3G Mobile Communication cdma2000 System – All-IP Architecture

ZXC10 BTSB I1 (V1.0)
cdma2000 Base Transceiver Station

Installation Manual

ZTE CORPORATION

ZXC10 BTSB I1(V1.0)

cdma2000 Base Transceiver Station

Installation Manual

Manual Version 20040615-R1.1
Product Version V1.0

ZTE CORPORATION

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Suggestions and Feedback

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Preface

About This Manual

This manual introduces the hardware installation flow and method of the ZXC10 BTSB I1.

It is one of the manuals of the CDMA cellular mobile communication system of ZTE. This manual is intended to provide basic installation operation guide to the engineering staff that install the ZXC10 BTSB I1 of ZTE. Operation and maintenance staff of the equipment can also use it as reference.

Standardized hardware installation is the basis for the normal and stable operation of the BS and is thus important in the project engineering. To guide the hardware installation of ZXC10 BTSB I1, this manual is arranged in the order of engineering installation. This manual first briefs the equipment composition, which enables the engineering staff to have an overall understanding of the ZXC10 BTSB I1 of ZTE. Then it details the installation flow of the equipment and the installation check.

How to Use This Manual

This manual comprises 15 chapters:

Chapter 1 Installation Overview briefs the equipment installation and commissioning flow, the hardware installation flow and the hardware installation precautions for the BTSB system.

Chapter 2 Installation Preparations introduces the preparations prior to the BTSB installation, including installation environment check, and preparation for tools, instruments and technical documentation.

Chapter 3 Unpacking and Acceptance describes unpacking, acceptance and handover of the goods.

Chapter 4 Cabinet Installation describes the installation of the BTSB cabinet, and the layout, connection and fixing of multiple cabinets.

Chapter 5 Power System Installation describes the installation procedure of the BTSB power system.

Chapter 6 Grounding System Installation describes the installation procedure of the BTSB grounding system.

Chapter 7 Cable Installation in Cabinet introduces the types of BTSB cabinet internal cables, and describes the installation procedure of them.

Chapter 8 Trunk Cable Installation describes the installation procedure of the BTSB trunk cables, and explains how to prepare the E1 cables and how to convert the 75 Ω trunk cables into the 120 Ω trunk cables.

Chapter 9 Monitoring System Installation introduces the composition of the monitoring system and describes its installation procedure.

Chapter 10 Main Antenna Feeder System Installation describes the installation preparation, the installation flow and the specific installation procedure of the main antenna feeder system, and explains how to check and test the antenna feeder and how to conduct waterproof treatment on the connector.

Chapter 11 GPS Antenna Feeder System Installation describes the installation preparation, the installation flow and the specific installation procedure of the GPS antenna feeder system.

Chapter 12 Board Installation describes the types and functions of boards used in the BTSB system, and how to install and replace them.

Chapter 13 Hardware Installation Check describes the hardware installation check requirements of the BTSB system.

Chapter 14 Power-on/Power-off describes the check prior to the BTSB power-on, and the detailed power-on and power-off operation procedures.

Appendix A - Appendix D gives supplementary information on the BTSB technical performance indices and board indicators, and an abbreviation form.

Conventions

Describing notational conventions, keyboard operation convention, mouse operation convention and four safety signs.

1. Notational conventions

   Angular brackets "<and>" identify names of keys and buttons, and the information typed by an operator from a terminal. Square brackets "[and]"

indicate a man-machine interface, menu item, data list, or field name. The symbol "-->" separates a multi-level menu, e.g., [File --> New --> Folder] indicates the [Folder] menu item under the [New] submenu of the menu [File].

2. Keyboard operation conventions

Format	Description
Character within angular brackets	Indicating a key or button name, e.g., <Enter>, <Tab>, <Backspace>, and <a>
<key 1+key 2>	Indicating to hold several keys down at the same time. For example, <Ctrl+Alt+A> indicates to hold down "Ctrl", "Alt" and "A" three keys
<key 1, key 2>	Press Key 1 first. Then release Key 1 and press Key 2. For example, <Alt, F> indicates to press and release <Alt> key, and then press <F> key

3. Mouse operation conventions

Format	Description
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 move the mouse

4. Signs

Four eye-catching signs are used in this manual to emphasize important and critical information.

 Note,  Caution,  Warning, and  Danger: Used to indicate the precautions during the operation.

Statement: The actual product may differ from what is described in this manual due to frequent update of ZTE products and fast development of technologies. Please contact the local ZTE office for the latest updating information of the product.

FCC & IC STATEMENT

Before using this product, read this important RF energy awareness and control information and operational instructions to ensure compliance with the FCC and IC 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 and IC grant.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the FCC and IC 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.

For OUTDOOR use, a PNALE Antenna with a maximum gain of 17dBi is authorized for use with this unit. Outside antennas must be positioned to observe minimum separation of 3.0M (9.84 feet.) for 800MHz unit and 2.5M (8.2 feet.) for 1900MHz unit from all users and bystanders. For the protection of personnel working in the vicinity of outside (uplink) antennas, the following guidelines for minimum distances between the human body and the antenna must be observed.

The installation of an OUTDOOR antenna must be such that, under normal conditions, all personnel cannot come within 3.0M (9.84 feet.)for 800MHz unit and 2.5M (8.2 feet.) for 1900MHz unit from the outside antenna. Exceeding this minimum separation will ensure that the worker or bystander does not receive RF-exposure beyond the Maximum Permissible Exposure according to section 1.1310 i.e. limits for Controlled Exposure.

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1 Installation Overview

Summary:

- Hardware installation flow of the BTSB system
- Precautions for BTSB installation

1.1 BTSB Installation Overview

The cabinet of ZXC10 BTSB I1 comprises three basic chassis: RF chassis (RFS), baseband chassis (BDS) and power chassis (PWS). These chassis can be combined in different ways in a cabinet, as shown in Fig. 1.1-1. The appearance of the BTSB macro base station of ZTE is shown in Fig. 1.1-2.

The BTSB system installation involves the following parts:

1. The BTSB cabinet, including the cabinet, internal cables and boards.
2. The power system, which provides -48V operating power for the system.
3. The grounding system, which provides protection ground for the parts of the BTSB.
4. The antenna system, including the antenna, jumpers and feeders (a test of the antenna & feeder system is necessary).
5. The GPS system, including the GPS and the feeder.
6. The trunk cable, that is, connecting the cables with the connectors.
7. The monitoring system, including the temperature, humidity and other environment sensors.

BTSB system installation is shown in Fig. 1.1-3.

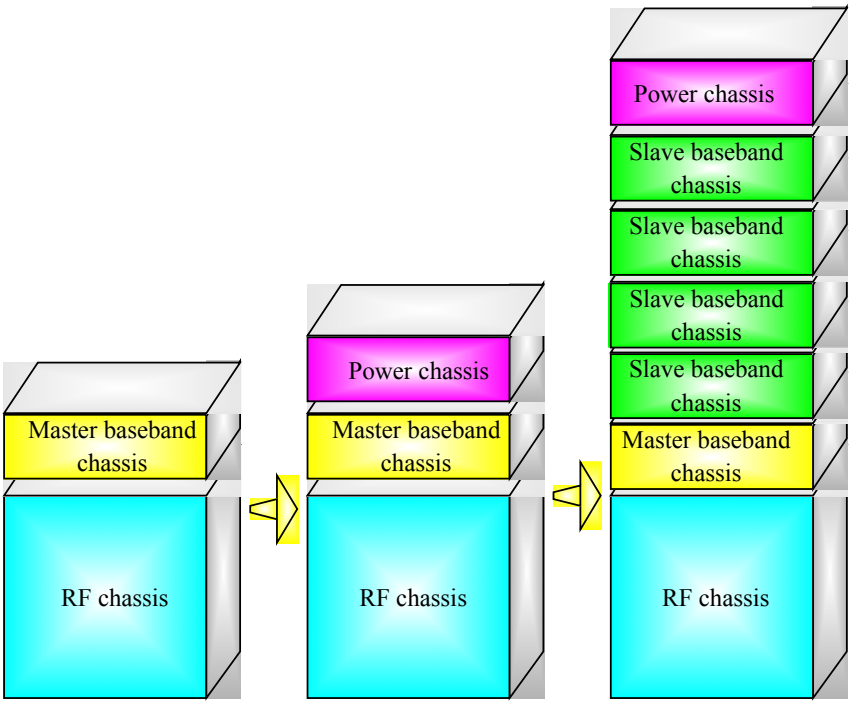


Fig. 1.1-1 BTSB Cabinet Composed of RF Chassis/BDS Chassis/PWS Chassis

Fig. 1.1-2 Appearance of BTSB Macro Base Station and PWS/BDS/RFS Chassis

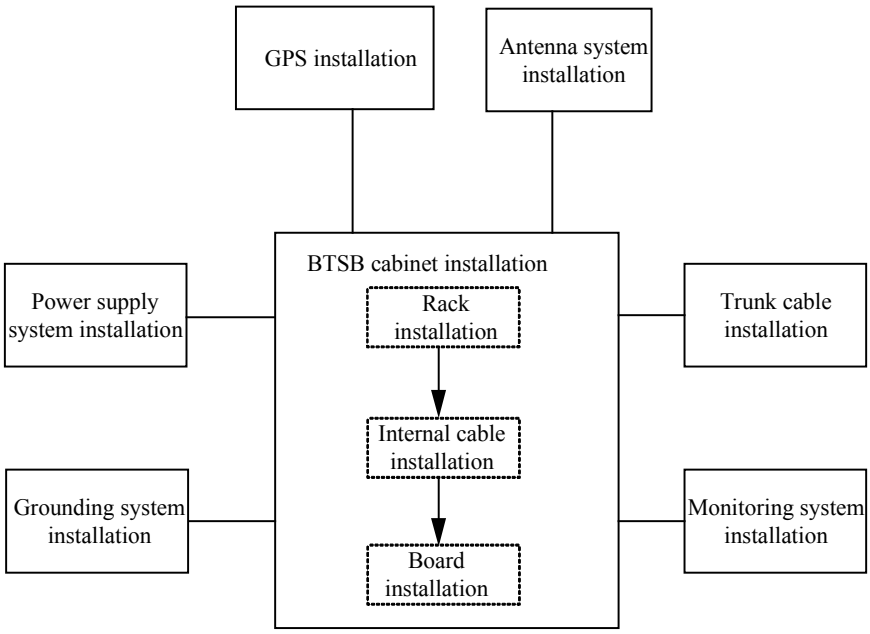


Fig. 1.1-3 BTSB Installation Hardware

1.2 BTSB Installation Flow Chart

The normal operation of ZXC10 BTSB I1 depends heavily on the quality of the installation engineering. The equipment must be installed in a systematic and standardized way to eliminate stability problems caused by improper installation and improve the reliability of the system.

This manual introduces the installation of BTSB and its parts step by step in an attempt to guide the engineering staff in their equipment installation.

The indoor installation of ZXC10 BTSB I1 includes cabinet installation and indoor cable connection and cabling. Please strictly follow these steps for installation:

1. Fix the rack base to the rack.
2. Position the rack and score & drill to fix it.
3. Install the power cable of the cabinet.
4. Install the monitoring cables and temperature/humidity sensors of the BTSB.
5. Install and connect the trunk cable.
6. Install boards and modules in the cabinet.
7. Connect the RF cable of the cabinet.

The detailed hardware installation flow of the BTSB system is shown in Fig. 1.2-1. This manual describes the specific installation procedure by chapters according to this flow.

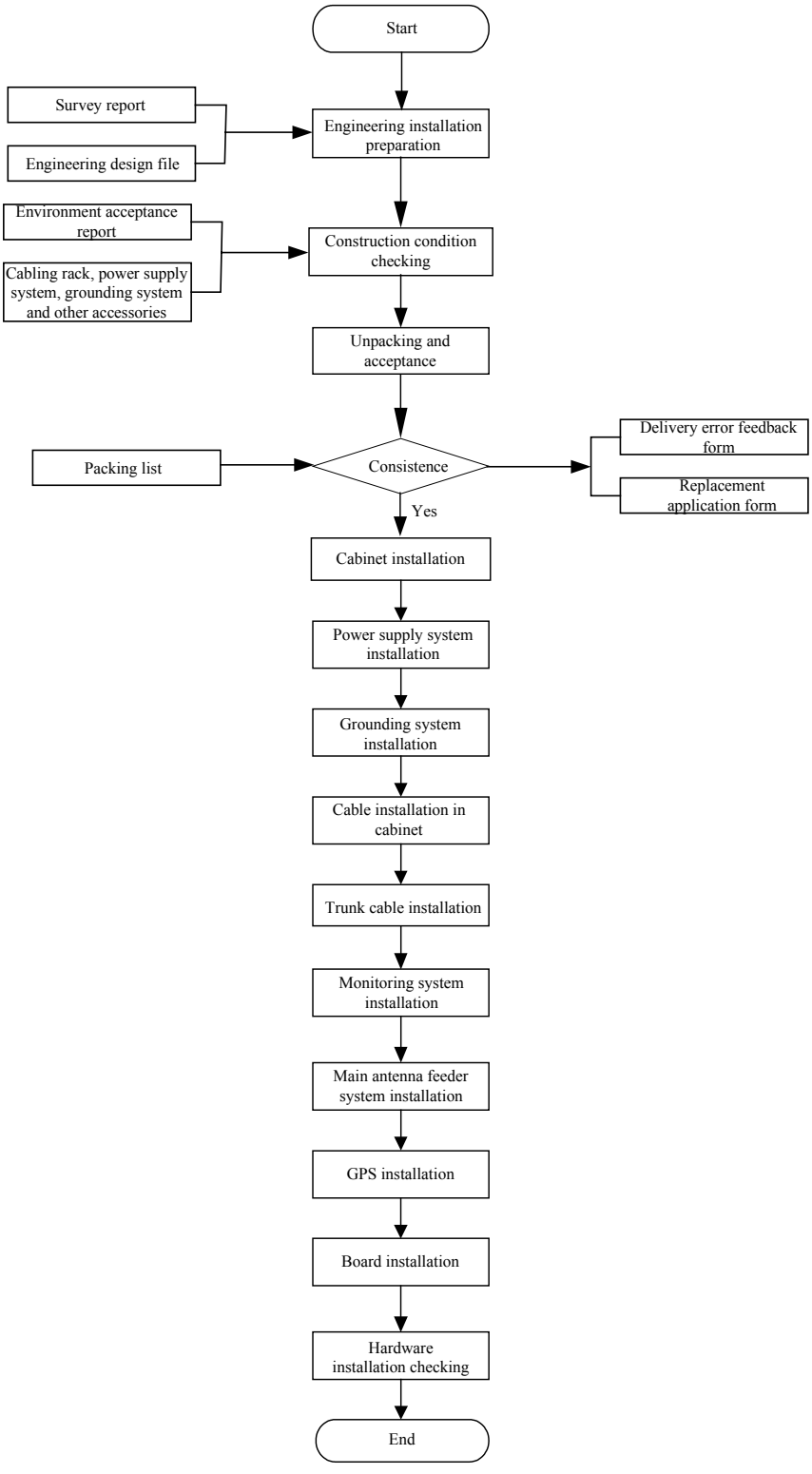


Fig. 1.2-1 Hardware Installation Flow

1.3 BTSB Precautions for Hardware Installation

Precautions for the BTSB hardware installation include:

1. Take careful precautions for the safety of yourself and the equipment during the installation.
2. Avoid hot swap during module installation.
3. In case of lightning, never install the antenna & feeder system.
4. Before the thunderstorm season every year, check whether the lightning arrester is in proper contact. In case any lightning arrester is damaged, replace it immediately.
5. Lock the door right after cabinet installation.

2 Installation Preparations

Summary:

- Environment check prior to the BTSB installation
- Tool and instrument preparation prior to the BTSB installation
- Technical documentation preparation prior to the BTSB installation

2.1 Checking the Installation Environment

Check the following environment items before installation:

Before installation, the customer should prepare the equipment room, power supply and grounding cables, and provide necessary facilities for the project implementation. The area and height of the equipment room should satisfy the requirements of the equipment layout. Otherwise, reconstructions are required to eliminate the problems faced during the installation, operation and maintenance of the equipment.

The BTSB should not be used in the environment with high temperature, thick dust, harmful gases, explosive articles or low air pressure. It shall be put far from transformer stations and traction substations, and shall not be in places with frequent shaking or great noises.

As the equipment of BTSB cannot be moved easily, the equipment room construction should be under a long-term plan.

The BTSB equipment room should comply with fire prevention regulations.

2.1.1 Checking the Equipment Room

The items for the equipment room inspection include:

1. The civil engineering of the equipment room and corridor has been completed, and the wall is fully dry.
2. The height and width of the doors in the equipment room should not cause any inconvenience for transporting the equipment. Usually, the height of the main

doors in the equipment room should be no less than 2.2 meters, and the width should be no less than 1 meter. The net height of the equipment room should be no less than 3 meters. The equipment room should have a sufficient area for the equipment with extra free space. For easy equipment operation and maintenance, the space for opening the front door should be no less than 1 meter, and the space at the rack rear should be no less than 0.8 meter.

3. The equipment room floor should be able to bear the weight over 450kg/m2.
4. The wall and ceiling of the equipment room should not chalk or peel off and should be free of dust accumulation. Fire-retardant materials should be used for decoration.
5. The shock-proof design of the equipment room should be one degree higher than the local anti-seismic requirements. Generally, the equipment room should be able to bear the earthquake of 7 on the Ritcher Scale. Otherwise, shock-proof reinforcement measures must be adopted for the equipment.
6. Air-conditioning facilities should be provided to maintain desired temperature and humidity in the equipment room.
7. Lightning screen or lightning arrester should be installed for the places in the equipment room vulnerable to the lightning. Outdoor metal pipelines should be grounded when being led into the equipment room.

2.1.2 Checking the Indoor Environment of the Equipment Room

The inspection of the indoor equipment room environment includes the inspection of humidity, temperature, air pressure, antistatic protection, anti-interference requirement, air conditioning, ventilation, dust proof, rodent proof, fire protection, lighting, and drainage facilities.

1. Requirements for the ambient temperature and humidity

   Working temperature: -5 °C ~ +55 °C

   Relative humidity: 15% ~ 93% RH

2. Requirements for the equipment room floor

   The level difference per square meter of the floor should not be more than 2 mm.

3. Cleanness

Cleanness is related to the amount of dust and harmful gases in the air. The equipment room should meet the following cleanness requirements:

- No explosive, conductive, magnetic or corrosive dust.
- Density of the dust whose diameter is larger than 5μm must be less than or equal to $3*10^4$ particles/m^3.
- No corrosive metal or gas that is harmful to insulations, such as SO2, NH3.
- The equipment room should be always kept clean, with the doors and windows properly sealed.

4. Lighting

The equipment room should be equipped with 3 types of lighting facilities: Common lighting, guaranteed lighting and emergency lighting.

5. Fire-proof requirements

The paint and decoration materials in the equipment room should be fire-proof. The cabling holes through the wall should be filled with fire-retardant materials. Fire-fighting devices should be equipped at the appropriate positions.

2.1.3 Checking the Power Supply System

1. DC power supply requirements:

1) BTSB employs -48V DC power supply so the equipment room should be equipped with an AC/DC power supply converter for working power supply. The DC voltage is allowed to range from -57V to -40V.

2) To guarantee uninterrupted operation of the BTSB even in case of mains supply failure, uninterrupted power supply facilities such as diesel engine generator group and storage battery should be available.

3) The noise level indices of DC power voltages shall meet the technical specifications by the former Ministry of Posts and Telecommunications.

4) The DC power supply should be provided with over-voltage/over-current protection and indicators.

2. AC power requirements (including the AC power for construction purpose and

that used for local operation & maintenance consoles)

1) Three-phase power supply: 380V, with the voltage fluctuation range of no more than 10%, frequency fluctuation range of no more than 5%, line voltage waveform distortion factor of less than 5%.

2) Single-phase power supply: 220V, with the voltage fluctuation range of no more than 10%, frequency fluctuation range of no more than 5%, line voltage waveform distortion factor of less than 5%.

3. Cabling requirements of the power supply system

Cabling of the power supply system should be correct, tidy and in good order, and has excellent insulation and reasonable arrangement. To prevent the power supply system from interfering with other signal lines, power cables and other cables should be laid separately, with special cabling troughs preferred.

In addition, during the cabling of the power supply system, the cross sections of the cable feeders and the busbars shall be able to meet the requirements for the medium-term or long-term capacity expansion.

2.1.3.1 Power System Range

Please see Table 2.1-1 for the DC power indices for the normal operation of ZXC10 BTSB I1 (supporting 24V DC power supply).

Table 2.1-1 DC Power Supply Indices for the Normal Operation of BTSB

Item	DC Voltage
Nominal value	−48V
Allowed fluctuation	−40 ~ −57V

2.1.3.2 Power Consumption

Power supply and power consumption: The power consumption of ZXC10 BTSB I1 refers to the overall power consumption when the operating voltage is -48V and the output power of each power amplifier is 20W, as shown in Table 2.1-2.

Table 2.1-2 Power Consumption Indices for the Normal Operation of BTSB

Configuration	Amplification Output	Working Voltage	1X Maximum Power Consumption (W)	DO Maximum Power Consumption (W)
1-carrier 1-sector	40W/carrier	-48V	About 1400W	About 1400W

Configuration	Amplification Output	Working Voltage	1X Maximum Power Consumption (W)	DO Maximum Power Consumption (W)
2-carrier 1-sector	40W/carrier	-48V	About 1400W	About 1400W
3-carrier 1-sector	40W/carrier	-48V	About 1400W	About 1400W
5-carrier 1-sector	40W/carrier	-48V	About 2000W	About 2000W
7-carrier 1-sector	40W/carrier	-48V	About 2000W	About 2100W
1-carrier 3-sector	40W/carrier	-48V	About 2500W	About 2600W
2-carrier 3-sector	40W/carrier	-48V	About 2600W	About 2600W
3-carrier 3-sector	40W/carrier	-48V	About 2600W	About 2700W
4-carrier 3-sector	40W/carrier	-48V	About 2600W	About 2700W
5-carrier 3-sector	40W/carrier	-48V	About 4400W	About 4500W
7-carrier 3-sector	40W/carrier	-48V	About 4500W	About 4600W
8-carrier 3-sector	40W/carrier	-48V	About 4500W	About 4700W
1-carrier 6-sector	40W/carrier	-48V	About 4300W	About 4400W
2-carrier 6 -sector	40W/carrier	-48V	About 4400W	About 4500W
3-carrier 6-sector	40W/carrier	-48V	About 4500W	About 4600W
4-carrier 6-sector	40W/carrier	-48V	About 4500W	About 4700W

2.1.4 Checking the Grounding System

The grounding regulations and resistance requirements (including the lightning protection requirements) are as follows:

The communication equipment should be well grounded for reliable operation. Good grounding ensures lightning protection and interference resistance. The grounding cables in the equipment room should be routed in a radiating or flat way. Three independent grounding cables should be used: The protection ground of the DC power distribution system, the work ground of the power system and the lightning protection ground.

The equipment adopts joint grounding with the grounding resistance less than 1 Ω. Generally, the grounding resistance of BTSB should be less than 5 Ω. The engineering requires the grounding resistance to be the smallest possible. The magnitude of grounding resistance is affected by grounding post resistance, leading wire resistance, contact resistance between the grounding post and soil as well as the soil type. The greatest impact on grounding resistance comes from soil type. In areas with poor soil conditions, some resistance-reducing agent (such as propenamide) may be added around the grounding stake to meet the requirements. Changes in temperature will also cause variations in resistance. In cold areas, the impact of temperature on the resistance

may be reduced by burying the stake deeply into the ground. Grounding stakes are usually made of galvanized materials in proper size. The connection cables from the grounding stake to the equipment should adopt copper-sheathed wires of good conductivity (core wire section area less than 50 mm^2, and length as short as possible). If necessary, anti-erosion protection can be provided to the grounding connection parts to guarantee low-resistance connection.

The working ground refers to the loop formed through the earth to transmit energy and information. For instance, the 3-phase AC power supply neutral line ground and the positive battery ground are both working grounds. This grounding approach can resist electromagnetic interference and cross talk.

The protection ground refers to the grounding of the metal shell of the power supply equipment to prevent hazards to human body due to power leakage.

In addition, the ground for lightning protection should be used to prevent lightning stroke from damaging the equipment and to protect the safety of lives and properties.

2.1.5 Checking the Outdoor Installation Environment for the Antenna Feeder System

1. Check whether the height and size of the feeder window comply with the requirements of the BTSB equipment and the engineering design drawing.
2. Check whether the height, weight bearing and grounding of the outdoor cabling rack comply with the engineering design.
3. Check whether the height, weight bearing and grounding of the indoor cabling rack comply with the engineering design.
4. Check the height, diameter, weight bearing, wind resistance, grounding, lightning protection and position of the antenna pole of the BTSB on the roof to make sure they comply with the BTSB equipment requirements and the engineering design drawing.
5. Check the height, diameter, weight bearing, wind resistance, grounding, lightning protection and position of the antenna pole of the BTSB on the iron tower to make sure they comply with the BTSB equipment requirements and the engineering design drawing.

2.1.6 Checking the Safety Conditions

Appropriate fire-fighting devices should be equipped in the equipment room, such as a certain quantity of portable powder fire-extinguishers. As for a large equipment room, a complete set of automatic fire-fighting system should be equipped. No inflammable or explosive articles should be placed in the equipment room.

1. Storage of flammable and explosive materials in the equipment room is strictly prohibited and necessary firefighting equipment must be installed.
2. Different outlets in the equipment room shall bear noticeable marks, and dynamic electricity and lighting electricity should be noticeably differentiated.
3. The equipment room should be far from high-voltage power lines, strong magnetic fields, strong electric sparks, or other factors that may threaten the security of the equipment room.
4. Reserved holes in the floors should be covered with safety cover plates.
5. Proper lightning protection facilities should be in place before the power lines and transmission lines are led into the equipment room.

2.1.7 Checking Other Auxiliary Equipment

Check the following items against the configuration requirements specified in the contract:

1. Check whether the external power supply and the power cable connecting the racks are ready.
2. Check whether the E1 cable connecting the BTSB and the BSCB is ready.

2.2 Preparing Tools and Instruments

A number of tools and instruments are to be used during the BTSB installation process. Prepare the tools and instruments as given in Table 2.2-1 and Table 2.2-2 below.

Table 2.2-1 Tools

Category	Name
Special tools	One feeder connector knife One wire skinner for 75 Ω coaxial cables One crimping pliers for 75 Ω coaxial cables

Category	Name
	One multi-functional crimping pliers One multimeter One SiteMaster VSWR tester Earth resistance tester
Concrete drilling tools	One electric percussion drill Several drill bits One cleaner One power terminal block (at least three 2-phase sockets and three 3-phase sockets, with the power capacity more than 15A)
General-purpose tools	Philips screwdrivers (4″, 6″ and 8″ each) Flathead screwdrivers (4″, 6″ and 8″ each) Adjustable wrenches (6″, 8″, 10″ and 12″ each) Dual-purpose spanners (17″ and 19″ each) One set of socket wrench One 5 kg nail hammer One 300 W iron One 40 W iron One roll of solder wire
Measurement tools	One 50 m tape measure One 5 m steel tape One 400 mm level bar One angle meter One compass Level Plumb
Protection tools	Anti-static wrist strap Safety helmet, slip-proof glove
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 paint brush One pair of scissors One hot blower One solder sucker One pair of hydraulic pliers Crowbar

Category	Name
Auxiliary tools	Pulley block Rope Ladder Forklift

Table 2.2-2 Instruments

Instrument Name	Manufacturer
Spectrum analyzer (needed in some special cases)	HP
Base station tester	SITE MASTER
Testing MS	Qualcomm
Compass	
Multimeter	
Field strength tester (needed in some special cases)	

2.3 Preparing Technical Documentation

The technical documents to be prepared before the commissioning of the equipment include:

1. Project Survey Report, BTSB System Project Design and Engineering Drawing, and Environment Acceptance Report.

   Project Survey Report should be completed by the engineering staff sent by the equipment supplier during the onsite survey. If engineering staff cannot conduct the survey in time, he should entrust the equipment user to fill in the report and mail it back after the survey for the preparation of engineering materials.

   BTSB System Project Design and Engineering Drawing should be completed by the design party entrusted by the equipment user, and its copy should be provided by the equipment user to the equipment supplier before equipment delivery.

   Environment Acceptance Report is used for the first engineering environment inspection during the project survey. If the environment is found to fail the inspection, the equipment user is requested to make improvement and solve the problem. The second environment inspection is conducted before the engineering starts.

2. ZXC10BTSB (V 1.0) cdma2000 Base Transceiver Station Installation Manual

   ZXC10 BTSB (V1.0) cdma2000 Base Transceiver Station Technical Manual

   ZXC10 BTSB (V1.0) cdma2000 Base Transceiver Station Hardware Manual

   ZXC10 BTSB (V1.0) cdma2000 Base Transceiver Station Maintenance Manual

3. Installation Acceptance Report and Test Acceptance Report.

   Installation Acceptance Report and Test Acceptance Report are the engineering materials for acceptance after the BTSB commissioning. They are provided by the equipment supplier to the equipment user at the time of delivery. They should be completed properly after the commissioning of the BTSB.

3 Unpacking and Acceptance

Summary:

- Unpacking of BTSB
- Acceptance of BTSB

3.1 Checking Goods against the Packing List

1. Check the *Delivery Checklist of ZTE Corporation*.
2. Unpacking inspection is conducted by the Project Supervising Committee and representatives from the user. First, check the total number of goods, the intactness of the packing boxes, and check whether the arrival place is the actual installation place against the packing list number attached to the packing boxes;
3. The packages can be opened if they are not damaged. Each package has a *Packing List*. The engineering supervisor should check item by item according to the *Packing List*. The *Unpacking Inspection Report* is placed in the packing box numbered 1#. First open the 1# packing box and take out the *Unpacking Inspection Report*. To check the total number of the goods against the inspection list and record it for filing.
4. During the unpacking inspection process, if there is any short and wrong shipment or goods damage, you should contact the ZTE headquarters.
5. The goods of ZTE may be packed in crate or carton. Different tools are required to open them on site.

Caution:

The ZXC10 BTSB I1 equipment is relatively expensive. During transportation, it shall be well packaged with clear waterproof and quake-resistant marks. Handle the equipment with care and protect it from sunshine and rain.

3.2 Unpacking the Wooden Box

3.2.1 Wooden Box Structure

The wooden boxes are generally used for packing heavy goods like rack.

The structure of the BTSB rack-packing box is shown in Fig. 3.2-1.

Fig. 3.2-1 Structure of the Wooden Box

3.2.2 Unpacking Procedure

1. Prepare appropriate tools such as nail hammer, pliers, straight screwdriver and crowbar.
2. First skin the packing sheet iron. Insert a flat-tip screwdriver into the slit between the box and the front cover board to make it loose; then insert the crowbar to unclench the cover board.
3. Keep the box on end and the legs downward, and pull the rack out of the box. Make sure not to remove the antistatic bag of the rack before pulling the rack out.
4. Remove the packing adhesive tape of the rack.

Note: The BTSB rack is equipped with casters for easy movement. However, you should control the moving direction with your hands during the move to avoid any damages or accidents.

3.2.3 Checking the Rack Appearance

Put the rack vertically on the solid ground. The rack should be erected upright without

tilting. Visually there is no dent, bump, scratches, peel, bubbling, stains or other similar damaged signs. The captive screws should not be loose, missing or misplaced. The installation slots for plug-in boxes are intact and the slot guide rails are not missing, damaged or broken. All fittings and accessories required for rack installation are complete. The labels of installation slots are intact and eligible. The busbar, the exhaust fan and the installation positions are not damaged or deformed. There is no rack surface paint flake-off or scratches.

3.3 Unpacking the Carton

3.3.1 Carton

Caution:

1. Avoid taking any circuit board out of the antistatic bags during the unpacking and acceptance. Do not open the antistatic bags until the board is to be mounted into the rack. In addition, avoid damaging any antistatic bag and keep it for future use when storing spare boards and packing the faulty boards for repair.

2. When the equipment is moved from a colder and drier place to a hotter and damper place, wait for 30 minutes before unpacking the equipment. Otherwise, moisture may appear on the surface of the equipment and cause damage.

3. Properly recycle the desiccants lest children may eat them by accident. Cartons are generally used to pack circuit boards and terminal equipment.

The circuit boards are placed in the anti-static protective bags during transportation. Before unpacking the boards, take proper anti-static protective measures to avoid damages. In addition, attention should be paid to the ambient temperature. Usually some desiccant is placed in the anti-static protective bag to absorb moisture and keep the bag dry.

The packing box of modules is shown in Fig. 3.3-1.

Fig. 3.3-1 Packing Box of Modules

3.3.2 Unpacking Procedure

Take the following steps to unpack a carton:

1. Use the diagonal pliers to cut the straps.
2. Use a paper knife to cut the adhesive tape along the slits on the box covers. Note that the cut shall not be too deep and damage the goods inside.
3. Count the quantity and types of boards inside the carton against the packing list attached and sign for the acceptance with the customer on site.

3.3.3 Checking the Boards

Check the boards against the delivery list and contact the equipment supplier in time if any incompliance is found.

3.4 Goods Acceptance and Handover

After the unpacking acceptance, both parties sign on the Unpacking Acceptance Report. after which the goods shall be handed over to the customer if they are to be kept by the customer after acceptance according to the contract terms. Each party shall hold a copy of the Unpacking Inspection Report and the Project Supervisor shall feedback the Acceptance Conclusion of the Report to be archived by the equipment supplier.

4 Cabinet Installation

Summary:

- Appearance and structure of the BTSB cabinet
- Installation procedure of a single BTSB cabinet
- Arrangement of the BTSB cabinets
- Connection and fixation between BTSB cabinets
- Standard of installing the BTSB cabinets

4.1 Cabinet Types

ZXC10 BTSB I1 is composed of three types of subracks, PWS, BDS and RFS, that can be combined flexibly into super base stations, as shown in Fig. 4.1-1These subracks provide powerful functions with lighter weight and small footprint, allowing easy movement and installation.

Fig. 4.1-1 Flexible Combination of ZXC10 BTSB I1 Subracks

4.2 RFS Cabinet Installation

The RFS cabinet supports base installation and support installation. The following sections detail the procedures of these two installations.

4.2.1 RFS Installation Flow

The base installation mode is to mount the cabinet on an adjustable base provided by ZTE in the case that there is antistatic floor in the equipment room. The support installation mode is to fix the cabinet with the pressure plate assembly to the floor in the cast that there are feet under the cabinet (the four feet of the cabinet). The cabinet installation flow is shown in Fig. 4.2-1.

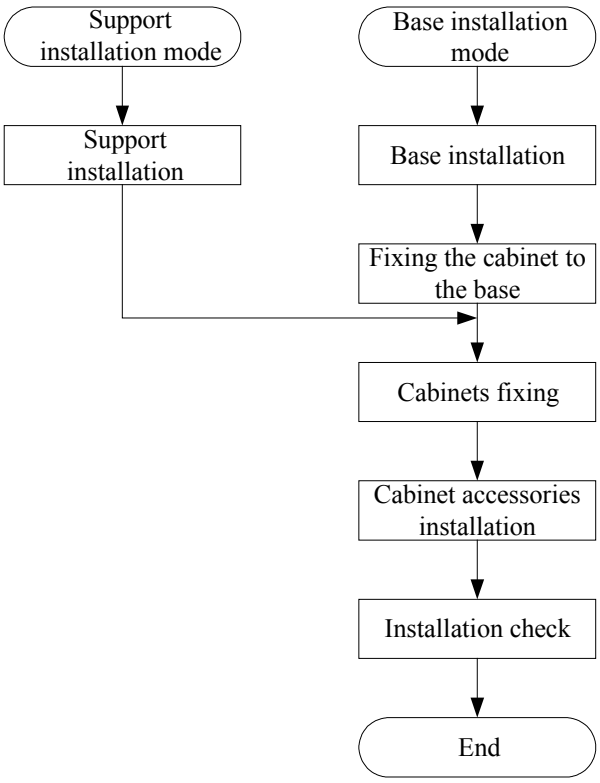


Fig. 4.2-1 Cabinet Installation Flow

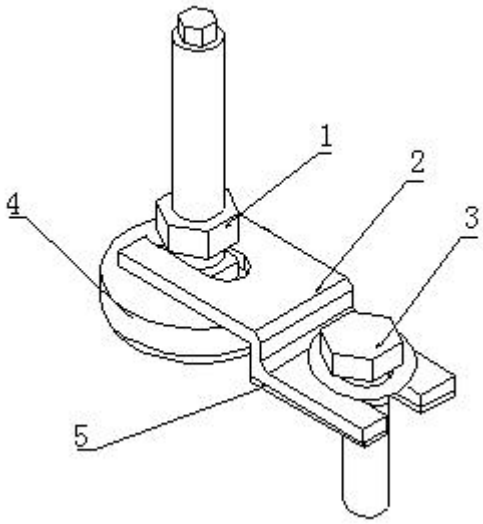
4.2.2 Support Installation Mode

4.2.2.1 Support and Pressure Plate Assembly

The support fixing amplification is shown in Fig. 4.2-2.

4.2.2.2 Support Installation Flow

Firstly, install the pressure plate assembly on the support as shown in Fig. 4.2-3.



1. Locking nut 2. Pressure plate 3. M10X25 bolt 4. Support 5. Insulating washer

Fig. 4.2-2 Zoom-in Diagram of Support Fixing

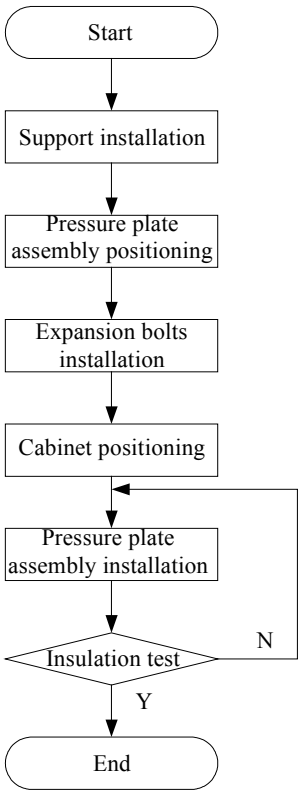
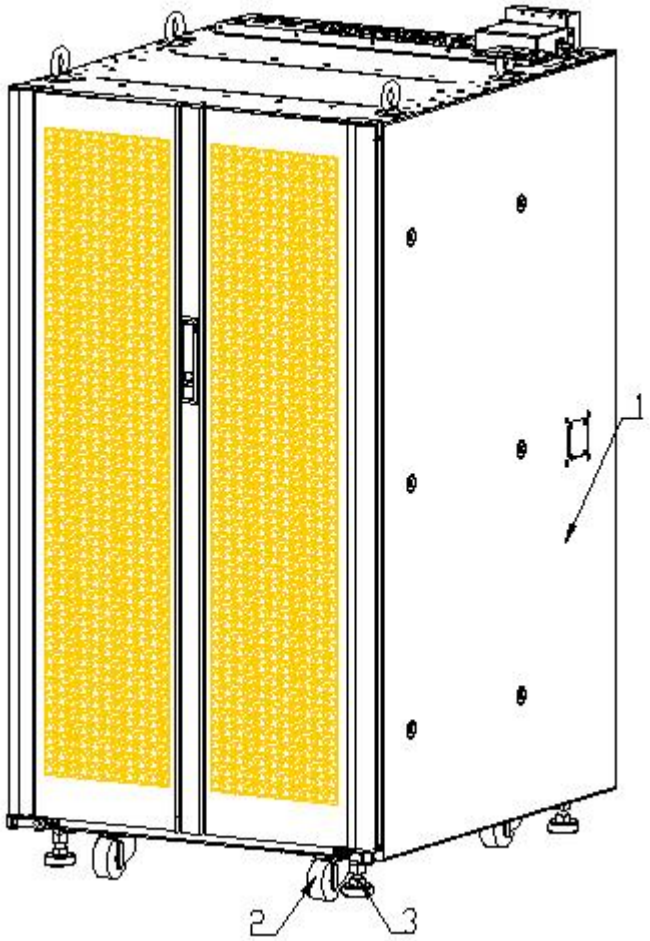


Fig. 4.2-3 Support Installation Flow

4.2.2.3 Adjusting the Supports

The cabinet base is equipped with supports and caster wheels. The supports should be suspended so that the cabinet can move with the caster wheels. Fig. 4.2-4



1. Cabinet 2. Caster wheels 3. Support

Fig. 4.2-4 Position of Caster Wheels and Supports

In the equipment room, screw off the support to make it 80 mm lower than the cabinet bottom. Thus, there is room for the baffle and the caster wheels. Rotate the supports downward , as shown in Fig. 4.2-5.

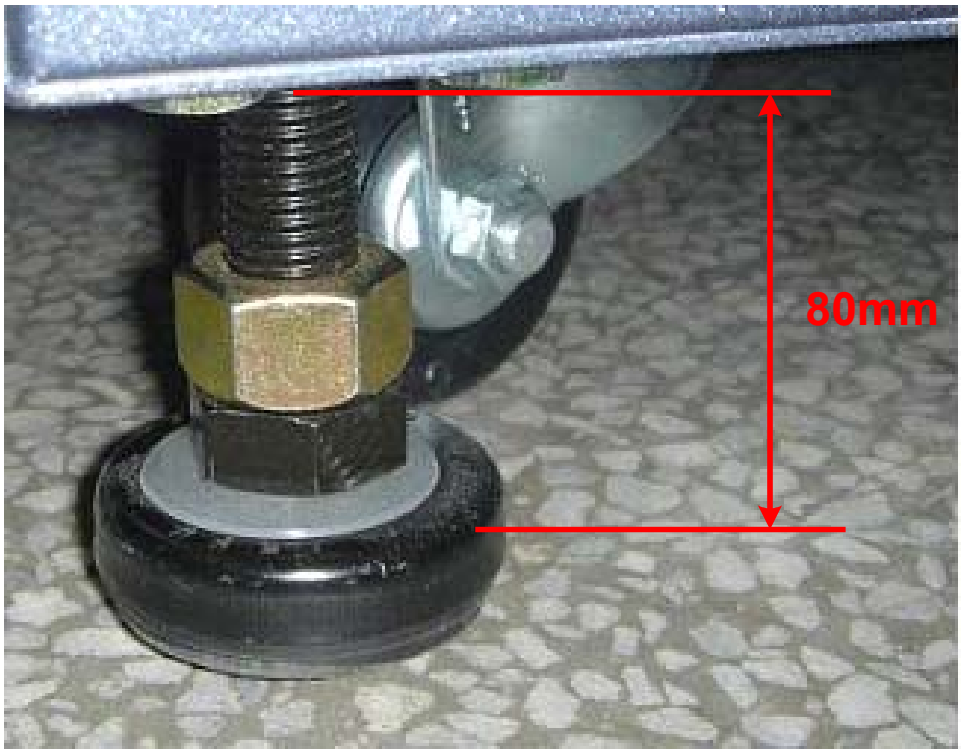


Fig. 4.2-5 Rotating Supports Downward

4.2.2.4 Positioning the Pressure Plate Assembly

1. Scoring

   Decide the position to install the base according to the basic size and cabinet size given in the construction plane design drawing; measure a few marking points with a tape measure, and mark two lines spaced 670 mm and parallel to the base line with an ink fountain; according to the design, mark the positions of the four installation holes for the first cabinet on the two lines; then mark the installation holes for other cabinets one by one. This is shown in Fig. 4.2-6.

