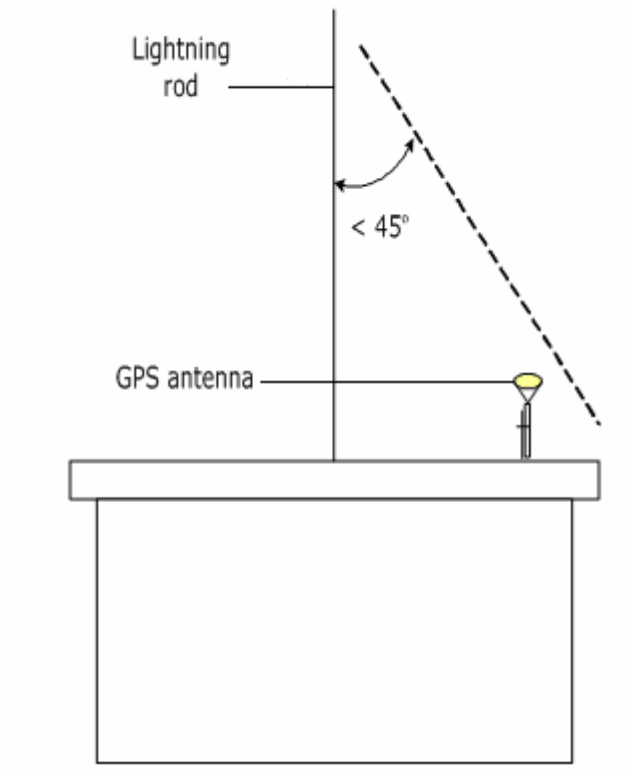
FIGURE 66 - TOWER MOUNTED GPS ANTENNA



- Roof Mounted

  Figure 67 shows position of a roof mounted GPS antenna.

FIGURE 67 - ROOF MOUNTED GPS ANTENNA



Caution:

- Both installation modes require that no obstacles are present in 150° GPS antenna elevation.

Installation Requirements

Following are GPS antenna installation requirements:

- GPS antenna installation position should have a broader view to track on maximum satellites.
- Keep coaxial cable short to reduce signal loss and lightning induction.
- For a tower mounted GPS antenna, keep horizontal distance between GPS pole and tower up to 11.81 inch (300 mm).
- Do not install GPS antenna under microwave antenna, high-voltage lines, television transmitting tower, or within radiation range of a mobile system antenna.

Lightning Protection Requirements

Following are lightning protection requirements to install a GPS antenna:

- Install GPS antenna within 45° lightning protection coverage area of tower. Otherwise, install a special lightning arrester for the GPS antenna.
- Place GPS antenna away from lightning strikes. If it is tower mounted, install it in a safe place on the roof or in tower lower part.
- Ensure that pole supporting GPS antenna is grounded.

NJ-9 Connector Preparation

This section describes NJ-9 GPS connector preparation procedure:

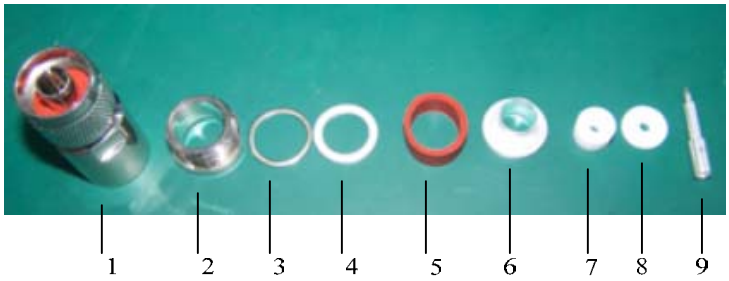
NJ-9 Connector

For GPS feeder cables shorter than 80 m use NJ-9 GPS connector. Figure 68 shows NJ-9 GPS connector.

FIGURE 68 - NJ-9 GPS CONNECTOR

Figure 69 shows NJ-9 GPS connector parts.

FIGURE 69 - NJ-9 GPS CONNECTOR PARTS



1. Shell
2. Tail connector
3. Air proof washer 1
4. Air proof washer 2
5. Air proof washer 3
6. Insulating washer
7. Insulating washer
8. Insulation plate
9. Inner conductor pin

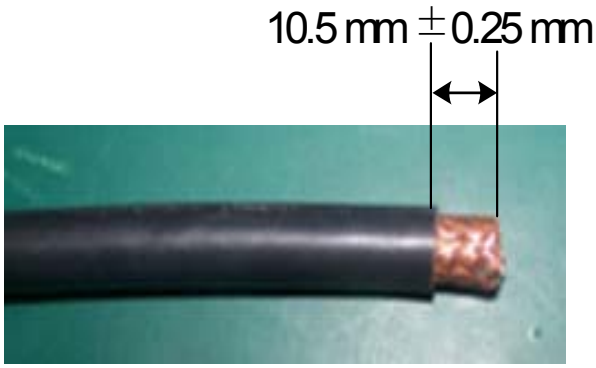
Connector Preparation Procedure

Take following steps to prepare GPS connector:

1. Stripping GPS cable shell

   Use sharp knife to strip GPS cable outer covers about 0.41 inch ± 0.009 inch (10.5 mm ±0.25 mm). Avoid damaging inner copper wires. Figure 70 shows stripped cable.

FIGURE 70 - STRIPPING GPS CABLE



2. Installing connector outer parts

   Assemble all NJ-9 outer parts from left to right on cable. Figure 71 shows external conductor assembly.

FIGURE 71 - EXTERNAL CONDUCTOR ASSEMBLY

Stretch copper wires back at one end to metal washer. Figure 72 shows white shielded layer after stretching copper wires.

FIGURE 72 - SHIELDED LAYER

Put sliver coated flange between shielded layer and insulation layer. Finally adjust shielded layer between flange and metal washer. Figure 73 shows inserting external conductor flange.

FIGURE 73 - INSERTING EXTERNAL CONDUCTOR FLANGE

3. Stripping insulation layer

   Strip insulation layer so that copper core appears. Avoid damaging copper core and cut insulation layer at equal lengths. Keep outer copper core length between 0.27 inch to 0.287 inch (7 mm to 7.3 mm). Figure 74 shows stripping insulation layer.

FIGURE 74 - STRIPPING INSULATION LAYER

Figure 75 shows cable after stripping insulation layer.

FIGURE 75 - AFTER STRIPPING INSULATION LAYER

4. Welding inner conductor pin

   Insert white insulation plate till it touches flange tightly. Figure 76 shows insulation plate insertion.

FIGURE 76 - INSERTING INSULATING PLATE

Melt a very thin layer of tin (Sn) and cover copper core homogeneously. For fixed temperature iron, adjust temperature to 350 degree Celsius and keep it for 10 seconds. For normal iron add more time till tin is melted properly. Insert copper core into pin tail hole. Ensure that pin tail touches insulation plate. Use iron to raise temperature when required. Figure 77 shows welding inner conductor pin.

FIGURE 77 - WELDING INNER CONDUCTOR PIN

5. Cutting Shielded layer

   Use plier to cut copper wires on shielded layer. Figure 78 shows this process.

