ZXCBTS (V5.4)

CDMA Micro Base Transceiver Station & RF Remote Station

Installation Manual

ZTE CORPORATION

ZXCBTS (V5.4) CDMA Micro Base Transceiver Station/RF Remote Station
Installation Manual

Manual Version 20050422-R1.1
Product Version V5.4

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ZTE CORPORATION

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Suggestions and Feedback

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Preface

About This Manual

This manual presents the hardware installation procedures of ZXCBTS micro base transceiver stations (BTSs)/remote stations.

It is one of ZTE manual series for CDMA cellular mobile communications system. It aims to providing guidance to the engineering personnel who install ZTE CDMA micro-BTS/remote stations, as well as offering reference for the equipment maintenance personnel.

Correct hardware installation is the basis for reliable and normal running of the base transceiver stations, thus enjoying importance in engineering construction. To facilitate the installation, this manual is written following the sequence of actual hardware installation. First, it briefs the structure of the ZXCBTS products, which is helpful for the installation personnel to get familiar with the equipment. Next, it describes the equipment installation procedures in detail. Finally, it presents how to check the equipment after the installation.

How to Use This Manual

1. Overview

   Introduces the basic structure, basic installation procedures and points for attention during installation of the micro-BTS/remote stations.

2. Preparations

   Introduces the preparations for the installation, including listing needed tools and checking the installation environment.

3. Open-box Inspection

   Introduces the procedures and cautions for opening boxes and inspecting the equipment.

4. Installation of Cabinet

   Details the fixation and installation of the cabinet of the equipment.

5. Installation of Power Supply System

Details the installation of the power supply system of the equipment.

6. Installation of Grounding System

   Details the installation of the grounding system of the equipment.

7. Connection of Cables

   Details the check of internal cable connections between various modules, as well as type selection and connection of external cables.

8. Installation of Primary Antenna Feeder System

   Details the installation of the antenna feeder system of the equipment, including the procedures of assembling feeder cable connectors, installing antenna, laying feeder cables, installing feeder cable window and grounding equipment.

9. Installation of GPS antenna feeder system

   Details the installation of GPS antenna feeder system for the equipment, including the procedures of assembling feeder cable connectors and installing antenna.

10. Installation of Internal Modules

    Details the installation of internal modules.

11. Hardware Installation Check

    Presents how to check the hardware installation.

12. Power-on and Power-off

    Presents the procedures of powering on/off the equipment.

13. Appendix

    Presents the equipment performance specifications, meaning of various indicators and connection of cables.

Conventions

1. Notational Convention

   Angular brackets “< >” identify names of keys and buttons, and the information typed by an operator from a terminal. Square brackets “[ ]” indicate a man-machine interface, menu item, data list or field name. The symbol “→”

separates a multi-level menu, for example, [File→New→Folder] indicates the [Folder] menu item under the [New] submenu of the menu [File].

2. Keyboard Operation Convention

Format	Description
<Key>	Indicate a key or button name, for example, <Enter>, <Tab>, <Backspace>, and <a>.
<Key1+Key2>	Press Key 1 and Key 2 at the same time.
<key1, Key2>	Press Key1 first. Then release Key 1 and press Key 2.

3. Mouse Operation Convention

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. Danger, Warning, Caution and Note Statements

 Note,  Caution,  Warning,  Danger statements are used throughout this manual to emphasize important and critical information. You must read these statements to help ensure safety and to prevent product damage.

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 CDMA Micro Base Transceiver Station & RF Remote Station, 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 2M (6.56 feet.) for 800MHz unit and 1.5M (4.92 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 2M (6.56 feet) for 800MHz unit and 1.5M (4.92 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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A List of Tables

1 Overview

🕮 Summary

- Listing the components to be installed.
- Describing the installation flow.
- Presenting points for attention during the installation

1.1 Introduction to Micro-BTS

With the development of various new technologies, Base Transceiver Station (BTS) is oriented to be small and intelligent, with low power consumption, low cost and high reliability. In large or medium-sized cities, common micro-BTS cannot meet the demand of some busy-traffic areas due to the block of high buildings. In addition, it is a waste for micro-BTS to be installed in some remote areas with less traffic. Moreover, micro-BTS have high requirements on the equipment room environment. To avoid the above problems, ZTE has developed ZXCBTS products.

ZXCBTS products are classified based on different frequency bands and transmitter powers. This manual serves for the installation of the following models:

Table 1.1-1 List of ZXCBTS Micro-BTS/Remote Stations (800MHz)

Model	Name	Rated Transmission Power
ZXCBTS M800T	CDMA micro-BTS (800MHz)	10W
ZXCBTS M802T	CDMA micro-BTS (800MHz)	20W
ZXCBTS R800T	CDMA remote station (800MHz)	10W
ZXCBTS R802T	CDMA remote station (800MHz)	20W

Table 1.1-2 List of ZXCBTS Micro-BTS/Remote Stations (1900MHz)

Model	Name	Rated Transmission Power
ZXCBTS M190T	CDMA micro-BTS (1900MHz)	5W
ZXCBTS M191T	CDMA micro-BTS (1900MHz)	10W

Model	Name	Rated Transmission Power
ZXCBTS M192T	CDMA micro-BTS (1900MHz)	20W
ZXCBTS R190T	CDMA remote station (1900MHz)	5W
ZXCBTS R191T	CDMA remote station (1900MHz)	10W
ZXCBTS R192T	CDMA remote station (1900MHz)	20W

ZXCBTS products include micro-BTS and remote stations, working in the frequency bands of 800MHz and 1.9GHz.

Micro-BTS system consists of Baseband Digital Subsystem (BDS), Timing & Frequency Subsystem (TFS), power supply subsystem, lightning protection subsystem and Radio Frequency Subsystem (RFS). The structure of M800T/M802T//M190T/M191T/M192T micro-BTS is illustrated in the following figure.