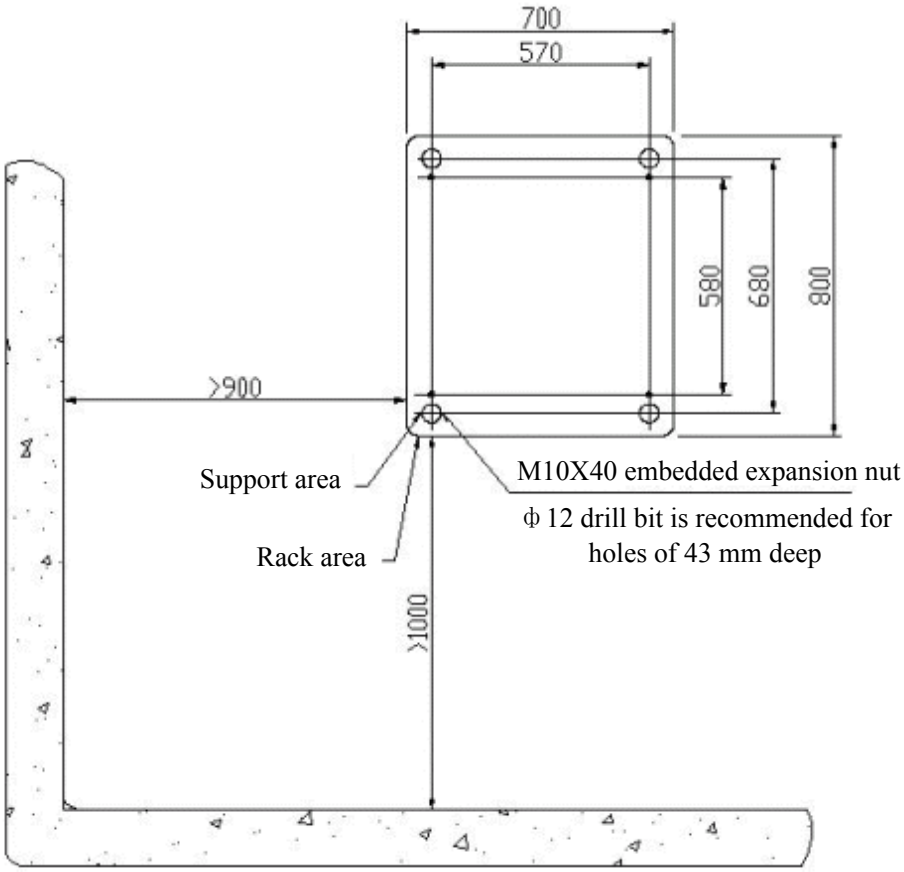


Fig. 4.2-6 Positions of Installation Holes of Cabinet Supports

2. Drilling

After the scoring in Fig. 4.2-6, select ϕ12 bit for drilling. Keep the bit vertical to the floor. Use both hands to hold the drill handle tightly and straightly without swing to avoid damaging floor and incline the hole.

The hole depth should be equal to the length of the expansion tube of expansion nut (or bolt) plus the flare head length. While drilling holes, use a vacuum cleaner to remove dust. Suck the dust in the holes once again after the holes are drilled. Measure the space between holes and place the base to check whether the holes are matched. For holes with large deviation, it is necessary to reposition and re-drill the holes before installing the expansion bolts (expansion nuts).

4.2.2.5 Installing the Embedded Expansion Nuts

Place the embedded expansion bolts in a drilled hole and hammer it fully into the

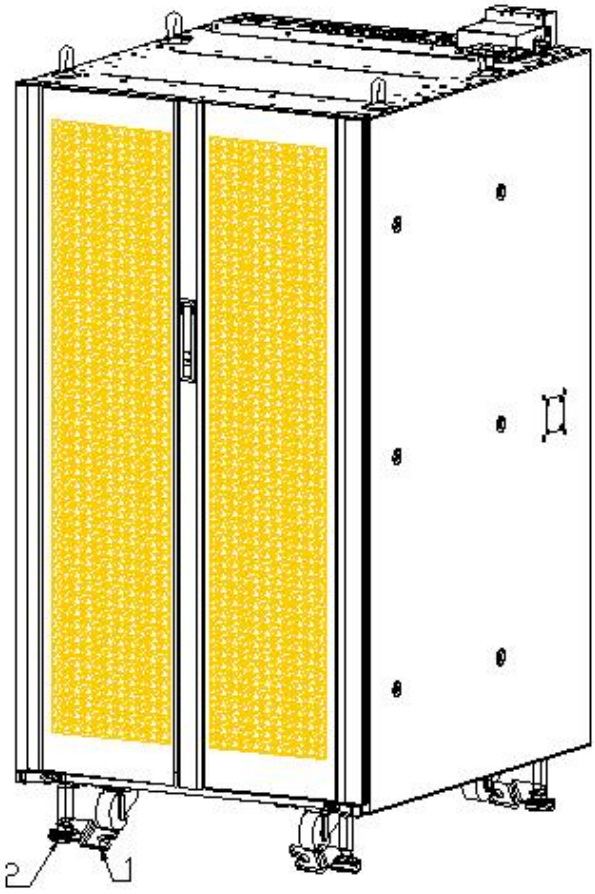
ground with a dedicated hammer or a rubber hammer.

4.2.2.6 Positioning the Cabinet

Move the cabinet to the right position, revolve the screws of the cabinet feet to adjust the height of the cabinet, select three points on the shelf and measure them with a level meter to make the rack level.

4.2.2.7 Installing the Pressure Plate Assembly

Put on the pressure plates onto the supports and fix the pressure plate with four M10 × 25 bolts, as shown in Fig. 4.2-7.



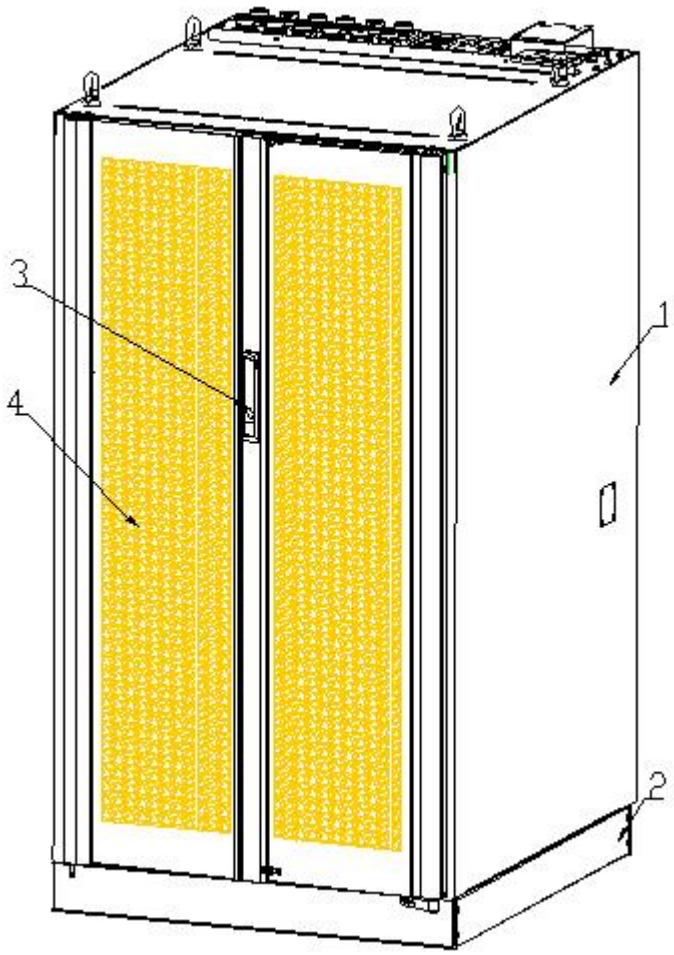
1 Pressure plate 2 Support

Fig. 4.2-7 Installing Supports and Pressure Plate

4.2.2.8 Installing the Baffle Assembly

Install the baffle assembly around the cabinet. The completion of the cabinet

installation is shown in Fig. 4.2-8.



1. Cabinet 2. Baffle 3. Lock 4. Vent

Fig. 4.2-8 Cabinet after Installation

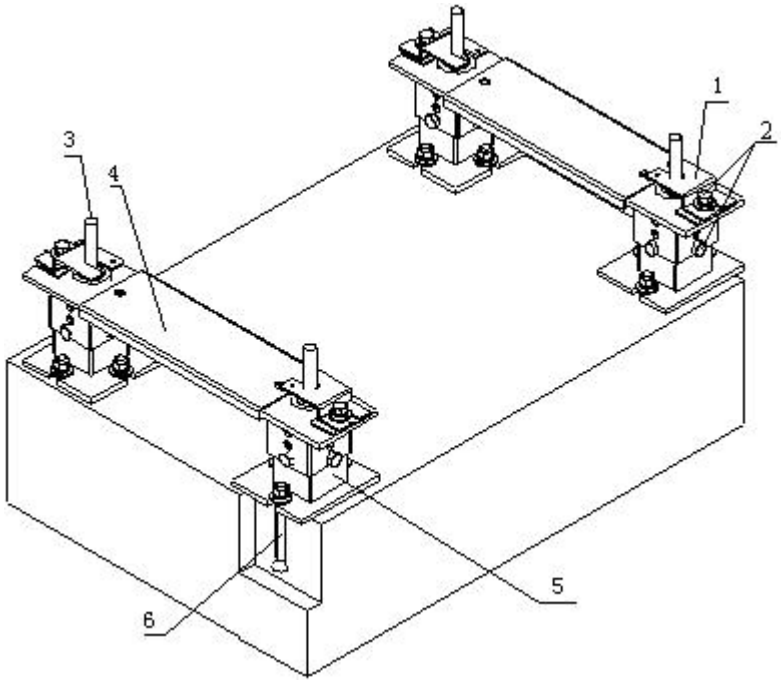
4.2.3 Base Installation Mode

4.2.3.1 Base Structure

The server cabinet is installed on ZTE's universal base that is composed of four independent square piers, two connection boards and some other accessories. Three types, different in adjustable heights, are available:

1. Type A 150 mm ~ 205 mm
2. Type B 185 mm ~ 285 mm
3. Type C 275 mm ~ 450 mm

The adjustable height means the height from the bottom of an installed cabinet to floor. The installation on universal base is shown in Fig. 4.2-9.



1. Pressure plate 2. M10 × 25 bolts 3 Cabinet support 4. Bracket 5. Base 6. M10 × 40 embedded expansion (12 ϕ bit, 43 hole depth)

Fig. 4.2-9 Installation on Universal Base

The bracket shown in the Fig. 4.2-9 is optional. When the bracket is not installed, the pressure plate can be installed at the inner side of the cabinet feet. The base installation flow is shown in Fig. 4.2-10.

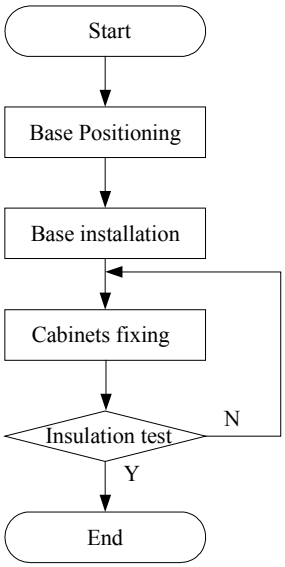


Fig. 4.2-10 Base Installation Flow

4.2.3.2 Positioning the Base

1. Scoring

   Decide the installation positions of the bases according to the benchmark dimensions and the cabinet dimensions given in the construction floor plan, get a few marking points by measuring with a long tape, and mark two lines that are 670 mm apart and parallel to the base line with an ink fountain. According to the design, determine the locations of the installation holes for the four bases one by one Fig. 4.2-11.

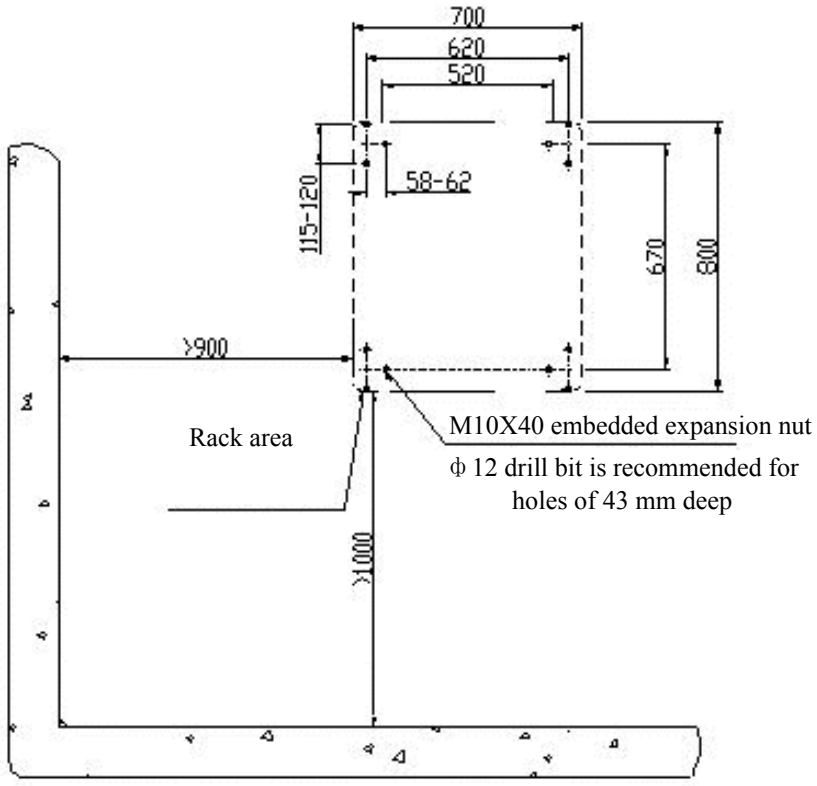


Fig. 4.2-11 Locations of the Installation Holes for the Four Bases

2. Drilling

After the scoring according to Fig. 4.2-11, select ϕ12 bit for drilling. Keep the bit vertical to the floor. Use both hands to hold the drill handle tightly and straightly without swing, to avoid damaging floor and incline the hole.

The hole depth should be equal to the length of the expansion tube of expansion nut (or bolt) plus the flare head length. While drilling holes, use a vacuum cleaner to remove dust. Measure the space between holes, place the adjustable base and check whether the holes are matched. For holes with large deviation, it is necessary to reposition and re-drill the holes before installing the expansion bolts.

Insert the expansion nut and expansion tube into the hole. Strike the expansion bolt with a rubber hammer till the expansion tube of the expansion bolt fully enters the floor. If the expansion bolt is being installed, the washer and nut on the bolt should be removed first.

4.2.3.3 Installing the Base

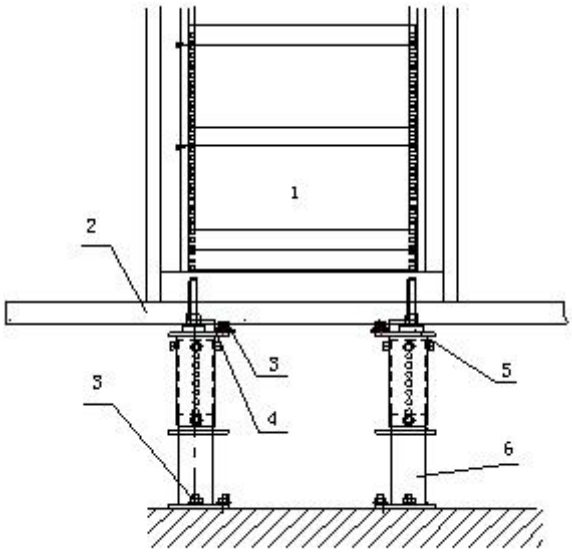
Arrange the base according to the scoring position and connect the parts according to Fig. 4.2-9. Adjust the height and tighten all bolts. Screw 12 M10 × 25 bolts in the embedded expansion nuts to fix the base parts.

4.2.3.4 Fixing the Cabinet

Lift the cabinet onto the base after adjusting the four feet of the cabinet 65 mm above the cabinet bottom. These four feet are nearly in the middle of the square plane of the base to align the pressure plates with the installation holes on the base.

Rotate the threaded rod of the support to adjust the height of the cabinet, and choose three points in the frame to keep the rack level with gradienter.

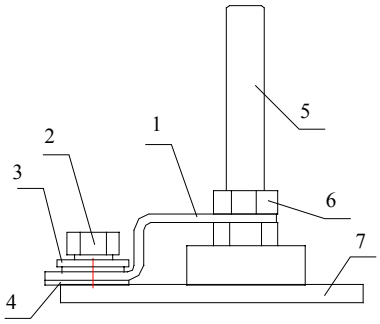
Clip the pressure plate parts onto the cabinet support. Tighten the retaining nuts. Fix the pressure plates on the base with four M10 × 25 bolts to fix the cabinet. The bracket is not installed, as shown in Fig. 4.2-12.



1. Inner equipment 2. Antistatic floor 3. M10 × 25 bolt 4. Pressure plate assembly 5. Cabinet support 6. Base

Fig. 4.2-12 Installing Pressure Plate of the Base

The view of the pressure plate in the above diagram is enlarged to show their detailed fixing relations, as shown in Fig. 4.2-13.



1. Pressure plate 2. M10 × 25 bolts 3 Washer 4. Insulation pad 5. Cabinet support 6. Retaining nut 7. Base

Fig. 4.2-13 Fixation of Supports, Pressure Plate and Base

4.2.3.5 Testing Insulation

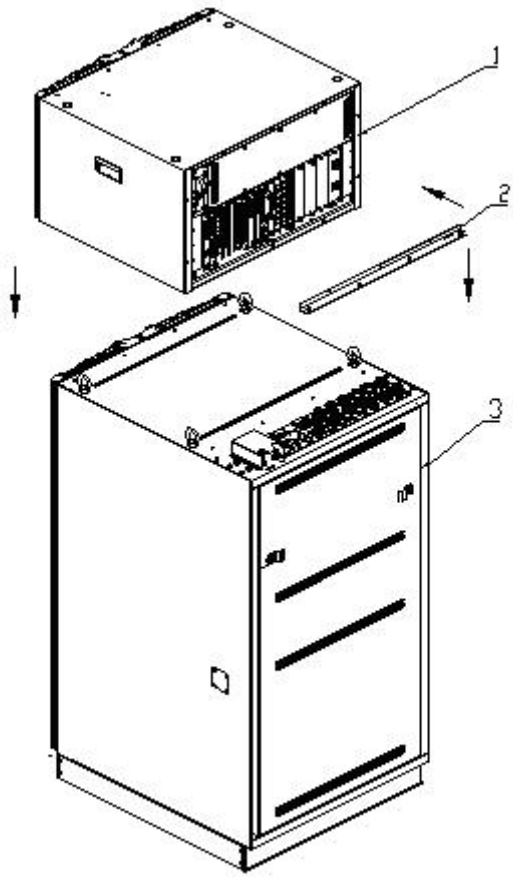
Connect the cabinet to the floor. The test is passed if electricity cannot be conducted through the connection.

4.2.4 Cabinet Stacking Mode

BDS and PWS are put on RFS.

4.2.4.1 Installing the BDS Unit

On the front cover, screw five M5 bolts inside RFS through the holes on the top of cabinet to the nut inside the BDS unit. On the back cover, fix the BDS unit to the RFS cabinet by screwing nine screws with the edge iron, as shown in Fig. 4.2-14.

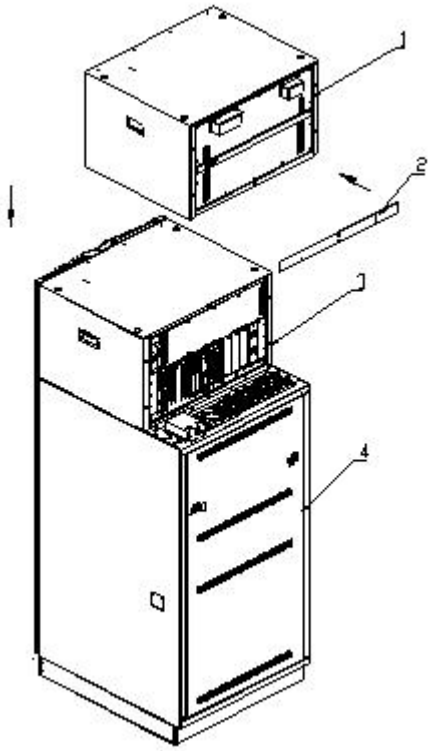


1. BDS unit 2. Jointing edge iron 3. RFS unit

Fig. 4.2-14 Installation of BDS Unit

4.2.4.2 Installing the PWS Unit

The PWS units are stacked on the BDS unit. Similarly, screw five M5 screws on the front cover and fix the two units together with ten screws and flat connection plate, as shown in Fig. 4.2-15.



1. PWS unit 2. Flat connection board 3. BDS unit (May be multiple) 4. RFS unit

Fig. 4.2-15 Installation of PWS Unit

The appearance of the BDS and PWS units after installation is shown in Fig. 4.2-16.

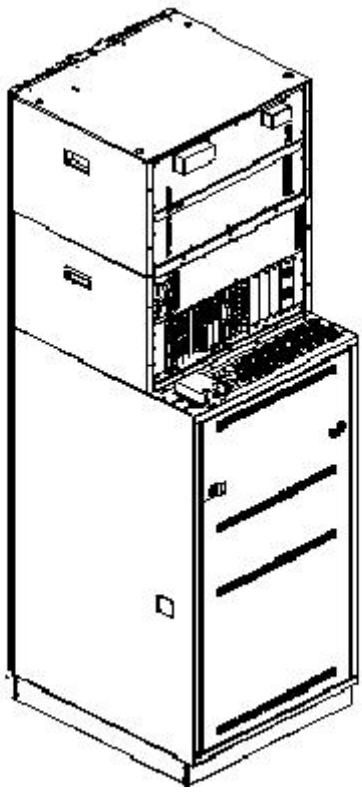
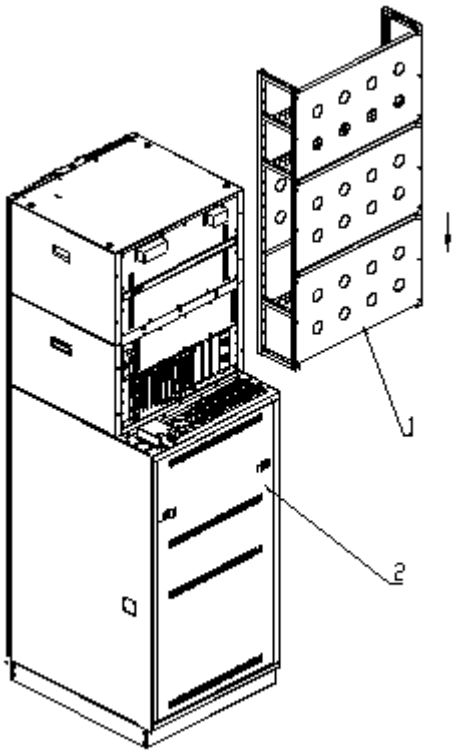


Fig. 4.2-16 Appearance of the BDS and PWS Units after Installation

4.2.5 Installing Cabinet Accessories

4.2.5.1 Feeder Fixing Rack

The feeder fixing rack is installed at the rear part of the top cover of the RFS cabinet, as shown in Fig. 4.2-17.



1. Feeder fixing rack 2. RFS cabinet

Fig. 4.2-17 Installation of Feeder Fixing Rack

A properly installed feeder fixing rack is shown in Fig. 4.2-18.

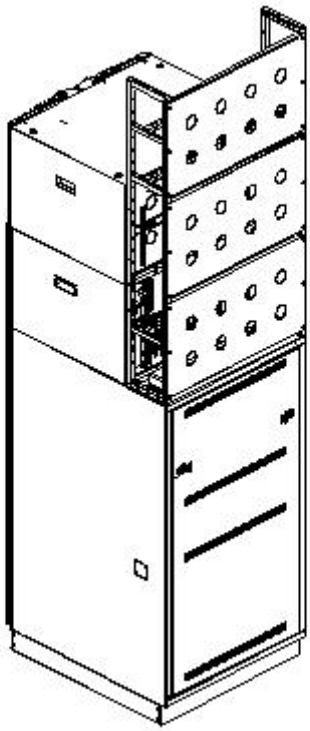
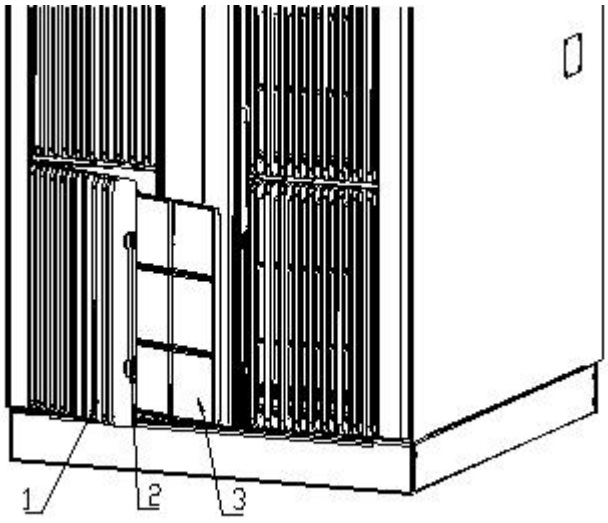


Fig. 4.2-18 Feeder Fixing Rack after Installation

4.2.5.2 Dust Filter



1. Plastic decoration panel 2. Pin 3. Dust-filtering network board

Fig. 4.2-19 Installation and Replacement of Dust Filters

The dust filters at the front of the cabinet of 3G can be replaced conveniently. Pull open the pin of the plastic decoration board. The decoration board can turn about 20 degrees to draw out the dust filtering network board for cleaning and replacement, as shown in Fig. 4.2-19. The dust filters are cleaned once every three hours or half year according to the specific environments of the equipment room.

4.2.6 Cabinet Installation Specifications

The layout, installation positions and directions of the cabinets should conform to the requirements in engineering design drawings.

1. The vertical error of the cabinet should be less than 3 mm.
2. When the cabinets are to be combined in a row, the adjacent cabinets should be close to each other. The cabinet fronts or backs should be in the same plane.
3. The captive screws must be fastened. The protrusion (height) of the same type nuts should be identical.
4. The PCB plug-in components should be in secure contact and can be plugged/unplugged easily. They should be in the same level when plugged in slots.
5. The parts on the cabinet should not be loose or damaged. The paint coating should not be peeled off or damaged. Otherwise, the lost paint should be supplemented.

5 Power Supply System Installation

Summary:

- Power cables of BTSB
- Installation method of the BTSB power supply
- Installation procedure of the BTSB power supply

5.1 Introduction to Power Cables

The DC power supply cables consist of the -48V cable (black), grounding cable (blue) and protection grounding cable (yellow green). The connector of the BDS power cable on BTSB is shown in Fig. 5.1-1.

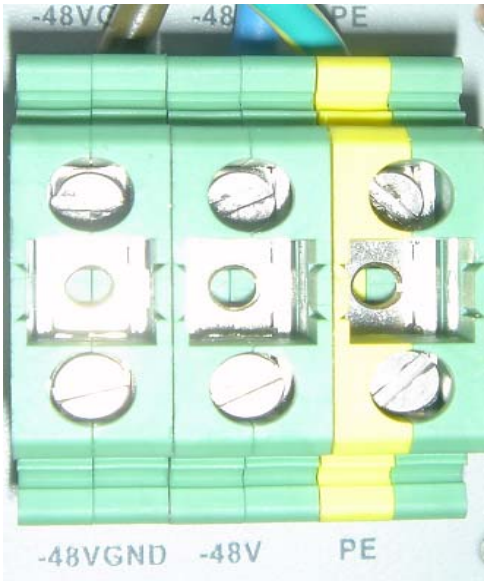


Fig. 5.1-1 BDS Power Cable Installation on BTSB

The diameter of the main power cable should be calculated by the actual capacity. The specifications of the three commonly used BTSB power cables are:

1. Black with the cross section area as 25 mm^2 (working grounding cable).

2. Blue with the cross section area as 25 mm^2 in section area (-48V).
3. Yellow green with the cross section area as 35 mm^2 (protection grounding cable).

5.2 Installation Flow of Power Cables

The power cable installation flow is shown in Fig. 5.2-1.

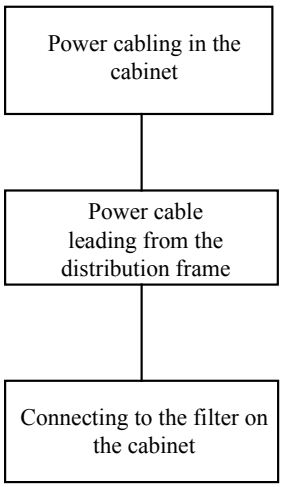


Fig. 5.2-1 Installation Flow of RFS Power

5.3 Cable Installation Procedure

The power supply is led into the filters by the power cables, distributed to the busbars on the two sides of the cabinet by PD, and then led to the backplane of each plug-in box by the busbars, As show Fig. 5.3-1.

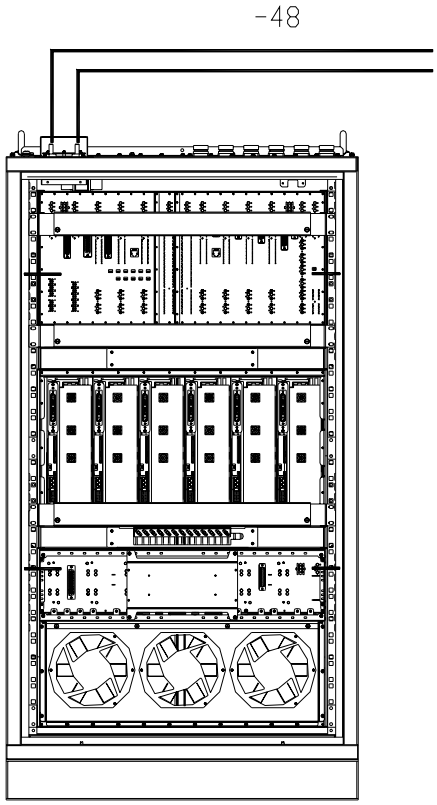


Fig. 5.3-1 RFS Power Cabling

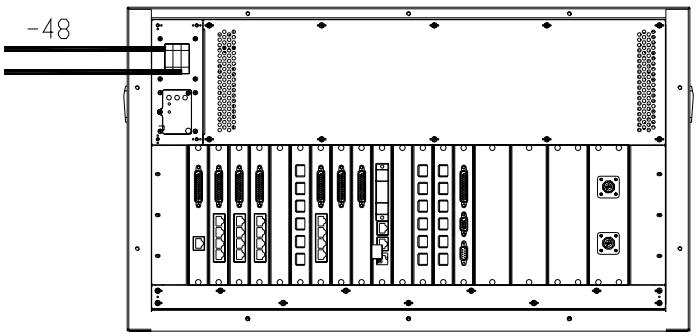


Fig. 5.3-2 BDS Power Cabling

The connection between the busbar and backplane through the -48V power cable is shown in Fig. 5.3-3.

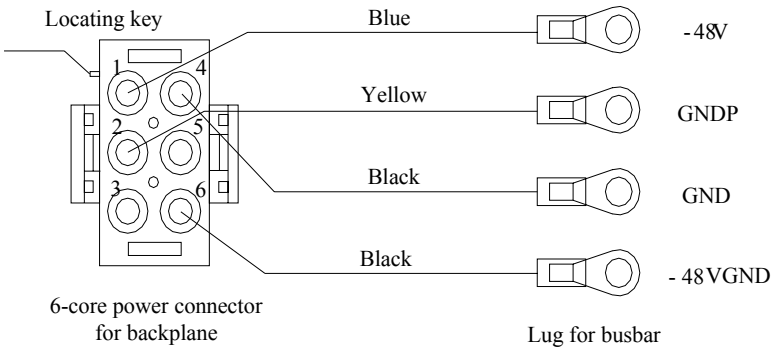


Fig. 5.3-3 Connection between Busbar and Backplane

End B of the power cable on the busbar usually has been connected before delivery. If the backplane of the plug-in box has been installed, the End A of the cable has been connected to the backplane. Only when the equipment capacity is to be expanded or the backplane is to be replaced, the power cables need to be connected on site.

1. Connection between the DC distribution cabinet and the DC distribution panel

   The PE grounding bar of the DC distribution cabinet must be reliably connected to the protective grounding bar provided by the carrier through the yellow/green wire with the copper core, plastic insulation layer and the same diameter as the power cable.

   The two -48V terminal blocks of the DC distribution cabinet should be reliably connected to the -48V DC negative busbars of the active/standby DC distribution panels respectively. The GND terminal blocks of the DC distribution cabinet should be reliably connected to the -48V DC positive busbars of the active/standby DC distribution panels respectively.

   If there is no DC distribution cabinet, PE wiring terminals of the cabinets must be reliably connected with the protective terminal blocks provided by the carrier. The power cables led out from -48 V and GND wiring terminals of each cabinet are directly connected to the -48V DC negative busbar and -48V DC positive busbar of the DC distribution panel.

2. Connection between the DC distribution cabinet and the cabinet

   Connect one end of the -48V power cable (blue, 16 mm2) to the -48V wiring terminal on the filter of the cabinet, and the other end to the -48V busbar of the DC distribution cabinet.

Connect one end of the -48V grounding cable (black, 16 mm2) to the GND wiring terminal on the filter of the cabinet, and the other end to the GND busbar of the DC distribution cabinet.

Connect the Protection Earth wire (PE) (yellow green, 25 mm2): one end is connected to the PE wiring terminal on the P power supply of the cabinet, and the other end to the PE busbar of the DC distribution cabinet.

3. Intra-module cabinet cascading

In the same module, the GND wiring terminals of each cabinet should be connected with each other via a shorted cable.

4. Precautions for connecting power cables

While fixing the lug at one end of the DC distribution frame, add the flat washer and spring washer to make sure that the lug is reliably fixed and that the cable and wiring bar are in good contact to minimize the contact resistance. For details, see Fig. 5.3-4.

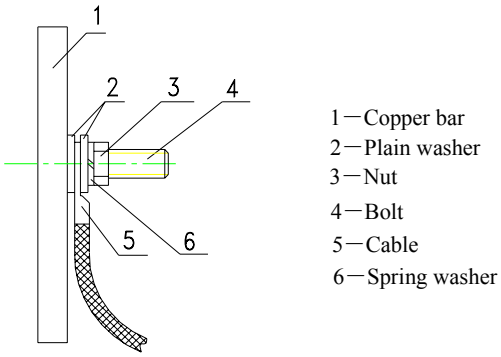


Fig. 5.3-4 Connecting Power Cable (1)

When installing lugs, if two or more cables need to be installed on one wiring post, the lugs should be crossed or installed in a back-to-back way, instead of being overlapped. If they must be overlapped, they should be bent into 45^{o} or 90^{o} before installation. Note that the big lug should be put under the small one. It is recommended to adopt this method in all the places where the lugs need to be installed. For details, see Fig. 5.3-5.

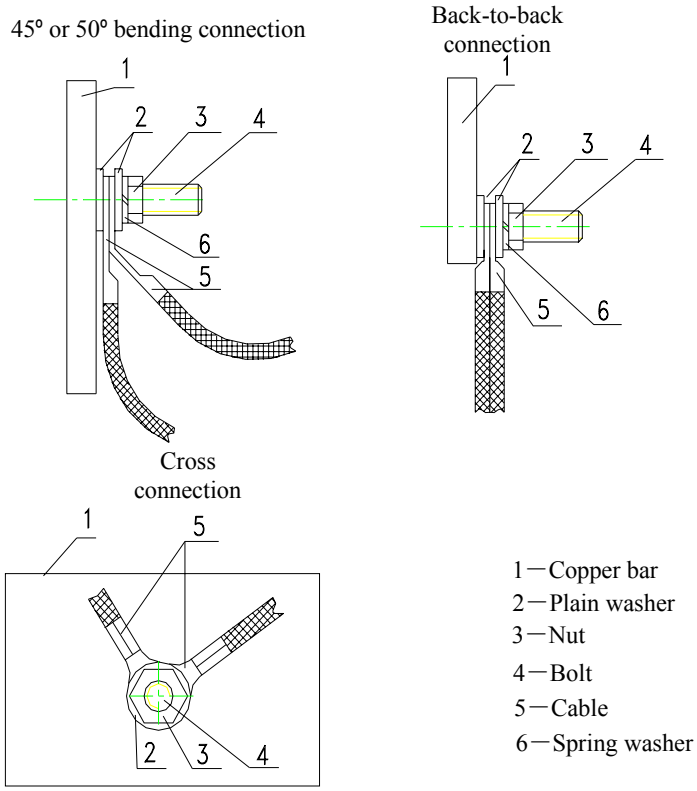


Fig. 5.3-5 Connecting Power Cable (2)

6 Grounding System Installation

Summary:

- Overview of BTSB grounding system installation
- Installation procedure of the BTSB grounding system

6.1 Grounding System Overview

This section describes the grounding of the BTSB equipment and the installation of the grounding device accessories required for the BTSB installation. It covers the installation of the grounding copper bar, the feeder grounding clip and the lightning arrester.

The purpose of grounding is to ensure the safety of human body and equipment and to improve the capability of the equipment to resist electromagnetic interference.

The grounding system consists of indoor part, outdoor part and underground ground grid of the building.

As to the engineering, the user is responsible for the basic ground grid construction of the grounding system, the grounding engineering of the iron tower and the building, and the provision of the connecting point for the indoor and the outdoor grounding copper bars to connect the ground grid via separate 50 mm2 wires, as shown in Fig. 6.1-1.

The wire of the indoor rack protection ground (PGND) is connected to the indoor grounding copper bar.

The wire of the BTSB rack working ground (–48VGND) is connected to the working ground terminal of the BTSB DC power rack.

To ground the lightning arrester, connect it to the outdoor grounding copper bar with a wire. To ground the feeder, connect each feeder to the outdoor grounding copper bar through a grounding clip before it enters the equipment room. This is shown in Fig. 6.1-1.

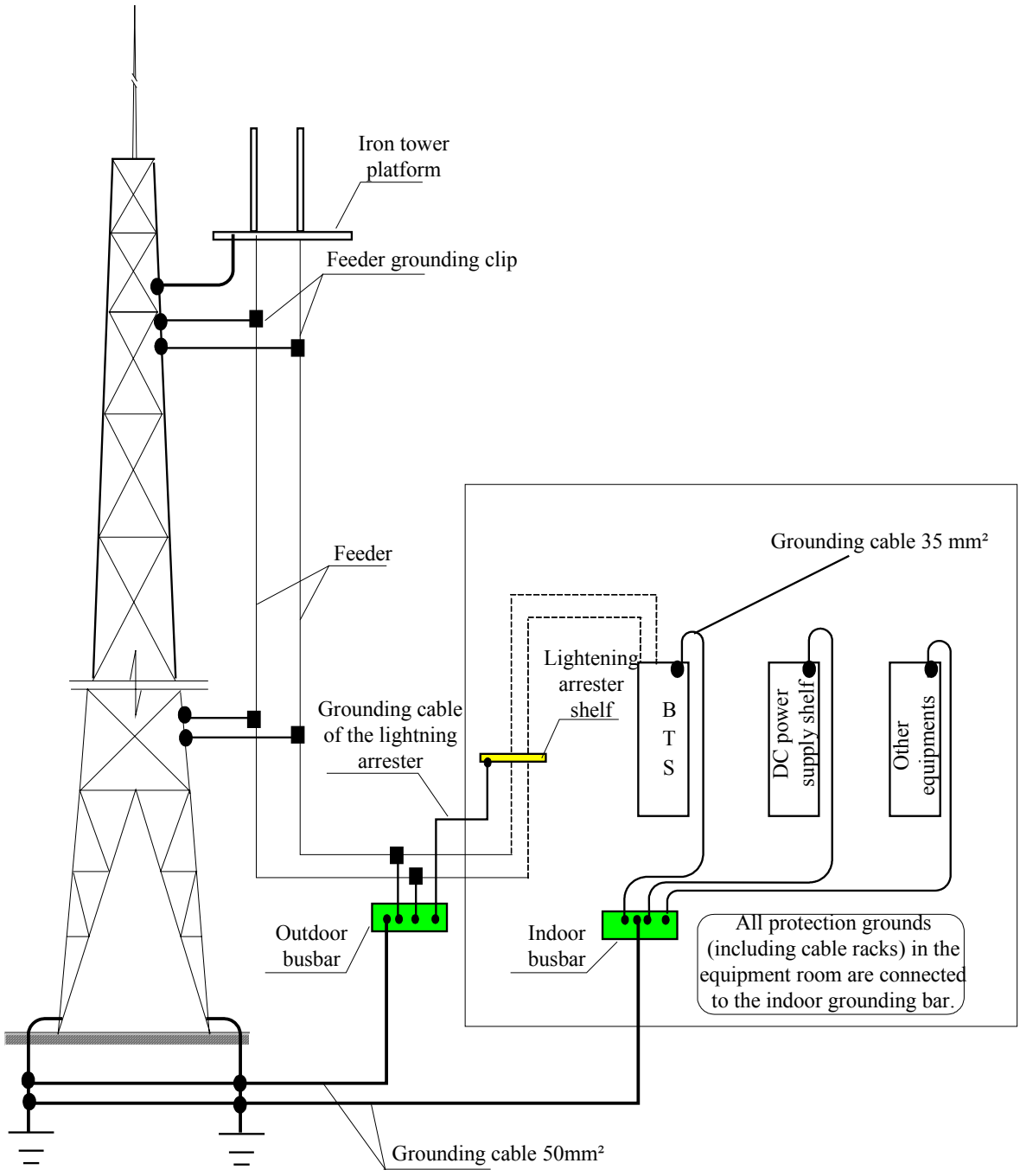


Fig. 6.1-1 Wiring for the BTSB Grounding

6.2 Installing the Grounding System

6.2.1 Installing the Outdoor Grounding Copper Bar

The outdoor grounding copper bar is used for lightning protection grounding. It is usually installed on the wall outside the feeder window. The best place for it is right under the feeder window or on the rainproof wall of the feeder well on the roof top. In principle, it is better to put it close to the feeder window.