FIGURE 78 - CUTTING SHIELDED LAYER

Plug pin into white supporting ring and assemble shell and cable. Figure 79 shows this process.

FIGURE 79 - ASSEMBLING SHELL AND CABLE

6. Shell tightening

   Put a piece of cloth between wrench and shell, use wrench to tighten shell and tail connecting parts. Figure 80 shows this process. Ensure that torque lies in the range of 98 Nm to 120 Nm and pin is at one level inside the cable.

FIGURE 80 - SHELL TIGHTENING

GPS Connector Installation Check

After GPS cable installation check following:

- Pin should be at same level inside the shell.
- Connector strength must be more than 60 N.
- Insulation resistance between pin and shell must be more than 5000 M ohms.
- Check resistance between feeder cable pins and conductors head.
- Check resistance between conductors head.

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Chapter 7

Board Installation

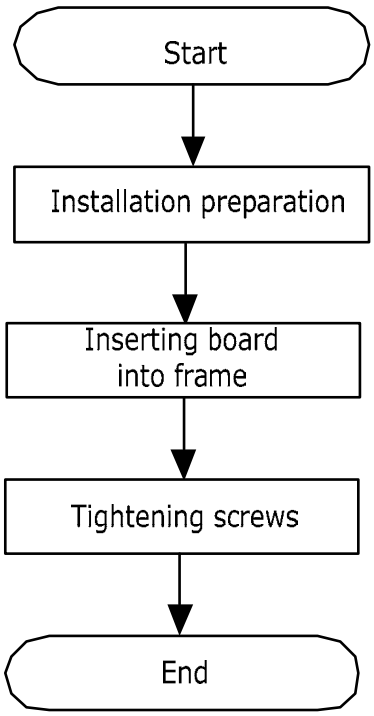
This chapter describes CBTS O1 board installation:

- Installation flow chart
- Installation procedure and precautions
- Installation precautions
- CBTS O1 board slot
- RFS board installation
- BDS boards installation

Installation Flow Chart

Figure 81 shows board installation flow chart.

FIGURE 81 - BOARD INSTALLATION FLOW CHART



Installation Procedure and Precautions

This section describes board installation in different plug-in boxes.

Caution:

- Ensure power is switched off before board installation. Only TRX and RFE are hot pluggable.

Installation Precautions

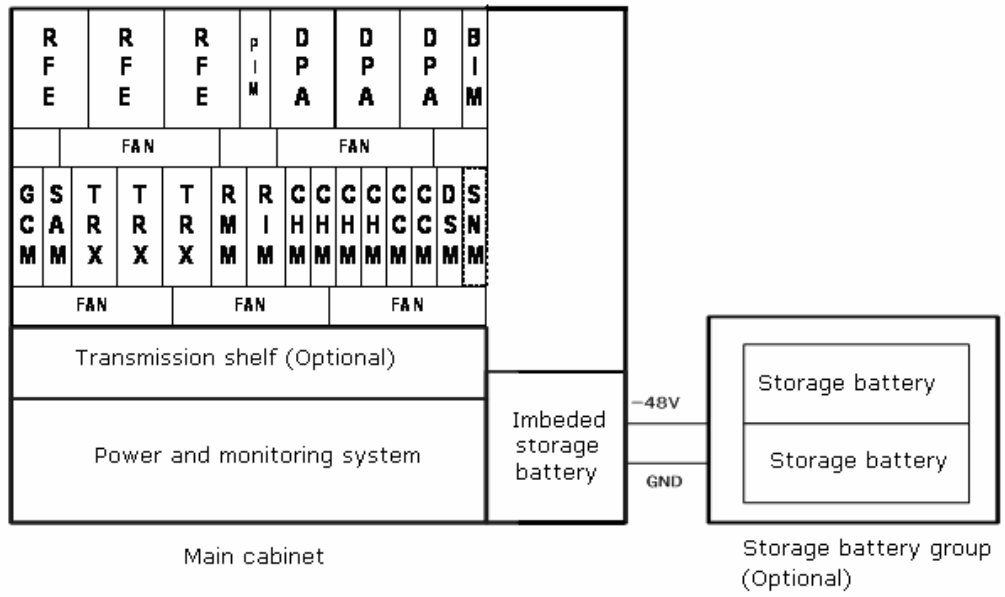
Take following precautions while board installation:

- Ensure anti-static wrist strap is grounded before operation.
- Ensure that slots for installing boards are consistent with required slots.
- To avoid damage, push boards slowly along the guide rail.

CBTS O1 Board Slot

Figure 82 shows CBTS O1 board slot.

FIGURE 82 - CBTS O1 BOARD SLOT



RFS Board Installation

Take following steps to install RFS boards:

1. Wear anti-static wrist straps.
2. Take boards out of anti-static bags and check damaged parts.
3. Select slot position for board installation.
4. Gently insert board vertically along the guide slot.
5. Lock board by pressing down ejector lever.

BDS Board Installation

Take following steps to install BDS board:

1. Preparations

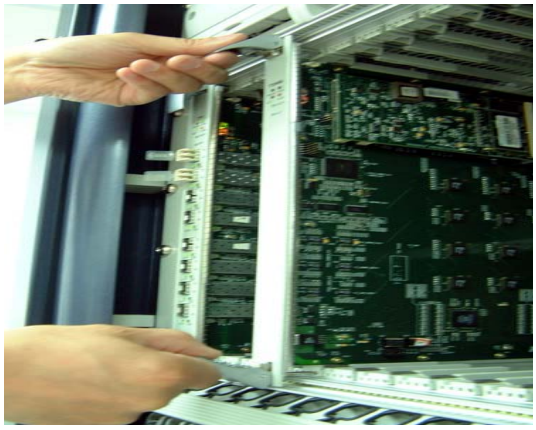
   Before installation, take board out of antistatic bag and check them. If any damages are found, register fault types, and pack them for repair.

2. Board insertion in plug-in box.

   While board insertion, determine board type and its slot, keep ejector lever in de-locking position. Push board along guide rail slowly into slot.

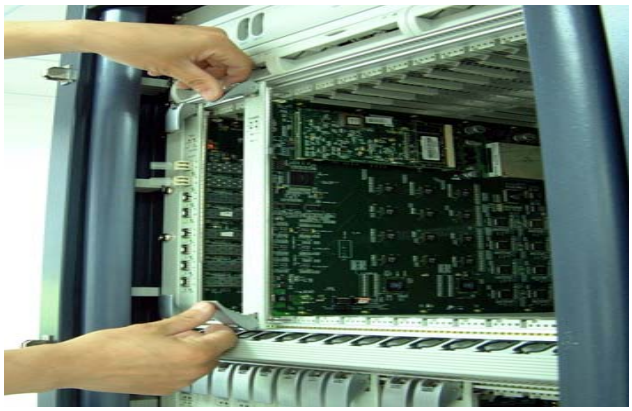
   Figure 83 shows to push board along guide rails till it reaches bayonet of extraction tool.