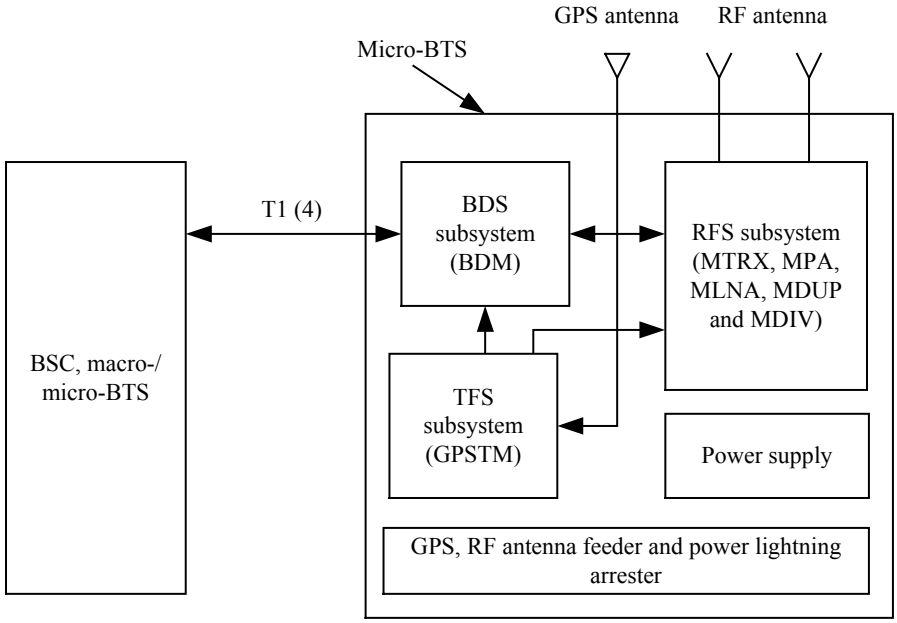


Fig. 1.1-1 Structure of ZXCBTS M800T Micro-BTS

Remote stations are similar to micro-BTS in structure, but different in replacing Baseband Digital Module (BDM) with Remote Fiber Module (RFM) and removing GPS Timing Module (GPSTM), for the clock signals of remote stations are demodulated from the signals sent through optical fiber. The structure of remote stations is illustrated in the following figure.

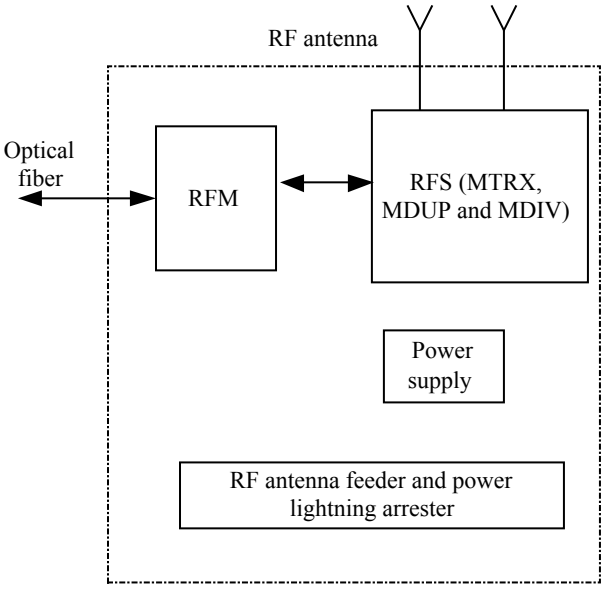


Fig. 1.1-2 Structure of Remote Stations

Remote stations should cooperate with the macro-/micro-BTS to achieve the BTS functions, so you need to configure Local Fiber Module (LFM) on micro-BTS or Optical Interface Module (OIM) on micro-BTS for interworking with the remote stations.

If the LFM is configured in a macro-BTS, the connection between the remote station and the macro-BTS is illustrated in the following figure.

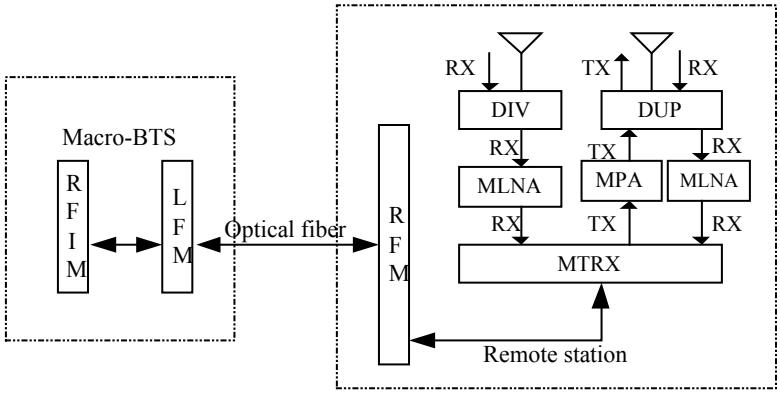


Fig. 1.1-3 Connection between Remote Station and Macro-BTS

If the OIM is configured in a micro-BTS, the connection between the remote station and the micro-BTS is illustrated in the following figure.

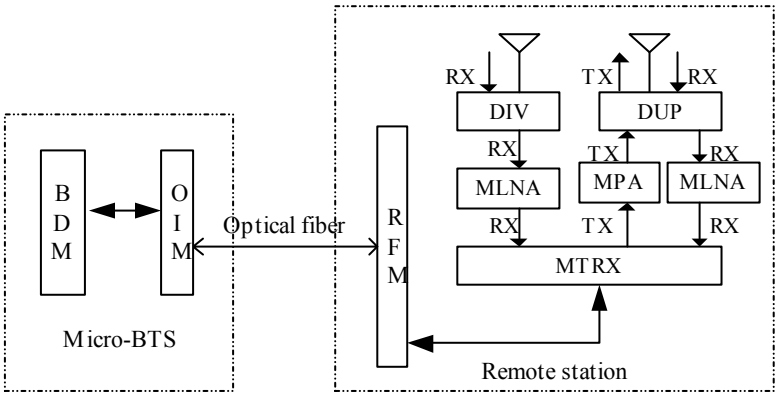


Fig. 1.1-4 Connection between Remote Station and Macro-BTS

1.2 Installation Overview

The hardware installation of micro-BTS/remote stations can be divided into the following aspects:

1. Installing shelf and boards, connecting internal cables and setting DIP switches
2. Installing the power supply system
3. Installing the grounding system
4. Locating and installing the antenna, jumper cable and feeder cable, and testing the antenna feeder system
5. Installing GPS and its feeder cables
6. Connecting trunk cables and assembling their connectors
7. Installing the alarm system for reporting abnormal temperature and humidity

See Fig. 1.2-1.

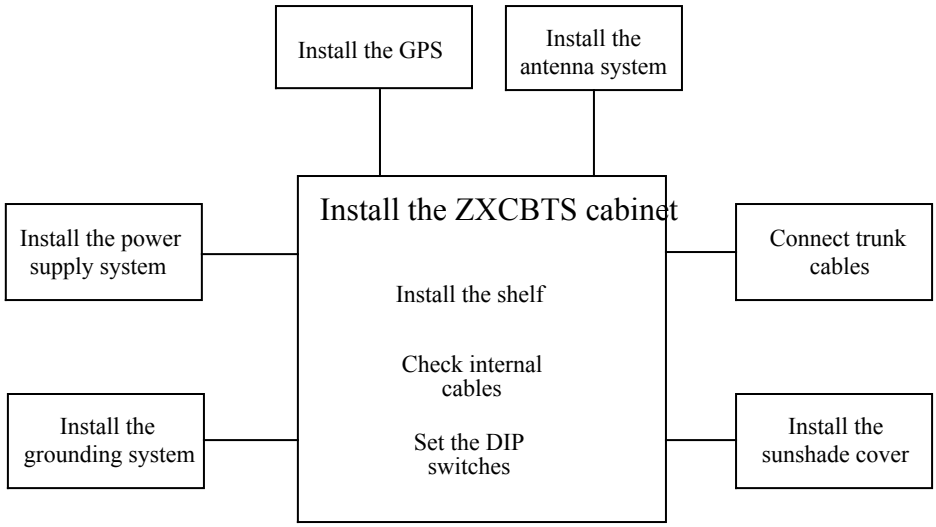


Fig. 1.2-1 Schematic Diagram of the Hardware Installation of Micro-BTS/Remote Station

1.3 Installation Flow

Install the equipment following the specified procedures strictly:

1. Install the support;
2. Locate the cabinet on the support;
3. Secure the cabinet;
4. Install the sunshade cover (necessary for outdoor installation);
5. Connect power cables and grounding cables of the cabinet;
6. Connect T1 cables of the cabinet;
7. Install the primary antenna feeder system to connect with the RF cables;
8. Install the GPS;
9. Install and test the boards and modules, and set the DIP switches;
10. Check the installation.