During the practical installation, first determine the installation position of the grounding copper bar by following the engineering design drawing, and then install the grounding copper bar on the wall with the expansion bolts. See Fig. 6.2-1 for the structure of the grounding copper bar.

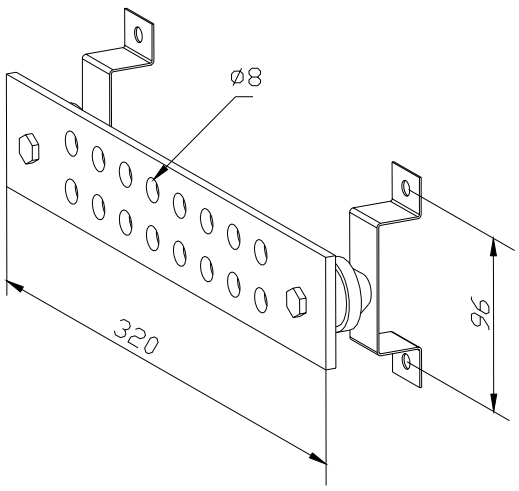


Fig. 6.2-1 Appearance of the Grounding Copper Bar

6.2.2 Installing the Feeder Grounding Clip

Caution:

No installation of grounding clip shall be performed in case of any lightning stroke, lest bodily injury may be incurred.

When installing the grounding clip, keep the feeder at the joint of the grounding clip and the feeder straight.

6.2.2.1 Grounding Principles of the Main Feeders

1. Usually, each main feeder should be grounded with grounding clips at least at three positions: on the tower platform, at the place where the main feeder leaves the tower for the outdoor cabling rack, and before the cable enters the equipment room. When the main feeder is over 60m, grounding clips should be added in the middle of it. Generally, a grounding clip is installed every 20m on the feeder.
2. The antenna feeder system, antenna support and new cabling rack installed on the roof top should be welded to the lightning protection grid of the building. The feeder should also be grounded at three positions: where it leaves the antenna pole, where it leaves the roof top, and where it enters the equipment room.
3. When the main feeder enters the equipment room from the roof top along the wall, the outdoor cabling ladder provided by the network operator must be grounded. If not, urge the network operator to finish it as soon as possible.

6.2.2.2 Installing the Grounding Clip

1. Prepare the tools: Paper cutter, flathead screwdrivers, wrench and sharp-nose pliers.
2. Select a proper installation position for the grounding clip. Cut open the sheath of the 7/8" feeder to the size of the grounding clip. The structure of the grounding clip is shown in Fig. 6.2-2.

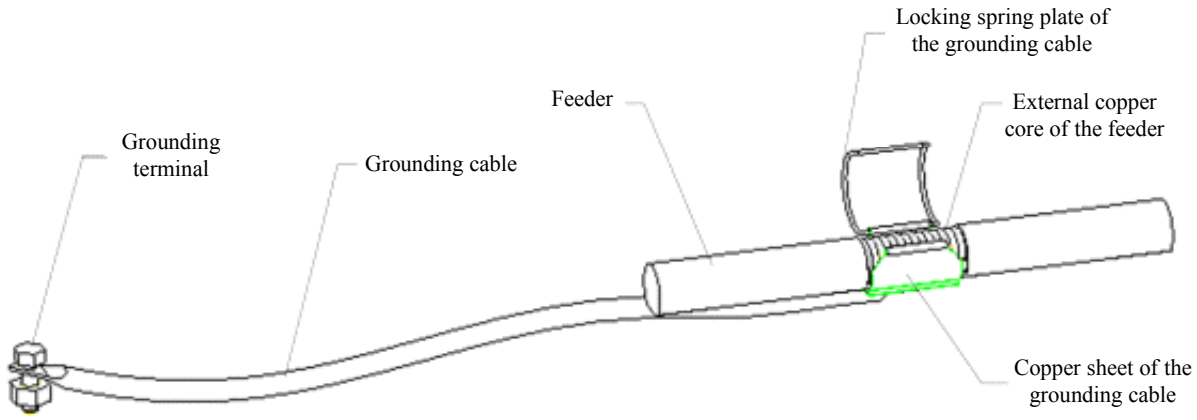


Fig. 6.2-2 Structure of the Grounding Clip

3. Lead the grounding cable of the feeder lightning grounding clip to the ground grid. No reverse direction is allowed. The angle formed by the grounding cable and the main feeder should not be more than 15^{o}. No reverse folding is allowed.

   In the case the antenna feeder system is installed on the tower, the grounding cable of the grounding clip should be led downward along the tower body.

   In the case the antenna feeder system is installed on the roof top, the grounding cable of the grounding clip should be led close to the building lightning protection grid.

4. Before installing the grounding clip, wrap the grounding cable at the grounding clip end that is close to the grounding cable copper sheet with the waterproof adhesive tape, as shown in Fig. 6.2-3. This can improve the sealing effect and prevent the rain from falling into the feeder interior along the grounding cable.

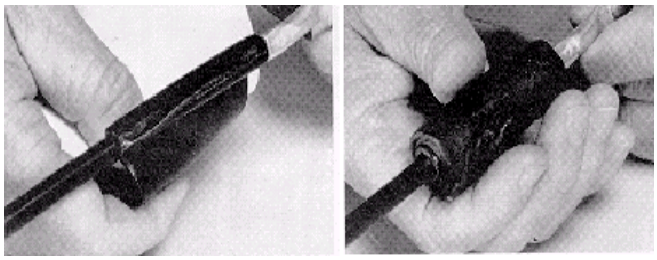


Fig. 6.2-3 Wrapping the Grounding Cable of the Grounding Clip with Waterproof Tape

5. Clamp the feeder external conductor with the grounding cable copper sheet and the locking spring plate, so that the grounding cable copper sheet and the feeder external conductor are fully meshed.

6. Take the following steps to conduct the waterproof treatment to the joint of the grounding clip and the feeder:

1） First wrap the waterproof adhesive tapes and then wrap the PVC tapes.

2） To wrap the waterproof adhesive tapes, apply them layer by layer from bottom to top first, then from top to bottom once again, and finally from bottom to top thrice, that is, wrap three layers of them. During the process, make sure the upper layer overlaps the lower layer by about half the width of the tapes.

7. The grounding end of the grounding clip can be connected to the main tower body or the outdoor cabling rack (connected to the lightning protection grid of

the building) on the roof top. Remove paint and oxide within the radius of about 13 mm at the connection place, and cover the clean area with antioxidant to ensure good electric contact. When the grounding end is connected, paint another coat of antirust paint.

8. Before the main feeder enters the room, the grounding end of the grounding clip can be connected to the outdoor grounding bar.

6.2.3 Installing the Indoor Lightning Arrester

For the wide-band lightning arrester that need not be grounded separately, you may directly connect it in serial to the place between the main feeder and the indoor cabinet top jumper. During the installation, the lightning arrester and indoor equipment as the cabling rack should be insulated.

For the lightning arrester that need be grounded, a lightning arrester frame should be provided. Please refer to the assembly instructions provided by the supplier for the assembling of the lightning arrester frame. The installation steps are as follows:

1. Install the lightning arrester on its frame in advance.

   During the installation, please note that the connectors at both ends of the lightning arrester are different: One end is a DIN male connector (DIN-M) and the other is a DIN female connector (DIN-F). Make sure that the DIN-M connector of all the lightning arresters installed on the frame are in the same direction, and the DIN-F connector of all the lightning arresters are in the same direction. The lightning arrester should be securely installed on the frame and in close contact with the frame.

2. Fix the assembled lightning arrester to the cabling rack.

   Plan the installation position carefully to make both the main feeder and the cabinet top jumper easily be connected to the lightning arrester and to enable easy cabling.

   The lower part of the lightning arrester frame that is secured to the cabling rack can be adjusted according to the width of the cabling rack.

   When the lightning arrester frame is installed on the cabling rack, make sure that its DIN-M connector points to the main feeder and its DIN-F connector points to the connection line from the jumper to the rack.

3. The lightning arrester is installed indoor. Its grounding cable should be connected to the outdoor grounding copper bar and should not contact with the conductor of the indoor cabling rack. The lightning arrester frame is insulated from the cabling rack.

The installation of the lightning arrester frame is shown in Fig. 6.2-4.

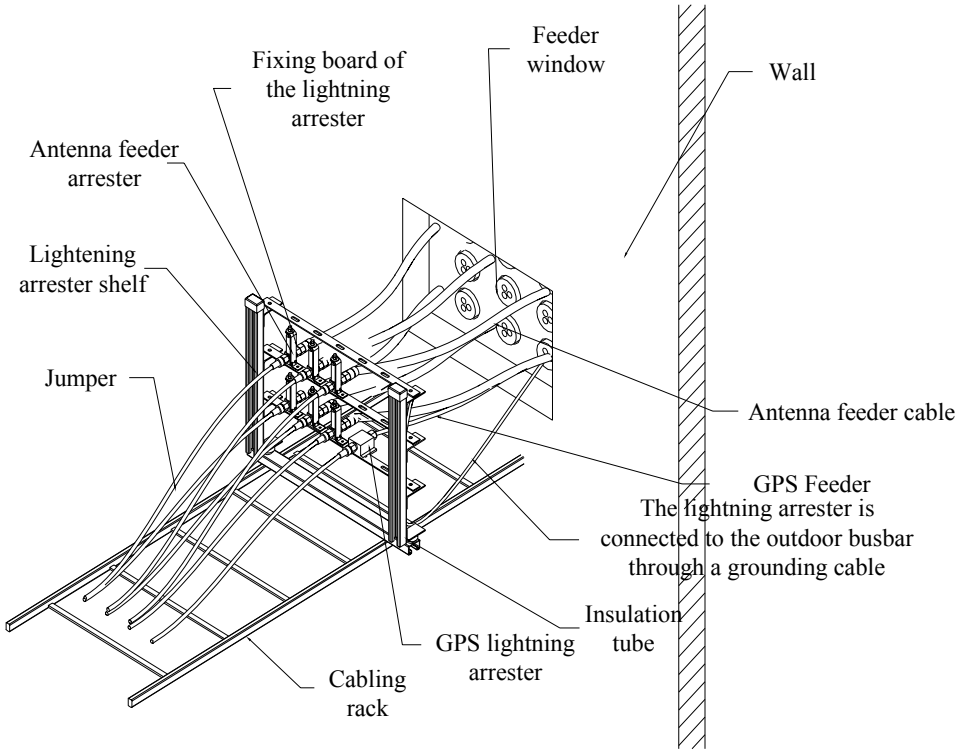


Fig. 6.2-4 Installing the Lightning Arrester Frame

7 Cable Installation in Cabinet

Summary:

- BTSB cable types
- Cable installation in the BDS cabinet
- Cable installation in the RFS cabinet
- Types and installation of inter-cabinet cables

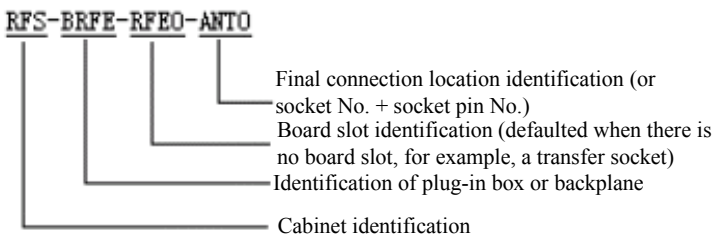
7.1 BTSB Cable Installation Overview

ZXC10 BTSB I1 has a BDS cabinet and an RFS that is usually mounted on the RFS cabinet. This chapter describes the internal cables of the BDS and RFS and the connection cables between them.

Note:

1. The sequence numbers 1, 2, 3, 4 and so on in the wiring table represent the numbers of cable components in the wiring diagram.
2. The combinations of the numbers and the terminal category symbols in the wiring diagram represent the directions of End As or End Bs in the wiring table.
3. Multiple terminals in different directions of the cable component of the same number are represented with code/B1 and code/B2.
4. Cable direction in the wiring table represents where the terminals of each cable component will go.

Example



5. Generally the internal cables have been installed before delivery, so you only need to check their status after the cabinet installation. Check whether the cables are properly connected, whether the socket connectors are firmly and properly inserted, and whether the distributed cables are in good order and without shortages. If any socket connector is damaged or loosened or any cable is scratched, try to repair it or re-distribute the cable.

7.2 Installing Cables in the BDS Cabinet

7.2.1 BDS Cable Types

The cables inside the BDS include power cables, optical fibers and internal monitoring cables. All these cables have been installed before delivery.

7.2.2 Installing Power Cables in the BDS

The power cables inside the BDS include those between the filter and the air switch, the air switch and the busbar on the right, the busbar and the BDS/FAN backplane.

1. The power cable between the filter -48V and the air switch is a 4 mm2 black cable identified by the blue heat-shrinkable tubes on both ends.
2. The power cable between the filter -48VGND and a -48VGND terminal of the right busbar is a 4 mm2 black cable with a lug crimped to the terminal for busbar.
3. The power cable between the filter PGND and the GND terminal of the right busbar is a 4 mm2 yellow green cable with a lug crimped to the terminal for busbar.
4. The power cable between the busbar and the BDS backplane is a 9-core cable, connecting to -48V, -48VGND and PE according to the identifications at the backplane and the busbar.
5. The power cable between the busbar and the BDS backplane is a 3-core cable, connecting to -48V, -48VGND and GND according to the identifications at the backplane and the busbar.

7.2.3 Installing Optical Fibers

Optical fibers should be installed to meet the configuration requirements in the contract.

They are usually used to connect a remote RF cabinet.

The optical fiber jumpers connect the blind match connectors of the BDS backplane RIM0 master/slave slots to the optical adaptors on the two BIM6 interface boards. The jumpers are available with the following types: MTP4-LC-0.5M, BMTP8-LC-0.5M and BMTP12-LC-0.5M, and the optical fibers are connected in the spectrum order of blue, orange, green, brown, gray, white, red, black, yellow, purple, pink and cyan.

When installing optical fibers, make sure that the bending radius is larger than 40 mm to prevent any damages. In addition, the optical fibers should not be bundled too tight and there should be some space kept between an optical fiber and the clips.

7.2.4 Installing Monitoring Cables in the BDS

The internal monitoring cables of the BDS include cables for front access control monitoring, CCM board temperature monitoring, CHM board temperature monitoring, flooding monitoring and fan monitoring.

The internal monitoring cables adopt the one-to-eight structure with the ends being A and B1 ~ B8. End A is connected to the X154EMSOCKET socket on the BDS backplane; B1 is connected to the front door position switch along the right side of the chassis; B2 is designed to be connected to the back door position switch (now idle); B3, B4 and B5 are temperature sensors connected to the top of the CCM and CHM boards; B6 is connected to the DB25 socket of the fan plug-in box backplane; B7 is to the lightning-proof board of the BDS filter; B8 is to the flooding sensor (unnecessary when the BDS is mounted on the RFS cabinet) at the lower right corner of the BDS.

7.2.5 Internal Cabling Table of the BDS

The internal cabling of BDS is shown in Table 7.2-1.

Table 7.2-1 Internal Cabling Table of BDS

Sequence No.	Cable Component Name	End A Direction	End B Direction
1	PWR	Filter –48v	Left connecting hole of the air switch (front view of cabinet)
2	PWR	Right connecting hole of the air-break (front view of cabinet)	Right busbar -48V
3	PWR	Filter -48VGND	Right busbar -48VGND

Sequence No.	Cable Component Name	End A Direction	End B Direction
4	PWR	Filter GNDP	Right busbar GND
5	PWR	Tandem grounding on the top of the BDS cabinet	Right busbar -48VGND
			Right busbar GND
6	PWR	BDS-BBDS-X1_1	Right busbar -48V
		_7	Right busbar -48VGND
		_8, 9	Right busbar GND
		_5, 6	Right busbar -48VGND
		_2, 3	Right busbar -GNDA
7	PWR	BDS-BFAN0-X1	Right busbar -48V/B3
			Right busbar -48VGND/B2
			Right busbar –GNDP/B1
8	MON	BBDS-X154/A	BDS front door position switch/B1
			FAN0TEMP/B3
			FAN1TEMP/B4
			FAN2TEMP/B5
			BFAN0-X5/B6
			Filter TPB0/B7
			Right corner of BDS cabinet/B8
9	GCMRF	GCM interface board-GCMANT	BBDS-GCMA-ANT
10	GCMRF	GCM interface board-GCMANT	BBDS-GCMA-ANT
11	JDX	Left grounding screw of the plug-in box	Left grounding screw of the front door
12	JDX	Right grounding screw of the plug-in box	Right grounding screw of the front door

Internal optical fiber cabling of BDS is shown in Table 7.2-2.

Table 7.2-2 Internal Optical Fiber Cabling of BDS

Sequence No.	Cable Component Name	End A Direction	End B Direction
13	BMTP-LC	BBDS-RIMA-BMTP	BDS-BIM6_OPT0-RX (blue)
			BDS-BIM6_OPT0-TX (orange)
			BDS-BIM6_OPT1-RX (green)
			BDS-BIM6_OPT1-TX (brown)
			BDS-BIM6_OPT1-TX (grey)
			BDS-BIM6_OPT1-TX (white)

			BDS-BIM6_OPT1-TX (red)
			BDS-BIM6_OPT1-TX (black)
			BDS-BIM6_OPT1-TX (yellow)
			BDS-BIM6_OPT1-TX (purple)
			BDS-BIM6_OPT1-TX (pink)
			BDS-BIM6_OPT1-TX (cyan)
14	BMTP-LC	BBDS-RIMA-BMTP	BDS-BIM6_OPT0-RX (blue)
			BDS-BIM6_OPT0-TX (orange)
			BDS-BIM6_OPT1-RX (green)
			BDS-BIM6_OPT1-TX (brown)
			BDS-BIM6_OPT1-TX (grey)
			BDS-BIM6_OPT1-TX (white)
			BDS-BIM6_OPT1-TX (red)
			BDS-BIM6_OPT1-TX (black)
			BDS-BIM6_OPT1-TX (yellow)
			BDS-BIM6_OPT1-TX (purple)
			BDS-BIM6_OPT1-TX (pink)
			BDS-BIM6_OPT1-TX (cyan)

7.2.6 Internal Cabling of the BDS

The internal cabling of BDS is shown in Fig. 7.2-1.

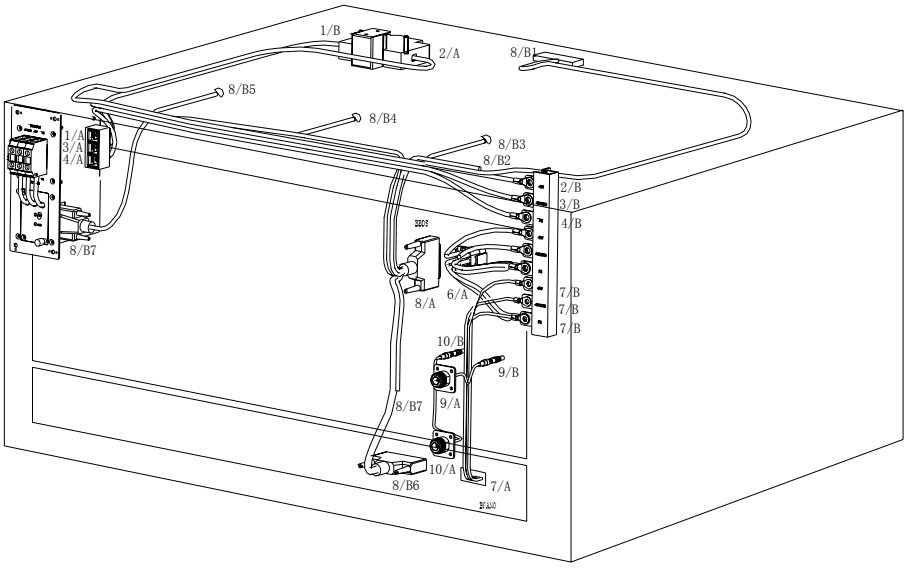


Fig. 7.2-1 Internal Cabling of BDS

7.3 RFS Installing Cables in the RFS Cabinet

The cables inside the RFS cabinet include power cable, signal cable, RF cable and monitoring cable. All these cables have been installed before delivery.

7.3.1 Installing Power Cables

The power cables inside RFS include the power cables between the filter and the air switch/the –48v bus bar, the busbar and the RFS backplane/linear amplifier LPA and the grounding cable between the backplane to the busbar.

The connection relationship of the RFS power cable is shown in Table 7.3-1.

Table 7.3-1 Connection Relationship of RFS Power Cables

Sequence No.	Cable Component Name	End A Direction	End B Direction
15	PWR	Filter –48v	Left connecting hole of the air switch (front view of cabinet)
16	PWR	Right connecting hole of the air-break (front view of cabinet)	Right busbar -48V
17	PWR	Filter -48VGND	Right busbar -48VGND
18	PWR	BDS-BFAN0-X1	Right busbar -48V
			Right busbar -48VGND
			Right busbar –PE1PE1
19	PWR	RFS-BTRX-X166_1	Right busbar -48V
		_7	Right busbar -48VGND
		_8, 9	Right busbar GNDD
		_5, 6	Right busbar –PE1
		_2, 3	Right busbar -GNDA
20	PWR	RFS-BRFE-X6_1	Right busbar -48V
		_7	Right busbar -48VGND
		_8, 9	Right busbar GNDD
		_5, 6	Right busbar –PE1
		_2, 3	Right busbar -GNDA
21	PWR	RFS-BLPA-X72_1	Right busbar -48V
		_7	Right busbar -48VGND
		_8, 9	Right busbar GNDD
		_5, 6	Right busbar –PE2
		_2, 3	Right busbar -GNDA
22	PWR	RFS-BLPA-LPA0_-48V	Left busbar -48V

Sequence No.	Cable Component Name	End A Direction	End B Direction
		RFS-BLPA-LPA1_-48V	
23	PWR	RFS-BLPA-LPA2_-48V	Left busbar -48V
		RFS-BLPA-LPA3_-48V	
24	PWR	RFS-BLPA-LPA4_-48V	Left busbar -48V
		RFS-BLPA-LPA5_-48V	
25	PWR	RFS-BLPA-LPA6_-48V	Left busbar -48V
26	PWR	RFS-BLPA-LPA0_-48VGND	Left busbar -48VGND
		RFS-BLPA-LPA1_-48VGND	
27	PWR	RFS-BLPA-LPA2_-48VGND	Left busbar -48VGND
		RFS-BLPA-LPA3_-48VGND	
28	PWR	RFS-BLPA-LPA4_-48VGND	Left busbar -48VGND
		RFS-BLPA-LPA5_-48VGND	
29	PWR	RFS-BLPA-LPA6_-48VGND	left busbar -48VGND
30	PWR	RFS-right busbar -48VGND	Busbar 1 on the top of the RFS
		RFS-right busbar GNDP	
		RFS-right busbar GNDP	
31	PWR	RFS right busbar-PE1	Busbar 2 on the top of RFS
		RFS right busbar-PE2	
32	FAN	LPAFAN0	BLPA-FAN0
33	FAN	LPAFAN1	BLPA-FAN1
34	FAN	LPAFAN2	BLPA-FAN2
35	JDX	Grounding screw of the left column	Grounding screw of the left front door
36	JDX	Grounding screw of the left column	Grounding screw of the left front door
37	JDX	Grounding screw of the left column	Grounding screw of the left front door

Power cable connection inside RFS is shown in Fig. 7.3-1.

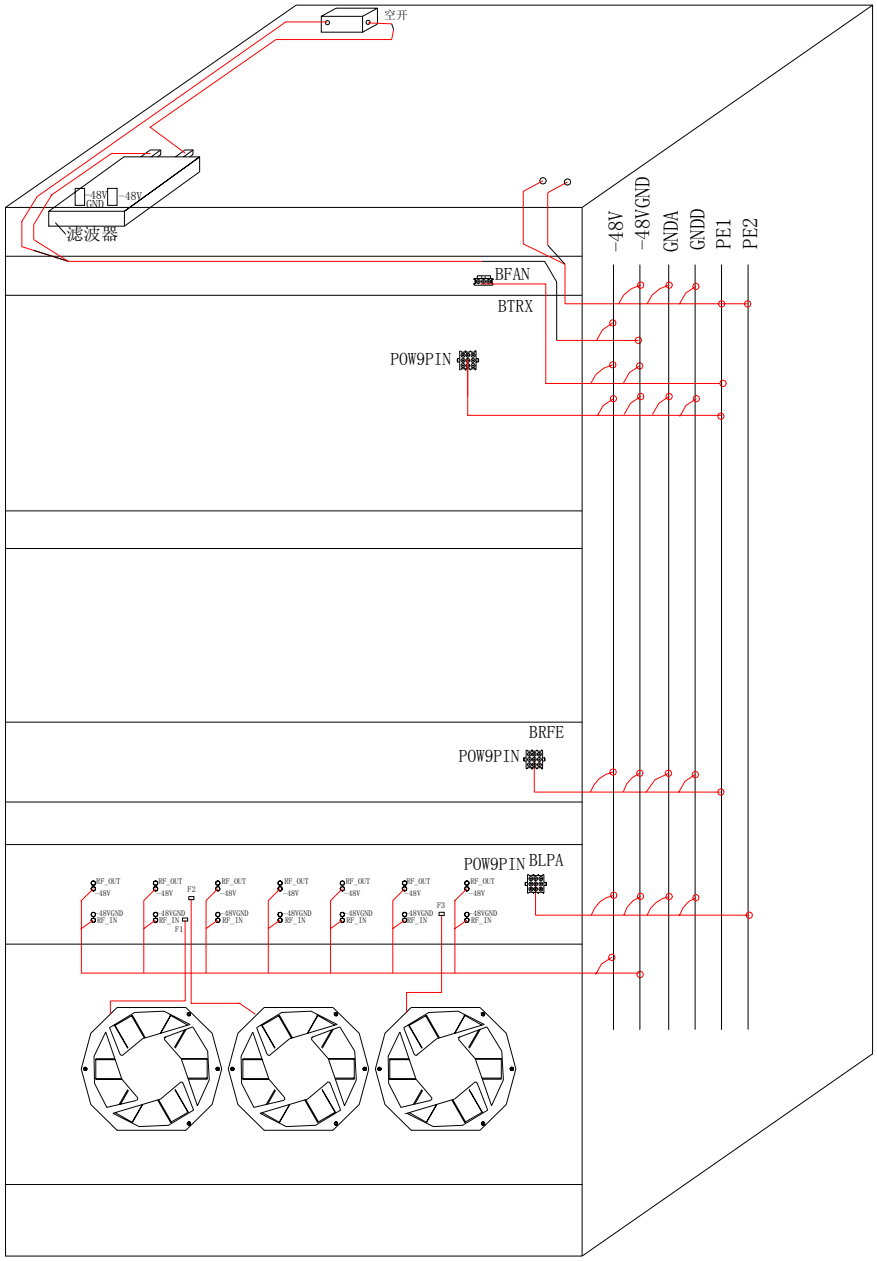


Fig. 7.3-1 Power Cabling in RFS

7.3.2 Installation Interconnection Signal Cables

The signal cable inside the RFS cabinet includes signal interconnection cable and lightening-proof signal cable. The inter-frame interconnection is between the TRX layer and the RFE layer and between the TRX layer and the LPA layer. And the inter-cabinet connection is between the RFS cabinet and BDS cabinet or between RFS

cabinet and BDS cabinet. The lightning-proof signal cable is connected to the TRX layer through the lightning board on the top of the cabinet and transit on the top of the cabinet.

The interconnection signal cable connection relationship in RFS cabinet is shown in Table 7.3-2.

Table 7.3-2 Interconnection Signal Cabling in RFS Cabinet

Sequence No.	Cable Component Name	End A Direction	End B Direction
38	LINK	RFS-BTRX_BBDS	RFS-Cabinet top_BDS
39	LINK	RFS-BTRX_BBDS	RFS-Cabinet top BPWS
40	LINK	RFS-BTRX-MON_485	RFS-Cabinet top EXT_MON
41	LINK	RFS-BTRX-OUT_MON	RFS-Cabinet top OUT_MON _
42	LINK	RFS-BTRX_BRFE	RFS-BRFE_BTRX
43	LINK	RFS-BTRX_BLPA	RFS-BLPA_BTRX

7.3.3 Installing Monitoring Cables

The monitoring cables inside RFS include the front door/back door access control monitoring, RMM/TRX board temperature monitoring, flooding monitoring and fan plug-in monitoring.

The monitoring cable connection relationship inside RFS cabinet is shown in Table 7.3-3.

Table 7.3-3 Monitoring Cabling in RFS Cabinet

Sequence No.	Cable Component Name	End A Direction	End B Direction
44	MON	RFS-BTRX-IN_MON/A	RFS front door position switch/B1
			RFS back door position switch/B2
			RFS-TRXFAN0/B3
			RFS-TRXFAN1/B4
			RFS-LPAFAN0/B5
			RFS-LPAFAN1/B6
			RFS-BFAN0-X5/B7
			RFS cabinet top RPD/B8
			Right corner of RFS cabinet/B9

The RFS backplane layout is shown in Fig. 7.3-2.

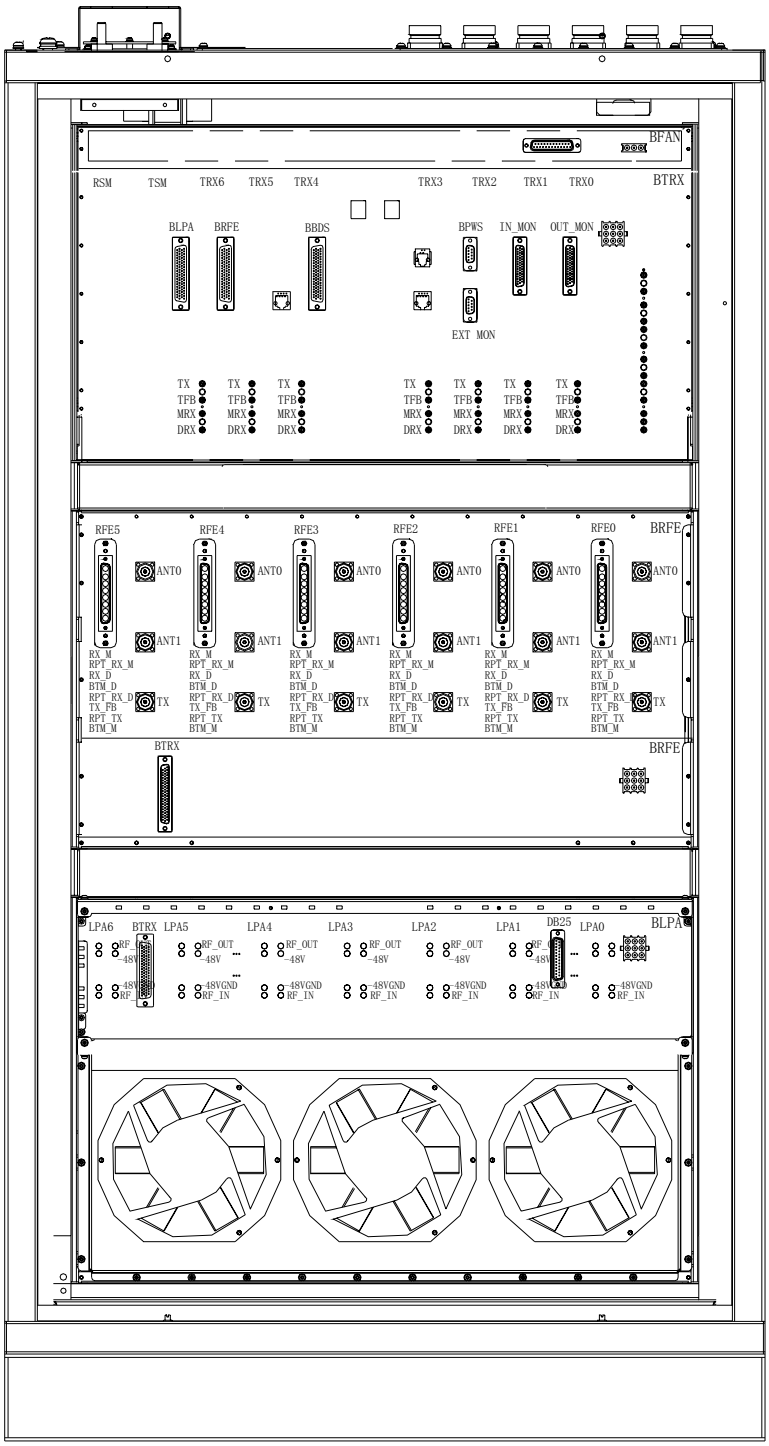


Fig. 7.3-2 RFS Backplane Layout

The layout of the interface board on the top of RFS cabinet is shown in Fig. 7.3-3.

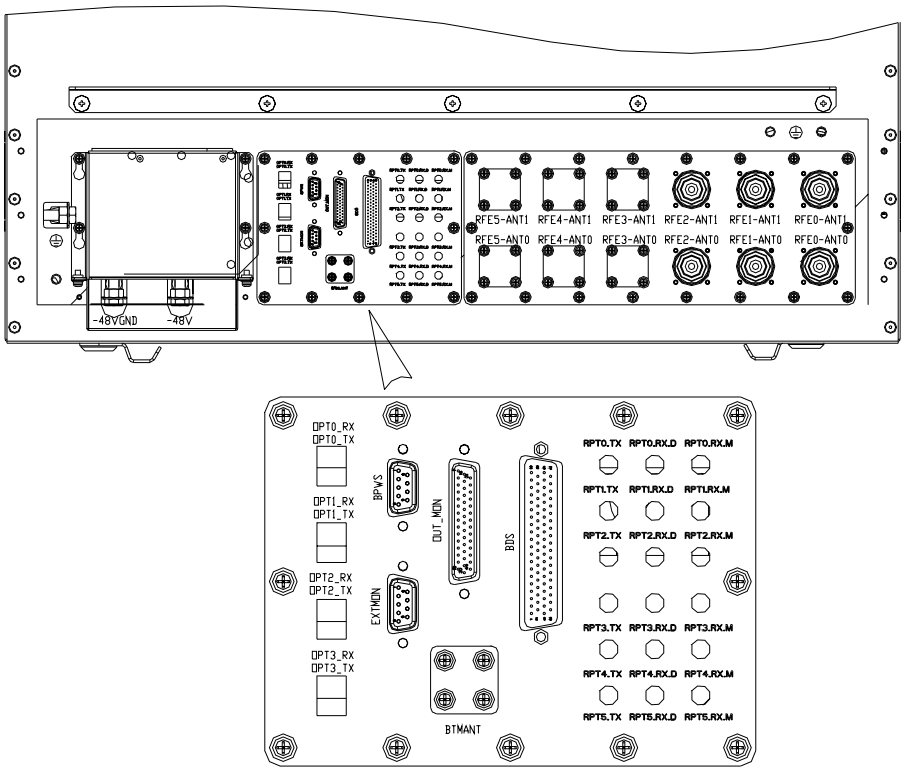


Fig. 7.3-3 Layout of the Interface Board on the Top of RFS Cabinet

The cabling of signal cables and monitoring cables inside RFS is shown in Fig. 7.3-4.

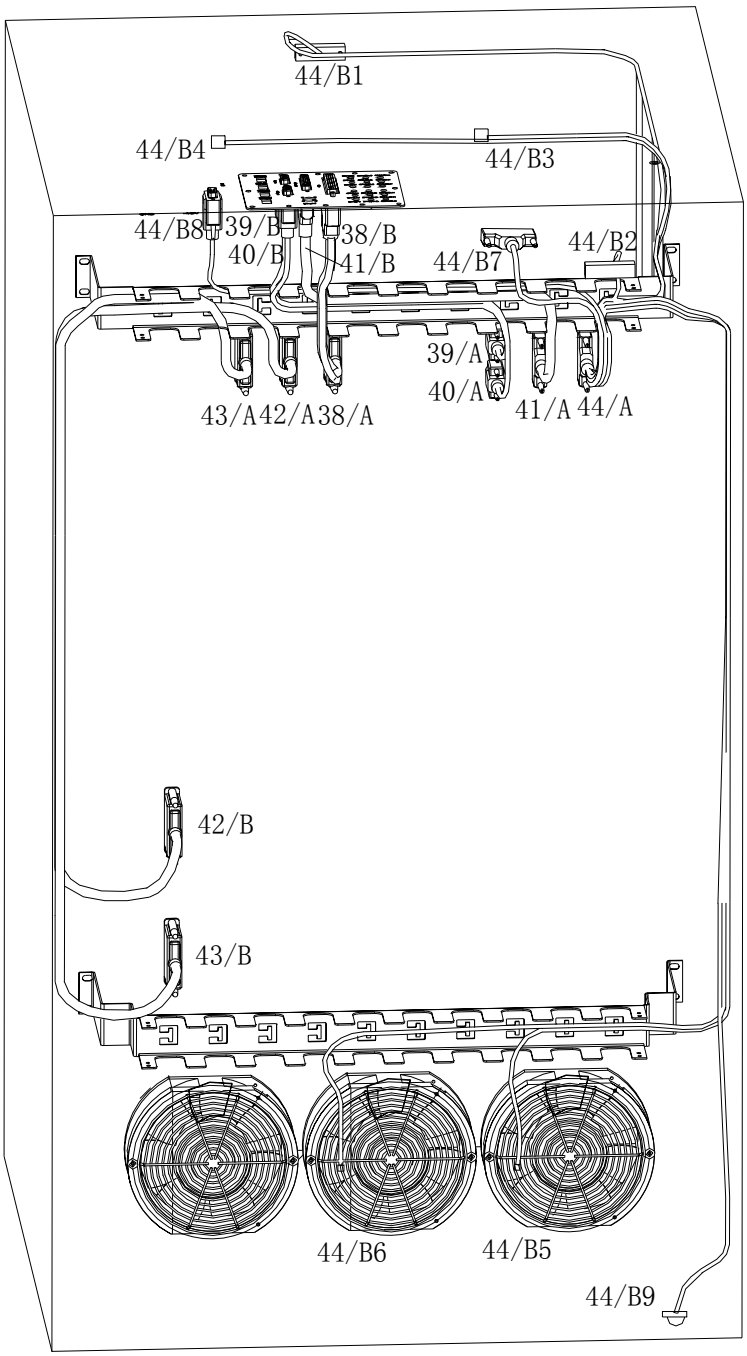


Fig. 7.3-4 Signal and Monitoring Cabling in the RFS

7.3.4 Installing RF Cables

The RF cables in the RFS cabinet refers to the FR cables from TRX to RFE, TRX to LPA, RFE to LPA and RFE to antenna feeder system. The first two cables are fully

configured in 8-carrier 3-section mode and the RF cable from RFE to the antenna feeder system is installed according to the specific configuration with two cables for one RFE.

The RF cable connection relationship inside an RFS cabinet is shown in Table 7.3-4.

Table 7.3-4 RF Cable Connection in the RFS cabinet

Sequence No.	Cable Component Name	Length	End A Direction	End B Direction
45	3GRF22-001	340	BTRX-TRX0-MRX_TRX	BRFE-RFE0-RX_M
46	3GRF22-001	340	BTRX-TRX0-DRX_TRX	BRFE-RFE0-RX_D
47	3GRF22-002	380	BTRX-TRX0-TFB_TRX	BRFE-RFE0-TX_FB
48	3GRF22-001	340	BTRX-TRX1-MRX_TRX	BRFE-RFE1-RX_M
49	3GRF22-001	340	BTRX-TRX1-DRX_TRX	BRFE-RFE1-RX_D
50	3GRF22-002	380	BTRX-TRX1-TFB_TRX	BRFE-RFE1-TX_FB
51	3GRF22-002	380	BTRX-TRX2-MRX_TRX	BRFE-RFE2-RX_M
52	3GRF22-002	380	BTRX-TRX2-DRX_TRX	BRFE-RFE2-RX_D
53	3GRF22-004	410	BTRX-TRX2-TFB_TRX	BRFE-RFE2-TX_FB
54	3GRF22-004	410	BTRX-TRX3-MRX_TRX	BRFE-RFE3-RX_M
55	3GRF22-004	410	BTRX-TRX3-DRX_TRX	BRFE-RFE3-RX_D
56	3GRF22-006	440	BTRX-TRX3-TFB_TRX	BRFE-RFE3-TX_FB
57	3GRF22-004	410	BTRX-TRX4-MRX_TRX	BRFE-RFE4-RX_M
58	3GRF22-004	410	BTRX-TRX4-DRX_TRX	BRFE-RFE4-RX_D
59	3GRF22-006	440	BTRX-TRX4-TFB_TRX	BRFE-RFE4-TX_FB
60	3GRF22-006	440	BTRX-TRX5-MRX_TRX	BRFE-RFE5-RX_M
61	3GRF22-006	440	BTRX-TRX5-DRX_TRX	BRFE-RFE5-RX_D
62	3GRF22-007	470	BTRX-TRX5-TFB_TRX	BRFE-RFE5-TX_FB
63	3GRF22-008	1060	BTRX-TRX0-TX_TRX	BLPA-LPA0-RF_IN
64	3GRF22-009	1180	BTRX-TRX1-TX_TRX	BLPA-LPA1-RF_IN
65	3GRF22-010	1300	BTRX-TRX2-TX_TRX	BLPA-LPA2-RF_IN
66	3GRF22-011	1420	BTRX-TRX3-TX_TRX	BLPA-LPA3-RF_IN
67	3GRF22-010	1300	BTRX-TRX4-TX_TRX	BLPA-LPA4-RF_IN
68	3GRF22-009	1180	BTRX-TRX5-TX_TRX	BLPA-LPA5-RF_IN
69	3GRF30-001	400	BRFE-RFE0-TX_R	BLPA-LPA0-RF_OUT
70	3GRF30-001	400	BRFE-RFE1-TX_R	BLPA-LPA1-RF_OUT
71	3GRF30-001	400	BRFE-RFE2-TX_R	BLPA-LPA2-RF_OUT
72	3GRF30-002	430	BRFE-RFE3-TX_R	BLPA-LPA3-RF_OUT
73	3GRF30-002	430	BRFE-RFE4-TX_R	BLPA-LPA4-RF_OUT
74	3GRF30-002	430	BRFE-RFE5-TX_R	BLPA-LPA5-RF_OUT
75	3GRF20-001	630	BRFE-RFE0-ANT0	RFS cabinet top-RFE0_0

Sequence No.	Cable Component Name	Length	End A Direction	End B Direction
76	3GRF20-002	710	BRFE-RFE0-ANT1	RFS cabinet top-RFE0_1
77	3GRF20-003	760	BRFE-RFE1-ANT0	RFS cabinet top-RFE1_0
78	3GRF20-004	840	BRFE-RFE1-ANT1	RFS cabinet top -RFE1_1
79	3GRF20-004	840	BRFE-RFE2-ANT0	RFS cabinet top-RFE2_0
80	3GRF20-005	920	BRFE-RFE2-ANT1	RFS cabinet top-RFE2_1
81	3GRF20-007	1260	BRFE-RFE3-ANT0	RFS cabinet top-RFE3_0
82	3GRF20-008	1310	BRFE-RFE3-ANT1	RFS cabinet top-RFE3_1
83	3GRF20-009	1110	BRFE-RFE4-ANT0	RFS cabinet top-RFE4_0
84	3GRF20-010	1210	BRFE-RFE4-ANT1	RFS cabinet top -RFE4_1
85	3GRF20-006	1010	BRFE-RFE5-ANT0	RFS cabinet top-RFE5_0
86	3GRF20-011	1040	BRFE-RFE5-ANT1	RFS cabinet top-RFE5_1

Note: Cables 81 ~ 86 are configured as required usually for the high carrier.