FIGURE 83 - BOARD PLUGGING (STEP 1)



- Push board forward and turn down extraction tool ejector levers on both sides. A click indicates that extraction tool is in the position and its ejector levers are hooked. Figure 84 shows this process.

FIGURE 84 - BOARD PLUGGING (STEP 1)



3. Tightening screws

   Tighten captive screws on extraction tools with flathead or Philips screwdrivers. Figure 85 shows this process.

FIGURE 85 - BOARD PLUGGING (STEP 3)

Note:

- To uninstall a board follow the reverse process that of board installation.

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Chapter 8

Hardware Installation Check

This chapter describes CBTS O1 hardware installation check:

- Cabinet installation check
- Cabling rack installation check
- Cable installation check
- Power and grounding cables
- Trunk and RF cables
- Board and sensor installation check
- Antenna and GPS feeder system installation check
- 1/2” indoor jumper
- Lightning arrester
- Primary and GPS feeder
- Three-way feeder clamp
- 1/2” outdoor jumper
- Antenna
- Feeder SWR
- Environment check

Cabinet Installation Check

Check following after CBTS O1 cabinet installation.

- Ensure that cabinet installation location complies with the engineering design drawing.
- Erect cabinet firmly that must resist an earthquake measuring up to 7.0 on Richter scale.
- Ensure that horizontal and verticality error and the gap between adjacent bases is less than 3 mm.
- Ensure all other equipment and cabinet front door are in one line.
- Ensure cabinet front and rear parts are at a distance of 39.37 inch (1000 m) and 31.49 inch (800 mm) away from the walls respectively.
- Ensure that all cabinet components are present.
- Ensure that all cabinet parts are fixed properly.
- Ensure inside cabinet is clean and all screws are tight with flat washers or spring washers.
- Ensure each base is equipped with four insulation spacers and base supporters are consistent with expansion screws holes.
- Ensure small cover plates at cabinet top are pushed forward to cover wire outlets.

Cabling Rack Installation Check

Ensure that:

- Cabling rack location and height meet the engineering design requirements.
- Cabling rack is in good shape.
- Cabling rack is laid out with a grounding cable.

Cable Installation Check

Check following CBTS O1 cables after installation.

Power and Grounding Cables

Check for following after laying power and grounding cables:

- Ensure that the equipment room power and grounding cables are in accordance with engineering design specifications.
- PGND protective grounding wire on a CBTS O1 cabinet employs 35 mm^2 yellowish green or yellow copper-core cable connected with indoor PGND grounding copper bars.
- Ensure that grounding cable is black copper core cable of 25 mm^2, -48 V power cable is blue copper core cable of 25 mm^2, and grounding bus has a diameter more than 35 mm^2.
- Each grounding point on grounding copper busbar is connected with one piece of equipment.
- Protective grounding and AC neutral cables are laid out separately.
- AC neutral line in power room is independently grounded.
- The outdoor grounding resistance is less than 5 ohm.
- Labels on both ends of power and grounding cables are correct.
- Avoid cable overlapping. All lengthy cables must be shortened or well coiled up.
- Copper lugs on both ends of power and grounding cables are soldered or pressed firmly.
- Entire power and grounding cables are made from one material with no connections in between.
- Grounding busbar is insulated from walls and shortest possible grounding cable is used.
- Connection of power supply to cabinet terminals is correct.
- Insulating protective sleeves are installed on both power supply connecting terminals.
- Power and grounding cables are not damaged.
- Wires at connecting terminals and lug handle are properly insulated.
- Connecting terminals are equipped with flat and spring washers.

Trunk and RF Cables

Ensure that:

- Trunk cable connectors are properly installed, labelled and are not loose.
- Trunk cables have some margin for expansion.
- Cable connector shell is properly connected with grounding system.
- RF cables between modules in cabinet are properly connected.
- Unused connectors are screwed on with a matching terminal.
- RF cables between TRX, DPA and RFE are in parallel and ensure some margin at bends.

Board and Sensor Installation Check

Ensure that:

- Slots for board installation comply with the engineering design.
- Board screws on cabinet are tightened properly.
- Board is properly connected with backplane.
- Temperature and humidity sensor are vertically installed and cables are properly connected to cabinet top.
- Smog sensor is horizontally installed and cables are properly connected to cabinet top.

Antenna and GPS Feeder System Installation Check

Ensure that antenna and GPS feeder system are installed according to engineering design specifications. Check for following after antenna and GPS feeder system installation:

1/2” Indoor Jumper

- Indoor jumper is properly connected to terminal on cabinet top.
- Indoor jumpers are tidy, in appropriate length and bound on cabling rack in order.
- Jumpers are laid in layers according to sectors.
- 11.81 inch (300 mm) straight jumpers are connected between cabinet and a lightning arrester.

Lightning arrester

- RF lightning arrester is connected to feeder connector and fastened tightly.
- GPS lightning arrester 6 mm^2 yellow grounding cable is properly connected with outdoor grounding copper busbar.
- RF and GPS lightning arresters are mounted between two crosspieces of cabling rack without touching cabling rack.
- Lightning arrester is insulated from cabling rack.
- Lightning arrester rack grounding cable is grounded and routed to outdoor grounding bar for reliable grounding.

Main GPS Feeder

- Ensure the main feeder profile is flat and smooth. There are no copper scraps in copper tube. Feeder connectors are connected tightly. Use a special cutter to prepare main feeder connector.
- 7/8" feeder connector is installed properly and tightened well to avoid any abnormal SWR caused by false connections.
- Feeder between the tower top and the equipment room is grounded in at least three points. Grounding points are bound firmly with proper waterproof measures.
- When tower is 2362.20 inch (60 m) above and needs a longer feeder, place another feeder grounding clip in middle of the tower.
- Feeder grounding clip terminals are fixed on steel plate of a nearby tower.

- Outer grounding copper busbar employs a special reliable path to an underground ground grid. The line width is more than 50 mm^2.
- For a building without a tower, antenna feeder ground at top is connected with nearby lightning protection ground grid on the roof.
- Feeder grounding cable is led from top to bottom. Separation angle between feeder and grounding cable is no more than 15°.
- Feeder cabling has no crisscrossing. Cables are arranged properly without twists and turns.
- Minimum bending radius of feeder is no more than 20 times the feeder radius, and bending radius of main feeder is more than 11.81 inch (300 mm).
- Main feeder cabling is well planned. Main feeders within a sector are arranged in a row and column consistently.
- Two name labels are bound on both feeder terminals, to ensure that feeders correspond to antennas with corresponding lengths on a feeder name plate.
- There is no dry joint in soldering GPS core wire.
- GPS copper core and outer layer are not short-circuited.
- GPS feeder connectors are tight.

Three – Way Feeder Clamp

- Three-way feeder clamp is fixed on outdoor cabling rack.
- Intervals between feeder fixed clips are even and in same direction.
- A feeder clamp is installed every 59.05 inch on primary feeder.