See Fig. 1.3-1.

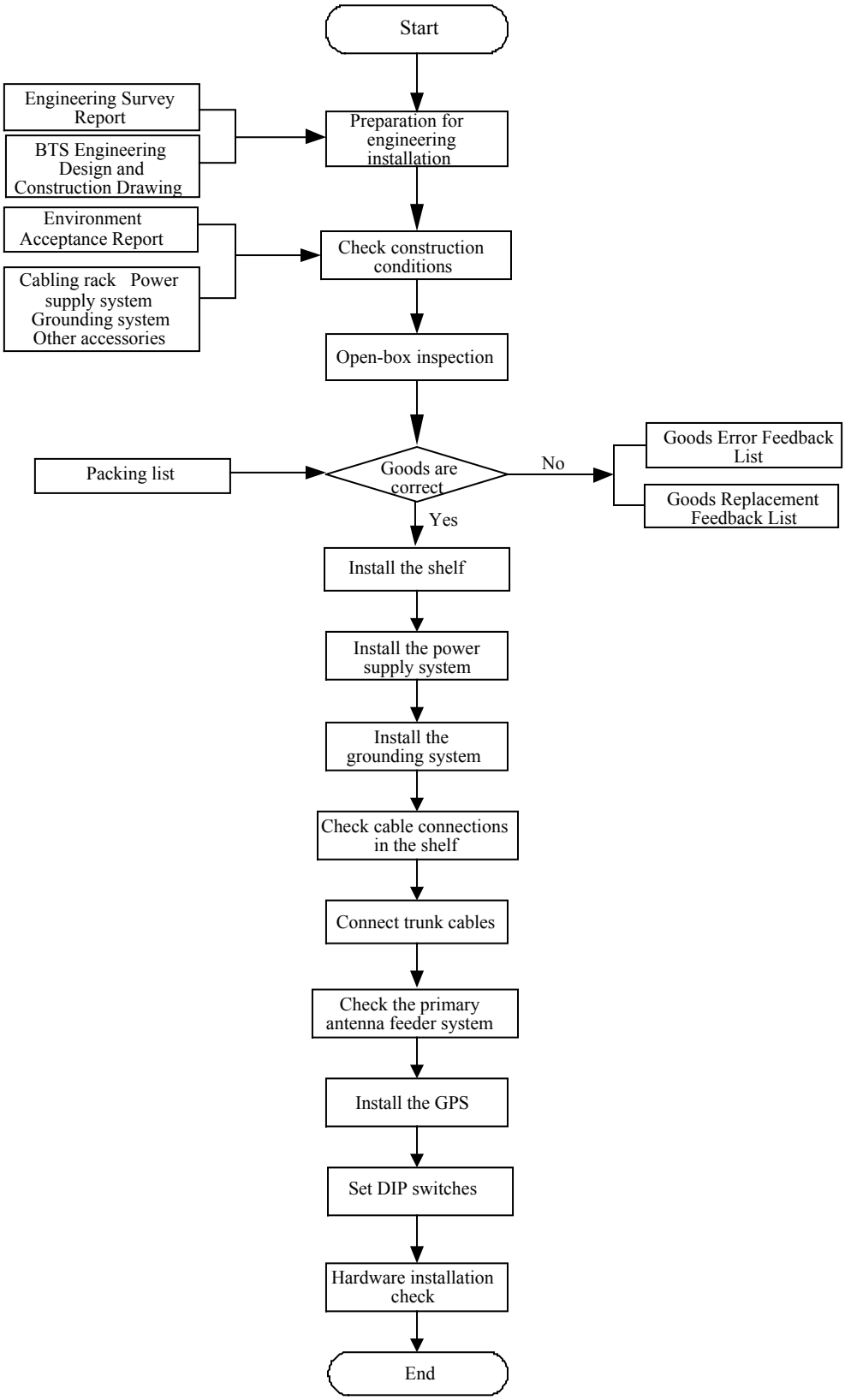


Fig. 1.3-1 Hardware Installation Flow Diagram

1.4 Points for Attention

Pay attention to the following points during the installation: The installation personnel should be trained to obtain the qualification entitled by ZTE and read this manual before the installation.

1. Do not operate on the cabinet or any module when the power is on.
2. Observe the relative requirements strictly when installing the BTS.
3. Do not install the antenna feeder system in thunder weather.
4. Before the thunder storm season of each year comes, check whether the lightning arrester is in good condition and is well contacted. If it is damaged, replace it immediately.
5. When the installation of the cabinet completes, lock the door immediately. If the door need be opened in case of maintenance, contact the professional personnel for help.

2 Preparations

Summary

- Describing the installation environment check.
- Listing the installation tools.
- Listing the technical documents needed for installation.

2.1 Installation Environment Check

The items to check:

2.1.1 Checking Equipment Building Conditions

Check if the layout, height, bearing capability, shock-proof ability, doors and windows, walls and troughs of the equipment building meet the requirements.

2.1.2 Checking Indoor Environment

Check the temperature, humidity, air pressure, ventilation condition, antistatic protection measures, anti-interference measures, dustproof measures, rodent-resistant measures, fire-protection facility, lighting condition, water supply and drainage system of the equipment room.

To the highest priority, the equipment should be installed on the cool and dry walls indoors with good ventilation; the fire-protection facility should be equipped; there should be no caustic gas or smog in the room and no leakage on the roof; the electromagnetic interference strength should be no more than 140dBμV/m (0.01MHz~110000MHz). Or the equipment can be installed on the shady walls outdoors with good ventilation and rain blocks. To the least priority, the equipment can be installed on common walls, towers or high poles. The operating temperature range of the equipment is between -40°C and +55°C, and the relative humidity range is between 5% and 100%.

2.1.3 Checking Power Supply System

Check the power supply ability and quality. A group of independent and stable 85V~138V (nominal 120V) AC power should be supplied to the equipment. It is prohibited to share the power supply with other high-power telecom equipment or the usually powered-down equipment.