The RF cable interface of RFS cabinet is shown in Fig. 7.3-5 and the cabling of the RF cables in RFS is shown in Fig. 7.3-6.

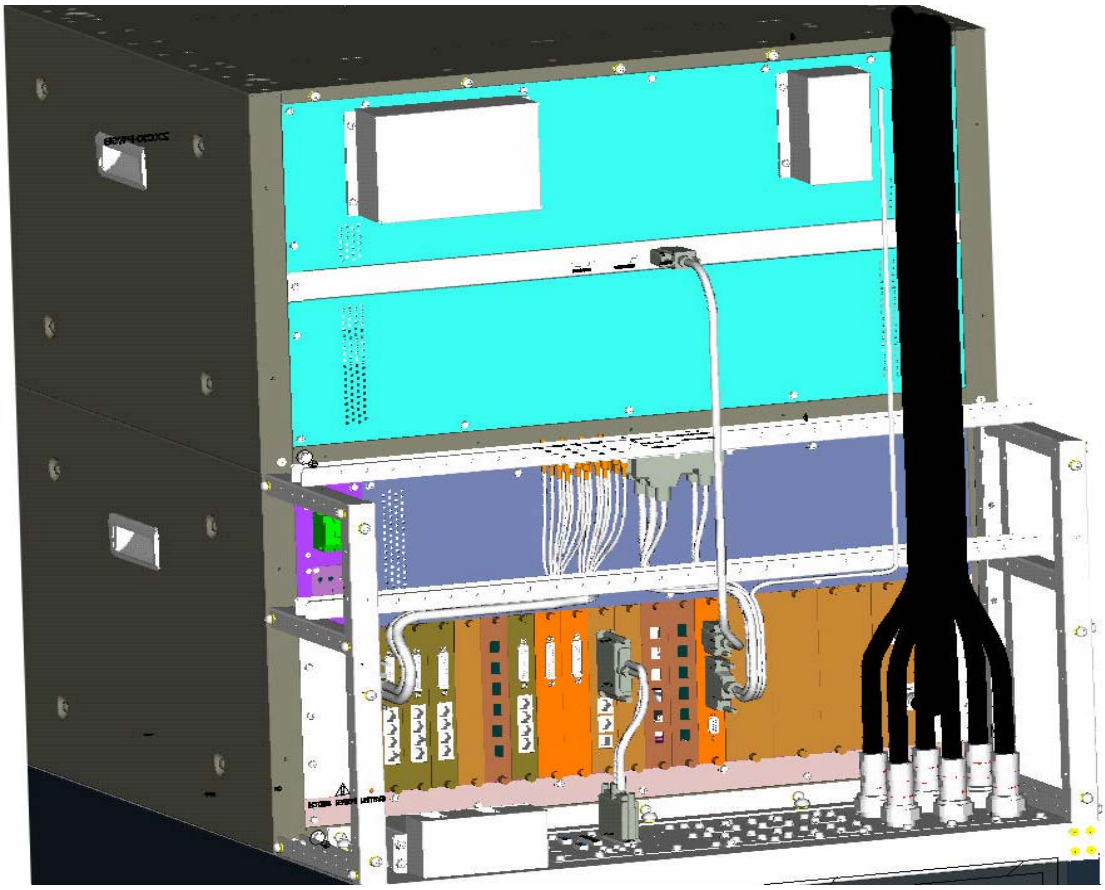


Fig. 7.3-5 RF Cable Interface in RFS

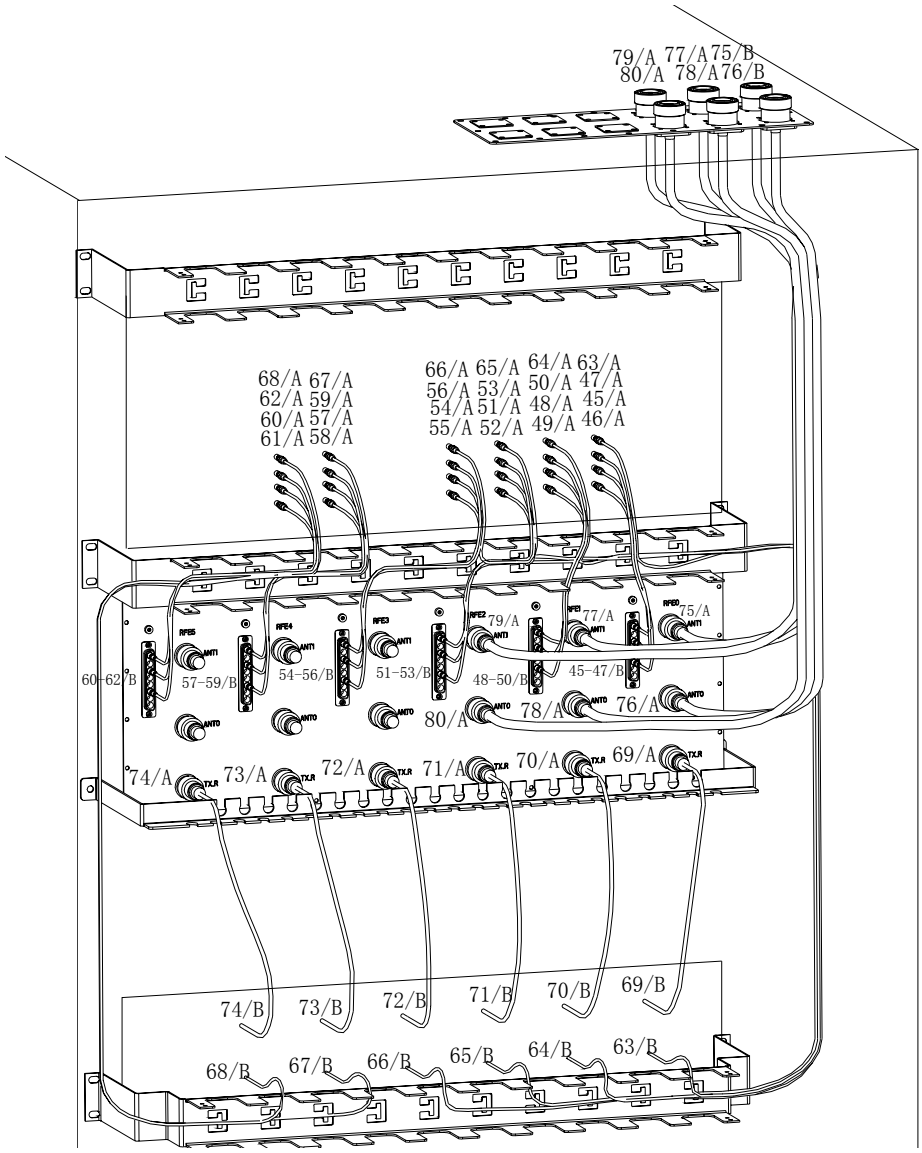


Fig. 7.3-6 RF Cabling in the RFS

7.3.5 Connecting Optical Fibers

The optical fibers in RFS refer to the optical fibers between the TRX subsystem and the BDS subsystem. They are connected from the RMM board on the BTRX backplane to the adaptor on the cabinet top for a transition. The optical fibers are configured pursuant to the contract. Optical fiber connection in RFS cabinet.

Table 7.3-5 Optical Fiber Connection Table in RFS Cabinet

Sequence No.	Cable Component Name	End A Direction	End B Direction
87	BMTP4-LC	RFS-BTRX-RMMA-OIBA	RFS-Cabinet top-OIBA_RX_0
			RFS-Cabinet top-OIBA_TX_0
			RFS-Cabinet top-OIBA_RX_1
			RFS-Cabinet top-OIBA_TX_1
88	BMTP4-LC	RFS-BTRX-RMMB-OIBB	RFS-Cabinet top-OIBB_RX_0
			RFS-Cabinet top-OIBB_TX_0
			RFS-Cabinet top-OIBB_RX_1
			RFS-Cabinet top-OIBB_TX_1

The overlong part of the optical fiber should be reeled into a ring shape with a diameter bigger than 80 mm and be hung on the horizontal cabling rack at the TRX layer loose with a clip.

7.4 Types and Installation of Inter-Cabinet Cables

The inter-cabinet cables include the interconnection cables between BDS and RFS (connect with the remote RFS via an optical fiber) an interconnection cable connecting the PWS cabinet and an E1 cable connecting BSC.

7.4.1 Installing BDS−RFS Interconnection Cable

The interconnection cables between the BDS cabinet and the RFS cabinet is used for all the signal connection between the two cabinets. End A is connected to the LRPS interface on the BIM4 interface of the BDS cabinet, while End B is connected to the BDS interface on the interface board on the top of the RFS cabinet. The connection relationship between the interconnection cables is as shown in Fig. 7.4-1.

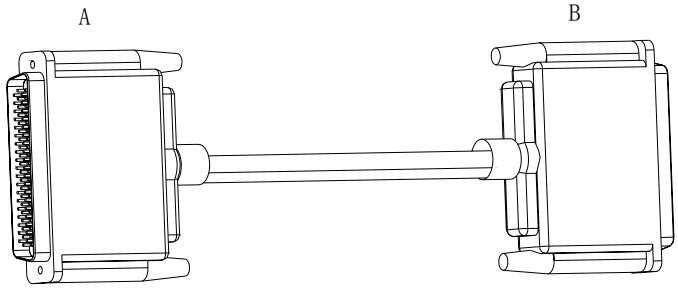


Fig. 7.4-1 Interconnection Cables between BDS and RFS Cabinets

7.4.2 Installing Optical Fibers

The clock signals and other interconnection signals between BDS and the remote RFS cabinet are transmitted through the optical fibers. There are four pairs of active/standby optical fibers. The optical interface connecting the BDS and RFS cabinets are LC connectors, which is connected through the optical fiber connector box. For the connection relationship, see the following Table 7.4-1.

Table 7.4-1 Optical Fiber Connection between BDS and RFS

Sequence No.	Cable Component Name	End A Direction	End B Direction
1	LC/PC-LC/PC	BDS-S11-BIM6_OPT0_TX	RFS-Cabinet top-OPT0_RX
2	LC/PC-LC/PC	BDS-S11-BIM6_OPT0_RX	RFS-Cabinet top-OPT0_TX
3	LC/PC-LC/PC	BDS-S11-BIM6_OPT1_TX	RFS-Cabinet top-OPT1_RX
4	LC/PC-LC/PC	BDS-S11-BIM6_OPT1_RX	RFS-Cabinet top-OPT1_TX
5	LC/PC-LC/PC	BDS-10-BIM6_OPT0_TX	RFS-Cabinet top-OPT2_RX
6	LC/PC-LC/PC	BDS-S10-BIM6_OPT0_RX	RFS-Cabinet top-OPT2_TX
7	LC/PC-LC/PC	BDS-S10-BIM6_OPT1_TX	RFS-Cabinet top-OPT3_RX
8	LC/PC-LC/PC	BDS-S10-BIM6_OPT1_RX	RFS-Cabinet top-OPT3_TX

7.4.3 Installing Interconnection Cables with BPWS

The cables for interconnecting with the BPWS cabinet have the DE9-core connector at the two ends. If BDS cabinets exist, connect BDS with BPWS, while if there is no BDS at the local end, connect the DE9-core socket on the top of the RFS cabinet to BPWS.

See Table 7.4-2 for the specific signal connection relation.

Table 7.4-2 Signal Connection Relationships of the Interconnecting Cable with BPWS

Pin No. at End A	1 2 3 4 5 6 7 8 9 Shell	Length (mm)
Color	(White/Blue) (White/Orange) (White) (White/Brown) (Red/Blue) Shielded wire	1200
Pin No. at End B	1 2 3 4 5 6 7 8 9 shell	

8 Trunk Cable Installation

Summary:

- Installation methods of the BTSB trunk cables
- Preparation of the E1 cables
- Conversion from the 75 Ω trunk cable to the 120 Ω trunk cable

8.1 Installing E1 Cables

E1 cables are available in two types, 75 Ω and 120 Ω cables. The connectors connecting BDS are equipped with a high-density D_SUB44 core. It is shown in Fig. 8.1-1.

Fig. 8.1-1 D_SUB44-core Connector Connecting BDS

8.1.1.1 75 Ω E1 Cable

A 75 Ω E1 cable includes 8 channels of E1 signals using two 8-core 75 Ω micro

coaxial cables of the type SFYE-75-2-1*8. The diameter of the single-core cable should be less than 2.05 mm. The structure of a 75 Ω E1 cable is shown in Fig. 8.1-2.

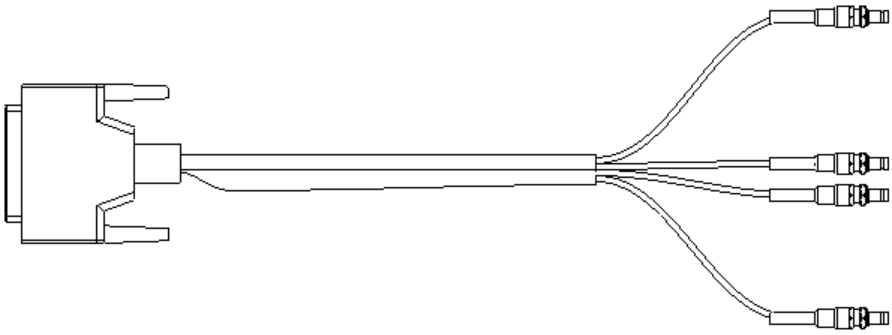


Fig. 8.1-2 Structure of 75 Ω E1 Cable

The internal cable connection relationship of a 75 Ω E1 cable is shown in Table 8.1-1.

Table 8.1-1 Internal Connection Relationship of a 75 Ω E1 Cable

Signal Definitions	**IN0**	**OUT0**	**IN1**	**OUT1**
Pin No. at End A	22 23	24 25	1 2	3 4
Cable Sequence No.	1-1-internal 1-1-external	1-2-internal 1-2-external	1-3-internal 1-3-external	1-4-internal 1-4-external
Signal Definitions	**IN2**	**OUT2**	**IN3**	**OUT3**
Pin No. at End A	5 6	7 8	9 10	11 12
Cable Sequence No.	1-5-internal 1-5-external	1-6-internal 1-6-external	1-7-internal 1-7-external	1-8-internal 1-8-external
Signal Definitions	**IN4**	**OUT4**	**IN5**	**OUT5**
Pin No. at End A	13 14	43 44	39 40	41 42
Cable Sequence No.	2-1-internal 2-1-external	2-2-internal 2-2-external	2-3-internal 2-3-external	2-4-internal 2-4-external
Signal Definitions	**IN6**	**OUT6**	**IN7**	**OUT7**
Pin No. at End A	35 36	37 38	31 32	33 34
Cable Sequence No.	2-5-internal 2-5-external	2-6-internal 2-6-external	2-7-internal 2-7-external	2-8-internal 2-8-external

Note: "1-1-internal, 1-1-external" refers to the internal and external conductors of the No.1 core wire of the first 8-core cable.

The labeled cable is the first 8-core cable. The signal sequence at End B is: IN0, OUT0 IN3, OUT3 for the first coaxial cable and IN4, OUT4 IN7 and OUT7 for the second

coaxial cable.

End A of the E1 cable is connected to the E1 interface on the BIM0 interface board at the back of BDS cabinet, while End B is connected to the silk screen interface on the transfer board at the feeder rack.

8.1.1.2 120 Ω E1 Cable

The 120 Ω E1 cable has three cores with the type being PCM-120-16*2*0.4sn. The structure of the cable is shown in Fig. 8.1-3.

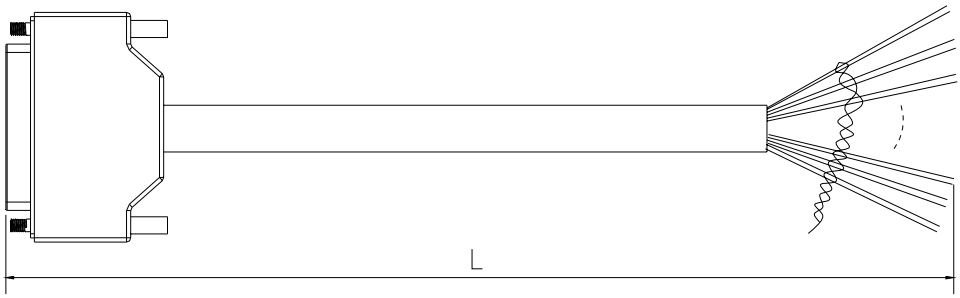


Fig. 8.1-3 Structure of 120 Ω E1 Cable

The internal cable connection relationship of an E1 cable is shown in Table 8.1-2.

Table 8.1-2 Internal Connection Relationship of the 120 Ω E1 Cable

Signal Definitions	**IN0**	**OUT0**	**IN1**	**OUT1**
Pin No. at End A	22 23	24 25	1 2	3 4
Cable Color	Blue/1 red blue/1 black	Pink/1 red pink/1 black	Green/1 red green/1 black	Yellow/1 red yellow/1 black
Signal Definitions	**IN2**	**OUT2**	**IN3**	**OUT3**
Pin No. at End A	5 6	7 8	9 10	11 12
Cable Color	Grey/1 red grey/1 black	Blue/2 red blue/2 black	Pink/2 red pink/2 black	Green/2 red green/2 black
Signal Definitions	**IN4**	**OUT4**	**IN5**	**OUT5**
Pin No. at End A	13 14	43 44	39 40	41 42
Cable Color	Yellow/2 red yellow/2 black	Grey/2 red grey/2 black	Blue/3 red blue/3 black	Pink/3 red pink/3 black
Signal Definitions	**IN6**	**OUT6**	**IN7**	**OUT7**
Pin No. at End A	35 36	37 38	31 32	33 34
Cable Color	Green/3 red green/3 black	Yellow/3 red yellow/3 black	Grey/3 red grey/3 black	Blue/4 red blue/4 black

Note: Blue/1 red indicates that there is one red identification on the blue line, and pink/2 red indicates that there are two identifications on the pink line.

End A of E1 cable is connected to the E1 interface on the BIM0 interface board at the back of the BDS chassis and End B is connected to DDF rack along the cabling ladder.

The correspondence between the pair at End B and signals is shown in Table 8.1-3.

Table 8.1-3 Correspondence between Cable Pairs at End B and Signals

1 (IN0)	2 (OUT0)	3 (IN1)	4 (OUT1)
Blue/1 red blue/1 black	Pink/1 red pink/1 black	Green/1 red green/1 black	Yellow/1 red yellow/1 black
5(IN2)	6(OUT2)	7(IN3)	8(OUT3)
Grey/1 red grey/1 black	Blue/2 red blue/2 black	Pink/2 red pink/2 black	Green/2 red green/2 black
9(IN4)	10(OUT4)	11(IN5)	12(OUT5)
Yellow/2 Red Yellow/2 Black	Grey/2 Red Grey/2 Black	Blue/3 Red Blue/3 Black	Pink/3 Red Pink/3 Black
13(IN6)	14(OUT6)	15(IN7)	16(OUT7)
Green/3 red green/3 black	Yellow/3 red yellow/3 black	Grey/3 red grey/3 black	Blue/4 red blue/4 black

8.2 Making E1 Cables

This section describes the preparation of the E1 cables.

1. Making the CC4Y-J32 connector for the E1 cable

   The method and procedure to make the connector at the ZXC10 BTSB I1 side is shown in Fig. 8.2-1.

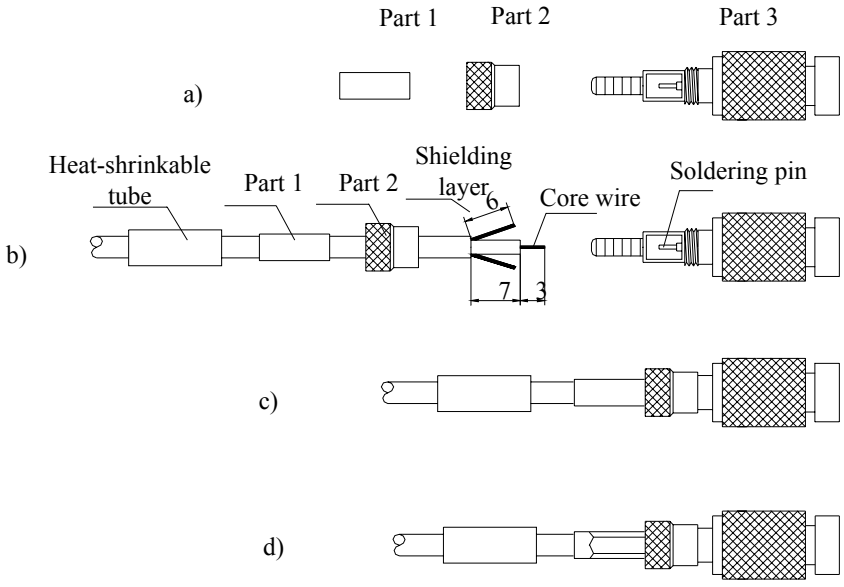


Fig. 8.2-1 Assembly of the CC4Y-J32 Coaxial Cable Connector

1） The plug parts of the CC4Y-J32 RF coaxial connector, as shown in a) of Fig. 8.2-1.

2） As shown in b) of Fig. 8.2-1, slip parts 1 and 2 around the cable, peel one end of the cable, tin the core wire, and then open the shielding layer forth to help inserting the plug crimping position.

3） After welding the core wire, screw part 2 to part 3, as shown in c) of Fig. 8.2-1.

4） Mount the crimping tube and crimp it with a special tool, as shown in d) of Fig. 8.2-1.

2. Make the coaxial connector plug at the DDF side

The structure of the connector is shown in Fig. 8.2-2.

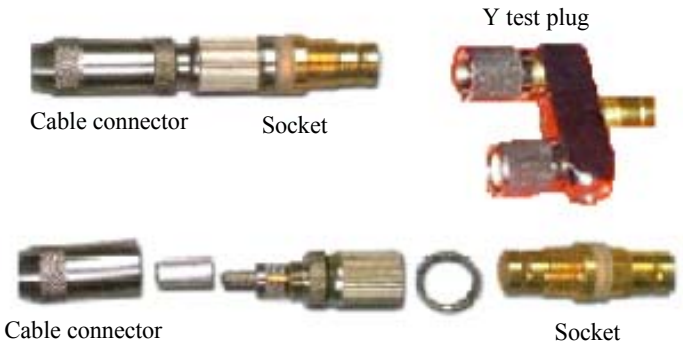


Fig. 8.2-2 Coaxial Connector of the DDF

Follow these steps to make a coaxial connector plug:

1) Peel the outer jacket of the cable for about 14 mm, as shown in a) of Fig. 8.2-3 .

2) Slip in sequence the cable connector sheath, the heat-shrink tube and the crimping tube. Open the shielding net forth with a net opening sleeve (or do it manually). And then strip the internal insulation layer to expose 3 mm of the internal conductor, as shown in b) of Fig. 8.2-3 .

3) Insert the core into the plug. Pay attention that the core wire must be inserted into the soldering pin at the back of the inner conductor, solder it securely, and trim the shielding mesh with 6 mm exposed, as shown in Fig. 8.2-3 c).

4) Push the crimping tube and the shielding net to the end of the connector, as shown in d) of Fig. 8.2-3 .

5) Use crimp pliers to crimp the crimping tube into a regular hexahedron. During the operation, crimp twice in different angles, as shown in Fig. 8.2-3 e).

6) Slip the heat shrink tube onto the crimped tube, heat it around with a hair drier to have it shrink, and then screw the tail cover, as shown in Fig. 8.2-3 f).

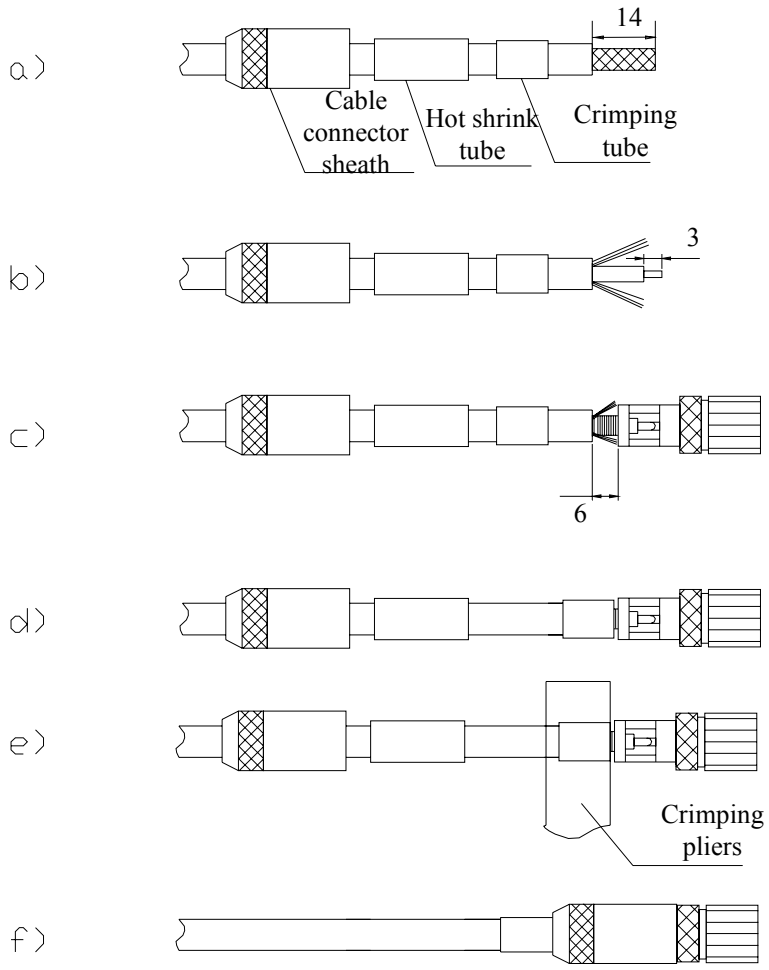


Fig. 8.2-3 Assembling DDF Coaxial Cable Plug

3. Trunk cable test

   The internal conductors of the connector at both ends and the inner conductors of the coaxial cable should be soldered securely without dry joint.

   In the connector at both ends, the internal conductors are conductive and the external conductors are conductive, while the internal and external conductors should not be shorted.

8.3 Converting 75 Ω Trunk Cable to 120 Ω Trunk Cable

Currently the impedance converter coded "5160087" is used to convert the 75 Ω trunk cable into the 120 Ω trunk cable. The following section describes the impedance converter.

8.3.1 Appearance of the Impedance Converter

Each converter is to serve for only one E1 cable. The interface for the 75 Ω trunk cable is a BNC connector, while that for the 120 Ω trunk cable is an 8P8C network cable socket.

The appearance and the connection relationship of the impedance converter are shown in Fig. 8.3-1.

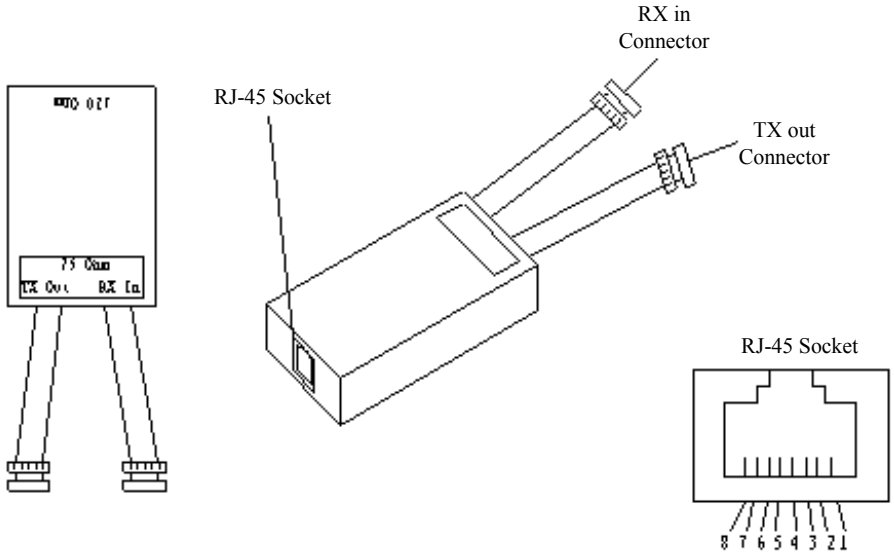


Fig. 8.3-1 Appearance and Wiring of an Impedance Converter

8.3.2 Wiring of the Impedance Converter

The wiring of the impedance converter is shown in Fig. 8.3-2:

1. Pins 1 and 2 are connected to the balanced signal. The balanced signal is converted into unbalanced signal by the converting chip and is then output from the coaxial TX end.
2. The unbalanced signal is converted into balanced signal at the RX end by the converting chip and is then connected to the RJ45 socket.
3. The shielding layer at the RX end can be connected to Pin 6 of the RJ45 socket through jumper JP2.
4. Usually, the shielding layer of the TX end is directly connected to the shielding layer of the RJ45 connector. It may also be connected to Pin 3 of the RJ45 socket through jumper JP1.

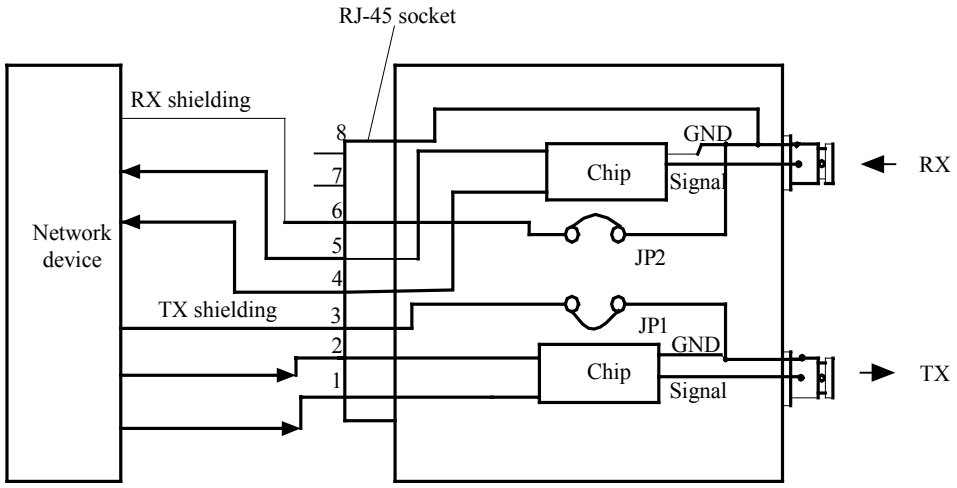


Fig. 8.3-2 Wiring of the Impedance Converter

See Table 8.3-1 for the specific wiring relation.

Table 8.3-1 Wiring Correspondence of the Impedance Converter

RJ45 Socket	Chip	Function
1&2	JP1	TX pair
3	JP1	TX shielded
4&5	JP2	RX pair
6	JP2	RX shielded

8.3.3 Technical Parameters of the Impedance Converter

Technical parameters of the impedance converter are as follows:

1. ITU-T G703 standard compliant
2. Rate: 2.048 Mbps
3. Balanced interface: 120 Ω RJ45 (8P8C, with shielded end)
4. Unbalanced interface: 75 Ω BNC (female)
5. Temperature: 0 °C – 50 °C
6. Humidity: 5% - 95% (non-condensing)
7. External power supply: unnecessary
8. Insulation: 100V

9 Monitoring System Installation

Summary:

- Composition of the monitoring system
- Installation procedure of the monitoring system

9.1 Composition of the Monitoring System

The structure of an external monitoring cable of an RFS is shown in Fig. 9.1-1.

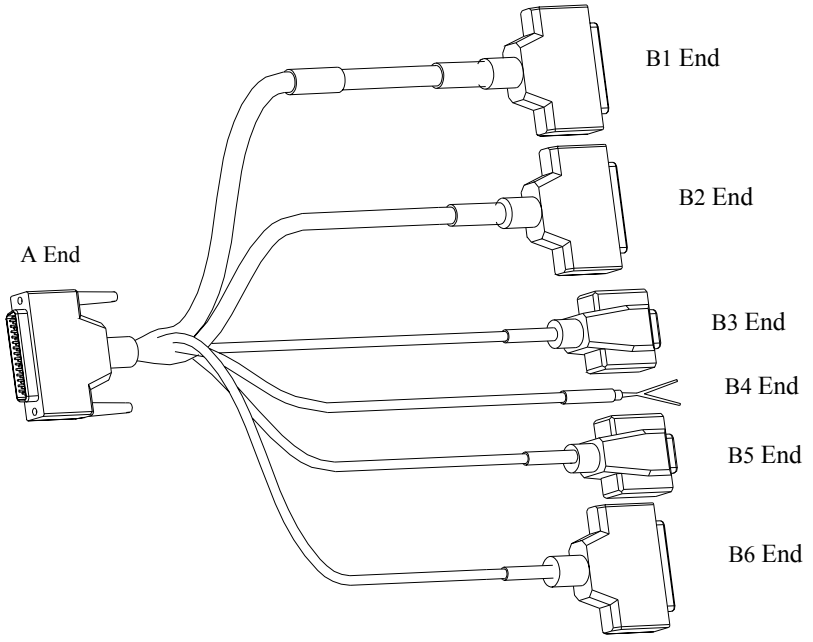


Fig. 9.1-1 Structure of External Monitoring Cable of RFS

The content of labels placed on the connectors are as shown in Table 9.1-1.

Table 9.1-1 Content of Labels Placed on the Connectors

End A	End B1	End B2	End B3

End A	End B1	End B2	End B3
Cable code/A OUT_MON	Cable code/B1 ~ B10 SW_IN	Cable code/B11 ~ B15 CTRL_OUT	Cable code/B16 HUM. TEMP_MON
	End B4	End B5	End B6
	Cable code/B17 DOOR_MON	Cable code/B18 INFRARED_MON	Cable code/B19 SMOG_MON

End A is connected to the socket OUT_MON on the BIM4 interface board of the BDS cabinet (if there is no BDS, it is connected to the OUT_MON D_SUB44 socket on the top of RFS cabinet). B1 to B3 and B5 to B6 are transferred to the installation board of the feeder rack. End B1 provides input for 10 pairs of switches, End B2 outputs 5 pairs of control variables, End B3 connects with the cables of temperature and humidity sensor, End B4 connects with the access control sensor of the equipment room, B5 connects with the infrared sensor cable and B6 connects with the smog sensor cable.

The installation of the temperature/humidity sensor and the smog sensor are the same as that of the IS95/1X system.

9.2 Installing the Monitoring System

9.2.1 Installing the Indoor Smog Sensor

The smog sensor should be installed on the ceiling as close to the rack as possible. The installation steps are as follows:

1. As shown in b) of Fig. 9.2-1, separate the upper part and the lower part of the smog sensor.
2. Connect the green and red cables (as shown in a) of Fig. 9.2-1) at End B of the 10 m smog sensor cable to the two terminals marked 1 and 3 at the bottom of the smog sensor (as shown in c) of Fig. 9.2-1).
3. Reassemble the upper and lower parts together, as shown in b) of Fig. 9.2-1.
4. Connect the DB25 plug at End A to the End B6 of the external monitoring cable of RFS.

The terminal connection of the smog sensor cable connector is described in Fig. 9.2-1.

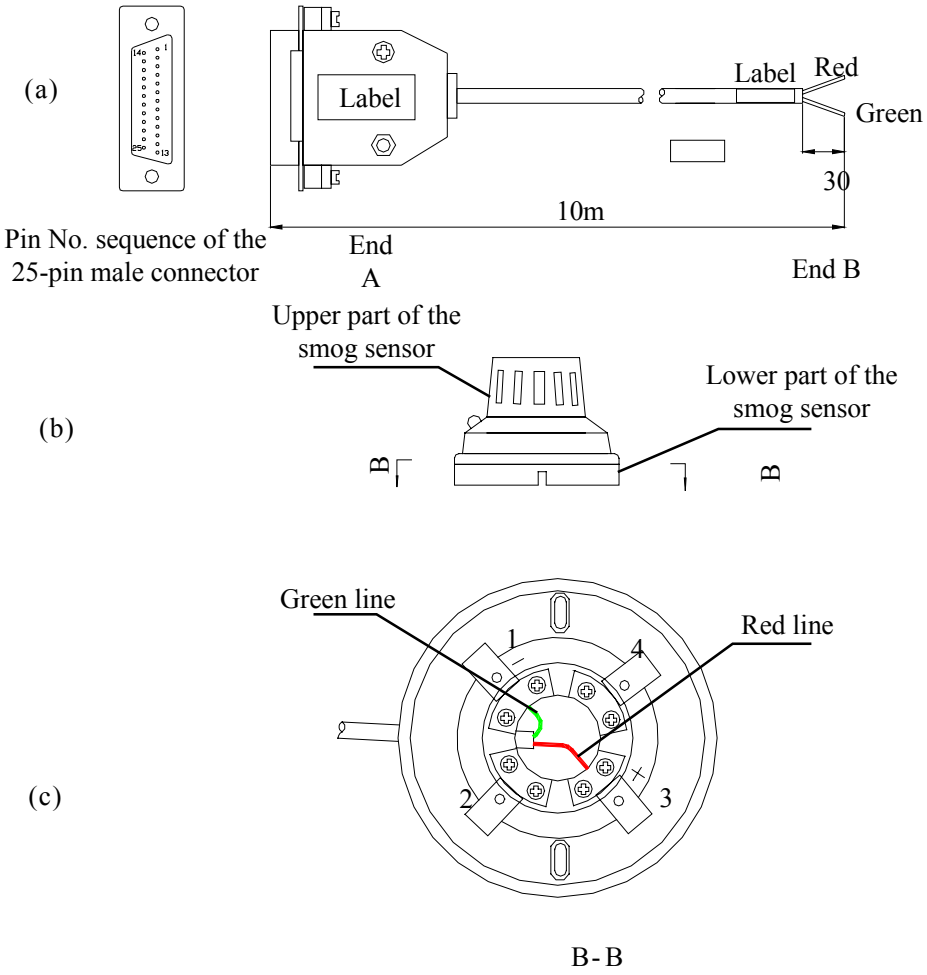


Fig. 9.2-1 Installing the Smog Sensor Base

Table 9.2-1 Terminal Connection of the Smog Sensor Cable Connector

Signal Definitions	25-pin Male Connector at End A	Cable Sequence No.	Smog Sensor Base at End B
+12V	10	Red	3 (+)
−12V	11	Green	1 (−)

9.2.2 Installing the Indoor Temperature/Humidity Sensor

The temperature/humidity sensor is mounted on the wall. Select a proper position on the wall in the equipment room, drill a hole of φ 6, put in a rubber cork, tighten the captive screw, and finally hang the sensor on the wall through the hole. The dimensions of the sensor are shown in b of Fig. 9.2-2.

Both the two ends of the sensor are the DB9 plug. The male plug at End A is connected

with End B3 of the RFS external monitoring cable. The DB9 female connector at End B is connected to the sensor.

The terminal connection of the cable connector is described in Table 9.2-2.

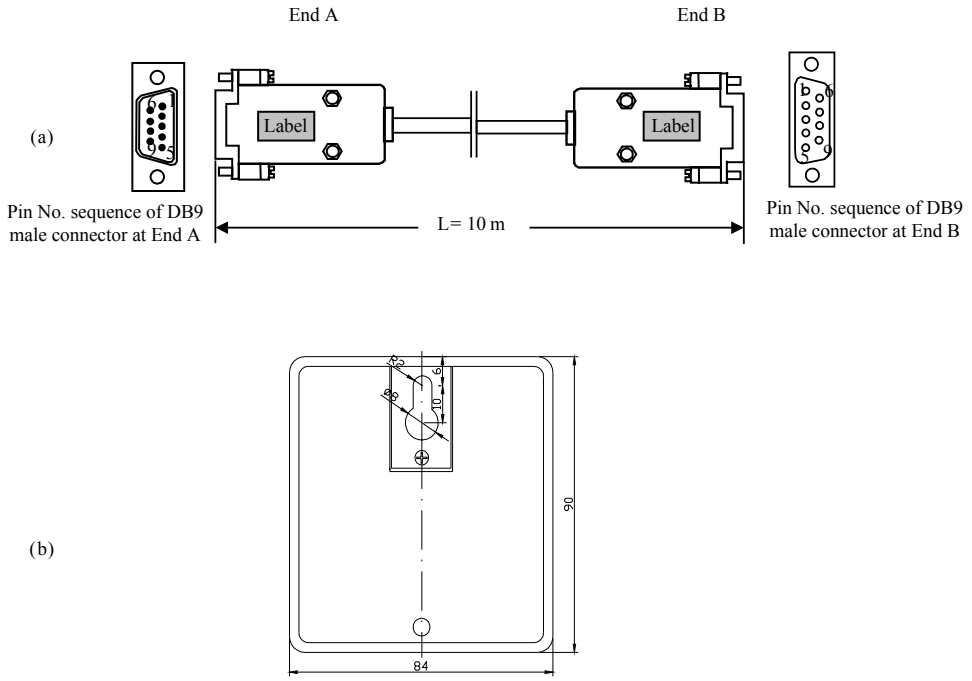


Fig. 9.2-2 Installation of Temperature-Humidity Converter

Table 9.2-2 Terminal Connection of the Temperature/Humidity Sensor Cable Connector

Signal Definitions	Pin No. at End A	Cable Color	Pin No. at End B
HUM	1	White	3
TEMP	7	Blue	4
GND	3	White	1
+5V	8	Orange	5
	6	Shielded cable	

9.2.3 Installing the Infrared Sensor

9.2.3.1 Installation Position

The infrared sensor should be installed on the upper part of a corner in the equipment room, so that it can detect the persons entering the equipment room through the door or window. The installation location of the infrared sensor is shown in Fig. 9.2-3.