1/2” Outdoor Jumper

- Antenna and 1/2" jumper, 1/2" jumper and main feeder are properly connected, connector threads are tightened and wrapped with waterproof adhesive tape.
- Jumper and antenna are parallel to each other with 11.81 inch (300 mm) distance in between at the joint.
- All outdoor jumper connectors are made waterproof and jumper is equipped with a waterproof curve.

Antenna

- Antenna support and tower are properly installed.
- Antenna model is according to networking planning design.
- Actual hanging height of an antenna is according to network planning design.
- RF and GPS antennas are included in the protection area of a lightning arrester (area within 45^0 down tilt from lightning arrester).
- Azimuth of antenna is according to network planning. Azimuth error of directional antenna is no more than 5^0.
- Actual mechanical down tilt of an antenna is according to network planning and two uni-polarization antennas have same down tilts.
- Actual electrically controlled down tilt of an antenna is according to network planning and two uni-polarization antennas have consistent down tilt.
- All antenna poles are firmly installed and properly grounded. Vertical error is less than 2^0. All antennas must be vertical to ground.
- Receive/transmit horizontal interval of an omni-directional antenna is not less than 137.79 inch (3.5 m).
- An omni-directional antenna is at least 59.05 inch (1.5 m) away from the tower while a directional antenna is at least 39.37 inch (1 m) away from the tower.
- While installing an omni-directional antenna on a roof, horizontal interval between omni-directional antenna and antenna lightning arrester is not less than 98.42 inch (2.5 m).
- An omni-directional antenna installed on a roof avoids blind area.
- Main diversity antennas match each other within the sectors and the set top jumpers on the rack.
- Diversity distance is 137.79 inch (3.5 m) for 800 MHz system, 59.05 inch for 1.9G system, and 263.77 inch (6.7 m) for 450 MHz system.
- Vertical interval between directional antennas within different sectors, installed on same antenna support is more than 23.62 inch (0.6 m).
- GPS spatial angle is more than 90^0.
- While installing GPS antenna on building top, it is equipped with an independent lightning arrester.

Feeder SWR

- SWR is measured after antennas and all feeders are installed.
- Indoor 1/2" jumper terminal is connected with an SWR tester for testing. SWR should be less than 1.5.
- Related Voltage Standing Wave Ratio (VSWR) value is specified, and a VSWR test diagram is available.

Environment Check

Ensure that:

- Outdoor engineering wastes are cleaned after the installation is over.
- Front and rear doors and cabinet sides are cleaned.
- Clean all fingerprint and other stains on cabinet surface.
- Indoor unused materials are put away. Material in equipment room is kept in order. Everything indoor is clean and tidy.
- Any engineering waste materials are disposed off. Leave no cable clips or sundries at the installation site.

Chapter 9

Power On and Off Mechanism

This chapter describes:

- Power supply inspection
- Precautions
- Power-on procedure
- Power-off procedure

Power Supply Inspection

Ensure following before powering on CBTS O1:

1. All boards are installed according to corresponding slot numbers and configurations.
2. All boards are properly inserted into slots.
3. Cables between same and different racks (including cables on cabinet backplane) are connected correctly.
4. Cables between CBTS O1 and BSC are connected correctly.
5. Input power supply is according to required values of 220 V. Fluctuation range is 130 V ~ 300 V AND 110 V in range of 90 V ~ 140 V.
6. Antenna feeder is installed correctly.
7. Racks, antennas feeder cables and lightning arresters are properly grounded.
8. All selection and control switches are set at specified start position.

Precautions

- Avoid hot plugging of boards, wear anti static wrist strap when required.
- Unplug all boards gently.
- Ensure right position of each board according to slot number.
- Do not touch any component, connector or wiring slot when holding a board.

Power-on Procedure

Take following steps to power on CBTS O1:

1. Ensure that various power switches are in OFF status.
2. Turn on AC power switch at cabinet bottom plate.
3. Turn on AC main switch AC MAIN SW of power subrack.
4. Turn on other switches of power subrack in following sequence:

   AC heat exchanger, AC lighting, L1_L10 load, DC heat exchanger, L12_transmission and battery.
5. Turn on breaker protection switch of each board one by one.
6. After powering on check indicators of each panel.

Caution :

- If anything goes wrong in any of above steps shut down power supply immediately, find fault and repeat the step again. Do not power on cabinet until fault is removed.

Power-off Procedure

CBTS O1 power-off procedure is reverse of power-on procedure.

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Appendix A

Packing, Storage and Transportation

This appendix describes:

- Packaging
- Cabinet packing
- Cabinet packing procedure
- Board packing
- Board packing procedure
- Base packing
- Engineering material packing
- Transportation
- Storage

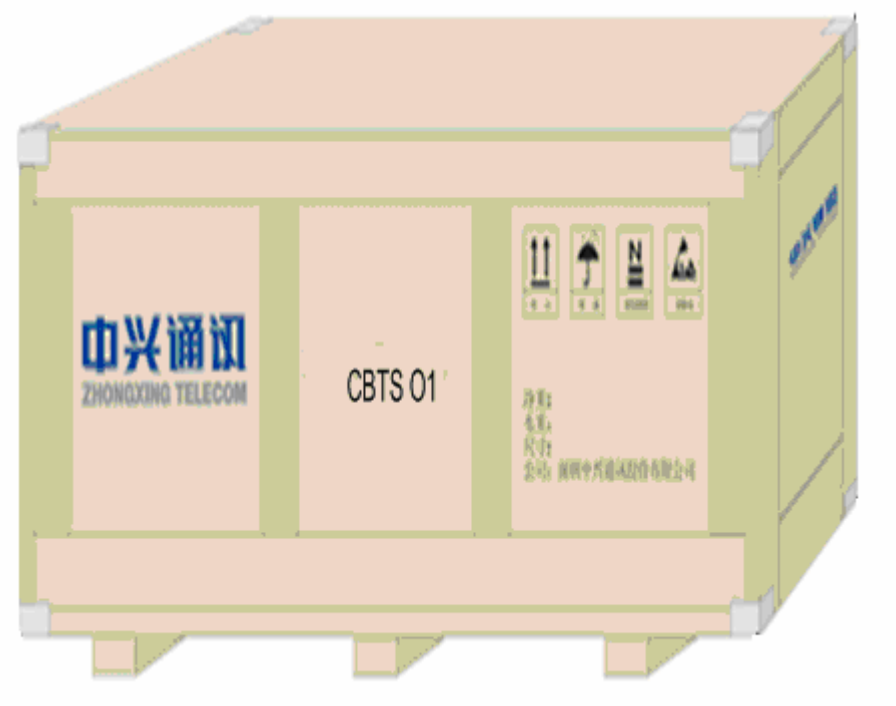
Packaging

Following sections describes packing cabinet parts in a wooden box.

Cabinet packing

Figure 86 shows wooden box dimensions to pack cabinet.