2.1.4 Checking Grounding System

The standard grounding system should be equipped and the resistance should be less than 5 ohm.

2.1.5 Checking Relative Devices

Check if the other devices relative to the normal operation of the equipment are in good condition, such as interface device, transmission device, Digital Distribution Frame (DDF) and Optical Distribution Frame (ODF).

2.2 Tools and Instruments

Prepare the tools and instruments needed for the installation in advance as listed in Table 2.2-1.

Table 2.2-1 Tools and Instruments Needed for the Installation

Type	Name
Special tools	One cutter for assembling feeder cable connectors One 75-ohm coaxial cable stripper 75-ohm coaxial crimping plier One multi-functional crimping plier One multimeter One SiteMaster standing wave ratio tester One earth resistance tester
Drilling tools	One percussive drill Several drill bits One cleaner One power connector board (with at least three two-pin and three-pin sockets respectively; the current capacity is more than 15 amp.)
General tools	Three cross screw-drivers (4”, 6” and 8”) Three straight screw-drivers (4”, 6” and 8”) Four adjustable wrenches (6”, 8”, 10” and 12”)

Type	Name
	Two spanners (17” and 19”) One hexagon spanner One socket wrench One 5kg nail hammer One 300W electric iron and one 40W electric iron One coil of solder wires
Measurement tools	One 50m tape measure One 5m steel tape measure One 400mm horizontal ruler One inclinometer One compass One multimeter Ruler One plumb
Protection tools	Antistatic wrist strap Safety helmet, slip-proof gloves
Locksmith tools	One hacksaw, several saw blades One sharp nose plier (8”) One diagonal plier (8”) One slip joint plier (8”) One vice (8”) A set of files (middle) One tweezers One paint brush One scissors One dryer One solder removal tool One hydraulic pressure pliers One crowbar
Assistant tools	Pulley group Rope Ladder Forklift

2.3 Technical Documents

Prepare the following technical documents:

1. *Engineering Survey Report, BTS Engineering Design and Construction Drawing, Environment Acceptance Report*

Engineering Survey Report should be filled by the technical engineers of the equipment provider during site survey. If they can not carry out the survey in time, you should survey the site, fill in the report and then send it to the equipment provider. This report is used for the preparation of construction materials.

BTS Engineering Design and Construction Drawing should be prepared by the design unit you entrusted, and a copy should be provided to the equipment provider before the delivery.

Environment Acceptance Report is used by the technical engineers of the equipment provider to check the construction environment during site survey. If any inconformity is found, you are required to solve the problem. Before the construction, the second check will be implemented.

2. *ZXCBTS(V5.4)CDMA Micro Base Transceiver Stations/RF Remote Stations Installation Manual, ZXCBTS(V5.4)CDMA Micro Base Transceiver Stations/RF Remote Stations Technical Manual, ZXCBTS(V5.4)CDMA Micro Base Transceiver Stations/RF Remote Stations Hardware Manual, ZXCBTS(V5.4)CDMA Micro Base Transceiver Stations/RF Remote Stations Maintenance Manual*

3. Installation Acceptance Report, Test Acceptance Report

   Installation Acceptance Report and *Test Acceptance Report* should be offered to you by the equipment provider during delivery. *Installation Acceptance Report* is filled after the BTS installation completes. *Test Acceptance Report* is filled during the BTS commissioning.

3 Open-box Inspection

🕮 Summary

- Describing the inspection procedures.
- Describing the open-box procedures.

3.1 Checking Packing List and Goods

🔔 Caution
Because ZXCBTS equipment is expensive, ensure that it is packed well and the flags for avoiding water and vibrations are marked. Load and unload the equipment gently, and avoided damage from sunshine and rain.

1. Check the "ZTE delivery sheet".
2. Open-box inspection should be done by the engineering supervisor and your representative. First, check if the total quantity of the goods is correct according to the packing list, if the packing boxes are in good condition, and if the delivery location is the right installation site.
3. Next, open the boxes and the engineering supervisor should check the goods based on the packing list. *Open-box Inspection Report* is put in the packing box numbered 1#. Open the 1# box and take out the *Open-box Inspection Report* to check if the total quantity of the goods is consistent with the checklist, and then archive the report.
4. During the inspection, if loss of goods, lack of goods, error delivery or any damage is found, find out the cause and feedback to the ZTE headquarter for handling.
5. The goods are packed in either cartons or wooden boxes. You need to open them on site using different tools.

3.2 Packaging

> **Note**
> **The cabinets of micro-BTS and remote stations are the same in structure, so is the packaging method.**

Put the support and other accessories of the ZXCBTS cabinet into the wooden box.

In the wooden box, the cabinet is packed with foam boards, a bubble bag and a plastic bag. After opening the box, you need not uplift it but directly take the equipment out. When carrying the box, be cautious to prevent the cabinet from being damaged.

The packing box for the ZXCBTS cabinet is shown in Fig. 3.2-1.

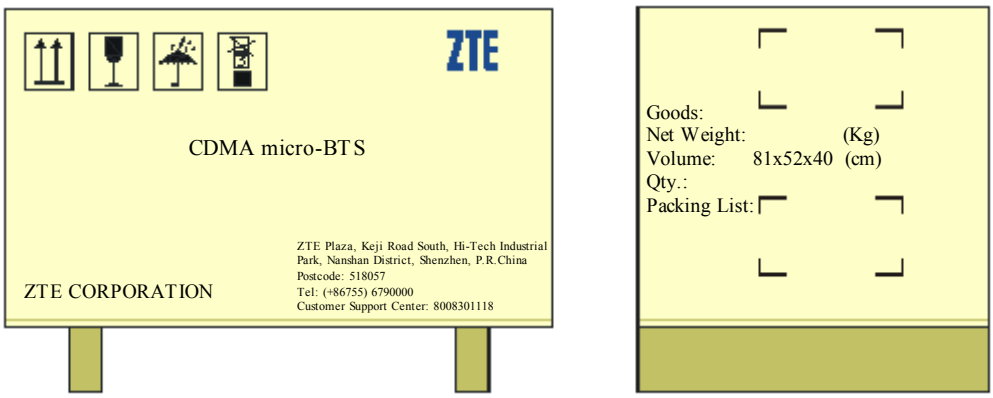


Fig. 3.2-1 Packing Box for ZXCBTS Cabinet

3.3 Open-box Procedures

Follow the steps below to open the box:

1. Open the cover board.
2. Remove the foam boards.
3. Take the micro-BTS out directly.

See Fig. 3.3-1.