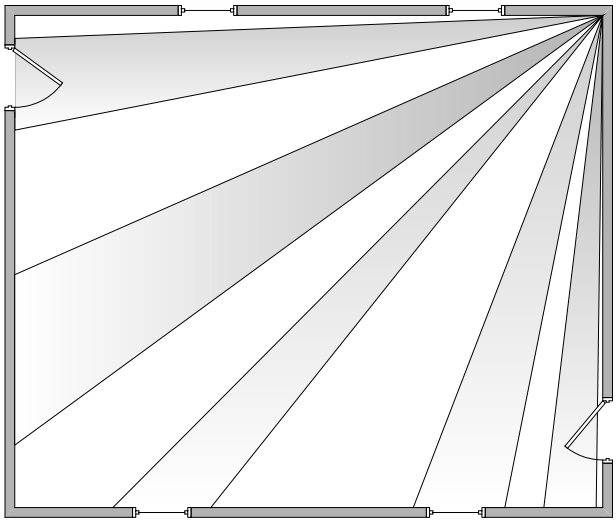


Fig. 9.2-3 Location of the Infrared Sensor

9.2.3.2 Structure of the Infrared Sensor

Note:

There is a wide variety of infrared sensors. The following describes only one of them. When installing an infrared sensor on-site, you may find the actual structure of the infrared sensor is different from the one introduced here. Please follow the specifications of this product for the installation guide.

The structure of an infrared sensor is shown in Fig. 9.2-4.

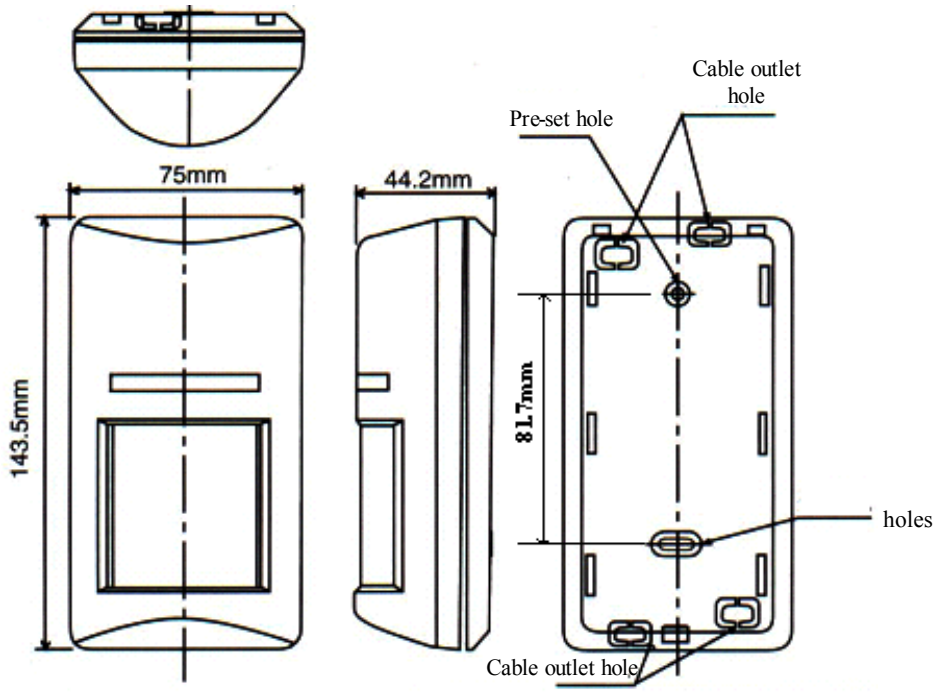


Fig. 9.2-4 Structure of Infrared Sensor

9.2.3.3 Installation and Cabling

1. Installation

   The infrared sensor is to be mounted on wall.

   To install the infrared sensor, drill two ϕ6 holes (to a depth suitable for placing the plastic expansion bolts, which is recommended to be no less than 30 mm) on the wall 81.7 mm apart. The line between the centers of the two holes should be vertical to the floor.

   Put the plastic expansion bolts to the two holes and tap them fully into the holes with a hammer.

   Take down the base from the infrared sensor, put two ϕ4 screws through the two holes on the base and screw them into the two plastic expansion bolts on the wall.

2. Cable connection

Note:

The cables of the infrared sensor will have been properly connected before delivery.

The job to do on-site is to sheath each cable in a metal pipe or a PVC fire-retardant pipe.

Fasten the infrared sensor to its base with one end being the DB9 connector and the DB9 male connector at the B5 end of the external monitoring cable of RFS, and the infrared sensor is at the other end, as shown in Fig. 9.2-5.

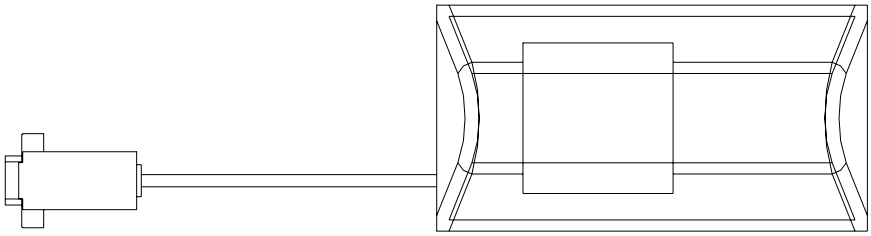


Fig. 9.2-5 Structure of Infrared Sensor Cable

10 Main Antenna Feeder System Installation

Summary:

- Installation preparation for the BTSB main antenna feeder system
- Structure of the BTSB main antenna feeder system
- Installation items and flow of the BTSB main antenna feeder system
- Installation procedure of the parts of the BTSB main antenna feeder system
- Installation check and test for the antenna feeder part
- Waterproof treatment of the connectors

The configuration of the BTSB antenna system is closely related to network planning. Different coverage areas and environments may require very different antenna feeder systems. Before installation, network planning has to be predetermined and should contain the layout, elevation, dip, gain and even diversity reception mode of the antenna.

Proper installation of the antenna is essential to the communication performance of the coverage areas and to the reliable operation of the mobile BTSB system. The antennas installed should be in correct direction, including correct dip and azimuth of the antenna in each sector. Besides, the antennas should have wind resistance capability (i.e. capability to withstand wind at the speed of 150 km/h).

Install the feeder properly so as to minimize signal loss during transmission. Make sure that it can operate reliably in all environments.

10.1 Preparation for Installing the Antenna Feeder System

This includes the preparations of staff, safety measures, tools and instruments, and technical documents, and the installation environment check.

The installation of the antenna feeder equipment is important to the installation of the BTSB equipment. Its construction quality is directly related to the operating performance of the entire BTSB system. Moreover, most of the BTSB installation engineering is the installation of the antenna feeder equipment that generally takes up 80% of the installation time of the whole BTSB system. The installation of the antenna feeder equipment involves the installation of the antenna, the jumper, the routing of the main feeder, and the installation of the lightning protection system and the GPS. Different antenna may be used, and the installation method and procedure also vary with the terrain, population density and installation environment. With the quality guaranteed, the installation supervisor should have the antenna installed flexibly and reasonably as required in specific situations by following the BTSB engineering design documents and the installation instructions of the special antenna provided by the manufacturer.

Prior to the installation of the antenna feeder system, inspect the qualification of the installation staff to work at heights, check and prepare the installation environment, the installation measures, the installation tools and the antenna feeder to be installed so that the installation can be carried out successfully.

10.1.1 Preparation by Installation Personnel

The engineering of the antenna feeder is generally conducted by the antenna feeder installation personnel under the supervision of the installation supervisor.

The installation supervisor should be familiar with the materials, tools and operation methods for the antenna engineering, organize and coordinate the installation persons for proper work with the spirit of top safety, especially in the operations on tower. The engineering supervisor fills the engineering data with sincere attitude.

Requirements for the installation staff: Staff that can conduct the installation professionally under the instruction of the supervisor. The staff working at heights should have no acrophobia and be in good health. In addition, he should have the qualification and certificate for working at heights, observe the requirements for using the safety tools and have purchased life insurance policy. Besides, alcohol drinking is prohibited.

10.1.2 Checking the Installation Environment

During the environment inspection, you should focus on the following: Whether the

outdoor lightning protection grounding cable has been in place with the core diameter more than 50 mm2, whether the distances between the antenna lightning arrester, the lightning protection grounding point, the outdoor cabling rack, and the antenna pole meet the design requirement and whether the strength and the wind-withstanding capability of the pole meet the design requirements. Check the necessary devices and auxiliary materials and negotiate with the user for specific wiring for the main feeder.

As to the installation of the antenna support, the equipment supplier puts forward requirements for the antenna structure and dimensions, while the network operator completes the installation as parts of the equipment room accordingly.

The network operator is also responsible for the installation of the antenna feeder installation environment such as the outdoor cabling rack, the lightning arrester, the lightning protection grounding peg, and the outdoor lightning protection grounding cable. The installation of the main feeder entry window requires the holing operation on the wall or roof of the building. It may deal with the infrastructure of the equipment room and should be implemented by the network operation, as a condition of the equipment room.

10.1.3 Checking the Safety Measures

Caution:

Operators on the tower must wear safety belt. Persons under the tower must wear safety helmet. Never climb the tower with loose clothes and slippery shoes.

1. Emphasize the safety precautions to the engineering staff.
2. Arrange the outdoor construction of the antenna feeder at daytime in clear weather and without strong wind.
3. Set up distinct marks at the engineering site to keep off people irrelevant. The persons under the tower are responsible for supervising the irrelative persons, especially kids, to be away from the construction field. The tools used on the tower, which may drop and injure the persons under the tower, must be treated seriously. For example, the tools and metal installation parts are cased in the canvas bag securely once they are not used. The canvas bag keeps enclosed unless a tool or part is to be taken out.

10.1.4 Preparing Installation Tools

The installation tools comprise:

1. Measurement tools: Compass, multimeter, angle meter, tape
2. Communication tools: Two MSs
3. Hoisting tools: Pulley, rope to pull the main feeder
4. Special tools: Main feeder cutter, special tools for preparing main feeder connectors
5. General-purpose tools: Adjustable wrench, sharp-nose pliers, diagonal pliers, electrical knife, file, hacksaw
6. Safety protection tools: Safety belt (used by engineering staff who step out of the platform on the tower), safety helmet, safety rope, thick uniform, RF-proof clothing, canvas tool bag, gloves, multi-purpose power socket
7. Others: Standing ladder, wooden axle hoisting tool for the main feeder (this can be borrowed from the local user).

10.2 Structure of the Antenna Feeder System

As shown in Fig. 10.2-1, the antenna feeder system comprises antenna, antenna jumper, main feeder, lightning arrester, cabinet-top jumper, grounding parts and others.

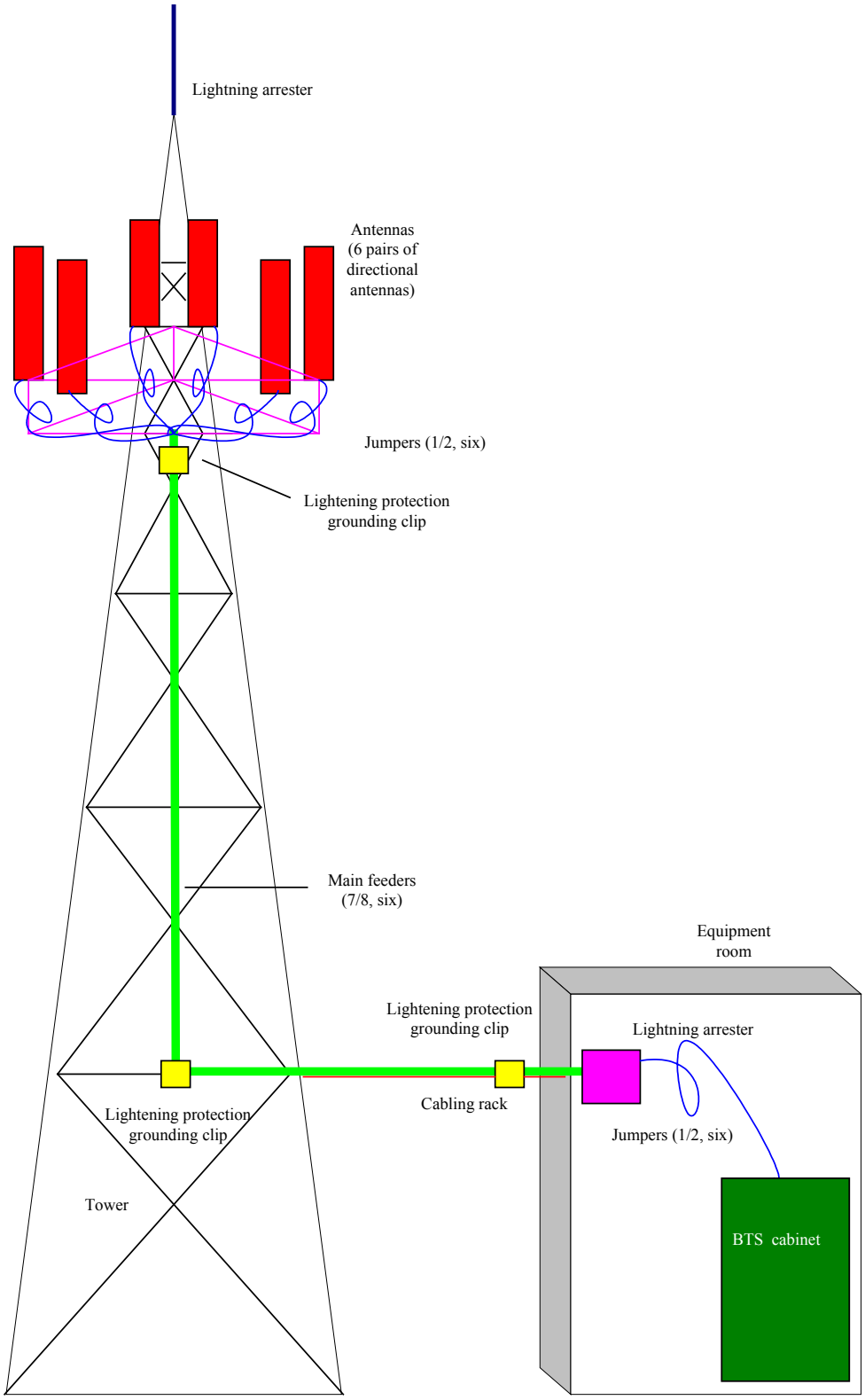


Fig. 10.2-1 Typical Structure of the Antenna Feeder System with Three Sectors

10.3 Installation Content and Flow

Caution:

1. Take careful precautions for the safety of yourself and the equipment during the whole antenna installation process.

2. When adjusting the antenna that has started working, take certain measures (for example, wear radiation-shielding clothing), and turn off the high power amplifier to avoid the direct radiation of the antenna to human body.

10.3.1 Technical Parameters for Antenna Installation

1. Antenna height

   It is determined by network planning.

2. Azimuth of antenna

   It is determined by network planning.

3. Pitch angle of antenna

   It is determined by network planning and is adjustable in the range of 0 °C ~ 10 °C.

4. Antenna direction

   It is determined by the azimuth of the antenna. Two antennas in the same sector should point to the same direction.

5. Distance between diversity antennas

   The two antennas in the same sector are diversity receiving antenna to each other with the same vertical height. The horizontal distance (d) is as large as possible to satisfy the engineering requirements just by following the formula below.

   d ≥10 ~ 20λ (or H/d = 11), where d is the horizontal distance between the diversity antennas, and H is the vertical height from the antenna to the floor. The diversity distance of the 1900 M carrier shall be more than 1.5 m while that of the 800 M carrier shall be more than 3.5 m.

10.3.2 Antenna Installation Flow

The antenna installation flow is shown in Fig. 10.3-1.

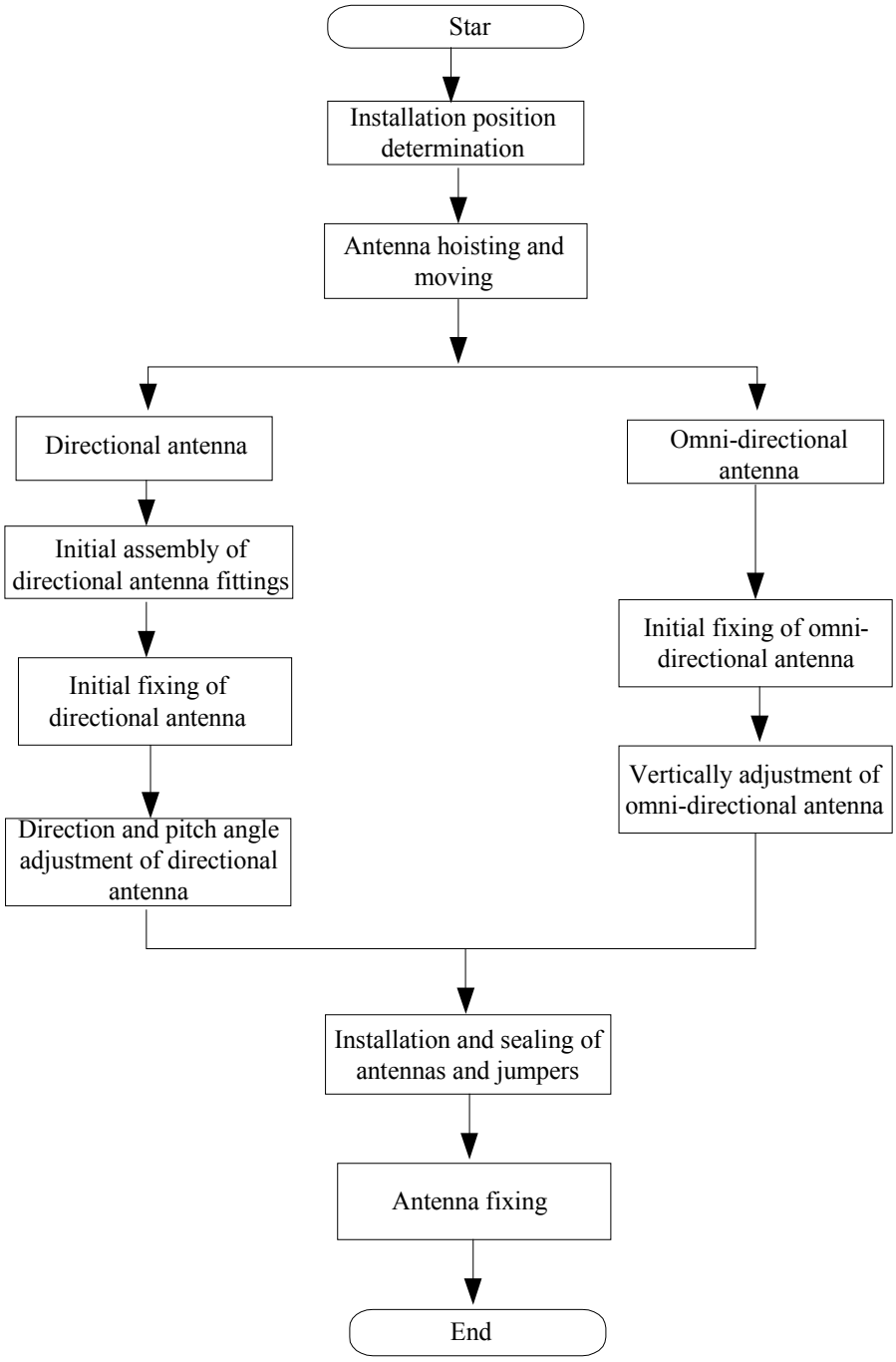


Fig. 10.3-1 Antenna Installation Flow

10.4 Installing the Parts

10.4.1 Determining the Antenna Installation Position

During the installation, the antenna installation position should be determined according to the antenna feeder installation drawing among the engineering design drawings. If the antenna support is installed in a place different as that shown in the engineering design drawing, second design should be done based on the network coverage requirement of the local BTSB, antenna diversity requirement, antenna azimuth and pitch angle. And design modification solution should be make then after consultation with the user representative and the design institution, lest the network coverage after the installation be affected.

10.4.2 Moving and Hoisting the Antenna

Caution:

Personnel both on and under the tower should coordinate to hoist the antenna. During the hoisting process, the personnel under the tower should pull the antenna away from the tower body by maneuvering the rope to keep the antenna from rubs with the tower body.

In the case the antenna is to be installed on the tower, use the rope and pulley block to hoist the antenna, the 3m antenna jumper and all the accessories (such as tools, safety belts, adhesive tapes and straps) to the tower-top platform and place them in a safe place. Take corresponding safety measures during the process. Small metal staff as antenna fixing parts and wrenches should be put in a sealed canvas tool bag before hoisting, as shown in Fig. 10.4-1.

Both ends of the directional antenna and the omni-antenna should be knotted for easy coordination of the staff both on and under the tower during the hoisting.

In the case the antenna is to be installed on the roof, move the antenna and the installation materials to the installation position manually.

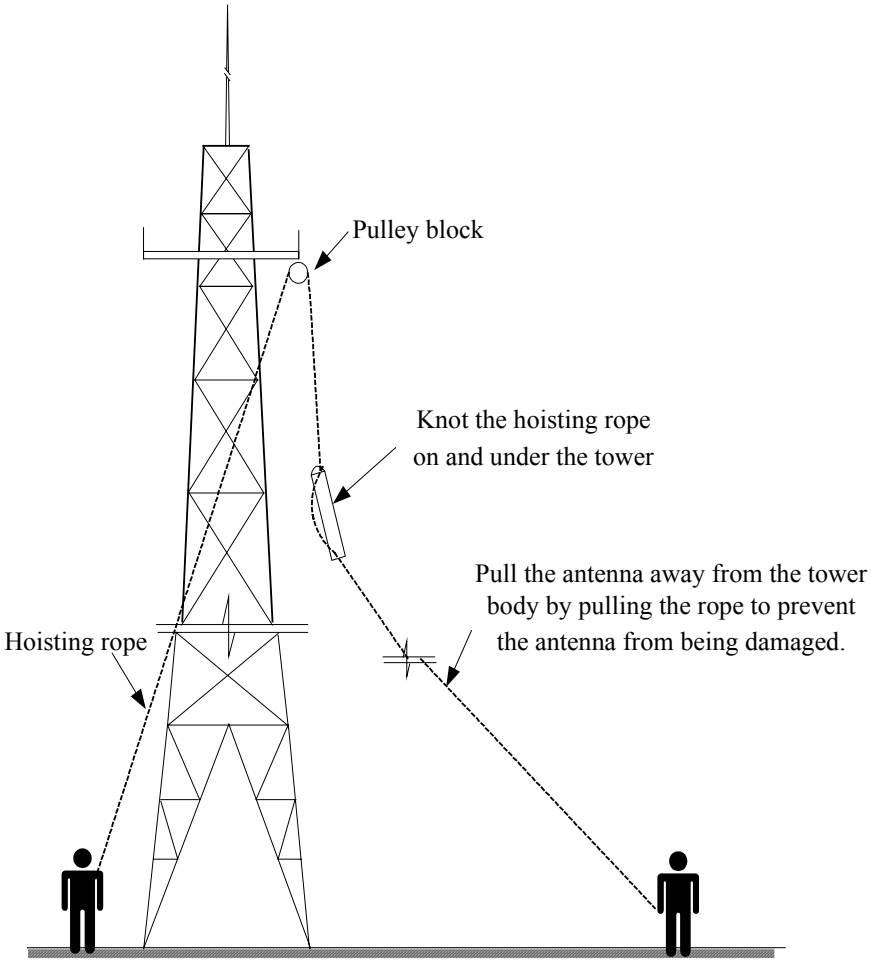


Fig. 10.4-1 Hoisting an Antenna

10.4.3 Installing and Adjusting the Directional Antenna

> **Note:**
>
> **The installation methods of antennas of different models vary from one manufacturer to another. This section takes the KATHRAIN antenna as an example to describe the antenna installation process. Please carefully read the installation instructions provided along with the antenna during the installation and install the antenna according to actual situation.**

1. Initial assembly of the directional antenna fittings

   The directional antenna has a number of installation fasteners. For example, the KATHRAIN antenna has two types of fasteners: 738516 and 737974. Before fixing the antenna, assemble fastener 737974 to the ends of the antenna, as

shown in Fig. 10.4-2, and then connect fasteners 737974 and 738516. Thus the initial installation of the directional antenna is completed. All accessories must be installed with spring and flat washers. Please refer to the instructions attached to the product for descriptions of other fasteners for the antenna of other manufacturers or of KATHRAIN.

Usually the antenna fixing accessories and the angle adjustment device accessories have been installed on the antenna under the tower.

2. Initial fixing of the directional antenna on the antenna pole

Mount the directional antenna installed with clamp accessories on the antenna pole: The screw should not be too tight that you are unable to adjust the direction and the pitch angle of the antenna, nor too loose lest the antenna might slip downward.

3. Adjusting the azimuth of the antenna

1) Use a compass to determine the azimuth of the antenna. And determine the installation direction of the directional antenna according to the engineering design drawing.

2) Turn the antenna slightly to adjust its facing direction, as shown in Fig. 10.4-2. At the same time measure the direction of the antenna with a compass till the error is within the engineering design requirements (generally not more than 5°).

3) Tighten the fastener 738516 after adjusting the azimuth of the antenna.

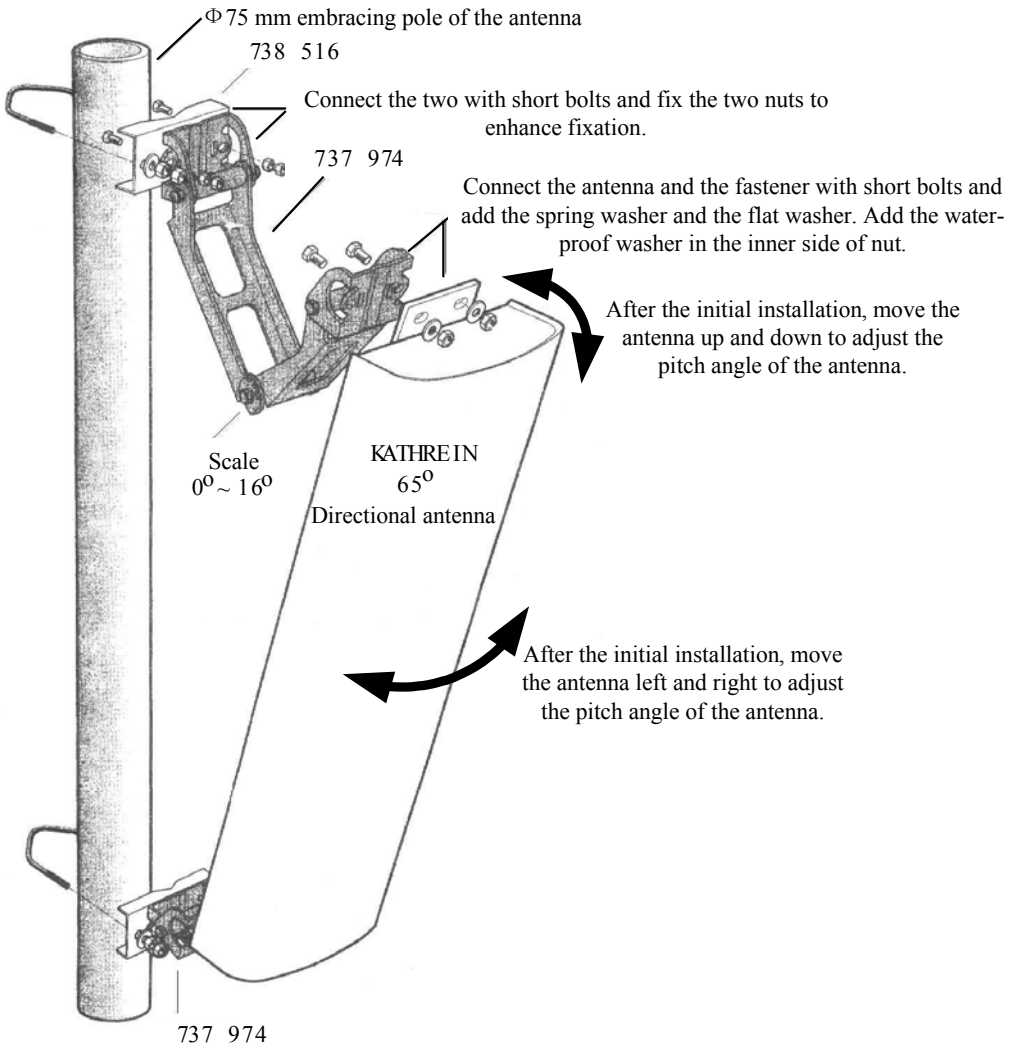


Fig. 10.4-2 Installing the KATHRAIN Antenna

4. Adjusting the pitch angle of the antenna

1) Adjust the pitch angle of the dip meter to the angle required by the engineering design.

2) Turn the top of the antenna slightly, let go or hold fast the antenna at its top. Adjust the pitch angle of the antenna till the bead is centered when the adjusted dip meter is next to the directional antenna, as shown in Fig. 10.4-3.

3) Tighten the fastener 737974 after adjusting the pitch angle of the antenna.

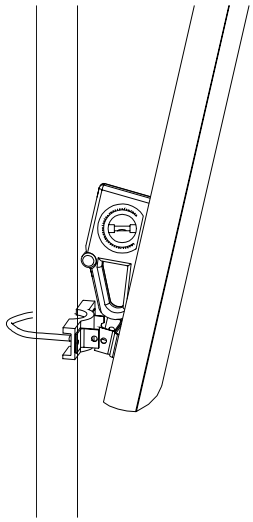


Fig. 10.4-3 Adjusting the Pitch Angle of the Antenna

10.4.4 Installing and Adjusting the Omni-antenna

Take the following steps to install the omni-antenna:

1. Put the jacket at the antenna lower part close to the support backbone. The top of the jacket should be flush with or slightly higher than the support top.
2. Fix the jacket at the antenna lower part and the support backbone at two points with antenna fixing clips. They should be fixed tight enough to bear weight and withstand wind, and should not be too loose or too tight lest the antenna jacket be damaged.
3. Check the antenna verticality. The omni antenna must be vertical. Make sure the antenna is vertical, and then fix it to the antenna pole.
4. Stick the support installed with the antenna out of the tower platform, and adjust the support to make the antenna vertical.

10.4.5 Sealing the Connection between Jumper and Antenna

> 🕮 **Note:**
>
> **The antenna and the jumper can be connected and waterproof treatment can be conducted on the joint before the antenna is fixed on the pole. This can reduce the working time at heights and improve the joint connection and waterproof quality.**

The installation steps are as follows:

1. Align the connector of the antenna jumper to the antenna interface and screw it tightly.
2. Perform waterproof treatment to the joint (See 10.6" Waterproof Treatment on Joint" for details):

1) Wrap starting from the root of the antenna joint with waterproof adhesive tape in the same direction as the fastening direction of the antenna jumper.

2) Stretch the waterproof adhesive tape to double its length, and apply it layer by layer till it covers about 5 cm of the bottom of the feeder joint. During the process, make sure the upper layer overlaps the lower layer by half the width of the tape.

3) Grip the tape with hands to make the tape tightly adhered;

4) Apply the PVC tape layer by layer on top of the waterproof adhesive tape. During the process, make sure the upper layer overlaps the lower layer by half the width of the tape.

10.4.6 Installing the Feeder Window

> 🕮 **Note:**
>
> **The size of the feeder cable window provided by ZTE is 400 mm × 400 mm. It is a four-hole window and 12 pieces of feeder cables can pass through it. A 300 mm × 300 mm hole should be drilled on the wall for the installation of this feeder cable window. If the user provides a special feeder window, then make the wall cavity according to the actual dimensions of the feeder window.**

The feeder window is usually mounted on the wall outside the equipment room between the indoor and the outdoor cabling racks.

If the main feeder window is to be installed on the building-top, sealing and waterproof treatment should be conducted on it. You may use asphalt or glass cement to seal the feeder window.

There are 4 holes in a feeder window through which a total of 12 feeder cables can pass through, as shown in Fig. 10.4-4. Follow the steps below to install a feeder window.

1. Determine the installation position of the feeder window as required by the

engineering design drawing.

2. Make a cavity on the wall according to the size of the feeder window.
3. Use a percussion drill to drill holes for the expansion bolts and fix the main board of the feeder window with expansion bolts.
4. The sealing gasket and sealing tube of the feeder window can be installed when the main feeder is introduced into the room. See 10.4.7.6 "Running the Primary Feeder Cable into the Equipment Room".
5. For cold areas with sand storms, even if the wall is thick, it is necessary to install timber baffle plates inside the equipment room to keep warm and keep sands outside.

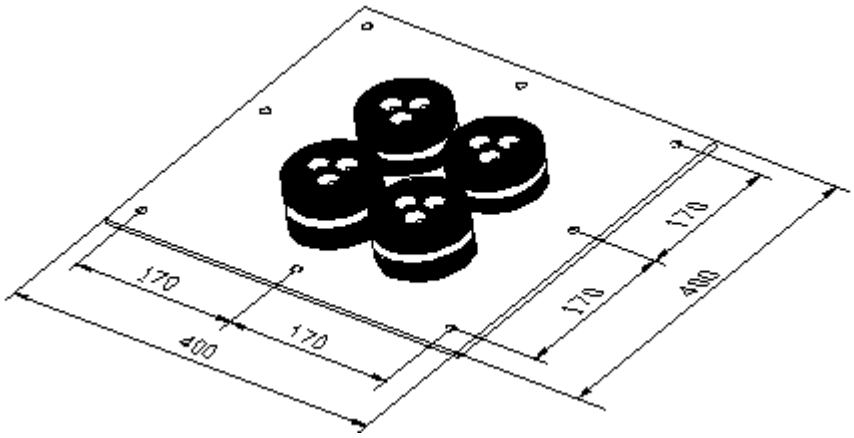


Fig. 10.4-4 Structure of the Feeder Window

10.4.7 Installing the Feeders

This section only describes the making of the 7/8" feeder connector, the connection and sealing of the jumper and the main feeder, the connection and sealing of the jumper and the antenna, and the layout and fixation of the feeder. It contains the following contents:

1. Determining and measuring the feeder route
2. Hoisting and cutting the feeder, and labeling the feeder
3. Making the feeder connector
4. Distributing and fixing the feeder

5. Installing the outdoor jumper and conducting waterproof treatment on the joint

The overall structure of a BTSB feeder is shown in Fig. 10.4-5.

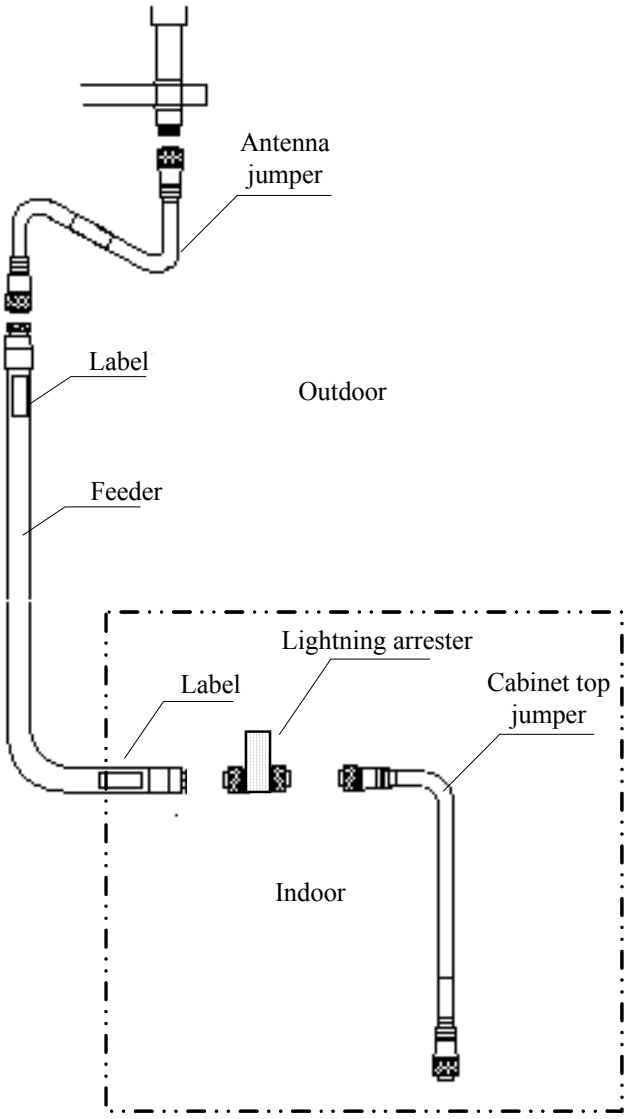


Fig. 10.4-5 Structure of a BTSB Feeder

10.4.7.1 Determining the Feeder Cable Route

During the engineering installation phase, the layout of the feeder should be determined according to the feeder wiring drawing among the engineering design drawings. If the layout of the feeder need be modified according to the practical situation, you should consult the user representative and try to solve the problem as early as possible. Please note that the length of the main feeder should be as short as possible.

10.4.7.2 Making Connectors of the Primary Feeder Cable

Caution:

The preparation of the feeder connector is the most important part in the antenna feeder installation engineering. The quality of the job directly relates to the equipment operation and the network quality.

Since the cutting tool used is sharp, use it correctly to avoid body injury.

This section takes the Rosenberger's 7/8" feeder connector as an example to describe the preparation process. For the installation of the feeder connector of other specifications or other manufacturers, please refer to their installation instructions.

Take the 7/8" main feeder connector as an example. The procedure to make the connector is as follows:

1. The common cutting tool for making the feeder connector is shown in Fig. 10.4-6.

Fig. 10.4-6 Cutting Tool for the 7/8" Feeder Connector

2. Measure a straight feeder section of about 150 mm to be installed with the connector, and cut and use a safety cutting tool to strip the feeder sheath 50 mm away from the end.

3. Put the feeder into the notch of the cutter (EASIAX), leaving a length of four sheath threads from the main blade. And then close the cutter handles. Since the position of the cutter is determined according to the threads on the external copper sheath of the feeder, the main blade should just be aligned to the crest at the center of a thread of the feeder.

4. Turn the cutter in the direction as marked on the cutter till the handles are completely closed and cut the internal and external copper conductors of the feeder completely. At the same time, the auxiliary blade of the cutter cuts the external plastic protection sheath of the feeder, as shown in Fig. 10.4-7.

Fig. 10.4-7 Cutting the Feeder with a Cutter

5. Check the cutting length of the feeder, as shown in Fig. 10.4-8.

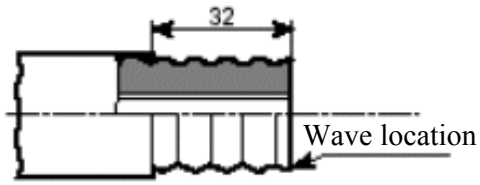


Fig. 10.4-8 Checking the Cutting Length of the Feeder

6. Separate the front part and back part of the feeder connector, and insert the back part into the feeder till it contacts with the first corrugation of the feeder.

7. Firmly insert the tube expander of the cutter into the feeder and turn it left and right to expand the external copper conductor of the feeder, so that it presses against the back part of the feeder connector. This is shown in Fig. 10.4-9.

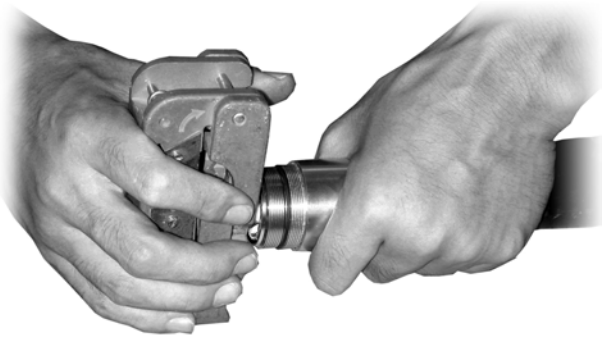


Fig. 10.4-9 Expanding the External Conductor of the Feeder with a Tube Expander

8. Check whether there is residual copper scraps. The external copper sheath should be evenly expanded without burrs. Pull the back part of the feeder connector outward while keeping it from slipping away from the feeder. Make it again if necessary.
9. Connect the front part and the back part of the feeder connector, as shown in Fig. 10.4-10.

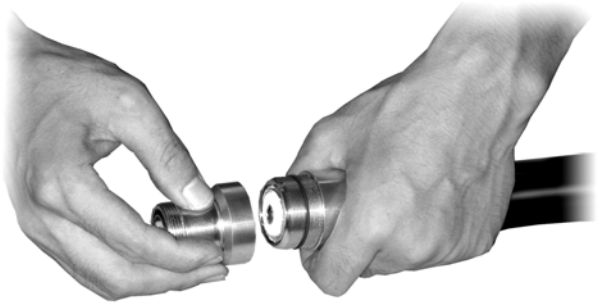


Fig. 10.4-10 Connecting the Front Part and the Back Part of the Feeder Connector

10. Screw the front part of the feeder connector, and fix it with an appropriate wrench, so that it does not move against the feeder. Then screw the back part of the feeder connector with the wrench till it is fixed, as shown in Fig. 10.4-11.

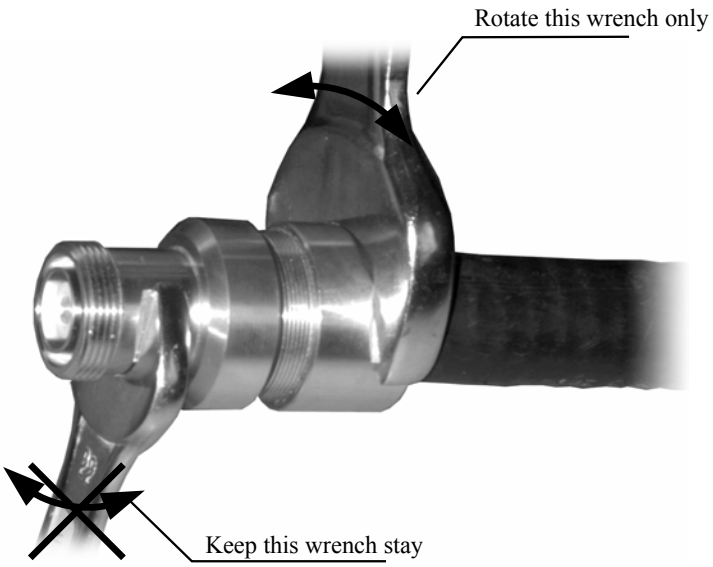


Fig. 10.4-11 Fixing the Front Part and the Back Part of the Feeder

10.4.7.3 Cutting the Feeders

Caution:

When cutting the main feeder, label it at both ends. Temporary label can also be attached to the middle of the feeder. It's very important to keep all the labels consistent. Otherwise, the feeder may not be correctly connected and the sectors may not correspond to the feeder.