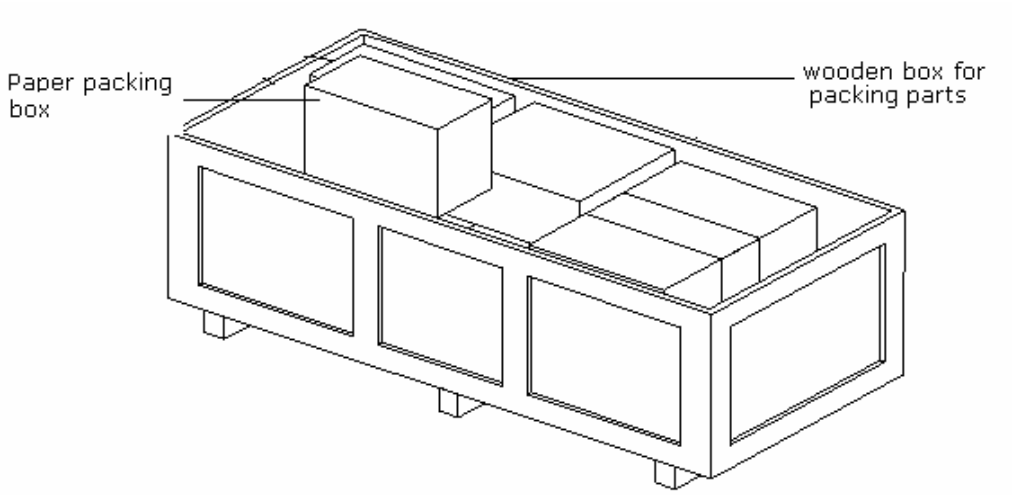
FIGURE 86 - WOODEN PACKING BOX FOR CABINET



Pack RFE board in a paper packing box made for RFE boards. Pack TRX and DPA boards in a universal paper packing box. Pack power board in a universal paper packing box for parts. Pack the base in a paper packing box made for base and put in a wooden packing box for parts.

Figure 87 shows wooden box used for packing parts. Pack engineering accessories in a universal external paper packing box and put them in a wooden packing.

FIGURE 87 - WOODEN PACKING BOX FOR PARTS



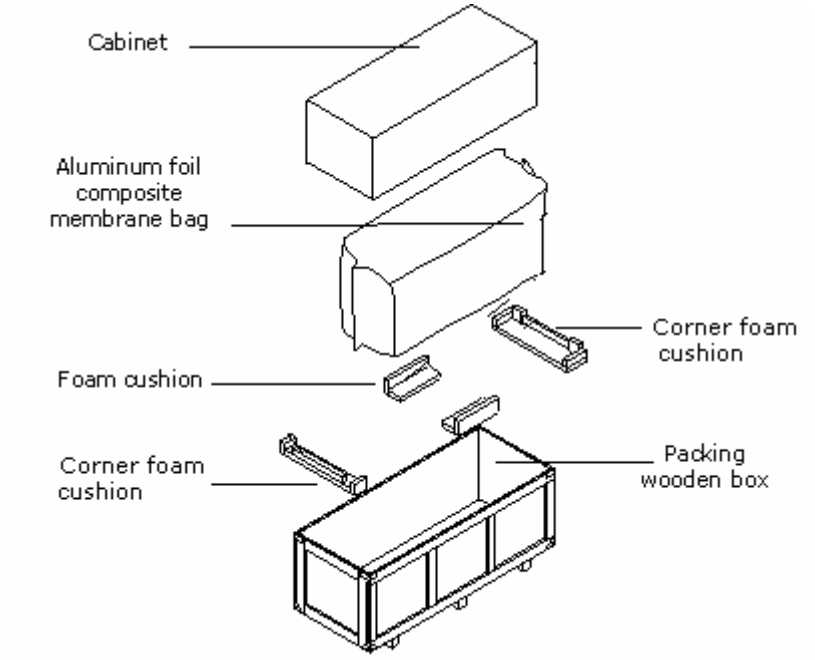
Cabinet Packing Procedure

Follow procedure below to pack a cabinet:

1. Blow away dirt from cabinet and clean it with ethyl alcohol.
2. Put dustproof caps onto DB9 socket and N-type socket at the set top, SAA socket and DB25 socket at E1 cable set top, and 17W2 female sockets at the DPA layer.
3. Lay cabinet onto the ground covered with a foam cushion, with cabinet door upward. Lower hook of an electric crane to a proper location. Put nylon rope on the hook around 4 hanging points. Hoist the hook to lift cabinet.
4. Open aluminum foil compound film bag and put cabinet into the bag.
5. Put a cushion into a wooden packing box, push wooden packing box until it is under the hoisted cabinet and put the cabinet slowly into the wooden box.
6. Put desiccant bags into aluminum foil compound film bag. To wrap cabinet tightly by aluminum foil compound film bag, extract air in the bag with a cleaner. Seal the aluminum foil compound film bag.

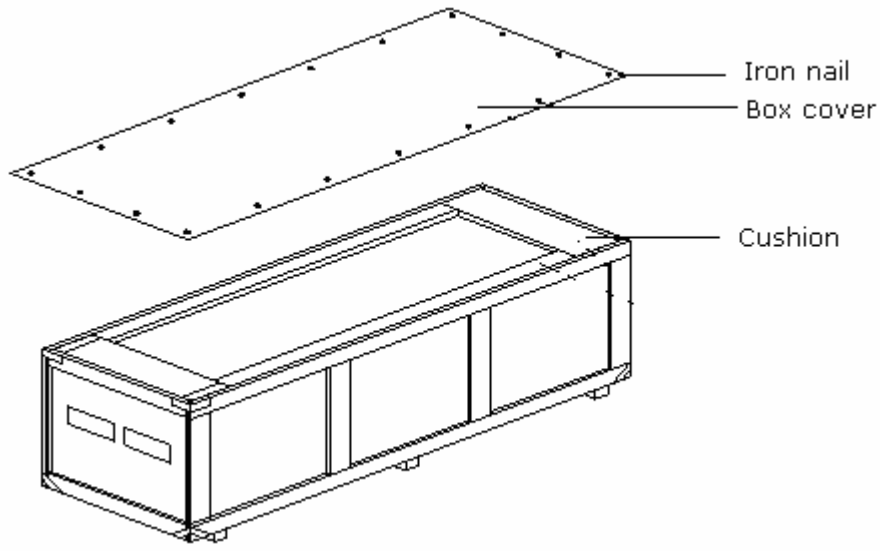
7. Put cushions around cabinet and put cabinet into a wooden packing box for cabinets, Figure 88 shows this process.

FIGURE 88 - CABINET PACKING



8. Seal a wooden packing box for cabinets. Put cushions around rack, cover the box and drive nails into wooden case. Figure 89 shows sealing a box.