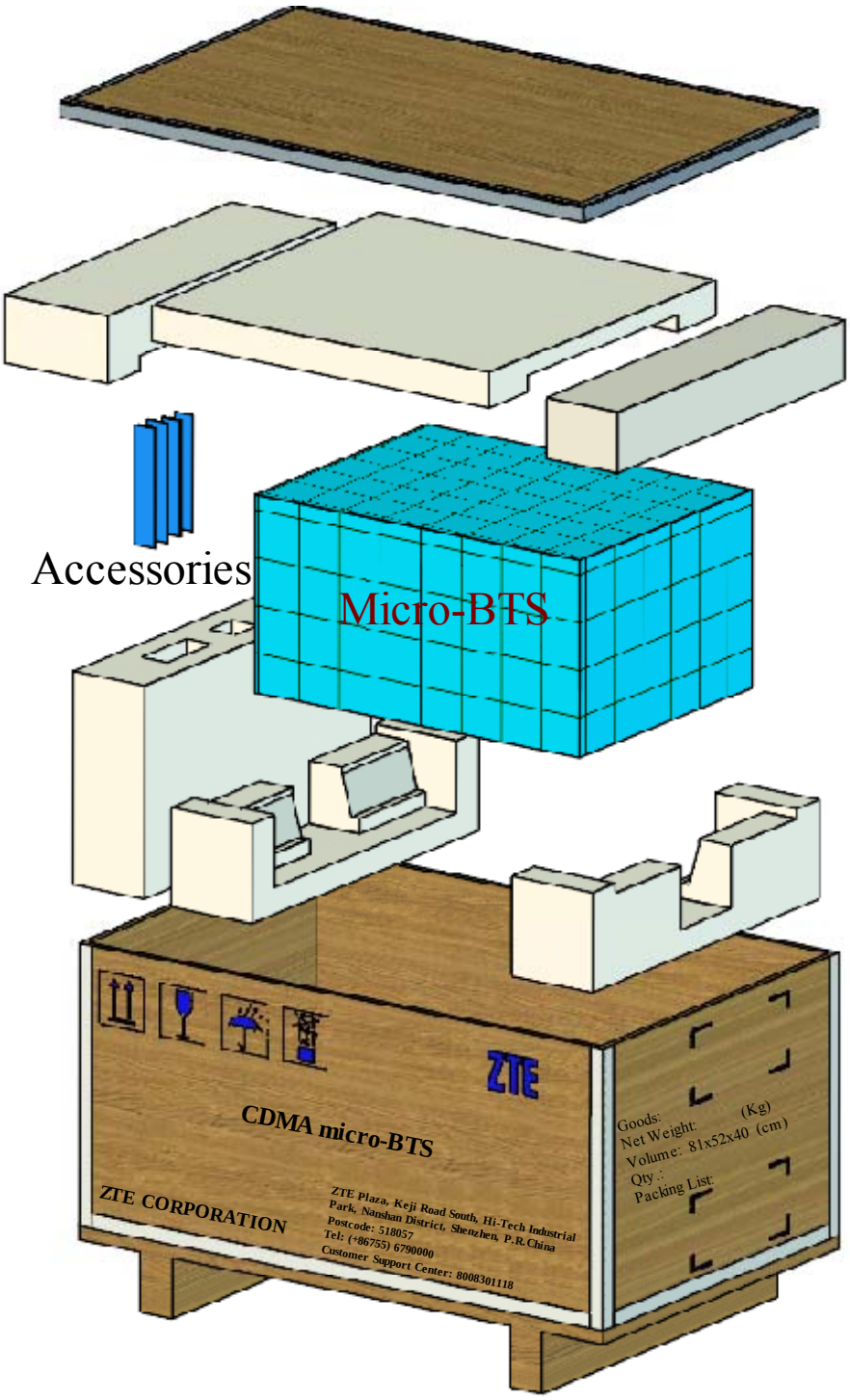


Fig. 3.3-1 Schematic Diagram for Opening a Box

4 Installation of Cabinet

Summary

- Describing the procedures to install the micro-BTS/remote station cabinet
- Describing the possible installation modes

4.1 Installation Flow

Note
The cabinets of ZXCBTS micro-BTS/remote stations are the same in structure, so is the installation method.

The cabinet can be installed in two modes: on pole or on wall. The installation flow is shown in Fig. 4.1-1.

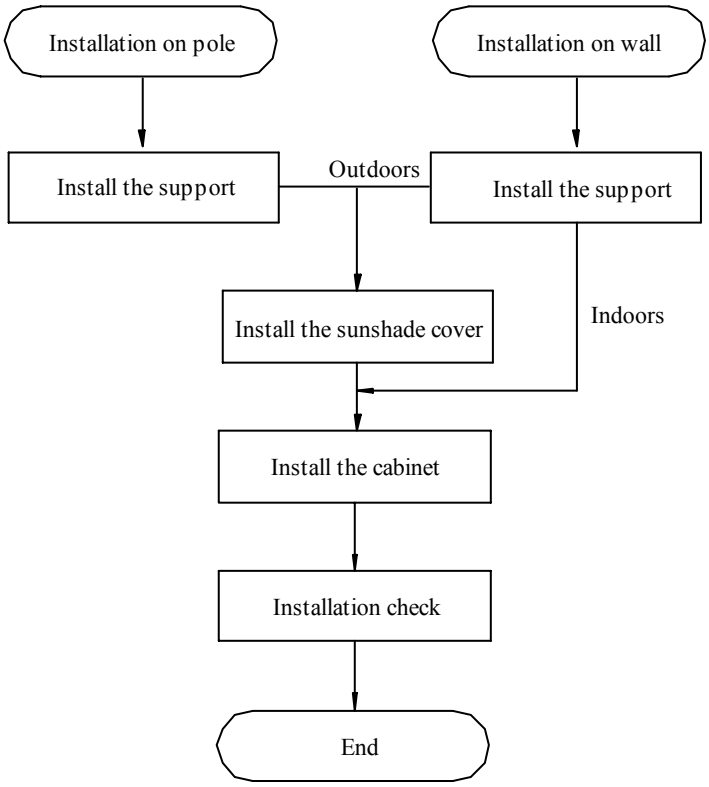


Fig. 4.1-1 Flow of Installing the Cabinet

4.2 Installation Modes

> **Note**
> **The cabinets of ZXCBTS micro-BTS/remote stations are the same in structure, so is the installation method.**

As shown in Fig. 4.1-1, the cabinet can be installed either on pole or on wall based on the actual environment.

4.2.1 Installing Cabinet on Pole

1. Disassemble the support from the cabinet.
2. Secure the support onto the pole with fixing plates and 260mm-long bolts. The diameter of the pole should be between 60mm and 90mm. 75mm is recommended. See Fig. 4.2-1.

   If the equipment is to be installed outdoors, face the front side southward and the back side northward (This rule is applicable to the case that the equipment is

installed in the Northern Hemisphere. If it is installed in the Southern Hemisphere, the opposite rule should be applied).

3. Install the sunshade cover onto the support with four M4 bolts. See Fig. 4.2-4.
4. Hold the cabinet to hang it onto the support, then push it into the shelf. See Fig. 4.2-2.
5. Align the bolt holes on the support with those on the cabinet, and then screw down four M8 hexagon bolts. See Fig. 4.2-3.
6. On the cabinet base there are hangers for rope. If necessary, use the rope to hang the cabinet onto the pole.