Usually the feeder is rolled over to the installation site. The length of the main feeder should be exactly measured again on site according to the final route negotiated with the user. The feeder should be cut into sections as required. The cutting steps are as follows:

1. For the antenna feeder to be installed on the roof

1) Determine the length of the main feeder in each sector again with a tape measure according to the actual route.

2) Cut the feeder to the length of the measured actual length plus 1 m to 2 m.

3) Attach the corresponding temporary labels (such as ANT1, ANT2, ANT3, ANT4, ANT5 and ANT6) to both ends of a main feeder after cutting it. When the feeder is installed, attach the formal label to it.

4) Move the cut feeders to the roof. During the process, take care that the feeders

are not damaged or pressed.

2. For the antenna feeder to be installed on the tower

1) Use roller support, pulley block and hoisting rope to lift one end of the feeder to the tower top. The person on the ground cuts the feeder to the length with which the feeder can reach the lightning arrester frame inside the equipment room (plus certain redundancy). Attach temporary labels to the lower part of the feeder. Once the feeder enters the equipment room, attach a formal label to it.

2) It is better to make the upper connector of the main feeder before hoisting it to reduce the time that the staff works at heights and to better ensure the installation quality of the feeder connector.

10.4.7.4 Raising the Main Feeder Cable of the Iron Tower

Caution:

During the hoisting, rough operations are not allowed, lest the sheath of the main feeder be damaged or scratched. The partial damage of a single main feeder will cause the whole cable be rejected as useless.

Take precautions for personal safety when hoisting the feeders.

If the antenna feeder system is to be installed on an iron tower, a pulley block should be used to hoist the primary feeder cables, as shown in Fig. 10.4-12. For the installation, you should follow the steps below:

1. Check again that the main feeder labels attached 0.3 m away from both ends of the main feeder are correct.

2. Wrap the main feeder connector made under the tower with flax (or antistatic packing bag together with foam) and strap it tightly.

3. Knot and fix the hoisting rope 0.4 m and 3.4 m away from the feeder connector to help the staff both on and under the tower pull up the feeder and to prevent the feeder and its connector from damage caused by their bumping into the tower during the hoisting process.

4. Hoist the feeder to the tower platform and fix the upper end of the cable to a proper place at several points, lest the cable fall down from the tower.

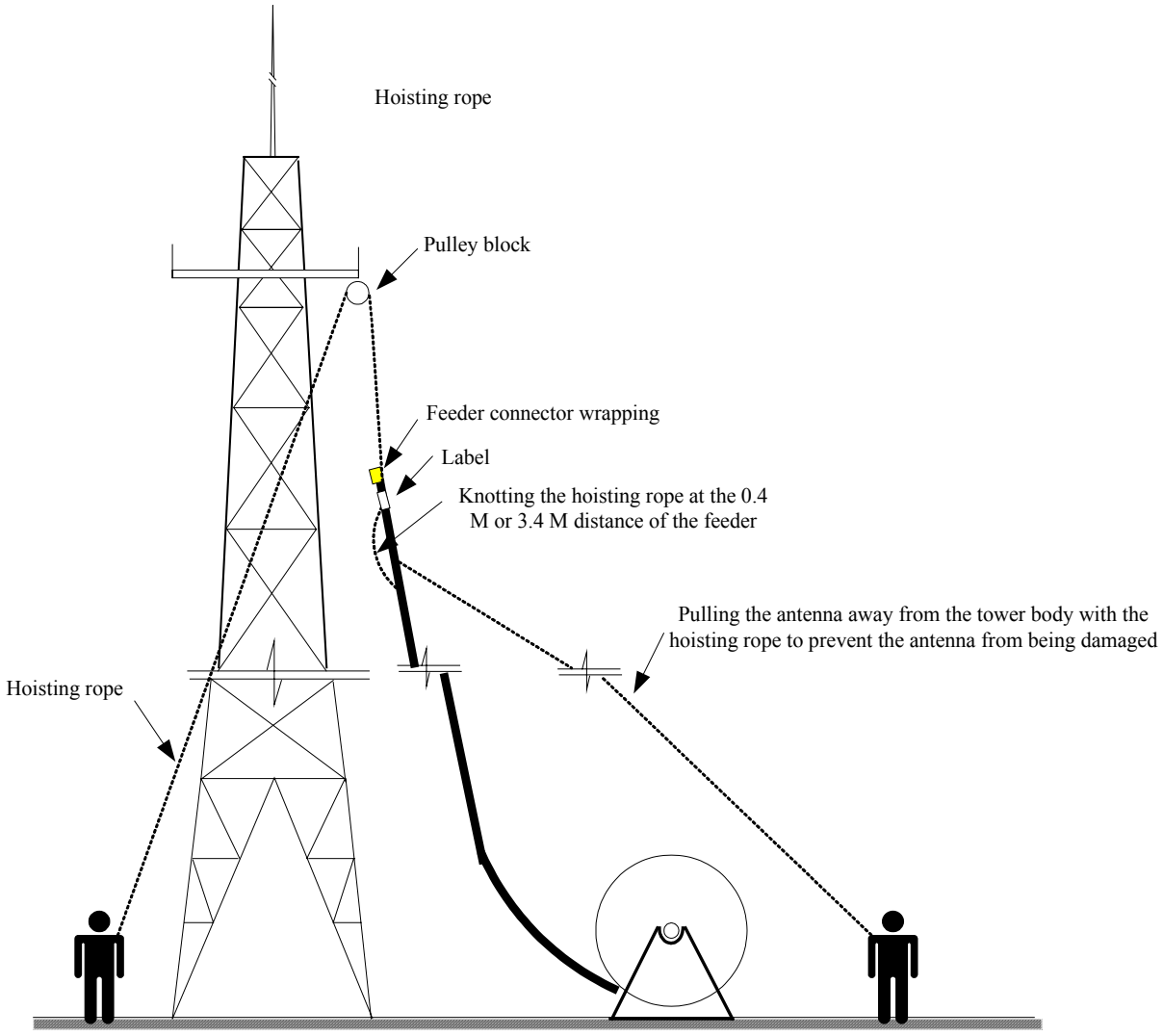


Fig. 10.4-12 Pulling the Feeder Cable up the Iron Tower

10.4.7.5 Laying and Fastening the Main Feeder Cable

1. Cabling principle of the main feeder

- The main feeder entering the equipment room from the feeder window and is routed along the indoor cabling rack should be bound neatly without crossing.
- The main feeder that is routed along the indoor cabling rack and the cabling rack on the tower should have no crossing.
- Make yourself familiar with the routing of the main feeder before cabling it. It is better to take down its actual route on paper to avoid rework due to crossing the cable.

- The minimum bending radius of the main feeder should not be less than 20 times the length of the radius of the main feeder. For one-time bending, the minimum bending radius is 90 mm. The minimum bending radius of repeated bends is 200 mm.
- The maximum spacing between the hangers is 1.65 m.

2. Cabling procedure of the main feeder

1) Pre-install the three-feeder clips every 1.5 meters (or according to the actual condition of the iron tower, but no more than 1.65 meters) along the iron tower or cabling rack. Note that the spacing should be as even as possible and the direction of installing them should be the same. When installing two rows of feeder clips inside the same cabling ladder, the two rows should be parallel and arranged neatly. Fig. 10.4-13 shows the appearance of a three-feeder clip.

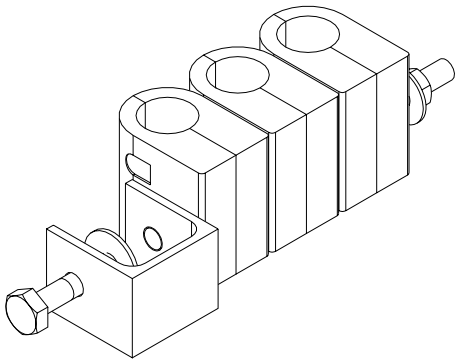


Fig. 10.4-13 Three-feeder Clip

2) Sort out the main feeders from the antenna to the equipment room inside.

3) Fix the main feeders from top to bottom and sort them out while attaching the three-feeder clips. Fasten the feeder clips after smoothing the main feeders. Note that you should keep the main feeders flat and straight rather than allowing any bulge between two feeder clips or fixing the feeders at the two ends simultaneously.

4) Fix the main feeders with three-feeder clips along the outdoor cabling ladders prepared by the network operator for the main feeders to be routed along the building top to the equipment room inside.

10.4.7.6 Running the Primary Feeder Cable into the Equipment Room

1. Precautions

- Fig. 10.4-14 and Fig. 10.4-15 illustrate how the common feeders enter the equipment room. Please ensure that the feeders will not bring any rain into the equipment room when entering the equipment room. For that purpose, you can design water curves as necessary.

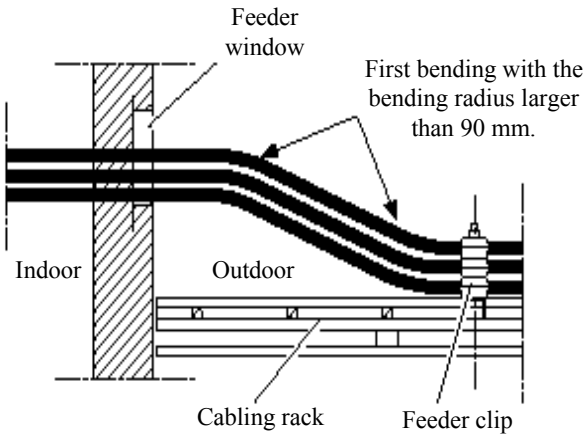


Fig. 10.4-14 Introducing Feeders into the Equipment Room (Method 1)

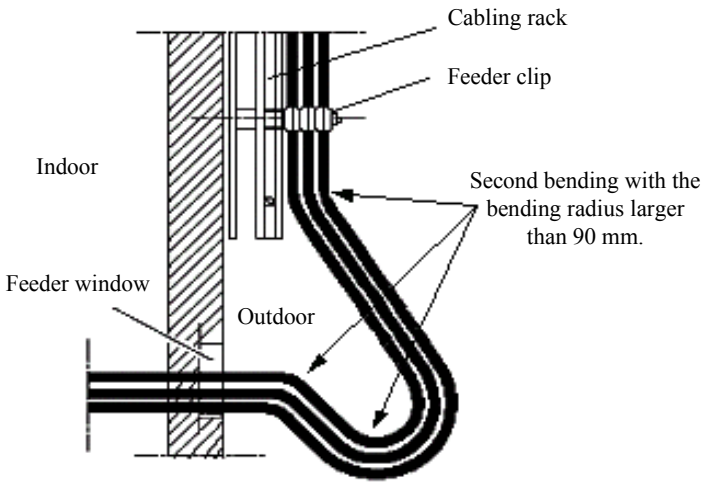


Fig. 10.4-15 Introducing Feeders into the Equipment Room (Method 2)

- Use cabling racks both indoors and outdoors to guide the feeders when introducing them through the feeder window into the equipment room.

2. Installation procedure

1) Loosen the fixing hoop from the feeder window to the proper position with reference to 10.4.6 "Installing the Feeder Window", and pull away the sealing cover of the aperture to thread the feeders.

2) Lead the feeders into the equipment room: Two persons are needed to cooperate with each other, one indoors and the other outdoors, to introduce the feeders from the outdoor cabling racks into the indoor cabling racks. During this process, care should be taken to avoid damaging the indoor equipment or damaging the feeder due to improper force applied on the outdoor feeder. Fasten the fixing hoop after pulling the feeders in place.

3) Do the following before cut the feeders:

- Check the labels:

  Ensure that the temporary labels on the feeders are complete before feeder cutting and are still attached on the feeders after cutting. This is very important to avoid feeder chaos.

- Determine the cutting position:

  When cutting the feeders, select the cutting position according to the equipment room conditions (such as the rack installation position, the cabinet-top jumper length, the lightning arrester configuration or the installation position of the lightning arrester frame), the bending radius of the feeders and the cabling requirements of the equipment room.

4) Prepare the indoor connectors for the main feeders.

5) Connect the main feeders to the lightning arresters.

   If a lightning arrester is not grounded, it should be directly mounted onto the feeders to ensure proper insulation between the lightning arrester and the cabling rack.

   If a lightning arrester is equipped with a lightning arrester frame, each feeder should be thoroughly adjusted to ensure the screw threads properly fit in with the lightning arrester when the main feed and the arrester are connected. For details, refer to 6.2.3, "Installing the Indoor Lightning Arrester".

10.4.8 Installing the Indoor Jumpers

Indoor cabinet-top jumpers are used between the lightning arrester connected to the main feeder and the rack. Usually the finished 2m cabinet-top jumpers are used, or the jumpers can be prepared on site according to the actual length required.

If the 2 m finished jumpers are used, they can be directly installed between the lightning arrester and the rack top.

If the jumpers are prepared on site, 1/2" feeders should be prepared through cutting according to the specific length of each jumper. Assemble proper feeder connectors onto both ends of the feeders according to the feeder connector assembly instructions, and connect the jumpers between the lightning arrester and rack top.

10.5 Checking and Testing the Installation of the Antenna Feeder Part

10.5.1 Lightning Protection for the Outdoor Antenna

For details of the lightning protection to the antenna, see Fig. 10.5-1.

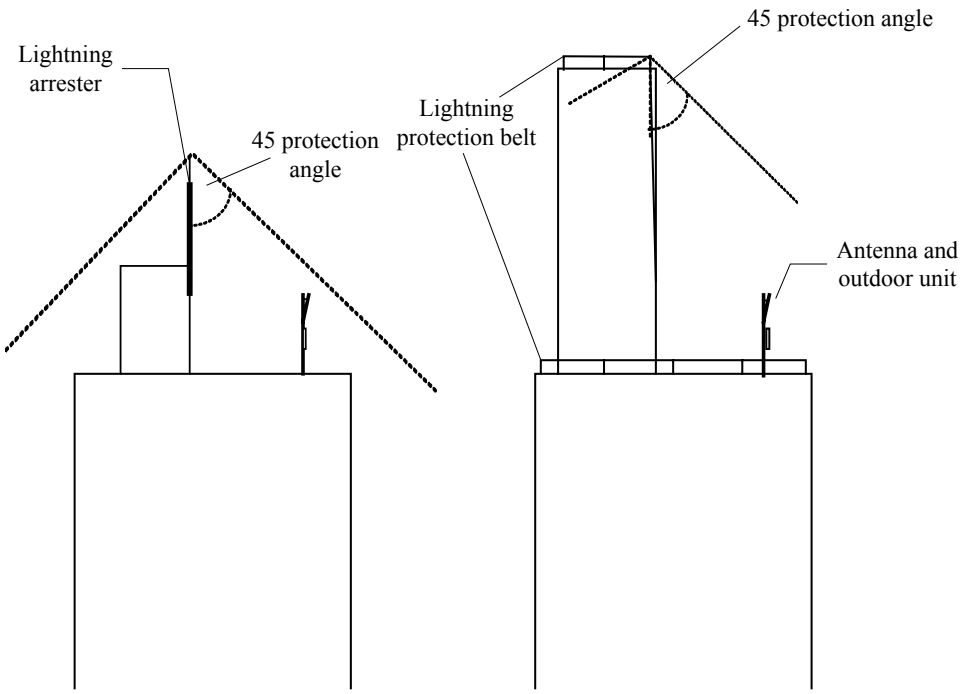


Fig. 10.5-1 Installation and Lightning Protection of Arrester

Installation standards involved in this figure:

1. The radio frequency antenna and GPS antenna must be installed within the 45° protection angle for arrester.
2. If necessary, install independent arrester for the GPS antenna.

10.5.2 Testing the Antenna SWR

After installing all the antenna feeders, conduct the SWR test on each of them. The measured SWR should be less than 1.5 and usually less than 1.3. If this is not satisfied, check immediately the feeder connectors installed, antenna, feeders and lightning arresters to find where the problem comes from. For the method of SWR test with SiteMaster, refer to Appendix G.

10.6 Waterproof Treatment for the Connectors

Caution:

The waterproof sealing for the outdoor jumpers and the feeder grounding clips of the antenna feeder system is an important part of the antenna feeder installation. It is of special concern. In the installation process, make sure to use waterproof tapes properly to ensure the quality of installing the antenna feeder system.

Use 1/2" jumpers, generally the 3 m finished jumpers, between the antenna and main feeder for transition. Connect the 1/2" jumper and the feeder and seal their connectors as follows:

1. Connect and fasten the antenna jumper and the main feeder connector.
2. Make waterproof treatment on the connectors in the following steps:

1) Cut waterproof adhesive tapes about 200 mm long.

2) Wrap the waterproof adhesive tapes from a low position where the connector is connected and apply them about 200 mm long to fill the low-lying parts of the connector, as shown in Fig. 10.6-1.

Fig. 10.6-1 Wrapping the Waterproof Adhesive Tapes (1)

3) Extend the adhesive tapes to double their length when wrapping them. The direction of wrapping should be the same as the direction of screwing the feeder connector, lest the feeder connector be loosened during the wrapping process.

4) As shown in Fig. 10.6-2, wrap the adhesive tapes layer by layer and then wrap them again in the reverse direction. The upper layer covers the lower layer by about 1/3 to avoid water penetration. Finally, reverse the direction and wrap them layer by layer again. Apply the tape with three layers without any cut in the entire process. Wrap the tapes around the feeder connector till they protrude about 20 mm from the feeder connector.

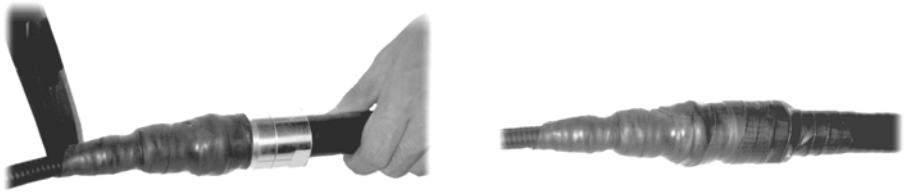


Fig. 10.6-2 Wrapping the Waterproof Adhesive Tapes (2)

5) Grip the waterproof adhesive tapes after wrapping them to ensure firm bonding between the tapes and the feeders/feeder connectors, as shown in Fig. 10.6-3.

Fig. 10.6-3 Wrapping the Waterproof Adhesive Tapes (3)

6) Apply two layers of the PVC tape on top of the waterproof adhesive tape. During the process, make sure the upper layer overlaps the lower layer by half the width of the tape.

7) Grip the PVC tapes and the waterproof adhesive tapes to make them tightly adhered to each other.

8) Tie the two ends of the adhesive tape with straps to prevent it from being aged or falling off.

11 GPS Antenna Feeder System Installation

Summary:

- Installation preparation for the GPS antenna feeder system
- Structure of the GPS antenna feeder system
- Installation flow of the GPS antenna feeder system
- Installation procedure of the parts of the GPS antenna feeder system
- Waterproof treatment for the connectors

11.1 Preparation for Installing the Antenna Feeder System

As the clock and frequency reference for CDMA, the GPS plays a very important role. According to the passive distance measurement principles, GPS antenna receives the navigation positioning signals from the GPS satellites and demodulates frequency and clock signals through the GPS signal receiver for use by the related units of the CDMA base station.

Requirements for the installation of the GPS antenna: The installation position of the GPS antenna should have a broad view so that the GPS antenna can track satellites as many as possible. Usually, select a safe place on the roof or at the lower part of the tower and try to make the GPS feeder short to reduce attenuation.

Lightning protection requirement of the GPS antenna: The GPS antenna is usually installed in the 45° lightning area of the iron tower. Otherwise, the user should make and install a special lightning arrestor.

Please note that the pole fixing the GPS antenna must be grounded.

11.2 Structure of the Antenna Feeder System

The composition of the GPS antenna feeder system is shown in Fig. 11.2-1.

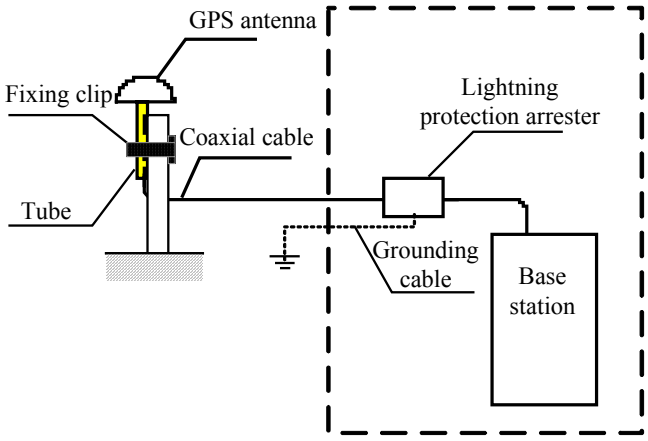


Fig. 11.2-1 Composition of the GPS Antenna Feeder System

11.3 Installation Flow

Follow these steps to install the GPS antenna feeder system:

1. Make the outdoor connector for the coaxial cable as making a GPS coaxial cable connector.
2. Thread the connector through the GPS accessory tube and distribute the coaxial cable from the GPS antenna to the GPS lightning arrester.
3. Screw the outdoor connector of the coaxial cable to the GPS antenna connector.
4. Keep the GPS antenna still while screwing the tube on the GPS antenna.
5. Fix the tube to the pole with a fixing clamp.
6. Cut the coaxial cable according to the installation of the GPS arrestor, make the indoor connector of the cable and connect it with the lightning arrestor. Note that the equipment end and the feeder end of the GPS lightning arrester must be correctly connected.
7. Distribute the coaxial cable between the GPS lightning arrester and the GPS port on the BTSB equipment.

11.4 Installing the Parts

11.4.1 Preparing the GPS Coaxial Cable Connectors

1. Peeling dimensions

The GPS coaxial cable is peeled according to the dimensions shown in Fig. 11.4-1.

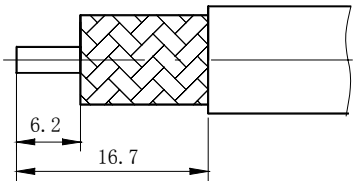


Fig. 11.4-1 Stripping GPS Cable

2. Welding core

Before welding the core wire, thread the parts with the cable in the sequence as shown in Fig. 11.4-2. Then, weld the cable core with the pin. The shielding layer of the cable should be opened and covered on the bush.

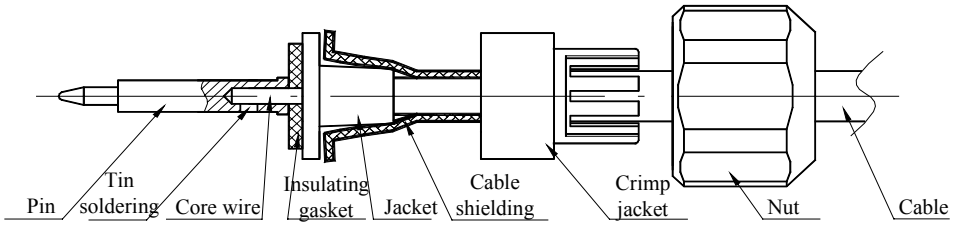


Fig. 11.4-2 Welding GPS Connector Pin

3. Installing parts

After welding the core, install the parts on the case. The structure of the cable assembly is shown in Fig. 11.4-3.

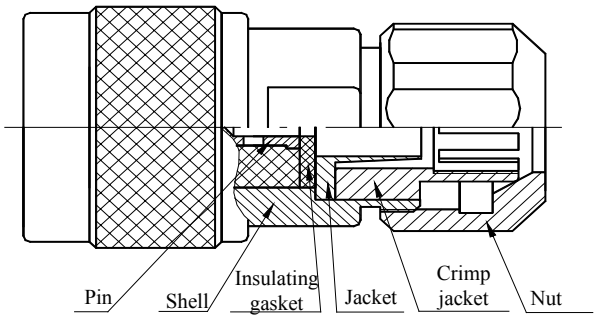


Fig. 11.4-3 Structure of the N-J7A Cable Connection Part

11.4.2 Installing the Lightning Arrester

Each GPS has its own lightning arrester installed between the GPS antenna and the BTSB rack. The lightning arrester should be connected to the outdoor grounding copper bar via a 6 mm^2 grounding cable. For the base station installed with a lightning arrester frame, you may fix the GPS lightning arrester onto the frame. In this case, the 6 mm^2 grounding cable is unnecessary. Be sure to connect the lightning arrester correctly.

Refer to 10.5.1 for more information about lightning protection of GPS antenna.

12 Board Installation

Summary:

- BTSB board types
- Installation and replacement of BTSB boards
- Installation sequence of BTSB boards

12.1 BTSB Board Types

The baseband system consists of the following boards:

The CHM implements Channel Elements (CEs) processing. The CE processing modules of each baseband system form a series of baseband processing sharing pools.

The RIM implements forward signal summary and reverse signal distribution as the interface between baseband and radio frequency. The RIM can run in active/standby mode.

The CCM implements control over base stations and switching for the base station networks. It can run in active/standby mode.

The DSM acts as the ABIS interface to the BSCB, and can run in active/standby mode.

The SNM acts as the SDH interface, and can run in active/standby mode.

The SAM monitors the environment.

The GCM provides an accurate GPS clock for the base station. It can run in active/standby mode.

The BIM base station interface module implements interface transfer between the active and standby BDSs, between baseband and radio frequency, and between the basest ion and the base station controller.

The PD distributes the power.

The Radio Frequency System (RFS) is located between the baseband system and the mobile station to implement air RF interface in the air, and data interface to the

baseband system at the wireline side. The RFS consists of the following boards:

The TRX implements signal frequency conversion and supports 6+1 backup.

The RMM provides interface between RF and baseband and can run in active/standby mode.

The PA amplifies the power of forward signals and supports 6+1 backup for linear power amplification.

The PIM provides interface for power amplification.

The RFE provides antenna feeder interface and reverse low noise amplification.

The BTM performs base station radio tests.

The SAM monitors the environment.

The TSM implements cross-OR operation on the TRX forward signals for backup.

The RSM implements cross-AND operation on the TRX reverse signals for backup.

The PD distributes the power.

12.2 RF Cabinet Boards

12.2.1 Receiver Front End (RFE)

The RFE module amplifies the reverse received signals with low noise, implements detachment, filter, SWR and power check for received/sent signals, and extracts & injects the BTM. Its performance has a direct impact on the transmission indices of the whole BTSB system.

The system requires a single cabinet to provide 24-carrier/sector. To this end, linear power amplifiers with 4-carrier are configured for the base station in most cases, and single-carrier higher-power amplifiers are adopted in special cases. The RFE is designed to adapt to all the possible configurations of the system, including the single-rack 6-sector configuration.

The principles and functions of the RFE are as follows:

Integrate duplexer (DUP) and filter (DIV) into one box. Then each RFE consists of 5 modules of 4 types (DUP, DIV, 2XLNA and PVD) to bear 4-carrier forward signals and two channels of reverse signals.

Filter the weak signals received by an antenna and amplify them with low noise.

Distribute power for the signals amplified with low noise, output them to the RSM and the TEST_PORT through two splitters.

Provide duplex functions.

Filter forward transmitting power signals.

Monitor the low noise amplifier state.

Check the standing wave of the transmission channel to determine the matching state of the antenna feeder.

Monitor the forward power, including the total power and the single carrier power. Provide more accurate channel power detection table through frequency selective circuit, thus a more accurate output power detection value for each carrier.

Incorporate in the automatic calibration of the output power.

Inject and acquire the BTM signals (DUP forward acquisition and DUP reverse/DIV injection).

Provide the TX test port for pre-distortion sampling.

Report to the RMM via the serial port about the power, VSWR alarms, and the LNA state. The RMM also controls the variable attenuator on the power detection link of the PVD for the expansion of the dynamic range of the detection link.

Support external tower top amplifier with the LNA design for links that makes gain adjustment through the background.

Detect the power of the all-channel bandwidth (5M) of 4-carrier and a given carrier at the same time.

12.2.2 Power Amplifier (PA)

The PA is the power amplification module for the whole RFS. With its great working current and high working temperature, it is required to provide some special linearity to be applied to CDMA systems. Therefore, the implementation of it, a key module in the BTSB, is a great challenge. High PA (for signal carrier amplification) or linear PA (for multi-carrier amplification) can be chosen for the base station. This section only addresses the principles of the linear PA (LPA).

The functions and principles of the LPA are as follows:

Depending on the input cross choice for the TSM and the output cross choice for the BLPA backplane, seven LPAs are configured for 6+1 backup.

The CDMA system adopts the QPSK modulation mode, a linear modulation mode. To reduce the spectral expansion of signals, some linear features are required from the PA. In addition, the PA shall also provide constant gain and precisely controllable output power. In the CDMA system, the ratio of peak power to average power of a signal is usually around 10 dB. To ensure the inter-modulation index, the PA shall provide a peak output power around 10 dB. Thus, the efficiency of the PA is reduced due to its great back off. To improve the efficiency of the PA, a technology in trend provides linear pre-distortion. In this solution, interfaces for linear distortion are reserved for forward compatibility with the subsequent R&D achievements.

Excellent performance is expected from the LPA in an environment with appropriate temperature and power drift. A thorough alarming system is thus required. At present six types of alarms are to be provided: Over-heat alarms, over-power alarms, VSWR alarms, loop 1 failure alarms, loop 2 failure alarms and power alarms.

Fully distributed power supply is adopted, and the centralized power shelf is removed. –48V direct power supply requires support from the LPA. As the power supply is converted to 27V by the internal power module, the heat consumption caused by the power conversion should be taken into account during the heat design of LPA.

12.2.3 Transceiver (TRX)

The TRX is to convert the forward/reverse link signals, such as the conversion from forward/reverse digital baseband signals to analog RF signals. The digital intermediate frequency (software radio) and the multi-carrier technologies enhance the performance and the integration of the system.

The working principles and functions of the TRX are as follows:

A TRX can transmit forward/reverse 4-carriers.

Process forward link signals: Receive forward baseband signals from the RMM; perform digital filtering, digital up-conversion, digital quadrature modulation, and digital intermediate frequency combination through the processing of the forward digital intermediate frequency; D/A convert, amplify and filter the signals through the intermediate frequency; simulate the up-frequency to the RF; control the forward power attenuation, amplify the RF; output the RF filter; switch TSM and then deliver

the signals to PA for power amplification.

Process reverse link signals: Input TRX_RX0/1 for the main/diversity RF signals from the RFE-LNA through the RSM switch for RF filtering, RF amplification, RF analog down-conversion, intermediate frequency amplification, intermediate frequency SAW filtering, reverse attenuation control, Automatic Gain Control (AGC) (when needed), and direct intermediate sampling (A/D); and then process by the reverse digital intermediate frequency RSP for digital quadrature modulation (down-conversion), digital splitting, digital filtering, digital sampling of the baseband signal; and output the reverse to the corresponding baseband time slot through baseband filter FIR, forward Digital AGC (DAGC) and reverse selection.

12.3 Cabinet Front Boards

12.3.1 Board Overview

12.3.1.1 Board Structure and Diagram

The mechanical structure of a common BTSB board is shown in Fig. 12.3-1.

The picture of a common BTSB board is shown in Fig. 12.3-2.

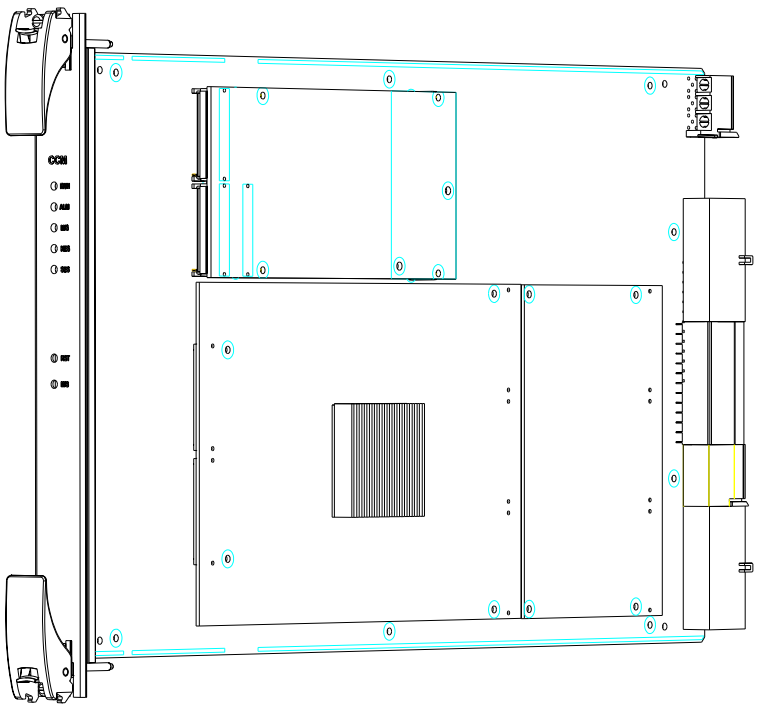


Fig. 12.3-1 Board Mechanical Structure

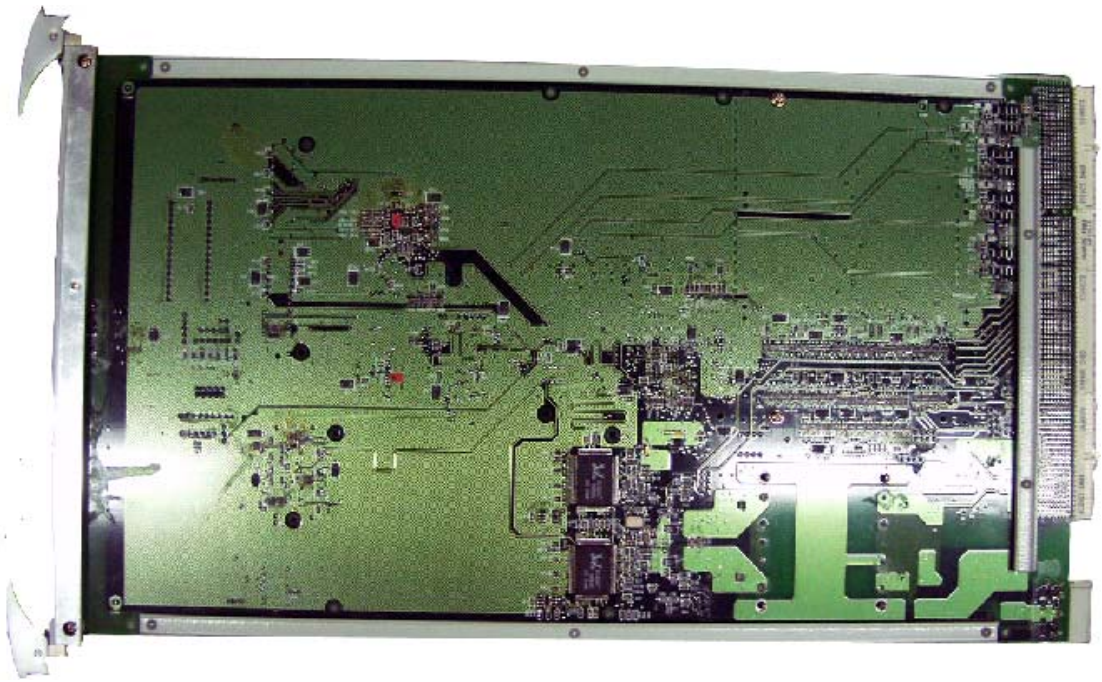


Fig. 12.3-2 Picture of a Board

12.3.1.2 Structure Overview

As shown in Fig. 12.3-1, the board has a panel in the front, and plug-ins at the back. Two ejector levers and some indicators are on the front panel.

12.3.2 Installing and Replacing the Boards

Open the ejector lever before the installation, align the board with the corresponding slot and push the board vertically until it reaches its position, and then push and press the ejector lever with some strength. A click sound indicates the board is in full position. Then fasten the M3x11 captive screws on the ejector lever.

To remove the board, loosen the M3x11 captive screws on the ejector lever, then hold the upper and lower of it with each hand, press the locks on the ends of the ejector lever with thumbs, pull it outside with both thumbs with some strength until the ejector lever detached from the guide rail, and then unplug the board. Fig. 12.3-3 shows the operation process.

Fig. 12.3-3 Loosening the Screws and Unplugging the RFE

12.4 Interface Boards at the Back of the Baseband Cabinet

12.4.1 Interface Board Overview

The BIM of the BDS system provides interface between the BDS cabinet (single shelf equipment) and the external equipment (PWS, BDS and RFS). Due to the great amount of the BIM interfaces, the functions of the BIM are assigned to 12 interface boards. The BIM is inserted from the back of the BBDS backplane to provide access for the external interfaces for 7 types of interface boards: BIM0, BIM1, BIM2, BIM3, BIM4, BIM5 and BIM6. Among these, boards BIM0 through BIM5 are pluggable passive boards, and BIM6 is an unpluggable optical interface board. For the detailed information on interfaces, see Table 12.4-1. Each type of board corresponds to a special slot and the cabinet is designed to prevent wrong insertion, as shown in Fig. 12.4-1.

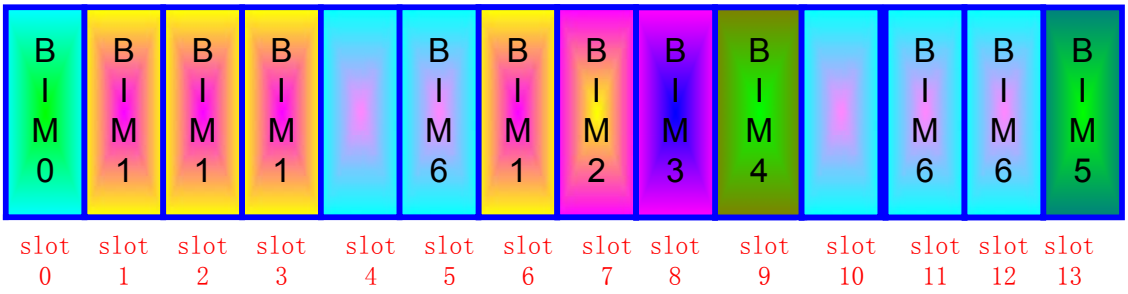


Fig. 12.4-1 BIM Interface Board Structure

The interfaces of the BIM interface boards are described in Table 12.4-1.

Table 12.4-1 BIM Interface Board Interfaces

Slot ID	BIM Version	Interface Name	Description
0	BIM0	BSC	ABIS circuit interface, E1X8, connected only in the BTS-BSC direction.
			ABIS FE interface for the connection between the BDS shelf and the BSC.
1	BIM1	MBDS	Media stream communication interfaces between the BDS and the MBDS, consisting of a master interface and a slave interface.
			FE interfaces for the control stream, consisting of a master one and a slave one.
			Cascading data interfaces between the SBDS and the MBDS for the system clock, circuit clock, control reset line, HW signals and order-wire signals.
2	BIM1	SBDS0	Media stream communication interfaces between the SBDS and the MBDS, consisting of a master one and a slave one.
			FE interfaces for the control stream, consisting of a master one and a slave one.
			Cascading data interfaces between the SBDS and the MBDS for the system clock, circuit clock, control reset line, HW signals and order-wire signals.
3	BIM1	SBDS1	Media stream communication interfaces between the SBDS and the MBDS, consisting of a master one and a slave one.
			FE interfaces for the control stream, consisting of a master one and a slave one.
			Cascading data interfaces between the SBDS and the MBDS for the system clock, circuit clock, control reset line, HW signals and order-wire signals.
4	Null		The location for the BIM6 fiber spooler, covered by a fake panel.
5	BIM6	BSC	The 2 X GE optical ports to connect to the BSC, and the 4 X SDH optical ports (fixed).
6	BIM1	SBDS2	Media stream communication interfaces between the MBDS and the SBDS0, consisting of a master one and a slave one.

Slot ID	BIM Version	Interface Name	Description
			Control stream communication interfaces between the MBDS and the SBDS0, consisting of a master one and a slave one.
			Cascading data interfaces between the MBDS and the SBDS0 for the system clock, circuit clock, control reset line, HW signals and order-wire signals.
7	BIM2	SBDS3	Notes: When cascaded with the SBDS3, the control stream/media stream communication interface does not star-connect to the MBDS, but cascades with SBDS0-SBDS2.
			Cascading data interfaces between the MBDS and the SBDS1 for the system clock, circuit clock, control reset line, HW signals and order-wire signals.
8	BIM3	EXTEND	The daisy chain cascade of the BTS uplinks, or the expanded access interface of the external equipment (when the SNM is configured, provide up to 8XE1 accesses). Also the expanded E1 interface of the BTS uplinks for up to 16 E1s.
9	BIM4	RFS TEST	FE debugging interfaces of the BTS control stream, the direct access points of LMT.
			FE debugging interfaces of the BTS media stream.
			BTS order-wire telephone interface.
			The LRFS electrical interface for the system clock, RF reference clock, baseband – RF interface data, and the control reset line.
10	Null		The location for the BIM6 fiber spooler, covered by a fake panel.
11	BIM6	RRFS	Six pairs of optical ports that are connected with the RRFS. The master RIM supports 6 pairs (fixed).
12	BIM6	RRFS	Six pairs of optical ports that are connected with the RRFS. The master RIM supports 6 pairs (fixed).
13	BIM5	PWS EM	PWS electrical interface for the RS485 communication interface, control reset cable, and single-chip remote download cable.
			The external expanded RS232/RS485 interface.
			External sensor interface for temperature, humidity, smog, flooding, and access control of the equipment room.
			Expanded Boolean input interface.
			The GPS interface in compliance with the specifications of the Ministry of Posts and Telecommunications.

12.4.2 Interface Board Diagram

The structure of the interface board at the back is shown in Fig. 12.4-2.

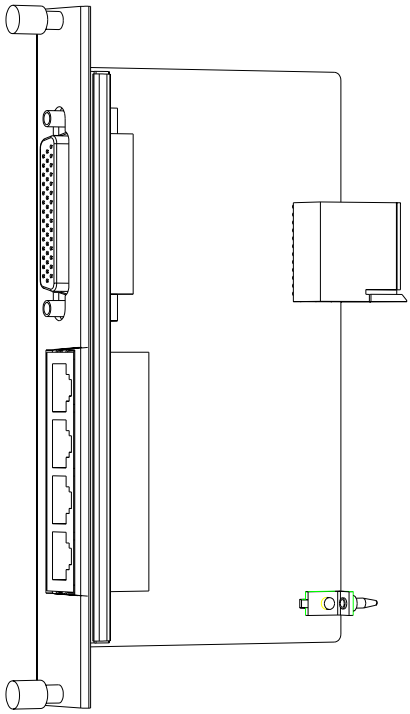


Fig. 12.4-2 Structure of a Back Interface Board

12.4.3 Interface Board Structure

As shown in Fig. 12.4-2, the interface board at the back has a panel in the front, and plug-ins at the back. Two captive screws and some plug-ins are on the panel.