FIGURE 89 - SEALING A BOX



Board Packing

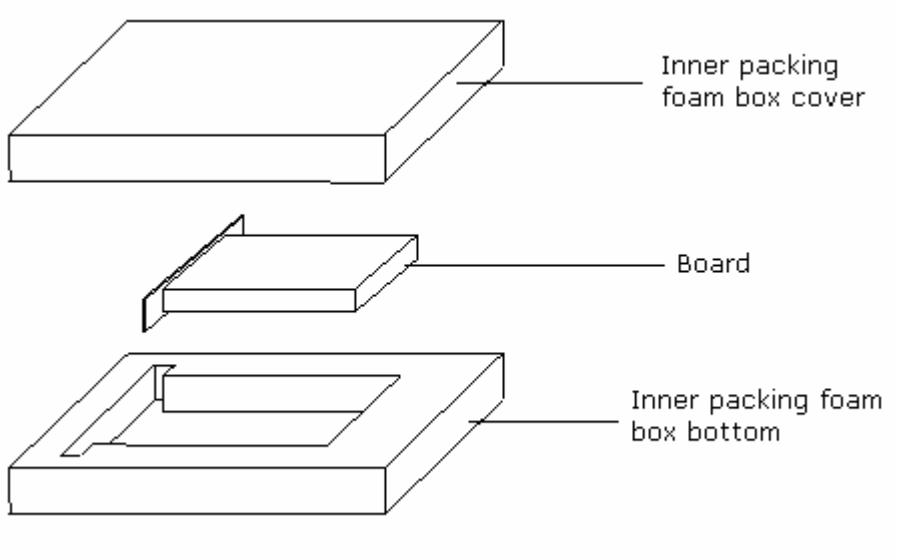
Before packing CBTS O1 cabinet, ensure to dismount heavy boards such as RFE-RFE, RFE-DIV, DPA and TRX from the cabinet, which are packed separately.

Board packing procedure

- RFE, TRX and DPA Packing

  Figure 90 shows that these boards are packed inside a packing foam box first and then put in the packing boxes.

FIGURE 90 - INNER PACKING FOAM BOX



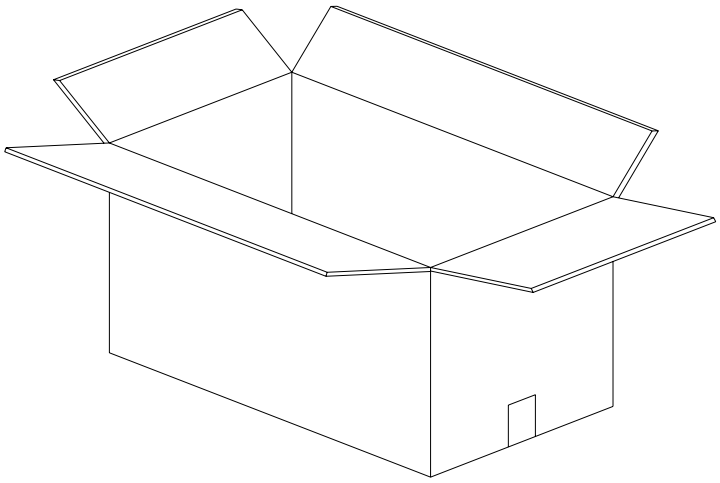
Board packing procedure is as follows:

i. Clean the board panels with alcohol.

ii. Place RFE, TRX and DPA boards into their own inner packing foam boxes. Mark cover and bottom of foam box with silkscreen for packing.

iii. After TRX and DPA boards are put into a foam box, put them into a universal paper packing box made for boards. Figure 91 shows packing box.

FIGURE 91 - GENERAL PAPER PACKING BOX FOR BOARDS



iv. Put RFE board into a foam box and then into a paper packing box. Figure 92 shows this box.

FIGURE 92 - PAPER PACKING BOX FOR RFE BOARDS

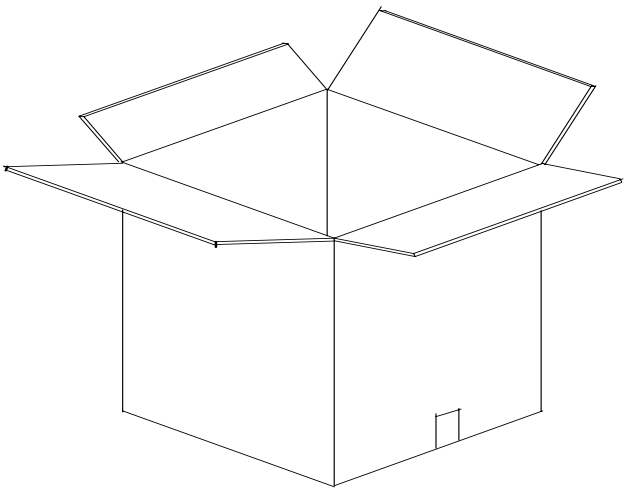
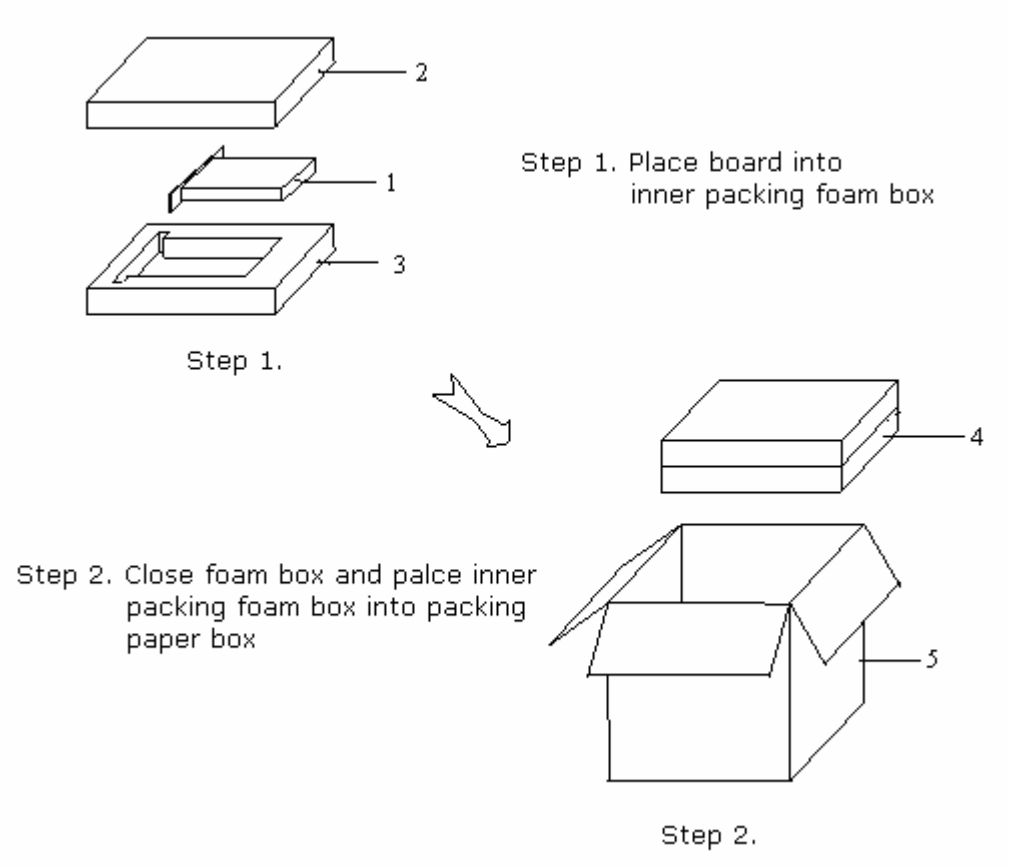


Figure 93 shows procedure for board packing.