See Fig. 4.2-1 for the schematic diagram of cabinet fastened on pole.

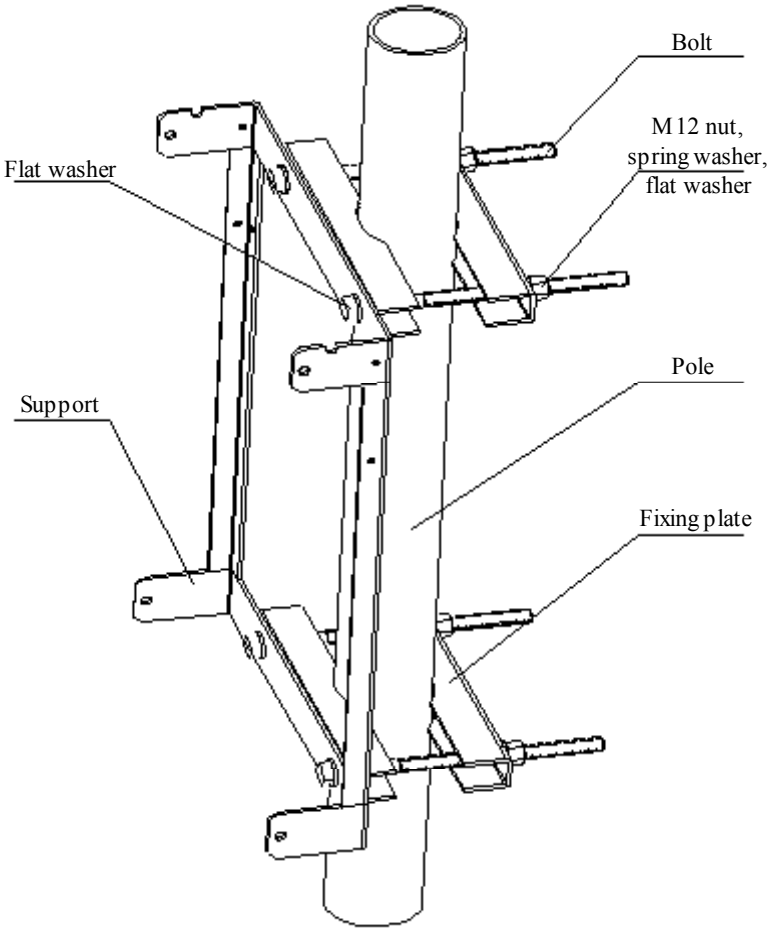


Fig. 4.2-1 Schematic Diagram of Fastening the Cabinet onto the Pole (step 1)

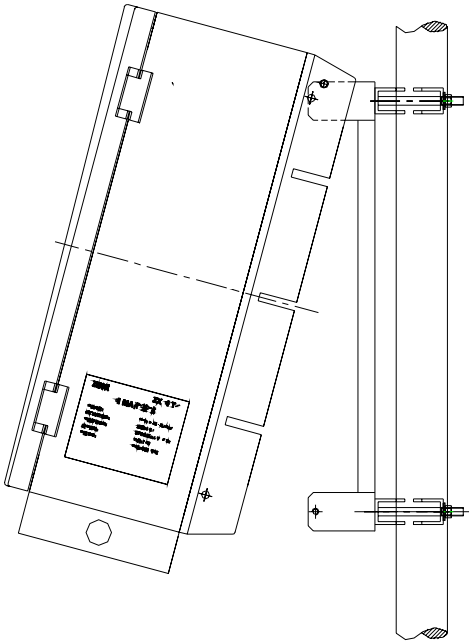


Fig. 4.2-2 Schematic Diagram of Fastening the Cabinet onto the Pole (step 2)

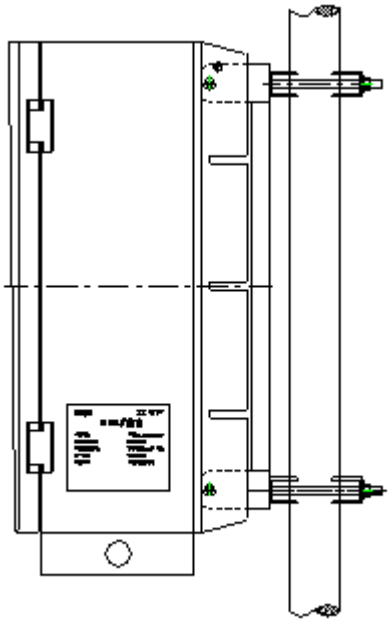


Fig. 4.2-3 Schematic Diagram of Fastening the Cabinet onto the Pole (step 3)

Fig. 4.2-4 Schematic Diagram of the Cabinet Fastened onto the Pole

Caution

For your safety, be sure to wear the safety belt when working at heights and the safety helmet when working at grounds. It is prohibited to work in thunder storm weather.

4.2.2 Installing Cabinet on Wall

1. Disassemble the support from the cabinet.
2. Mark four points on the wall based on the four holes on the support, and then drill four holes with a percussive drill (using M12 drill bit). Secure the support onto the wall with four M10 expansion bolts. See Fig. 4.2-5.
3. Hold the cabinet to hang it onto the support, and then push it into the shelf.
4. Align the bolt holes on the support with those on the cabinet, and then screw down four M8 hexagon bolts.
5. Install the sunshade cover if the equipment is to be installed outdoors.

See Fig. 4.2-6 for the schematic diagram of installing cabinet on wall.

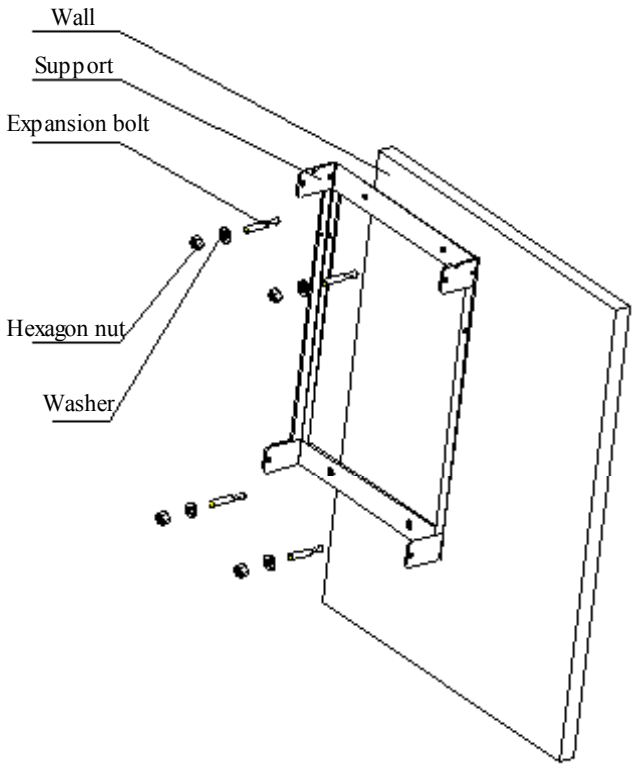


Fig. 4.2-5 Schematic Diagram of Installing the Support onto the Wall

Fig. 4.2-6 Schematic Diagram of Installing the Cabinet onto the Wall

Note

The modules and cables in micro-BTS (including ultra-wide coverage micro-BTS) and remote stations have been installed, connected and tested before delivery. Before commissioning, you only need to check if they are loose due to conveyance. Refer to Chapter 7 for the connection of cables between cabinets.