12.4.4 Installing and Replacing the Interface Boards

To install a board, align the board with its slot, push the board vertically until it is in position, and fasten the captive screws.

To remove the board, loosen the screws, grasp the screws and unplug the board.

12.5 Board Installation Sequence

Install the boards into their corresponding slots as shown in Fig. 12.5-1 or by referring to the diagram in the hardware manual.

Fig. 12.5-1 Positions of Boards

13 Hardware Installation Check

Summary:

- M452/R452 hardware installation check

Check the installed items before you power on the BTSB.

13.1 Checking the Cabinet

The installation of an indoor cabinet involves the installation of a BTSB rack and other cabinets (such as DC/AC power cabinets). After cabinet installation, check the following items:

1. The rack installation location conforms to the design drawing.
2. A rack, when fixed, should be firmly erected to resist a 7.0 earthquake.
3. The levelness error of a cabinet should be less than 3 mm, but its vertical missing should be no more than 3 mm. The gap between two adjacent stands should be no more than 3 mm.
4. The front door of the rack should be flush with the front edges of other equipment, without any concave or convex.
5. The front of the rack should be no less than 1 m away from the wall, and the rear of the rack, 0.8 m away from the wall.
6. The parts on the rack should not fall off or be damaged. The rack should be painted well and the labels on it should be correct, clear and complete.
7. Check all over the cabinet to make sure that no metal scrap or conducting wire is left. The cabinet inside is clean and has no leftover.
8. All screws should be tightened with flat washers or spring washers placed correctly.
9. Each stand should be equipped with 4 partition insulators. If installed close to walls, some of them should be placed between each stand and walls to make a

cabinet and walls insulated.

10. The stand supporter should be consistent with the hole sites of expansion screws.
11. The upper plane of the conductive floor in the equipment room is no higher than the lower surface of the stand lest the radiating of a stand should be affected.
12. After all cables are laid out, the small cover plates of the wire outlets at the cabinet top should be pushed forward to cover the wire outlets and to prevent rodents entering the cabinet.
13. In the case of a combined cabinet, check whether the cabinets are well arranged and the connecting pieces at the combined cabinet top are firmly installed.
14. The surface of the integrated equipment should be clean and tidy, and the paint outside it should be in good condition. The identifications should be correct, clear and complete.
15. The front door of the cabinet can be easily opened or closed.

13.2 Checking the Cable Racks

Requirements:

1. The location and height of the cable rack should meet engineering design requirements.
2. The flat steel of the cable rack should be flat and straight, without any apparent warping or obliqueness.
3. Each cable rack should be equipped with a grounding cable. All connection points should be superior in electrical performance and they are well connected with the grounding body in the equipment room.

13.3 Checking Cable Laying, Binding and Identifying

Principles:

1. The cables are laid flat and straight, without any apparent fluctuation, skewness, crossing or jump wire in air. Any remaining length should be curled, bound and laid in a cable trough.

2. Cables should be bent smoothly and evenly and the outer part of the arc should be as vertical or horizontal.
3. Power cables and signal cables are separated from each other with at least 150 mm in between.
4. Both cable ends should be clearly labeled or marked to prevent connection mistakes.
5. Connector locations should be compact, firm, well-contacted and upright without broken or bending.
6. After being laid, cables should be trimmed to look straight, tidy and pleasing to the eye, without any crossing.
7. Cable straps should be made tidy and pleasing to the eye. Cable ties should be evenly spaced, neither too tight nor loose, and go in the same direction.
8. Any excess cable strap should be cut and all indoor cable straps must be cut from the root, without any tips left.
9. Cable straps shall be left with some margins when cut after binding.
10. All cable straps must be cut from the root, and no tip shall be left.
11. Each label identifies the uses of the cable and the same content should be written for the labels attached on both cable ends.
12. Wrap labels with some cellulose tape to prevent any loosening.
13. All cables, especially main feeders and indoor 1/2" jumpers, should be labeled. All labels should be arranged in a tidy and beautiful way and in the same direction.

13.4 Checking the Power Cables and Grounding Cables

Requirements:

1. The power cables and grounding cables in the equipment room shall be laid in accordance with engineering design requirements.
2. The PGND cable on a BTS rack employs 35 mm2 yellowish green or yellow copper-core cables and are connected with indoor PGND copper bars. They shall be well contacted and firm. The GND/BGND cable adopts the black

copper-core cable with the cross-section area 25 mm2. The -48V power cable adopts the blue copper-core cable with the cross-section area 25 mm2. All these cables are laid straight and connected reliably.

3. A grounding bus cable should be directly connected with an indoor ground cable bus without connected to any intermediate equipment. The diameter of the grounding bus cable shall be more than 50 mm2.
4. Each grounding point on the grounding copper bar can only be connected with one piece of equipment.
5. The protective grounding cable and the AC neutral cable are separated instead of being placed or used together.
6. The AC neutral line in the power room is independently grounded.
7. The outdoor grounding resistance shall be less than 5 ohm
8. Each cable is identified clearly and correctly.
9. The grounding cable of a power cable, when laid, should be bound separately from other cables.
10. The remaining length of the grounding cable and power cable should be cut off instead of coiling it up and reserving it.
11. The copper lugs on both ends of power cables and grounding cables shall be soldered or pressed firm.
12. The power cable and the grounding cable should be of whole material and no connector is allowed in the middle.
13. The grounding bar shall be insulated from walls and the grounding cable shall extend as short as possible.
14. The primary power supply is correctly connected to the power supply terminals on the rack.
15. The lifting lug of a power cable should be soldered or pressed firm and upright.
16. The power cable and copper lug must be contacted in a reliable and firm way and are sealed with an adhesive tape. The copper lug must be connected firmly with the power cabinet (or the BTS rack).
17. Insulated protective sleeves are well installed on both connecting terminals of

the power supply on the rack top.

18. Power cables, ground cables, trunk cables and RF cables should not be broken or damaged.
19. The labels on both ends of the power cable and ground cable shall be clear and correct.
20. The bare wires at the connecting terminals and lug handle should be tightly wrapped with insulating tape or a heat-shrink tube instead of being exposed.
21. The connecting terminals should be equipped with flat washers and spring washers.

13.5 Checking the E1 Cables

Requirements:

1. E1 cable connectors are reliably installed, without any short-circuit or damage.
2. E1 cables are connected correctly and labeled clearly.
3. No E1 connector gets loose. Test with a multimeter whether the connector shell and grounding system are well connected. Otherwise, the ring flange of the connector and shell are in poor contact.
4. The E1 cables on the set top should reserve some margin length. Do not stress them in case they cannot be reliably connected with the rack connectors when the cable rack vibrates.
5. E1 cable connectors must be connected reliably.

13.6 Checking the Sensors

Requirements:

1. The temperature/humidity sensor is vertically installed and cables are correctly connected to the cabinet top.
2. The smog sensor is horizontally installed and cables are correctly connected to the cabinet top.

13.7 Checking the Internal Connections of the Cabinet

Requirements:

1. The RF cables between modules within the rack shall be reliably connected.
2. The screws of all modules within the rack must be fastened to the greatest extent to prevent any unreliable connection.
3. Any unused connector is screwed on with a matching terminal.
4. The RF cables shall avoid crossing and over stretching. Some margins are expected to be reserved at the turning corner and the connectors shall connect firmly.

13.8 Checking Indoor 1/2" Jumpers

Requirements:

1. According to the name plate of the main feeder, use 1/2" jumpers to connect with the connecting terminals on the rack top.
2. The labels of 1/2" indoor jumpers should indicate the corresponding sectors and the length of the main feeder.
3. Indoor jumpers should be tidy and in appropriate length. They should be bound on the cable rack in order.
4. The cabling should provide convenience for maintenance and capacity expansion.
5. Jumpers should be laid by layers and sectors.
6. There should be 30 cm flat and straight where jumpers and a lightning arrester are connected.

13.9 Checking the Lightning Arrester

Requirements:

1. The RF lightning arrester is connected to the connectors of the feeder, and fastened tightly.
2. The 6 mm2 yellow ground cable of the GPS lightning arrester shall be reliably connected to the outdoor grounding bar.

3. The RF lightning arrester and the GPS lightning arrester should be mounted between two crosspieces of the cable rack without touching the cable rack. Insulation from the cable rack is required.

13.10 Checking the Lightning Arrester Rack

Requirement:

1. The lightning arrester rack installed should be insulated from the cable rack.
2. The lightning arrester should be installed on the lightning arrester rack in a firm, reliable and beautiful way.
3. The grounding copper cable of the lightning arrester rack must be routed to the outdoor grounding copper bars for reliable grounding.
4. When led outdoors, the grounding copper cable of the lightning arrester rack must be insulated from indoor conductors.

13.11 Checking the Primary Feeder Cables and GPS Feeder Cables

Requirements:

1. To make a main feeder connector, you have to use a special cutter. The profile of the main feeder should be flat and smooth. The main feeder has no copper scraps in its copper tube. The feeder connector should meet the standards and be connected tightly.
2. 7/8" feeder connector should be tightened with a big spanner and installed in place to avoid any abnormal SWR caused by false connections.
3. The feeder between the tower top and the equipment room should be grounded in at least three points. The first location is within 1 m from the tower up to the platform. The second is within 1 m from the tower to the front of the outdoor cable rack. The third is within 1m between the feeder and the feeder window. The grounding points should be bound firmly with proper waterproof measures. Where a grounding kit is installed, the sheath of a feeder is removed according to the kit size. When installing the grounding kit, pay attention to waterproof measures. The terminal of the grounding kit connected with a grounding cable should face downward lest any rainwater should flow into the feeder along the grounding cable.

4. If a tower is above 60 m and needs a longer feeder, another feeder grounding clip should be placed in the middle of the tower.
5. If a feeder is off the tower and routed for above 20 m at the building top or on the cable rack before going into the room, another grounding clip for lightning protection should be put at the building top or on the cable rack.
6. The terminals of the grounding clip of a feeder should be fixed on the steel plate of a nearby tower.
7. The outdoor grounding copper bar employs a special reliable path to an underground ground grid. The line width should be more than 50 mm2. Otherwise, users should lay connecting cables as soon as possible.
8. For a building without a tower, the antenna feeder ground at the top should be connected with the nearby lightning protection ground grid on the roof.
9. If the feeder employs a downward cable ladder to go along walls downward from the building top and enters a room, the cable ladder should be grounded.
10. The grounding cable of a feeder should be led from up to down. The separation angle between the feeder and grounding cable should be no more than 15º.
11. The cabling of the feeders should be visually appealing without crisscrossing. They should be well arranged and have no apparent twists and turns. The feeders entering a room should be tidy, flat, straight and with identical bending angle. The main feeders are correctly connected and the sectors concerned are correct too.
12. The minimum bending radius of a feeder should be no more than 20 times the feeder radius, and the bending radius of the main feeder should be more than 0.3 m.
13. The cabling of the main feeders should be planned. When the cabinet front is parallel to the direction in which a feeder enters a room or the cabinet back is facing the direction in which a feeder enters a room, the main feeders within a sector should be arranged as a row. The arrangement order of each row should be consistent. When the cabinet front faces the direction in which a feeder enters a room, one sector is arranged as a column and the arrangement order of each column should be consistent.
14. The feeder connector should have no bare copper sheet. Two name labels should

be bound on both terminals of a feeder to ensure that feeders correspond to antennas. Write corresponding lengths on a feeder name plate.

15. Avoid any dry joint in soldering GPS core wire.
16. GPS copper core and external outer layer cannot be short-circuited. The core pin of a feeder connector should be parallel to the external end face of a GPS feeder connector.
17. Tighten the GPS feeder connectors.

13.12 Checking the Feeder Cable Window and Water-Blocking Curve of the Primary Feeder Cable

Requirements:

1. A feeder window is fixed on one indoor wall and the feeder hole bulging on the feeder window faces outdoors.
2. The glue injection hole on the packing gland on the feeder sealing window should be sealed upward and window boards should be installed on one indoor wall.
3. When a feeder window is installed at the building top to lead a feeder into the room, it should be well sealed.
4. When an outdoor feeder enters the equipment room, a waterproof bend must be made at the outdoor feeder window. The lowest point of the waterproof bend is required to be 10 cm ~20 cm lower than the lower edge of the feeder window.
5. The minimum bending radius of a feeder should be no more than 20 times the feeder radius, and the bending radius of the main feeder should be more than 0.3 m.
6. The indoor and outdoor parts of a feeder should be both above 0.5 m. There should be 0.3 m flat and straight at the lightning protection rack.

13.13 Checking the Three-Way Feeder Cards

Requirements:

1. The three-way feeder card should be fixed on the outdoor cable rack.

2. The intervals between the feeder fixing clips should be even and in the same direction.
3. A feeder card should be installed every 1.5m on the main feeder.

13.14 Checking the Outdoor 1/2" Jumpers

Requirements:

1. Antennas and 1/2" jumpers. The 1/2" jumpers and main feeders should also be correctly connected. The threads of the connectors should fit in and the connectors are tightened.
2. The jumper connected with an antenna should be bound to the support crossbar to the steel frame of the tower.
3. The wrapping requirements between an antenna and 1/2" jumper connector and the wrapping between a 1/2" jumper and the main feeder connector are as follows: a. the connector is wrapped with some waterproof self-adhesive tape; b. the waterproof self-adhesive tape at an antenna terminal must be wrapped until the antenna root; c. the feeder terminal should be wrapped until 10 cm away from the connector; d. the waterproof self-adhesive tape is wrapped with an insulating tape longer than the waterproof self-adhesive tape.
4. At the joint between the jumper and the antennas, they should be parallel to each other with 30 cm in between.
5. The connector is wrapped with a waterproof self-adhesive tape, which must be extended to an antenna root. Wrap the feeder terminal until 10 cm away from the connector. Wrap the waterproof self-adhesive tape with an insulating tape longer than the waterproof self-adhesive tape.
6. All outdoor jumper connectors should be waterproof and the jumper should be equipped with a waterproof bend.

Fig. 13.14-1 shows the waterproof method for the outdoor 1/2” jumper.

Fig. 13.14-1 Waterproof Outdoor 1/2” Jumper

13.15 Checking the Antenna

Requirements:

1. An antenna support and a tower should be connected in a reliable and firm way.
2. Check the model of the antenna in use to make sure that it conforms to networking planning.
3. The hanging height of an antenna refers to the distance between the ground and the middle of the antenna. It is required that the actual hanging height of an antenna conforms to network planning, and the antenna should be installed as designed.
4. The RF antenna and the GPS antenna should be included in the protection area of a lightning arrester (the area within the downdip of 450 from the lightning arrester).
5. Measure the azimuth of an antenna. In case of a unipolarization directional antenna, each antenna should be measured. The actual azimuth of an antenna

conforms to network planning and two antennas within the same sector goes in the same direction. The azimuth error of the directional antenna is no more than ±0.50.

6. Measure the actual mechanical downdip of an antenna with an angulometer. In case of a unipolarization antenna, each antenna should be measured. An omni antenna will not be checked and a directional antenna should have the azimuth error of no more than ±0.50. The actual mechanical downdip of an antenna conforms to network planning and two unipolarization antennas have consistent downdips.
7. The electrically controlled pointer antenna is adjusted with a ejector lever , and the electrically controlled digital antenna is controlled with key input in the equipment room. Note that the control line connected with the antenna is vulnerable. In the case it is broken, it has to be directly adjusted with a spanner at the antenna terminal. Each of the unipolarization antennas should be measured. The actual electrically controlled downdip of an antenna conforms to network planning and two unipolarization antennas should have consistent downdips. This is not required if it is not an electrically controlled antenna.
8. All antenna poles should be firmly installed and well grounded. All antenna poles are required to be vertical to the ground and the vertical error should be less than 20. In particular, all antennas must be vertical to the ground. Check with a line hammer to keep the vertical error less than 20.
9. The receive/transmit horizontal interval of an omni antenna should be no less than 3.5 m.
10. An omni antenna should be at least 1.5 m away from the tower while a directional antenna should be at least 1 m away from the tower.
11. The jacket top of an omni antenna should be level to a support or slightly higher than the support top.
12. When an omni antenna is installed on a roof, the horizontal interval between the omni antenna and antenna lightning arrester should be no less than 2.5 m.
13. An omni antenna installed on a roof should avoid blind area.
14. Check the matching relationship of the main diversity antennas within the sectors and the set top jumpers on the rack.

15. The diversity distance between two antennas within one sector refers to the vertical distance between the parallel lines of the two antennas front surfaces. It is not the distance between two antennas. Diversity distance is irrelevant to bipolarization antenna. The diversity distance should be 3.5 m for the 800M system, 1.5 m for the 1.9G system, and 6.7 m for the 450M system.
16. The vertical interval between directional antennas within different sectors installed on the same antenna support should be more than 0.6 m.
17. When isolated from an antenna in G network, the vertical separation should be more than 1 m, and the horizontal separation more than should be more than 2 m.
18. GPS antenna should be vertical, secure, in a position as low as possible, and without barrier. The GPS spatial angle should be more than 900.
19. When there is no tower, the GPS antenna should be installed on the building top and equipped with an independent lightning arrester.

Fig. 13.15-1 shows the installation of the transmission antenna.

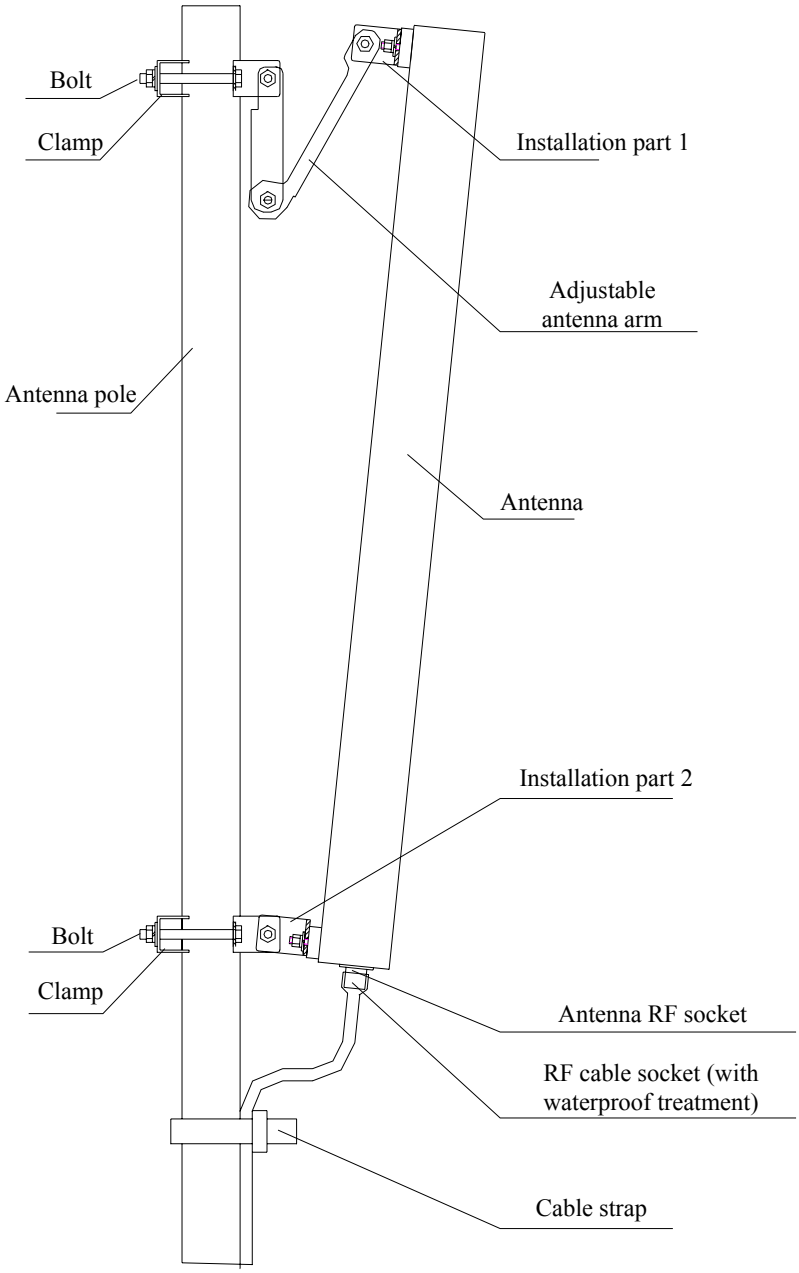


Fig. 13.15-1 Antenna Installation Checking the Feeder SWR

13.16 Checking Feeders of SWR

Requirements:

1. Measure the SWR after antennas and all feeders are installed.
2. The terminal of the indoor 1/2" jumper to the rack is connected with an SWR tester for testing. The SWR should be less than 1.5, preferably 1.3.

3. Fill in a corresponding vswr value and provide vswr test-chart.

13.17 Checking Indoor & Outdoor Environments

Requirements:

1. Clean outdoor engineering waste. After the installation is over, the outdoor work site should be recovered to what it was, without any cable strap, stub, waste paper box, waste cable or waste plastic bag. The whole site should be clean and tidy.
2. Put away indoor unused materials. The materials to be put in the equipment room should be kept in order. Keep everything indoor clean and tidy. No littering is allowed.
3. Remove any cable strap, stub, desiccant and other engineering materials under the raised floors at the rack bottom and around the rack.
4. Clean the front door, rear door and side plate of the rack, leaving no visible stains caused by hand touching. There should be no dirt inside and outside the rack (dead angle) and inside the cabinet, there should be no cable clip or sundries left.
5. Clean the fingerprint or other stains on the cabinet surface.

13.18 Base Station Information Table

Record the model and the sequence number of all parts installed for the required base station information table.

14 Power-on/Power-off

Summary:

- Power-on/Power-off of the PWS (AC/DC) of the BTSB
- Power-on/Power-off the BDS shelf
- Power-on/Power-off the RFS shelf

14.1 Checking before Power-on

Check the following power switches:

1 The upper level switch of the AC power

2. The input AC power switch of the system

3. The DC power switch of the BDS shelf

4. The DC power switch of the RFS shelf

5. The battery loop switch that is in the rupturing state

14.1.1 Checking the External Connections of the Rack

1. Check the AC power connection: Examine carefully whether the power cable connected to the AC power cable terminal of the PWS shelf at the cabinet top is correctly connected. (Note: This power supply can be AC 220V 3-wire input with voltage ranging 150V ~ 285V, or AC tri-phrase five-wire input with voltage ranging 150V ~ 285V and line voltage 270V ~ 490V.) Do not reversely connect the live wire and the null wire and be sure to fasten the screws.

2. Check the DC power connection: Examine carefully whether the terminal block is correctly connected to the DC battery of the PWS shelf. Be sure that the polarity is not reversely connected, the voltage is in the range of -40V ~ -57V, and the screws are fastened.

3. Make sure that E1 cables are correctly connected without insecure connections.

4. Check the antenna feeder system. Check with an SWR tester to see whether the SWR of the antenna feeder is less than 1.5 (generally less than 1.3). Feeder connectors should be well assembled and no feeder or antenna is faulty.
5. Check whether the grounding cable is reliable.
6. Check whether the cable labels are pasted securely, correctly and beautifully.

14.1.2 Checking the Internal of the Rack

1. Open the front door of the upper rack, check the switches on the upper door of the PWS shelf and the lightning arrester to see if they are reliable. There shall be no stubs, wires or anything else in the slots for the rectifier module in the lower shelf.
2. Open the front door to the BDS shelf of the rack in the middle. There shall be no stubs, wires or anything else.
3. Open the front door to the RFS shelf of the lower rack. Connectors shall be provided at the back of the corresponding slot of the RF module.
4. Check the connections at the rear part of the rack to see whether the BDS and RFS cables are correctly and firmly connected, and whether connectors are connected correctly and firmly according to the cable labels.
5. Check whether the RF cables at the rear part of the rack are correctly and firmly connected, and whether connectors are connected correctly and firmly according to the cable labels.
6. Open the back door of the rack and check whether the labels and the connections are correct, whether the connections become insecure because of moving, particularly the RF cables, and the connection between the power busbar of the rack and the power connector on the board.
7. Check the DIP switches on the backplane for incorrect setting. Check whether the DIP switches on the backplane of the rear part of the rack are in the right position when necessary.

14.2 Procedure of Power-on

14.2.1 Initial Power-on

1. Open the front door of the upper rack, check whether the rectifier module of the PWS shelf is pluggable. When the rectifier module is unplugged, it shall be partially seated in the shelf. When the PMM is inserted into the slot, it shall be partially seated in the shelf.
2. Open the front door to the BDS shelf of the rack in the middle, insert a board, and then abort the insertion to make it partially seated in the shelf. Insert the fan shelf, and then abort the insertion to make it partially seated in the shelf.
3. Open the front door to the RFS shelf of the lower rack, unplug all boards to make them all partially seated in the shelf. Insert the RF module, connect all cables, and make sure the switch is off.
4. AC power-on: Switch on the upper level AC power, and connect the corresponding AC voltage for the terminal. Switch on the AC input. It is over when the D-level lightning-proof indicators on the right corner of the front panel are all on.
5. DC power-on: Insert a rectifier module and start it. The indicators shall present no alarms with the current zero, and the output DC voltage 48V ~ 54V. Insert the rectifier module in turn with the others unplugged, the indicators shall be normal. Keep one rectifier module plugged, and insert the PMM to complete the PWS shelf check.
6. Switch on the BDS shelf, insert and start the fan, and insert a board to complete power-on. If the fan is not started, check for any error on the DC 48V or an ill plugging of the fan.
7. Switch on the RFS shelf, insert and start the fan, and insert a board to complete power-on. If the fan is not started, check for any error on the DC 48V or the fan.
8. Switch on the loop of the battery to see if it is normal. Disconnect the switch after the power-on is complete.
9. Insert into the rectifier modules, BDS boards, RFS boards and modules in turn to see if they are normal.
10. Switch on the loop of the battery to complete the power-on.

If any exception occurs, switch off the power for a check.

14.2.2 Normal Power-on

1. AC power-on: Switch on the upper level AC power, connect the corresponding AC voltage for the terminals, switch off the AC power input, and complete when the D-level lightning-proof indicators on the right corner of the front panel are all on.
2. DC power-on: Insert and start one rectifier module. The indicators shall present no alarms with the current zero, and the output DC voltage 48V ~ 54V. Insert the rectifier module in turn with the others unplugged, the indicators shall be normal. Keep one rectifier module plugged, and insert the PMM to complete the PWS shelf check.
3. Switch on the BDS shelf, insert and start the fan, and then insert a board to complete a normal power-on. If the fan cannot be started, check for errors on the DC 48V or an ill insertion of the fan.
4. Switch on the RFS shelf, insert and start the fan, and then insert a board to complete a normal power-on. If the fan can not be started, check for errors on the DC 48V or an ill insertion of the fan.
5. Switch on the loop of the battery to complete the battery power-on. If it is normal, the power-on is completed.

14.3 Procedure of Power-off

1. Power off the LPA module.
2. Power off the BDS shelves.
3. Power off the RFS shelf.
4. Power off the battery loop.
5. Cut the AC power input.
6. Cut the AC power for the external of the rack.

14.4 Hot Swap

The LPA and PIM in the BTSB rack have their own power switches and shall be plugged/unplugged only when their power switches are turned off.

The other boards in the BTSB rack, such as PRM, PMM, CHM, CCM, DSM, SNM, RIM, GCM, SAM, BTM, RMM, TSM, RSM, TRX and RFE, are all hot-swappable.

Appendix A Technical performance indices of the BTSB

A.1 Mechanical indices

Dimensions and weight:

Single cabinet (baseband cabinet + RF cabinet): 700 mm (W) × 800 mm (D) × 1600 mm (H)

RFS cabinet: 700 mm (W) × 800 mm (D) × 1200 mm (H)

BDS cabinet: 700 mm (W) × 600 mm (D) × 400 mm (H)

Optional PWS rack: 700 mm (W) × 600 mm (D) × 400 mm (H)

BTS cabinet color: Black

Table A.1-1 indicates the weight of the integrated machine and the bearing capability of the equipment room floor:

Table A.1-1 Weight of the Integrated Machine

Configuration	Weight
4-carrier 1-sector	About 150 kg
4-carrier 3-sector	About 180 kg
4-carrier 6-sector/8-carrier 3-sector	About 240 kg

A.2 Power indices

Power supply and power consumption: The power consumption of ZTC10-BTS refers to the overall power consumption when the operating voltage is 48V and the output power of each power amplifier is 20W, as shown in Table A.2-1.

Table A.2-1 BTS Power Consumption Indices in Normal Operation

Configuration	Power Amplifier Output	Working Voltage	Maximum Power Consumption of 1X (W)	Maximum power consumption of DO (W)
1-carrier 1-sector	40 W/carrier	-48V	About 1400 W	About 1400 W
2-carrier 1-sector	40 W/carrier	-48V	About 1400 W	About 1400 W
3-carrier 1-sector	40 W/carrier	-48V	About 1400 W	About 1400 W
5-carrier 1-sector	40 W/carrier	-48V	About 2000 W	About 2000 W
7-carrier 1-sector	40 W/carrier	-48V	About 2000 W	About 2100 W
1-carrier 3-sector	40 W/carrier	-48V	About 2500 W	About 2600 W
2-carrier 3-sector	40 W/carrier	-48V	About 2600 W	About 2600 W
3-carrier 3-sector	40 W/carrier	-48V	About 2600 W	About 2700 W
4-carrier 3-sector	40 W/carrier	-48V	About 2600 W	About 2700 W
5-carrier 3-sector	40 W/carrier	-48V	About 4400 W	About 4500 W
7-carrier 3-sector	40 W/carrier	-48V	About 4500 W	About 4600 W
8-carrier 3-sector	40 W/carrier	-48V	About 4500 W	About 4700 W
1-carrier 6-sector	40 W/carrier	-48V	About 4300 W	About 4400 W
2-carrier 6-sector	40 W/carrier	-48V	About 4400 W	About 4500 W
3-carrier 6-sector	40 W/carrier	-48V	About 4500 W	About 4600 W
4-carrier 6-sector	40 W/carrier	-48V	About 4500 W	About 4700 W

Appendix B Using SiteMaster

Different models of SiteMaster are used differently. For usage information, please refer to the documents came with the device.

B.1 Selecting a frequency range

1. Press <ON> of SiteMaster to turn on the meter.
2. Press <FREQ> on the main menu.
3. Press <F1> on the [Frequency] menu.
4. Input the frequency for [Lower], such as “825MHz”, and then press <ENTER> for confirmation.
5. Press <F2> on the [Frequency] menu.
6. Input the frequency for [Higher], such as “880MHz”, and then press <ENTER> for confirmation.
7. When confirmed, press <MAIN> to return to the main menu.

B.2 Checking SiteMaster

SiteMaster shall be checked in the case of frequency, environment and feeder parameters changes. Follow these steps to check:

1. Make sure that a correct frequency range is input in SiteMaster, then begin the check.
2. Press <STARTCAL> to begin the check.
3. Press <Measuring OPEN>, <MeasuringSHORT>, and <Measuring Load> one by one as prompted to complete the check.
4. Include the extension cable came with the meter to the check for measurement accuracy.

B.3 Inputting feeder parameters

1. Press <DIST>.
2. Press <MORE>.
3. Press <LOSS> to enter the feeder loss per meter (dB), which varies with providers and models. Then press <ENTER> for confirmation.
4. Press <PROP V> to enter the relative transmission rate, which varies with providers and models. Then press <ENTER> for confirmation.
5. Press <MAIN> to return to the main menu.

B.4 Installing the tester

Connect one end of the self-contained extension cable to the RFE jumper connector inside the rack and the other terminal to the Refl interface of the meter.

If there is an active device like a tower top amplifier or a trunk amplifier in the feeder measuring, jumpers shall be used to dodge it.

B.5 Measuring SWR

1. Press<OPT>.
2. Press <B1> to choose [MODE].
3. Press <Up> or <Down> to select [SWR] and press <ENTER> for confirmation.
4. Press<MAIN> to return to the main menu.
5. Input a proper frequency range if necessary.
6. Check the meter if necessary.
7. Press<MAIN> to return to the main menu.
8. Press<RUN> to begin the measure.
9. Press <AUTOSCALE> to adjust the Y-coordinate.
10. View the SWR values of the frequency points within this frequency band, as shown in Fig. B.5-1.

11. Press <Save Display> to save the data.

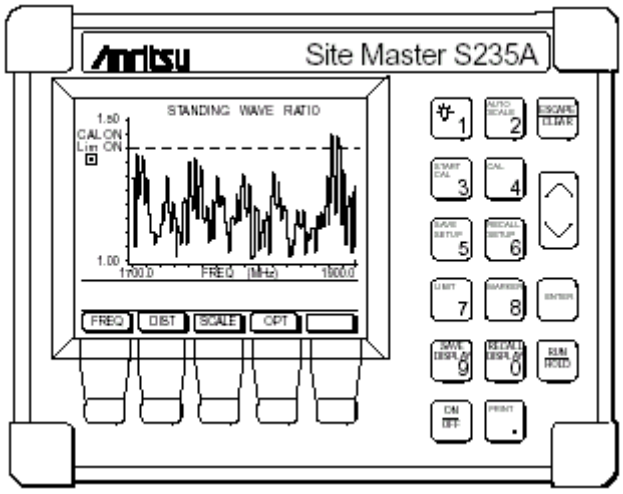


Fig. B.5-1 SWR Test for the Antenna Feeder

B.6 Measuring DTF

1. Press <OPT>.
2. Press <B1> to choose [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 necessary.
6. Check the meter if necessary.
7. Input a proper feeder length if necessary.
8. Press <MAIN> to return to the main menu.
9. Press <RUN> to begin the measure.
10. Press <AUAOSCALE> to adjust the Y-coordinate.
11. Press <Mark> to view the SWR value of each frequency point within this frequency band. Check the fault, as shown in Fig. B.6-1.
12. Press <Save Display> to save the data.

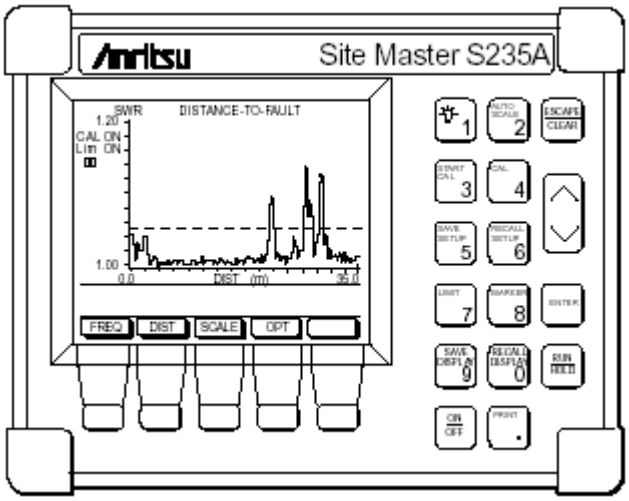


Fig. B.6-1 Antenna Feeder DTF Measurement

Appendix C BTSB board indicators

C.1 RMM indicators

The BTSB has more than ten boards. The first three indicators, RUN, ALM and M/S, on these boards function similarly. This section takes the indicators on the RMM as an example.

- RUN indicates the operating state of the board.
- ALM indicates exception occurred on the board.
- M/S indicates whether the board is the master one.

Fig. C.1-1 shows the indicators of the RMM.

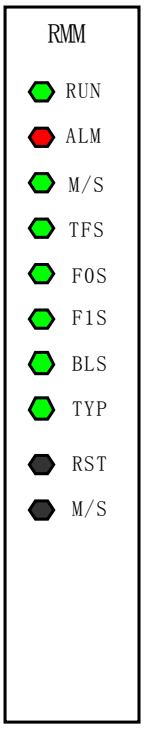


Fig. C.1-1 Indicators on the RMM

C.2 Board indicators

Table C.2-1 shows the states and meanings of the indicators on the BTSB boards.

Table C.2-1 BTSB Board Indicators

CCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
RUN	Green	RUN indicator	Solid on: The version starts to run and attempts to obtain a network address. Solid off: No power or CPU down. Extremely slow flash: (0.2 HZ, 50%): BOOT requests for a version download. Slow flash (1/3 HZ, 50%): Notifying the power-on to the basic processes. Normal flash (5/3 HZ, 50%): Powered on for normal working. Quick flash (50/7 HZ, 50%): Disconnected with the external.	Normal flash (5/3 HZ, 50%)
ALM	Red	Alarm indicator	Solid on: Alarm. Off: Normal.	Solid off
M/S	Green	Master/Slave indicator	Solid on: Master board. Solid off: Slave board.	Solid on/off
HES	Green	Run indicator for signaling stream IP communication platform	Solid on: Normal Solid off: Abnormal or not in position	Solid on
SES	Green	Run indicator for media stream IP communication platform	Solid on: Normal Solid off: Abnormal or not in position	Solid on
DSM Indicators				
Indicator Name	Color	Meaning	Descriptions	Normal State
RUN	Green	Run indicator	Solid off: No power or CPU down. Solid on and quick flash: Loading version (20 HZ). Slow flash: Normal (2 HZ)	Flash
ALM	Red	Alarm indicator	Solid on: Alarm. Off: Normal	Off

CCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
M/S	Green	Master/Slave indicator	Solid on: Master board Off: Slave board	Solid on for master board. Solid off for slave board.
E0S	Green	Group 0 E1 indicator	Running state for the uplink DT0 through DT3 Flash green with flash frequency as 0.125 HZ and period as 8 S: Normal. 1S (On Off Off Off Off Off Off Off Off): DT0 is normal. Not on: DT0 is abnormal. 2S (Off Off Off Off Off Off Off Off Off) interval 3S (On Off On Off Off Off Off Off Off): DT1 is normal. Not on: DT1 is abnormal. 4S (Off Off Off Off Off Off Off Off Off) interval 5S (On Off On Off On Off Off Off Off): DT2 is normal. Not on: DT2 is abnormal. 6S (Off Off Off Off Off Off Off Off Off) interval 7S (On Off On Off On Off On Off Off): DT3 is normal. Not on: DT3 is abnormal. 8S (Off Off Off Off Off Off Off Off Off) interval Solid off: 4 × E1 are abnormal.	Flash

CCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
E1S	Green	Group 1 E1 indicator	Running state of the uplink DT4 through DT7 Flash green with flash frequency as 0.125 HZ and period as 8 S: Normal. 1S (On Off Off Off Off Off Off Off Off Off): DT4 is normal. Not on: DT4 is abnormal. 2S (Off Off Off Off Off Off Off Off Off Off) interval 3S (On Off On Off Off Off Off Off Off Off): DT5 is normal. Not on: DT5 is abnormal. 4S (Off Off Off Off Off Off Off Off Off Off) interval 5S (On Off On Off On Off Off Off Off Off): DT6 is normal. Not on: DT6 is abnormal. 6S (Off Off Off Off Off Off Off Off Off Off) interval 7S (On Off On Off On Off On Off Off Off): DT7 is normal. Not on: DT7 is abnormal. 8S (Off Off Off Off Off Off Off Off Off Off) interval Solid off: 4 × E1 are abnormal.	Flash

CCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
E2S	Green	Group 2 E1 indicator	Running state for the downlink DT0 through DT3 Flash green with flash frequency as 0.125 HZ and period as 8 S: Normal. 1S (On Off Off Off Off Off Off Off Off Off): DT0 is abnormal. Not on: DT0 is abnormal. 2S (Off Off Off Off Off Off Off Off Off Off) interval 3S (On Off On Off Off Off Off Off Off Off): DT1 is abnormal. Not on: DT1 is abnormal. 4S (Off Off Off Off Off Off Off Off Off Off) interval 5S (On Off On Off On Off Off Off Off Off): DT2 is abnormal. Not on: DT2 is abnormal. 6S (Off Off Off Off Off Off Off Off Off Off) interval 7S (On Off On Off On Off On Off Off Off): DT3 is abnormal. Not on: DT3 is abnormal. 8S (Off Off Off Off Off Off Off Off Off Off) interval Solid off: 4 × E1 are abnormal.	Flash

CCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
E3S	Green	Group 3 E1 indicator	Running state of the downlink DT4 through DT7 Flash green with flash frequency as 0.125 HZ and period as 8 S: Normal. 1S (On Off Off Off Off Off Off Off Off): DT4 is normal. Not on: DT4 is abnormal. 2S (Off Off Off Off Off Off Off Off Off) interval 3S (On Off On Off Off Off Off Off Off): DT5 is abnormal. Not on: DT5 is abnormal. 4S (Off Off Off Off Off Off Off Off Off) interval 5S (On Off On Off On Off Off Off Off): DT6 is abnormal. Not on: DT6 is abnormal. 6S (Off Off Off Off Off Off Off Off Off) interval 7S (On Off On Off On Off On Off Off): DT7 is abnormal. Not on: DT7 is abnormal. 8S (Off Off Off Off Off Off Off Off Off) interval Solid off: 4 × E1 are abnormal.	Flash
HWS	Green	Run indicator of the HW link	Solid on: Normal Solid off: Abnormal or no HW signal	Solid on when there are HW signals, and solid off when there is not.
CHM1 Indicators				
Indicator Name	Color	Meaning	Description	Normal State

CCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
RUN	Green	RUN indicator	Solid on: The version starts to run and attempts to obtain a network address. Off: No power or CPU down. Extremely slow flash (0.2 HZ, 50%): Boot requests to download the version. Slow flash (1/3 HZ, 50%): Notifying the power-on to the basic processes. Normal flash (5/3 HZ, 50%): Powered on for normal working. Quick flash (50/7 HZ, 50%): Disconnected with the external.	Normal flash (5/3 HZ, 50%)
ALM	Red	Alarm indicator	Solid on: Fault. Solid off: No fault.	Solid off
SCS	Green	System clock state Run indicator of system clock	Solid on: Normal Solid off: Abnormal	Solid on
BLS	Green	Baseband link state Run (forward/reverse) indicator of baseband link	Solid on: Normal Solid off: Abnormal	Solid on
TYPE	Green	CHM type Channel board type indicator (LEDs of different colors indicate different board types [CHM versions]).	Solid on: Normal	Solid on
RIM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
RUN	Green	Power indicator	Quick flash: Normal. Off: Abnormal.	Quick flash
ALM	Red	Alarm indicator	Solid on: Alarm. Off: Normal.	Solid off
M/S	Green	Master/Slave indicator	Solid on: Master board. Off: Slave board.	Solid on/off

CCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
SCS	Green	Slave		
RLS0	Green	PP2S clock indicator	Flash every 2 seconds: Normal. Off: Abnormal.	Flash every 2 seconds
RLS1	Green	OIB6 optical port lock indicator	Solid on: Locked. Off: Unlocked.	Solid on/off
LLS	Green	Slave		
BLS	Green	Slave		
GCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
RUN	Green	Run indicator	2/3 HZ: Powering on. 10/3 Hz: Normal.	3 Hz flash
ALM	Red	Alarm indicator	Off: No alarm. 10/3 HZ flash: Logic × CS50 self-test fails. 2/3 HZ flash: Logic EPF6016 self-test fails when the CCB is in position.	Solid off
M/S	Green	Master/Slave indicator	Solid on: Master. Solid off: Slave.	Solid on/off
ANT	Green	GPS antenna feeder indicator	Solid on: Normal Solid off: The antenna feeder and the satellite are initializing. 2/3 Hz: Antenna feeder circuit broken. 10/3 Hz: The antenna is normal but fail to receive satellite signals. 0.4 HZ: Antenna short-circuit.	Solid on
SCS	Green	System clock indicator	Solid on: Normal. Solid off: Fault.	Solid on
RCS	Green	RF clock indicator	Solid on: Normal. Solid off: Fault.	Solid on
CCS	Green	Circuit clock indicator	Solid on: Board in position and normal. Solid off: Board not in position or abnormal.	Solid on with board. Solid off without board.
TYP	Green	Receiver type indicator	Solid off: GPS single receiver Solid on: GPS/GNS bimodal receiver	1 HZ flash
RMM Indicators				
Indicator Name	Color	Meaning	Description	Normal State

CCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
RUN	Green	Run indicator	Solid off: Normal. Off: Abnormal.	Solid on
ALM	Red	Alarm indicator	Solid on: Alarm. Off: Normal.	Solid off
M/S	Green	Master/Slave indicator	Solid on: Master board. Off: Slave board.	Solid on/off
TFS	Green	PP2S clock indicator	Flash every 2 seconds: Normal. Off: Abnormal.	Flash every 2 seconds
FOS	Green	OIB0 optical port lock indicator	Solid on: Locked. Off: Unlocked.	Solid on/off
F1S	Green	OIB1 optical port lock indicator	Solid on: Locked. Off: Unlocked.	Solid on/off
BLS	Green	Slave		
TYP	Green	Phase-lock Loop (PLL) lock indicator	Solid on: Locked. Off: Unlocked.	Solid on
TRX Indicators				
Indicator Name	Color	Meaning	Description	Normal Status
RUN	Green	Run indicator	Solid on: Powering on. Slow flash: Normal. Quick flash (20 HZ, 50%): Downloading the version.	Slow flash (2 HZ, 50%)
ALM	Red	Alarm indicator	Solid off: Fault. Solid off: No fault	Solid off
ACT	Green	Active state Working state indicator	On: In operation. Solid off: Slave board.	Solid on indicates the board is in operation, and solid off indicates the board is a slave board.
SCS	Green	System clock state Run indicator for the system clock	Solid on: Normal. Solid off: Abnormal.	Solid on

CCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
FSS	Green	Frequency synthesizer state Run indicator for the frequency synthesizer including reference, RF local oscillator and IF local oscillator PLL working state	Solid on: Normal. Solid off: Abnormal or not in position.	Solid on
BLS	Green	Baseband link state Run indicator for baseband link (forward)	Solid on: Normal. Solid off: Abnormal.	Solid on
MDS	Green	Master/Diversity receiver state Run indicator for the master/diversity receivers	Solid on: Normal Solid off: Unbalancing between master/diversity receivers	Solid on
TYPE	Green	TRX type TRX module types (on the panel, LEDs of different colors indicate different types [TRX versions]) .	Not on: Linear predistortion not supported. Solid on: Linear predistortion supported.	Depend on the type
RFE Indicators				
Indicator Name	Color	Meaning	Description	Normal State

CCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
RUN	Green	Run indicator	Solid on: The version starts to run and attempts to obtain a network address. Solid off: No power or CPU down. Extremely slow flash (0.2 HZ, 50%): Boot requests to download the version. Slow flash (1/3 HZ, 50%): Notifying the power-on to the basic processes. Normal flash (5/3 HZ, 50%): Powered on for normal working. Quick flash (50/7 HZ, 50%): Disconnected with the external.	Flash
ALM	Red	Alarm indicator	On: Alarm.	Off
LNA0	Green	Working state indicator for the master receiver LNA0	On: Normal. Off: Abnormal.	On
LNA1	Green	Working state indicator for the diversity receiver LNA1	On: Normal. Off: Abnormal.	On
VW0	Green	State indicator for VSWR detection 0 (< 1.5)	On: Normal. Off: Abnormal (VSWR > 1.5).	On
VW1	Green	State indicator for VSWR detection 1 (< 3.0)	On: Normal. Off: Abnormal (VSWR > 3.0).	On
PLL	Green	Working state indicator for the frequency selective circuit PLL	On: Normal. Off: Abnormal.	On
LPS	Green	Working state indicator for the input low power	On: Normal. Off: Abnormal.	On
TAS	Green	Working state indicator for the tower top amplifier	On: Configured. Off: Not configured.	On

CCM Indicators				
Indicator Name	Color	Meaning	Description	Normal State
LPA Indicators				
Indicator Name	Color	Meaning	Description	Normal State
RUN	Green	Run indicator	Flash (0.3 S on and 0.3 S off): Normal.	Flash
ALM	Red	Alarm indicator	On: Alarm.	Off
ACT	Green	Working state indicator	On: Output. Off: Slave board or output is switched off.	On
OPS	Green	Over-power indicator	On: Normal. Off: Abnormal.	On
OTS	Green	Over-temperature indicator	On: Normal. Off: Abnormal.	On
VWS	Green	SWR detection indicator	On: Normal. Off: Abnormal.	On
L1S	Green	Loop 1 validity check indicator	On: Normal. Off: Abnormal.	On
L2S	Green	Loop 2 validity check indicator	On: Normal. Off: Abnormal.	On
PWS	Green	Power state indicator	On: Normal. Off: Abnormal.	On

Appendix D Abbreviations

Abbreviation	Description
1X EV	1X Evolution
1X EV-DO	1X Evolution Data Only
1X EV-DV	1X Evolution Data & Voice
1xEV-DO	1x evolution Data Optimized
24PB	24V Power Board
2G BTSB	2G BaseStation Transceiver
3G BTSB	3G BaseStation Transceiver
A	
AAA	Authentication Authorization Accounting
AAL	ATM Adaptation Layer
AAL2	ATM Adaptation Layer type 2
AAL5	ATM Adaptation Layer type 5
Abis Interface	Abis Interface—the interface of BSCB--BTSB
ABS	Air BreakSwitch
AC	Asynchronous Capsule
ACB	Amplifier Control Board
ACCH	Associated Control Channel
ACCM	Asynchronous Control Character Map
ACIR	Adjacent Channel Interference Ratio
ACK	Acknowledgement
ACLR	Adjacent Channel Leakage Power Ratio
ACS	Adjacent Channel Selectivity
ADF	Application Dedicated File
ADN	Abbreviated Dialing Numbers
AESA	ATM End System Address
AGC	Automatic Gain Control
AH	Authentication Header
AI	Acquisition Indicator
AICH	Acquisition Indicator Channel
AID	Application IDentifier
AIUR	Air Interface User Rate
AK	Anonymity key
ALC	Automatic Level Control

Abbreviation	Description
ALCAP	Access Link Control Application Protocol
ALW	Always
AM	Acknowledged Mode
AMB	Attenuation Matching Board
AMF	Authentication Management Field
AMP	Address Management Protocol
AMR	Adaptive Multi Rate
AN	Access network
ANID	Access Network Identifiers
AP	Access preamble
APB	ATM Process Board
APD	AC Power Distribution Module
APDU	Application Protocol Data Unit
API	Application Programming Interface
ARM	ARM processor
ARP	Address Resolution Protocol
ARQ	Automatic Repeat Request
AS	Access Stratum
ASC	Access Service Class
A-SGW	Access Signaling Gateway
ASN.1	Abstract Syntax Notation One
AT	Access terminal
ATM	Asynchronous Transfer Mode
ATR	Answer To Reset
ATT	Attenuator
AUC	Authentication Center
AUTN	Authentication token
AWGN	Additive White Gaussian Noise
A Interface	A Interface—the interface of BSCB-MSC
B	
B-BDS	Backplane of Baseband Digital Subsystem
BBDS	Backplane of BDS
BBS	BTSB Baseband Subsystem
BCC	Bear Channel Connect
BCCH	Broadcast Control Channel
BCFE	Broadcast Control Functional Entity
BCH	Broadcast Channel

Abbreviation	Description
BCS	BTSB Communication Subsystem
BCSN	Backplane of Circuit Switch Network
BCTC	Backplane of Control Center
BDM	Baseband Digital Module
BDM1900	1.9G Baseband Digital Module
BDM800	800M Baseband Digital Module
BDS	Baseband Digital System
BER	Bit Error Ratio
BGPS	Backplane of GPS
BGT	Block Guard Time
BIC	Baseline Implementation Capabilities
BID	Binding Identity
BIM	BDS Interface Module
B-ISDN	ISDN Broadband ISDN
BLER	Block Error Rate
BLPA	Backplane of LPA
BMC	Broadcast/Multicast Control
BOC	Bell Operating Company
BPD	BDS Power Distribute
BPSK	Binary Phase Shift Keying
BPSN	Backplane of Packet Switch Network
BPWS	Backplane of PWS
BRFE	Backplane of RFE
BRFS	Backplane of TRX and BDM/RFM
BS	Base Station
BSCB	Base Station Controller
BSM	Base Station Management
BSP	Board Support Package
BSS	Base Station System
BSSAP	Base Station System Application Part
BTM	BTSB Test Module
BTRX	Backplane of TRX
BTSB	Base Transceiver System
BUSN	Backplane of Universal Switching Network
BWT	Block Waiting Time
C	
CA	Certificate Authentication
CAA	Capacity Allocation Acknowledgement

Abbreviation	Description
CAMEL	Customized Application for Mobile network Enhanced Logic
CAP	CAMEL Application Part
C-APDU	Command APDU
CB	Cell Broadcast
CBA IPI	CMM-Based Appraisals for Internal Process Improvement
CBR	Constant Bit Rate
CBS	Cell Broadcast Service
CC	Control Channel
CC/PP	Composite Capability/Preference Profiles
CCB	Configuration Control Board
CCBS	Completion of Calls to BusySuBSCBriber
CCCH	Common Control Channel
CCF	Call Control Function
CCH	Control Channel
CCK	Corporate Control Key
CCM	Communication Control Module
CCP	Compression Control Protocol
CCPCH	Common Control Physical Channel
CCTrCH	Coded Composite Transport Channel
CD	Capacity Deallocation/Collision Detection
CDA	Capacity Deallocation Acknowledgement
CDF	Command Dispatch Functions
CDMA	Code Division Multiple Access
CDR	Call Detail Record
CDSU	Channel/DataService Unit
CE	Channel Element
CEB	Channel Element Board
CES	Channel ElementSubsystem
CFN	Connection Frame Number
CGI	Common Gateway Interface
CHAP	Challenge Handshake Authentication Protocol
CHM	Channel Processing Module
CHM-1X	Channel Processing Module for cdma2000
CHM-95	Channel Processing Module for IS-95
CHUB	Control HUB

Abbreviation	Description
CIB	Circuit-bearer Interface Board
CIC	Circle Identify Code
CLA	Class
CLK	Clock
CLKD	CLOCK Distributor
CLKG	CLOCKGenerator
CLNP	Connectionless network protocol
CLNS	Connectionless network Service
CM	Configuration Management
CMB	Combiner
CMF	Connection Monitor Function
CMIP	Common Management Information Protocol
CMIS	Common Management Information Service
CMM	Capability Maturity Model
CMU	Carnegie-Mellon University
CN	Core Network
CNAP	Calling Name Presentation
CNL	Co-operative Network List
COA	Care-of-Address
COCOMO	Constructive Cost Model
CONS	Connection-oriented network Service
CPCH	Common Packet Channel
CPCS	Common Part Convergence Sublayer
CPICH	Common Pilot Channel
CPM	Calling Processing Module
CPP	Core Processor Part
CPS	Common PartSublayer
CPU	Central Processing Unit
CR	Change Request
CRC	Cyclic Redundancy Check
CRF	Command Resolve Function
CRNC	Controlling Radio Network Controller
C-RNTI	Cell Radio Network Temporary Identity
CS	Circuit Switched
CSCF	Call Server Control Function
CSE	CamelService Environment
CS-GW	Circuit Switched Gateway
CSM	CellSite Modem

Abbreviation	Description
CSM5000	CellSite Modem ASIC 5000
CSU/DSU	Channel Service Unit/ Digital Service Unit
CTCH	Common Traffic Channel
CTDMA	Code Time Division Multiple Access
C-TPDU	Command TPDU
CW	Continuous Wave (unmodulatedSignal)
D	
D_K	DBS Kernel Module
D_M	D_Method
D_S	D_Service
D_V	D_View
DAC	Digital-to-Analog Converter
DAD	Destination Adress
DAM	DECT Authentication Module
DBS	Database Subsystem
DC	Dedicated Control (SAP)
DCA	Dynamic Channel Allocation
DCCH	Dedicated Control Channel
DCH	Dedicated Channel
DDI	Direct Dial In
DECT	Digital Enhanced Cordless Telecommunications
DF	Dedicated File
DHCP	Dynamic Host Configuration Protocol
DHO	Diversity Handover
DIF	Data Intermediate Frequency Module
diff-serv	Differentiated Services
DIU	Digital Interface Module
DL	Downlink (Forward Link)
DLC	Data Link Control
DN	Destination Network
DNS	Directory Name Service
DO	Data Object
DoD	Department of Defense
DOI	Domain of Interpretation
DP	Defect Prevention
DPC	Destination Point Code
DPCCH	Dedicated Physical Control Channel

Abbreviation	Description
DPCH	Dedicated Physical Channel
DPDCH	Dedicated Physical Data Channel
DRAC	Dynamic Resource Allocation Control
DRC	Data Rate Control
DRNC	Drift Radio Network Controller
DRNS	Drift RNS
DRX	Discontinuous Reception
DSA	DigitalSignature Algorithm
DS-CDMA	Direct-Sequence Code Division Multiple Access
DSCH	Downlink Shared Channel
DSM	Data Service Module
DTB	Digital Trunk Board
DTCH	Dedicated Traffic Channel
DTI	Digital Trunk Interface Element
DTMF	Dual Tone Multiple Frequency
DTX	Discontinuous Transmission
DUP	Duplexer
E	
ECTRA	European Committee of Telecommunications Regulatory Affairs
EDC	Error Detection Code byte
EDGE	Enhanced Data rates for GSM Evolution
EF	Elementary File
EFD	Event Forwarding Discriminator
E-GGSN	Enhanced GGSN
EGPRS	Enhanced GPRS
EHB	(Ethernet HUB Board)
E-HLR	Enhanced HLR
EIRP	Equivalent Isotropic Radiated Power
EJB	Enterprise Java Beans
EMC	Electromagnetic Compatibility
EMF	Network Element Mediation Function
EMI	Electromagnetic interference
EMS	Electromagnetic Susceptibility
ESB	Ethernet Switch Board
ESD	electrostatic discharge
ESP	Encapsulating Security Payload
ESU	Extended SuBSCBriber unit

Abbreviation	Description
ETSI	European Telecommunications Standards Institute
etu	elementary time unit
EUT	equipment under test
F	
F/R-CCCH	Forward / Reverse Common Control Channel
F/R-DSCH	Forward/Reverse Dedicated Signal Channel
F/R-DCCH	Forward / Reverse Dedicated Control Channel
F/R-FCH	Forward / Reverse Fundamental Channel
F/R-PICH	Forward / Reverse Pilot Channel
F/R-SCCH	Forward / Reverse Supplemental Code Channel
F/R-SCH	Forward / Reverse Supplemental Channel
FA	Foreign Agent
FAC	Foreign Agent Challenge
FACH	Forward Access Channel
F-APICH	Dedicated Auxiliary Pilot Channel
F-ATDPICH	Auxiliary Transmit Diversity Pilot Channel
FAUSCH	Fast Uplink Signaling Channel
FAX	Facsimile
F-BCCH	Broadcast Control Channel
FBI	Feedback Information
F-CACH	Common Assignment Channel
FCI	File Control Information
FCP	Flow Control Protocol
F-CPCCH	Common Power Control Channel
FCS	Frame Check Sequence
FD	Full duplex
FDD	Frequency Division Duplex
FDMA	Frequency Division Multiple Access
FE	Front End
FEC	Forward Error Correction
FER	Frame Erasure Rate/Frame Error Rate
FFS	For Further Study
Flexible-Rate	Flexible Data Rate
FLPC	Forward Link Power Control
FM	Fault Management
FN	Frame Number
FNUR	Fixed Network User Rate

Abbreviation	Description
FP	Function Point
F-PCH	Paging Channel
F-QPCH	Quick Paging Channel
FS	Frequency Synthesizer
FSB	Frequency Synthesizer Board
F-SYNCH	Sync Channel
FTAM	File Transfer Access Maintenance
FTB	Fiber Transceiver Board
FTC	Forward Traffic Channel
F-TDPICH	Transmit Diversity Pilot Channel
FTP	File Transfer Protocol
G	
GC	General Control (SAP)
GCM	GPS Control Module
GID1	Group Identifier (level 1)
GID2	Group Identifier (level 2)
GLI	GE Line Interface
GMSC	Gateway MSC
GMSK	Gaussian Minimum Shift Keying
GP	Guard Period
GPCM	General Purpose Chip-select Machine
GPRS	General Packet Radio Service
GPS	GPS Timing Module
GPSR	Global Position System Receiver
GPSTM	GPS Timing Module
GRE	Generic Routing Encapsulation
GSM	Globe System for Mobil Communication
GSN	GPRS Support Nodes
GTP	GPRS Tunneling Protocol
H	
HA	Home Agent
HCS	Hierarchical Cell Structure
H-CSCF	Home CSCF
HDLC	High-level data link control
HDR	High Data Rate
HE-VASP	Home Environment Value Added Service Provider
HF	Human Factors
HHO	Hard Handover

Abbreviation	Description
HIRS	High-speed Interconnect Router Subsystem
HLR	Home Location Register
HN	Home Network
HO	Handover
HPA	High Power Amplifier
HPLMN	Home Public Land Mobile Network
HPS	Handover Path Switching
HRPD	High rate packet data
HRR	Handover Resource Reservation
HSCSD	HighSpeed Circuit Switched Data
HSS	Home SuBSCBriber Server
HTTP	Hyper Text Transfer Protocol
HTTPS	Hyper Text Transfer Protocol
HWB	HW-signal process Board
I	
I/O	Input/Output
IANA	Internet Assigned Numbering Authority
I-Block	Information Block
IC	Intergroup Coordination
ICC	Integrated Circuit Card
ICGW	Incoming Call Gateway
ID	Identifier
IDEAL	Initiating-Diagnosing-Establishing-Acting-Leveraging
IE	Information Element
IEC	International Electrotechnical Commission
IETF	Internet Engineering Task Force
IF	Intermediate Frequency
IFS	Information FieldSizes
IFSC	Information FieldSize for the UICC
IFSD	Information FieldSize for the Terminal
IIC	Integrated Circuit Interface Circuit
IKE	Internet Key Exchange
IM	Intermodulation
IMA	Inverse Multiplexing on ATM
IMAB	IMA Board
IMEI	International Mobile Equipment Identity
IMGI	International mobile group identity

Abbreviation	Description
IMSI	International MobileSuBSCBriber Identity
IMT-2000	International Mobile Telecommunications 2000
IMUN	International Mobile User Number
IN	Intelligent Network
INAP	Intelligent Network Application Part
INF	INFormation field
IP	Internet Protocol
IPB	IP Process Board
IPCP	IP Control Protocol
IP-M	IP Multicast
IPSec	IP Security
ISAKMP	InternetSecurity Association and Key Management Protocol
ISCP	Interference Signal Code Power
ISDN	Integrated Services Digital Network
ISM	Integrated Software Management
ISO	International Standardization Organization
ISP	Internet Service Provider
ISUP	ISDN User Part
ITU	International Telecommunications Union
IUI	International USIM Identifier
IWFB	Inter Working Function Board
J	
J2EE	Java 2 Platform Enterprise Edition
JAR file	Java Archive File
JD	Joint Detection
JDMK	Java Dynamic Management Kit
JMS	Java MessageService
JNDI	Java Naming Directory Interface
JP	Joint Predistortion
JPEG	Joint Photographic Experts Group
JTAPI	Java Telephony Application Programming Interface
JTS	Java TransactionService
JVM	Java Virtual Machine
K	
kbps	kilo-bits perSecond
KP	Key Practice
KPA	Key Process Area

Abbreviation	Description
KSLOC	KiloSource Lines Of Code
ksps	kilo-symbols perSecond
L	
L1	Layer 1 (physical layer)
L2	Layer 2 (data link layer)
L3	Layer 3 (network layer)
L3Addr	Layer 3 Address
LAC	Link Access Control
LAI	Location Area Identity
LAN	Local Area Network
LATA	Local Access and Transport Area
LCD	Low Constrained Delay
LCF	Link Control Function
LCP	Link Control Protocol
LCS	LocationServices
LE	Local Exchange
LEN	Length
LFM	Local Fibre Module
LLC	Logical Link Control
LMF	
LMT	Local Management Terminal
LN	Logical Name
LNA	Low Noise Amplifier
LOMC	Local OMC
LOS	Line OfSight
LPA	Linear Power Amplifier
LPF	Low Pass Filter
LRU	Large Replacing Unite
LSA	Localised Service Area
LSB	Least Significant Bit
LTZ	Local Time Zone
LUP	Location Update Protocol
M	
M&C	Monitor and Control
MA	Multiple Access
MAC	Message authentication code (encryption context)
MAF	Application Management Features

Abbreviation	Description
MAHO	Mobile Assisted Handover
MAP	Mobile Application Part
MC	Message Center
MCC	Mobile Country Code
MCE	Module Control Element
Mcps	Mega-chips perSecond
MCU	Media Control Unit
MDIV	Diversity
MDIV800	Micro Diversity
MDN	Mobile Directory Number
MDS	Multimedia DistributionService
MDUP	Duplex
MDUP800	Micro Duplex
ME	Mobile Equipment
MEHO	Mobile evaluated handover
MER	Message Error Rate
MExE	MobileStation (application) Execution Environment
MF	Mediation Function
MGCF	Media Gateway Control Function
MGCP	Media Gateway Control Part
MGPS	Micro GPS
MGT	Mobile Global Title
MGW	Media GateWay
MHEG	Multimedia and Hypermedia Information Coding Expert Group
MHz	Mega Hertz
MIB	Management Information Base
MIF	Management Information Function
MIN	Mobile Identification Number
MIP	Mobil IP
MIPS	Million Instructions PerSecond
MIT	MO Instance Tree
MLNA	Micro Low Noise Amplifier
MLNA800	Micro Low Noise Amplifier
MM	Mobility Management
MMI	Man Machine Interface
MML	Man Machine Language
MNC	Mobile Network Code

Abbreviation	Description
MNIC	Multi-service Network Interface Card
MNP	Mobile Number Portability
MO	Mobile Originated
MOF	MO administration Function
MOHO	Mobile Originated Handover
MONB	MONIOTR BOARD
MOS	Mean OpinionScore
MPA	Micro Power Amplifier
MPA800	Micro Power Amplifier
MPB	Main Process Board
MPC8260	Motorola Power PC 8260
MPC860	
MPD	Micro-BTSB Power Distribution
MPEG	Moving Pictures Experts Group
MPM	MSC Processing Module
MRB	Media Resource Board
MRF	Media Resource Function
MS	MobileStation
MSB	MostSignificant Bit
MSC	MobileSwitching Center
MSE	MExEService Environment
MSG	ManagementSteering Group
MSID	MobileStation Identifier
MSIN	MobileStation Identification Number
MSM	MessageSwitching Module
MSP	MultipleSuBSCBriber Profile
MSU	MainSuBSCBriber unit
MT	Mobile Termination
MTBF	
MTP	Message Transfer Part
MTP3-B	Message Transfer Part level 3
MTRX800	Micro Transmitter & Receiver
MTSI	Master ToSlave Interface
MUI	Mobile User Identifier
N	
NAD	Node Address byte
NAI	Network Access Identifier

Abbreviation	Description
NAS	Non-AccessStratum
NBAP	Node B Application Part
NCK	Network Control Key
NCM	Network Control Module
NDC	National Destination Code
NDUB	Network Determined User Busy
NE	Network Element
NEF	Network Element Function
NEHO	Network evaluated handover
NIM	Network Interface Module
NITZ	Network Identity and Time Zone
NMC	Network Management Center
NMSI	National MobileStation Identifier
NNI	Network-Node Interface
NO	Network Operator
NP	Network Performance
NPA	Numbering Plan Area
NPI	Numbering Plan Identifier
NRT	Non-Real Time
NSAP	Network Service Access Point
NSCK	Network Subset Control Key
NSDU	Network Service data unit
NSS	Network SubSystem
NT	Non Transparent
Nt	Notification (SAP)
NUI	National User / USIM Identifier
NW	Network
O	
O&M	Operations and Maintenance
O_AMP	O_AlarmManagementPart
O_CMP	O_Configuration Management Part
O_PMP	O_Performance Management Part
O_RMP	O_Right Management Part
O_TMP	O_Test Management Part
OCCCH	ODMA Common Control Channel
ODCCH	ODMA Dedicated Control Channel
ODCH	ODMA Dedicated Channel
ODMA	Opportunity Driven Multiple Access

Abbreviation	Description
ODTCH	ODMA Dedicated Traffic Channel
OIB	Opticall Interface Board
OIM	Optical Interface Module
OMC	Operation Maintenance Centre
OMF	Operation Maintenance Function
OMI	Operation Maintenance Interface
OMM	Operation Maintenance Module
OMS	Operation & Maintenance Subsystem
OO	Object-Oriented
OOF	Operation Outputting Function
OPD	Organization Process Definition
OPF	Organization Process Focus
OPRM	Optical Receiver Module
OPTM	Optical Transmitter Module
ORACH	ODMA Random Access Channel
OSA	Open Service Architecture
OSF	Operations Systems Function
OSS	Operating Systems Subsystem
OSS_CLP	OSS_Communicating Link Part
OSS_FMP	OSS_File Management Part
OSS_RSP	OSS_Running Support Part
OSS_SCP	OSS_Status Control Part
OSS_SWD	OSS_Software Download
OVSF	Orthogonal Variable Spreading Factor
OWB	Order Wire Board
P	
PA	Power Amplifier
PAB	Power Amplify Board
PACA	Priority Access and Channel Assignment
PAM	Power Alarm Module
PAP	Password Authentication Protocol
PBP	Paging Block Periodicity
PBX	Private Branch eXchange
PC	Power Control
PCB	Protocol Control Byte
PCCC	Parallel Concatenated Convolutional Code
PCCH	Paging Control Channel

Abbreviation	Description
PCCPCH	Primary Common Control Physical Channel
PCF	Packet Control Function
PCH	Paging Channel
PCK	Personalisation Control Key
PCM	Process Change Management
PCMCIA	Personal Computer Memory Card International Association
PCP	Packet Consolidation Protocol
PCPCH	Physical Common Packet Channel
PCS	Personal Communication System
PCU	Packet Control Unit
PD	Power Divider
PDB	Process Database
PDCP	Packet Data Convergence Protocol
PDF	Detecting of Power Direction Forward
PDH	Plesiochronous Digital Hierarchy
PDN	Public Data Network
PDP	Packet Data Protocol
PDR	Detecting of Power Direction Reverse
PDSCH	Physical DownlinkShared Channel
PDSN	Packet DataServing Node
PDU	Protocol Data Unit
PERT	Program Evaluation and Review Technique
PG	Processing Gain
PHB	Per Hop Behavior
PHS	Personal Handyphone System
PHY	Physical layer
PhyCH	Physical Channel
PI	Page Indicator
PICH	Pilot Channel
PID	Packet Identification
PIM	Power Amplifier Interface Module
PIN	Personal Identify Number
PL	Physical Layer
PLI	POS Line Interface
PLMN	Public Land Mobile Network
PM	Project Manager
PMD	

Abbreviation	Description
PMM	Power Monitor Module
PN	Pseudo Noise
PNP	Private Numbering Plan
POMC	
POTS	Plain Old Telephony Service
PowerQUICC	
PP2S	
PPM	Protocol Process Module
PPP	Point-to-Point Protocol
PPS	Protocol and Parameter Select (response to the ATR)
PR	Peer Reviews
PRACH	Physical Random Access Channel
PRE	Pre-amplifiy Board
PRM	Power Rectifier Module
PRX	Predistortion Receiver Board
PS	Packet Switched
PSB	Power Splitter Board
PSC	Primary Synchronization Code
PSCH	Physical Shared Channel
PSE	PersonalService Environment
PSI	PCF Session ID
PSM	Power Supplier Module
PSN	Packet Switch Network
PSOS	
PSPDN	
PSTN	Public Switched Telephone Network
PTM	Power Transition Module
PTM-G	PTM Group Call
PTM-M	PTM Multicast
PTP	Point to point
PU	Payload Unit
PUSCH	Physical Uplink Shared Channel
PVD	Power VSWR Detect Board
PWRD	POWER Distributor
PWS	Power System
Q	
QA	Quality Assurance

Abbreviation	Description
QAF	Q3 Adaptor Function
QC	Quality Control
QoS	Quality of Service
QPM	Quantitative Process Management
QPSK	Quadri PhaseShift Keying
QXF	Qx Interface Function
R	
R_CLP	Communication Link Part
R_CLP_InSubsystem	
R_CLP_InterSubsystem	
R_CLP_MasterSlave	
R_CLP_TrafficData	
R_FMP	File Management Part
R_FMP_Background	
R_FMP_Foreground	
R_RSP	Running Support Part
R_RSP_AbnormityProcess	
R_RSP_MemoryManagement	
R_RSP_ProcessCommunication	
R_RSP_ProcessDispatch	
R_RSP_StartupConfigration	
R_RSP_SystemObservation	
R_RSP_Timer Management	
R_SCP	System Control Part
R_SCP_Boot	
R_SCP_MainControl	
R_SCP_StatusControlManagement	
R00	Release 2000-01-18
R99	Release 1999
RA	Routing Area
RAB	Reverse Activity Bit
RAC	Reverse Access Channel
R-ACH	Access Channel
RACH	Random Access Channel
RADIUS	Remote Authentication Dial-In User Service
RAI	Routing Area Identity
RAN	Radio Access Network
RANAP	Radio Access Network Application Part

Abbreviation	Description
R-APDU	Response APDU
RB	Radio Bearer
R-Block	Receive-ready Block
RC	Radio Configuration
RDF	Resource Description Format
R-EACH	Enhanced Access Channel
RF	Radio Frequency
RFCM	RF Control Module
RFE	Routing Functional Identity
RFF	RF Filter
RFIM	RF Interface Module
RFM	Remote Fiber Module
RFM1900	1.9G Remote Fiber Module
RFM800	Remote Fiber Module
RFS	RFIM
RFU	Reserved for Future Use
RIM	RF Interface Module
RL	Radio Link
RLC	Radio Link Control
RLCP	Radio Link Control Protocol
RLP	Radio Link Protocol
RM	Requirements Management
RMI	Remote Method Invocation
RMM	RF Management Module
RN	Radio Network
RNC	Radio Network Controller
RNS	Radio Network Subsystem
RNSAP	Radio Network Subsystem Application Part
RNTI	Radio Network Temporary Identity
ROI	Return On Investment
RPB	Router Protocol Process Board
RPC	Reverse Power Control
RPD	RFS Power Distribute
RPT	Repeater
RRC	Radio Resource Control
RRI	Reverse Rate Indication
RRM	Radio Resource Management

Abbreviation	Description
RRP	Mobile IP Registration Reply
RRQ	Mobile IP Registration Request
RSA	Rivest-Shamir-Adleman public key algorithm
RSCP	ReceivedSignal Code Power
R-SGW	Roaming Signalling Gateway
RSM	Reverse Switch Module
RSSI	Received Signal Strength Indicator
RST	Reset
RSVP	Resource Reser Vation Protocol
RT	Real Time
RTC	Reverse Traffic Channel
RTOS	Real Time Operate System
RTP	Real Time Protocol
R-TPDU	Response TPDU
RU	Resource Unit
RUM	Route Update Message
RUP	Route Update Protocol
RX	Receive
Rx	Receiver
RX	Receiver
RXB	Receiver Board
S	
S/N	Signal/Noise
S_BSSAP	BaseStation System Application Part
S_CCHSP	SPS Control Channel Signal Process
S_CEC	SPS Channel Element Controller
S_CEM	Channel Element Modem
S_MTP	Message Transfer Part
S_MTP3	Message Transfer Part3
S_RCM	SPS_Radio Channel Control Mange
S_SCCP	Signalling Connection Control Part
S_SVLP	Selector Vocoder Low-Layer Process
S_TCHL2P	Traffic Channel Layer2 Process
S_TCHL3P	Traffic Channel Layer3 Process
S_TLH	Traffic Link Handler
S_VIM	Vocoder Interface Module
SA	Security Association
SAAL	Signaling ATM Adaptation Layer

Abbreviation	Description
SACCH	Slow Associated Control Channel
SAD	Source ADdress
SAM	Site Alarm Module
SAP	Service Access Point
SAPI	Service Access Point Identifier
SAR	Segmentation and Reassembly
SAT	SIM Application Toolkit
SB	Storage Battery
S-Block	Supervisory Block
SC	Synchronous Capsule
SCC	Serial Communication Controller
SCCB	Software Configuration Control Board
SCCH	Synchronization Control Channel
SCCP	Signaling Connection Control Part
SCCPCH	Secondary Common Control Physical Channel
SCE	Software Capability Evaluation
SCF	Service Control Function
SCH	Synchronization Channel
SCI	SuBSCBriber Controlled Input
SCM	Sub-BDS Control Module
SCP	Session Configuration Protocol
SCS	System Control Subsystem
S-CSCF	Serving CSCF
SCWLL	
SDCCH	Stand-Alone Dedicated Control Channel
SDF	Service Discovery Function
SDH	Synchronous Digital Hierarchy
SDHB	SDH Board
SDL	Specification & Description Language
SDP	Software Development Plan
SDTB	Sonet Digital Trunk Board
SDU	Service Data Unit
SE	Security Environment
SEI	Software Engineering Institute
SEPG	Software Engineering Process Group
SF	Spreading Factor
SFI	Short EF Identifier

Abbreviation	Description
SFN	System Frame Number
SGSN	Serving GPRS Support Node
SHA	Secure Hash Algorithm
SHCCH	Shared Channel Control Channel
SIC	Service Implementation Capabilities
SIE	Sector Interface Element
SIM	GSMSuBSCBriber Identity Module
SINR	Signal to interface plus noise ratio
SIP	Session Initiated Protocol
SIR	Signal-to-Interference Ratio
SLA	Service Level Agreement
SLOC	Source Lines Of Code
SLP	Signaling Link Protocol
SMC	Serial Management Controller
SME	
SMF	Session Management Function
SMP	Session Management Protocol
SMS	Short Message Service
SMS-CB	SMS Cell Broadcast
SN	Serving Network
SNM	Switching Network Module
SNP	Signaling Network protocol
SoLSA	Support of Localised Service Area
SOW	Statement Of Works
SP	Switching Point/Service Provider
SPA	Software Process Assessment
SPB	Signaling Process Board
SPCK	Service Provider Control Key
SPE	Software Product Engineering
SPI	Software Process Improvement
SPLL	System Phase Lock Loop
SPM	Service Process Module
SPP	Software Project Planning
SPS	Signal Process Subsystem
SPTO	Software Project Tracking and Oversight
SQA	Software Quality Assurance
SQM	Software Quality Management
SQN	Sequence number

Abbreviation	Description
SR1	Spreading Rate 1
SRNC	Serving Radio Network Controller
SRNS	Serving RNS
S-RNTI	SRNC Radio Network Temporary Identity
SRS	Software Requirement Specification
SS7	Signaling System No.7
SSC	Secondary Synchronization Code
SSCF	Service Specific Co-ordination Function
SSCF-NNI	Service Specific Coordination Function-Network Node Interface
SSCOP	Service Specific Connection Oriented Protocol
SSCS	Service Specific Convergence Sublayer
SSDT	Site Selection Diversity Transmission
SSF	System Support Function
SSM	Software Subcontract Management
SSSAR	Service Specific Segmentation and Re-assembly Sublayer
STC	Signaling Transport Converter
STTD	Space Time Transmit Diversity
SVBS	Selector & Vocoder Bank Subsystem
SVC	Switched virtual circuit
SVE	Selector & Vocoder Element
SVICM	Selector & Vocoder Interface Control Module
SVM	Selector & Vocoder Module
SVP	Selector & Vocoder Processor
SVPM	Selector & Vocoder & PCF Module
SVPP	Selector & Vocoder & PCF Processor
SW	Status Word
T	
TC	Transmission Convergence
TCH	Traffic Channel
TCM	Technology Change Management
TCP	Transmission Control Protocol
TCP/IP	
TD-CDMA	Time Division-Code Division Multiple Access
TDD	Time Division Duplex
TDMA	Time Division Multiple Access

Abbreviation	Description
TE	Terminal Equipment
TE9	Terminal Equipment 9 (ETSISub-technical committee)
TF	Transport Format
TFC	Transport Format Combination
TFCI	Transport Format Combination Indicator
TFCS	Transport Format CombinationSet
TFI	Transport Format Indicator
TFM	Timing Frequency Mudule
TFS	Timeing &FrequencySubsystem
TLLI	Temporary Link Level Identity
TLS	Transport LayerSecurity
TLV	Tag Length Value
TMB	Traffic Manage Board
TMN	Telecommunication Management Network
TMSI	Temporary MobileSuBSCBriber Identity
TN	Termination Node
TOD	Time of Date
TP	Training Program
TPC	Transmit Power Control
TPDU	Transfer Protocol Data Unit
TPTL	Transmission Power Track Loop
TQM	Total Quality Management
TR	Technical Report
TrCH	Transport Channel
TRX	Transmitter and Receiver
TS	Technical Specification
T-SGW	Transport Signalling Gateway
TSM	Transmit Switch Module
TSNB	TDM Switch Network Board
TSTD	Time Switched Transmit Diversity
TTI	Transmission Timing Interval
TWG	Technical Work Group
TX	Transmit
Tx	Transmitter
TXB	Transmitter Board
U	
UAF	User Applications Function

Abbreviation	Description
UARFCN	UTRA Absolute Radio Frequency Channel Number
UARFN	UTRA Absolute Radio Frequency Number
UART	Universal Asynchronous Receiver Transmitter
UATI	Unicast Access Terminal Identification
UCS2	Universal CharacterSet 2
UDD	Unconstrained Delay Data
UDP	User Datagram Protocol
UDR	User Data Record
UE	User Equipment
UER	User Equipment with ODMA relay operation enabled
UI	User Interface
UICC	Universal Integrated Circuit Card
UIM	Universal Interface Module
UL	Uplink (Reverse Link)
ULB	Universal LED Board
UM	Unacknowledged Mode
UMS	User Mobility Server
UMTS	Universal Mobile Telecommunications System
Um Interface	Um Interface—the interface of MS-BTSB
UNI	User-Network Interface
UP	User Plane
UPM	User Programming Machine
UPT	Universal Personal Telecommunication
URA	User Registration Area
URAN	UMTS Radio Access Network
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
U-RNTI	UTRAN Radio Network Temporary Identity
USC	UE Service Capabilities
USCH	Uplink Shared Channel
USIM	Universal SuBSCBriber Identity Module
USSD	Unstructured Supplementary Service Data
UT	Universal Time
UTD	Detecting Voltage of Temperature
UTRA	Universal Terrestrial Radio Access
UTRAN	Universal Terrestrial Radio Access Network
UUAF	Unit User Applications Function

Abbreviation	Description
UUI	User-to-User Information
UUS	UuStratum
UWSF	Unit Workstation Functions
V	
VA	Voice Activity factor
Variable-Rate	Variable Data Rate
VASP	Value Added Service Provider
VBR	Variable Bit Rate
VBS	Voice Broadcast Service
VC	Virtual Circuit
VCO	Voltage Control Oscillator
VGCS	Voice Group Call Service
VHE	Virtual Home Environment
VLR	Vistor Location Register
VMS	
VoIP	Voice Over IP
VPLMN	Visited Public Land Mobile Network
VPM	VLR Processing Module
VPN	Virtual Private Network
VSWR	Voltage Standing Wave Ratio
VTC	Voice Transcoder Card
W	
WAE	Wireless Application Environment
WAP	Wireless Application Protocol
WBS	Work Breakdown Structure
WCDMA	Wideband Code Division Multiple Access
WCF	Workstation Control Function
WDP	Wireless Datagram Protocol
WIN	Wireless Intelligent Network
WMF	Windows Management Function
WPB	Wireless Protocol Process Board
WSF	Workstation Function
WSP	Wireless Session Protocol
WTA	Wireless Telephony Applications
WTAI	Wireless Telephony Applications Interface
WTLS	Wireless Transport Layer Security
WTP	Wireless Transaction Protocol
WTX	Waiting Time eXtenstion

Abbreviation	Description
WWT	Work Waiting Time
WWW	World Wide Web
X	
XRES	Expected user RESponse
Z	
ZXC10- BSSB	cdma2000 BaseStation System
ZXC10- BSCB	cdma2000 Base Station Controller
ZXC10- BTSB	cdma2000 Base Transceiver Station
ZXC10- MBTS	cdma2000 Micro Base Transceiver Station
ZXC10- BDSB	cdma2000 Baseband Digital System
ZXC10- PWSB	cdma2000 Power System
ZXC10- RFSB	cdma2000 Radio Frequency System
ZXC10- CBTS	cdma2000 Compact Base Transceiver Station
ZXC10- PBTS	cdma2000 Pico Base Transceiver Station
ZXC10- AGWB	cdma2000 Access Gateway
ZXC10- MGWB	cdma2000 Media Gateway
ZXC10-BSS	
ZXC10-BSC	
ZXC10-BTS	
ZXC10-BSS 1X	
ZXC10-BSC 1X	
ZXC10-BTS 1X45	
ZXC10-BTS 1X80	
ZXC10-BTS 1X19	
ZXC10-BTS 1X21	
ZXCBTS M800	
ZXCBTS M802	
ZXCBTS M803	
ZXCBTS M804	
ZXCBTS M190	
ZXCBTS M191	
ZXCBTS M192	
ZXCBTS R800	
ZXCBTS R802	
ZXCBTS R804	
ZXCBTS R190	
ZXCBTS R191	

Abbreviation	Description
ZXCBTS R192	
ZXICS C800	
ZXPOS CNA1	
ZXPOS CNT1	
ZXRPT C800	
ZXRPT C801	
ZXRPT C810	
ZXRPT C190	
ZXRPT C191	