FIGURE 93 - PACKING RFE, DPA AND TRX BOARD

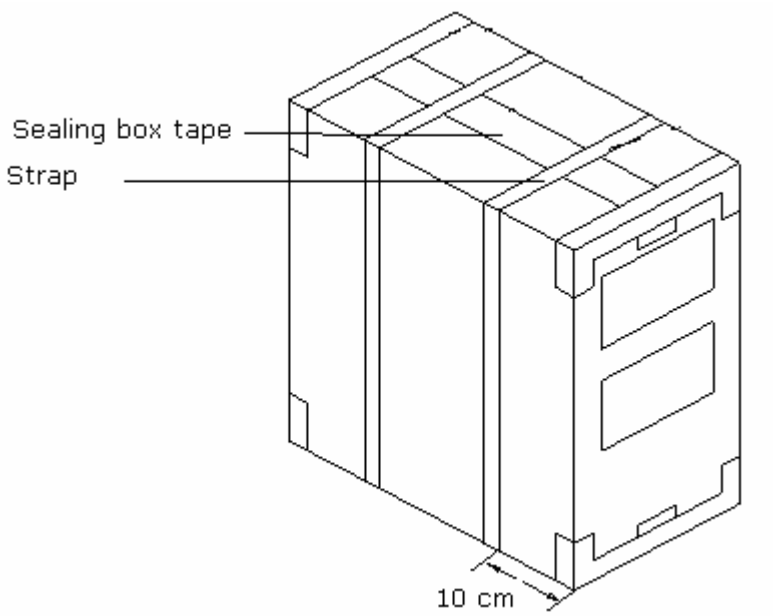


1. Board
2. Inner packing foam box cover
3. Inner packing foam box bottom
4. Closed foam box
5. Paper packing box

v. Put packing list into a paper packing box and some packets of desiccant.

vi. Seal the box top with a tape according to H shape. Figure 94 shows to put straps around the paper box at 3.39 inch (10 cm) away from the end.

FIGURE 94 - SEALING AND PACKING



Base Packing

CBTS O1 cabinet base is packed in a paper packing box for base. Pack 8 M10 x 80 expansion bolts and washers in a small plastic bag and put into a paper packing box for bases. After packing, put the paper packing box for bases into a general wooden packing box for parts.

Engineering Materials Packing

Put engineering materials (such as antenna, power and transmission cables, 1/2" jumper, GPS cable, three-way feeder clamp, and grounding clip) into original paper packing boxes.

Put small engineering materials (such as the lightning arrester, adhesive tape and connecting nose) into a general external paper packing box for engineering accessories according to their quantity codes.

Seal above paper packing boxes and put them into a wooden packing box for engineering accessories.

Transportation

Take following measure for equipment transportation:

- Products are in a specified container and according to container transportation marks.
- There are no more than 3 layers for wooden packing box and 4 layers for paper packing box. Sophisticated equipment is placed above and others below. Centre of gravity height is no more than 78.74 inch (20 m), and vehicle is not overloaded.
- Vehicle velocity is such to ensure safety based on road conditions.
- Products are away from flammable, explosive or corrosive articles.
- Protect equipment from rain, snow or other liquids, dirt, sunlight, collision and materials with strong magnetism and radiation while transportation.
- Cover equipment with tarpaulin during open-air transportation.
- In long-distance transportation, do not load equipment on an open ship or carriage. In case of transhipment, do not store equipment in an open storehouse.
- Deliver and store precision instrument, meters, computers and monitors according to moisture, shock and pressure-proof labels in the packing box.
- Always keep products upright.
- Pay attention to safety while handling equipment. Ensure that only skilled workers are operating the handling tools.

Storage

Take following measure for equipment storage:

- Products and its components are in original packages.
- Storage sites are clean, dry, and ventilated, with air-conditioning and lighting facilities. Temperature and humidity range is according to the requirement.
- Equipment is not under direct sunlight.
- Storehouse is equipped with moisture-proof, dustproof, shockproof and corrosion-resistance facilities, and the corresponding antistatic facilities for static-sensitive materials.
- All goods are clean and in order with clear labels.
- Keep a record of all equipment. Ensure goods location codes or other necessary marks for the stored materials.

- Check stock conditions regularly. Update inventory record once a month.
- Install antistatic floorboards at warehouse entrance.
- Place material in warehouses based on “First-in-first-out” principle.
- Check equipment conditions by performing tests, if the product is stored for more than six months.

Appendix B

SiteMaster Usage

This appendix describes SiteMaster usage:

- Frequency range selection
- SiteMaster check
- Feeder input parameters
- Tester installation
- Measuring SWR
- Measuring DTF

Note:

- SiteMaster usage depends on model type used. Refer to device usage documents attached for usage.

Frequency Range Selection

Take following steps to select a frequency range using SiteMaster:

1. Press <ON**>** to turn on SiteMaster meter.
2. Press <FREQ**>** on the main menu.
3. Press <F1> on the [Frequency] menu.
4. Input [Lower] frequency, such as 825 MHz, and press <Enter**>** for confirmation.
5. Press <F1> on the [Frequency] menu.
6. Input [Higher] frequency, such as 880 MHz, and press <Enter> for confirmation.
7. After confirmation, press [Main] to return to the main menu.

SiteMaster Check

Check the SiteMaster for frequency, environment and feeder parameters changes. Take following steps to check:

1. Before check, ensure that input frequency range in SiteMaster is correct.
2. Press <STARTCAL> to start check.
3. Press <Measuring OPEN>, <Measuring SHORT> and <Measuring Load> as indicated to complete the check.
4. Include the extension cable attached with the meter to ensure measurement accuracy.

Feeder Input Parameters

Take following steps to input feeder parameters:

1. Press <DIST>
2. Press <MORE>
3. Press <LOSS> to enter input feeder loss (dB) per meter. Press <Enter> for confirmation.
4. Press <PROP V> to enter relative transmission rate. Press <Enter> for confirmation.
5. Press <Main> to return to the main menu.

Tester Installation

Connect extension cables one end to RFE jumper connector inside the cabinet and other end to Refl meter interface.