According to the configuration requirement, you might need to add optical fiber modules or CSM5000 expansion modules in the expansion slots of the corresponding BDM board.

If any fault occurs, the maintenance personnel can refer to this manual for simple maintenance.

5 Installation of Power Supply System

🕮 Summary

- Describing the methods for installing the power supply system..
- Describing the procedures to install the power supply system..

5.1 Introduction to Power Cables

The micro-BTS/remote stations are supplied by 120V AC power or -48V DC power. AC micro-BTS are supplied by 120V AC power, and DC micro-BTS are supplied by -48V DC power.

5.1.1 -48V DC Power Cable

The ZTE -48V DC ZXCBTS equipment is equipped with a piece of 10m-long cable, which can meet the installation requirement in most cases. If you need to assemble the cable on site in special cases, follow the instructions in this section. The DC power cable connector is a four-pin connector, and the power cable adopts four-core cable, as shown in Fig. 5.1-1. The corresponding relationship between the core wires and the binding posts are listed in Table 5.1-1.

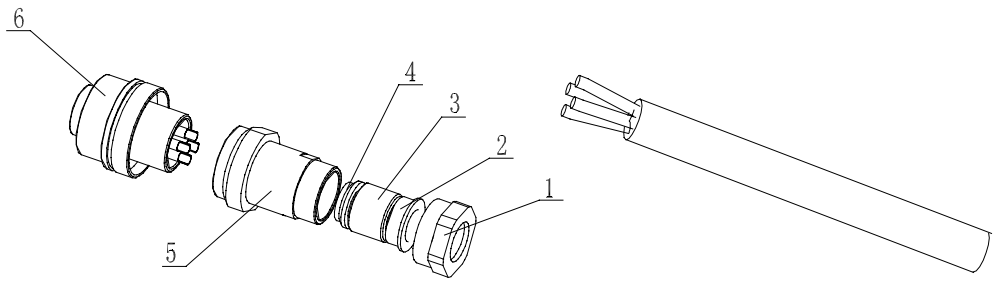


Fig. 5.1-1 Four-pin Connector and Four-core Power Cable

Table 5.1-1 Corresponding Relationship between Core Wires and Binding Posts

Binding Post No.	Color of Core Wire	Power Polarity
1	Blue	-48V
2	Red	-48V
3	Black	-48VGND
4	Olivine	-48VGND

5.1.2 120V AC Power Cable

The ZTE 120V AC ZXCBTS equipment is equipped with a piece of 10m-long cable, which can meet the installation requirement in most cases. If you need to assemble the cable connector on site in special cases, follow the instructions in this section. The AC power cable connector is a three-pin connector, and the power cable adopts three-core cable. Refer to Table 5.1-2 for the corresponding relationship between the core wires and the binding posts.

Table 5.1-2 Corresponding Relationship between Core Wires and Binding Posts

Binding Post No.	Color of Core Wire	Power Polarity
1	Yellow and green	PE
2	Brown	L
3	Blue	N

5.2 Connection of Power Cables

120V AC power supply and -48V DC power supply are used for the micro-BTS and remote stations. A waterproof connector is used to connect the power to the POWER terminal at the bottom of a cabinet, as shown in Fig. 5.2-1.

1. Select a suitable type of power cable.

   If the cabinet is installed outdoors, outdoor shielded power cables should be used for power supply, which can withstand the influences of ultraviolet lights, rains and temperature changes. If common three-core AC power cables are used in special cases, PVC pipes should be added for protection.

   If the cabinet is installed indoors, common three-core power cables can be used for power supply.

2. Power cables should be laid in order. If they are laid in parallel with T1 signal cables, an interval of 200mm is required between them.
3. Upon bundling of power cables, the space between two cable ties should be less than 0.5m to prevent friction with the tower upon swing of cables and avoid damage of power cable sheath.

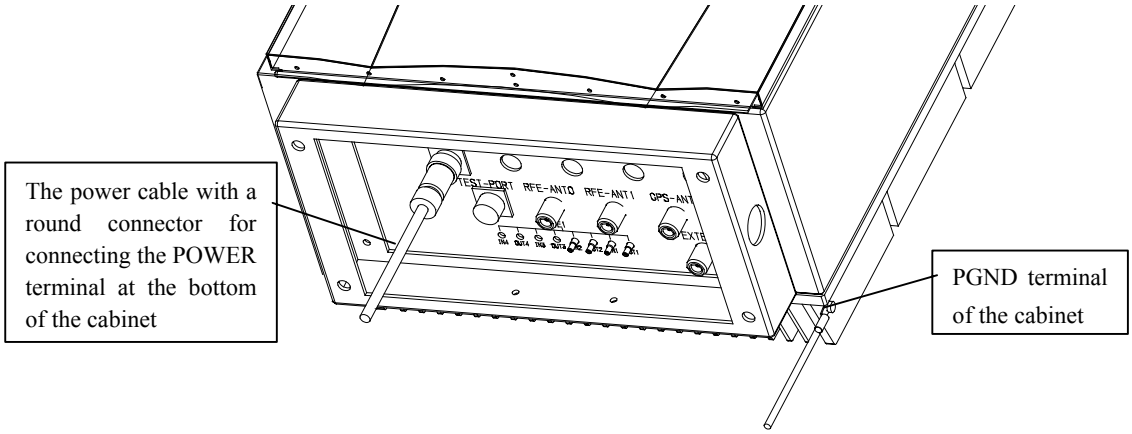


Fig. 5.2-1 Connection of Power Cables and Grounding Cables at the Bottom of a Cabinet

5.3 Assembling Power Cable Connector

5.3.1 Assembling -48V DC Power Cable Connector

Step 1: Put the connector components 1, 2, 3, 4 and 5 onto the cable, as shown in Fig. 5.3-1.