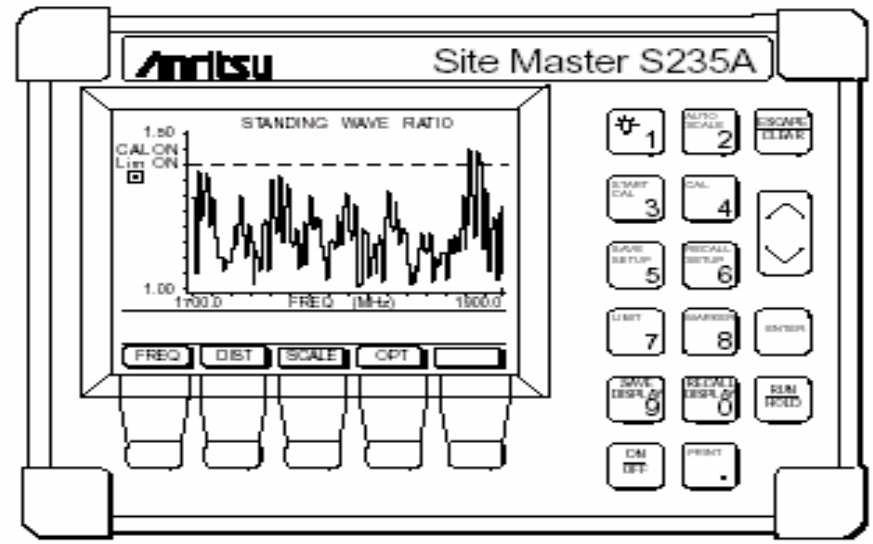
If active devices such as tower top amplifier or trunk amplifier are used for feeder measurement, use jumpers to dodge it.

Measuring SWR

Take following steps to measure SWR:

1. Press <OPT>
2. Press <B1> and select [MODE]
3. Press <Up> or <Down> to choose <SWR> and press <Enter> for confirmation.
4. Press <MAIN>to return to the main menu.
5. Input a proper frequency range if required.
6. Check meter if required.
7. Press <MAIN>to return to the main menu.
8. Press <RUN> to take measurement.
9. Press <AUTO SCALE> to adjust screen Y-coordinates.
10. View the frequency SWR values within this frequency band, Figure 95 shows this process.
11. Press <Save Display> to store data.

FIGURE 95 - ANTENNA FEEDER SWR TEST

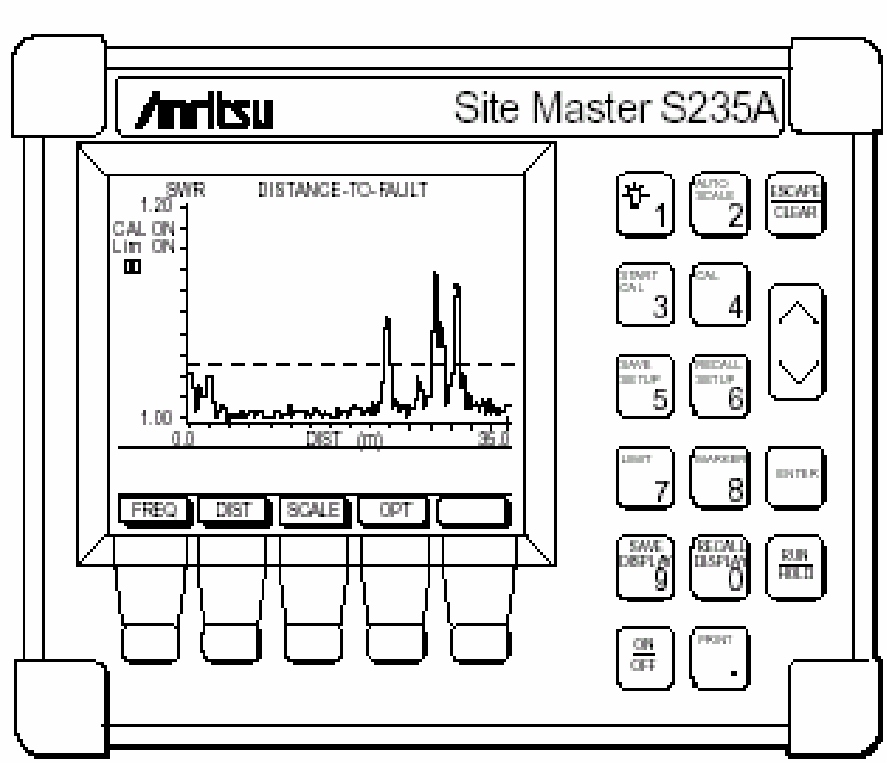


Measuring DTF

Take following steps to measure DTF:

1. Press <OPT>
2. Press <B1>and select {MODE}
3. Press <Up> or <Down> to choose [SWR] and press <Enter> for confirmation.
4. Press <MAIN> to return to the main menu.
5. Input a proper frequency range if required.
6. Check meter if required.
7. Input a proper feeder length if required.
8. Press <MAIN> to return to the main menu.
9. Press <RUN> to take measurement.
10. Press <AUTO SCALE> to adjust screen Y-coordinates.
11. Press <Mark>to view SWR value of each frequency point within this frequency band. Check the fault points. Figure 96 shows DTF measurement.
12. Press <Save Display>to save data.

FIGURE 96 - MEASUREMENT OF ANTENNA FEEDER DTF



Acronyms

Abbreviation	Full Name
1x EV	1x Evolution
1x EV - DO	1x Evolution Data Only
1x EV - DV	1x Evolution Data & Voice
2C3S	Two carriers and three sectors
4C3S	Four carriers and three sectors
A	A Interface - Interface between BSC and MSC
AAA	Authentication, Authorization and Accounting
Abis	Abis Interface - Interface between BSC and BTS
ATM	Asynchronous Transfer Mode
BDS	Baseband Digital System
BIM	BDS Interface Module
BSC	Base Station Controller
BSS	Base Station System
BTS	Base Transceiver Station
CBTS O1	Compact Base Transceiver Station
CCM	Communication Control Module
CDM	Clock Distribution Module
CHM	Channel Processing Module
DBS	Database Subsystem
DSM	Data Service Module
EPLD	Electrically Programmable Logic Device
FA	Foreign Agent
FER	Frame Error Rate
FPGA	Field Programmable Gate Arrays
GCM	GPS Control Module
GCKM	GPS Clock Module
HA	Home Agent
HDLC	High Level Data Link Control
HDR	High Data Rate

Abbreviation	Full Name
HLR	Home Location Register
DPA	High Power Amplifier
IP	Internet Protocol
LNA	Low Noise Amplifier
MAC	Media Access Control
MBTS	Master BTS
MSC	Mobile Switching Center
MTBCF	Mean Time Between Critical Failure
MTBF	Mean Time Between Failure
MTTR	Mean Time To Recovery
O&M	Operations and Maintenance
OMC	Operation and Maintenance Center
OSS	Operating System Subsystem
OTD	Orthogonal Transmit Diversity
OW	Order Wire
PA	Power Amplifier
PCF	Packet Control Function
PDSN	Packet Data Serving Node
PP2S	Pulse Per 2 seconds
PPP	Point to Point Protocol
RF	Radio Frequency
RFS	Radio Frequency Subsystem
RIM	Radio Interface Module
RRFS	Remote RFS
RSSI	Received Signal Strength Indicator
RX	Receiver
SAM	Site Alarm Module
SBTS	Slave BTS
SCH	Synchronization Channel
SCS	System Control Subsystem
SDH	Synchronous Digital Hierarchy
SNM	SDH Net Module
STS	Space Time Spreading
TOD	Time of Date
TX	Transmit

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