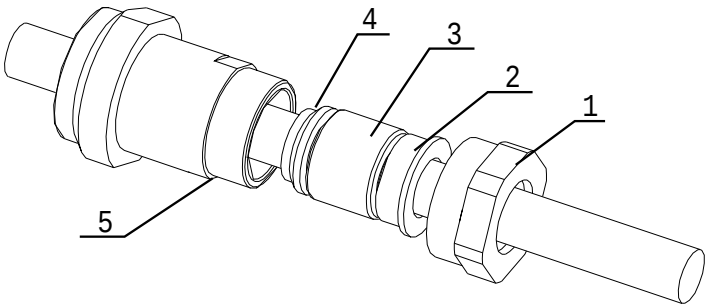


Fig. 5.3-1 Assembling a Power Cable Connector (step 1)

Step 2: Strip the 17mm-long sheath off the four-core cable at the end to be welded. If the sheath of more than 17mm is stripped, the component 3 cannot press the cable tight; if less than 17mm, inconvenience might be caused for installation. See Fig. 5.3-2.

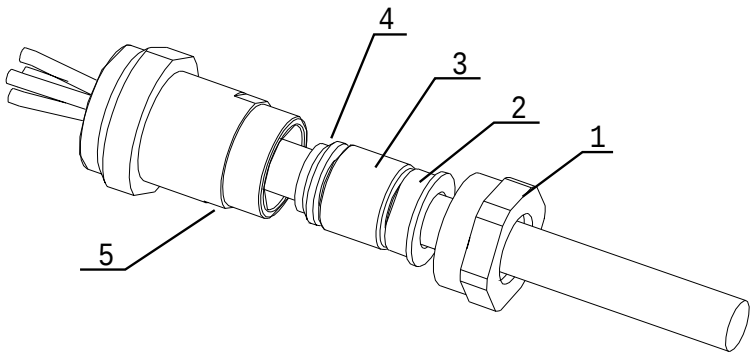


Fig. 5.3-2 Assembling a Power Cable Connector (step 2)

Step 3: Strip the 5mm-long insulation layer off the four core wires respectively, twist up the copper core wires and brush a slice layer of soldering tin on them, and then put a 10~15mm-long heat-shrink tube onto each core wire.

Step 4: Joint the core wires respectively with the binding posts of the component 6 by welding them, push the heat-shrink tubes to the proper position and then make them shrink, as shown in Fig. 5.3-3. Refer to Table 5.1-1 for the corresponding relationship between the core wires and the binding posts.

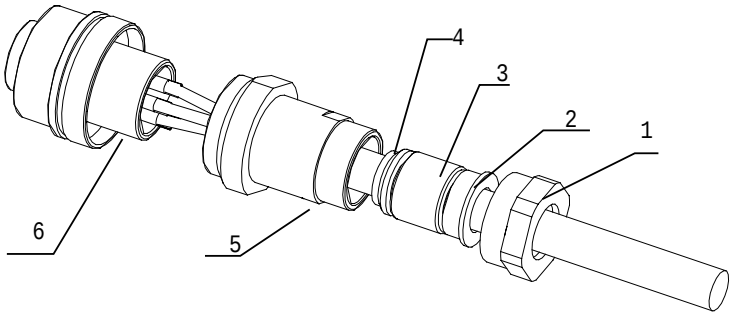


Fig. 5.3-3 Assembling a Power Cable Connector (step 4)

Step 5: Screw to connect the component 5 with the component 6, as shown in Fig. 5.3-4.

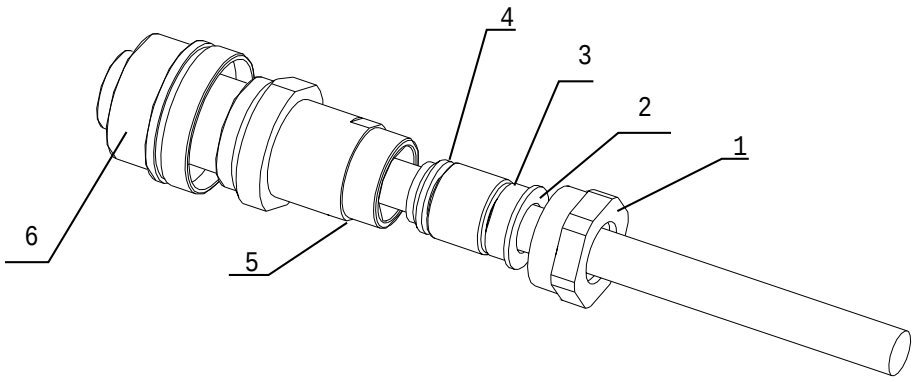


Fig. 5.3-4 Assembling a Power Cable Connector (step 5)

Step 6: Push the components 2, 3 and 4 into the component 5, and then screw down the component 1 onto the component 5. Be sure to screw the component 1 but not 5. See Fig. 5.3-5.

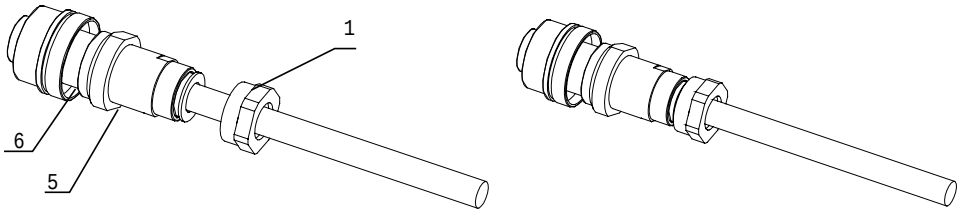


Fig. 5.3-5 Assembling a Power Cable Connector (step 6)

5.3.2 Assembling 120V AC Power Cable Connector

The steps for assembling an AC power cable connector are the same as that for assembling a DC power cable connector. The only difference is that the three-pin connector and three-core power cable are used for AC power cables. Refer to the preceding contents for the procedures and Table 5.3-1 for the corresponding relationship between the core wires and the binding posts.

Table 5.3-1 Corresponding Relationship between Core Wires and Binding Posts

Binding Post No.	Color of Core Wire	Power Polarity
1	Yellow and green	PE
2	Brown	L
3	Blue	N

6 Installation of Grounding System

🕮 Summary

- Describing the method for installing the grounding system

6.1 Introduction to the Grounding System

This section details the procedures to install the grounding system, including grounding copper busbar and feeder cable grounding kit.

Grounding aims to protecting both the human being and the equipment against lightning shock and electromagnetic interference.

The grounding system is composed of indoor groundings, outdoor groundings and underground grounding net.

The grounding system of a ultra-wide coverage micro-BTS includes protection grounding on the chassis, lightning arrester for RF components in the cabinet, for GPS antenna, for T1 cables, for 120V AC power and for feeder cable grounding kit.

The customer needs to complete the construction of the basic grounding net and the grounding system of the tower and other buildings, and offer the points for connecting the indoor and outdoor grounding busbars to the grounding net through different 50mm^2 wires. The conductor led from the PGND terminal of the shelf is connected to the grounding copper busbar, and the conductor led from the -48VGND of the shelf is connected to the DC power copper busbar.

Each feeder cable should be connected to the outdoor grounding copper busbar through the cable grounding kit before being led into the equipment room. See Fig. 6.1-1.

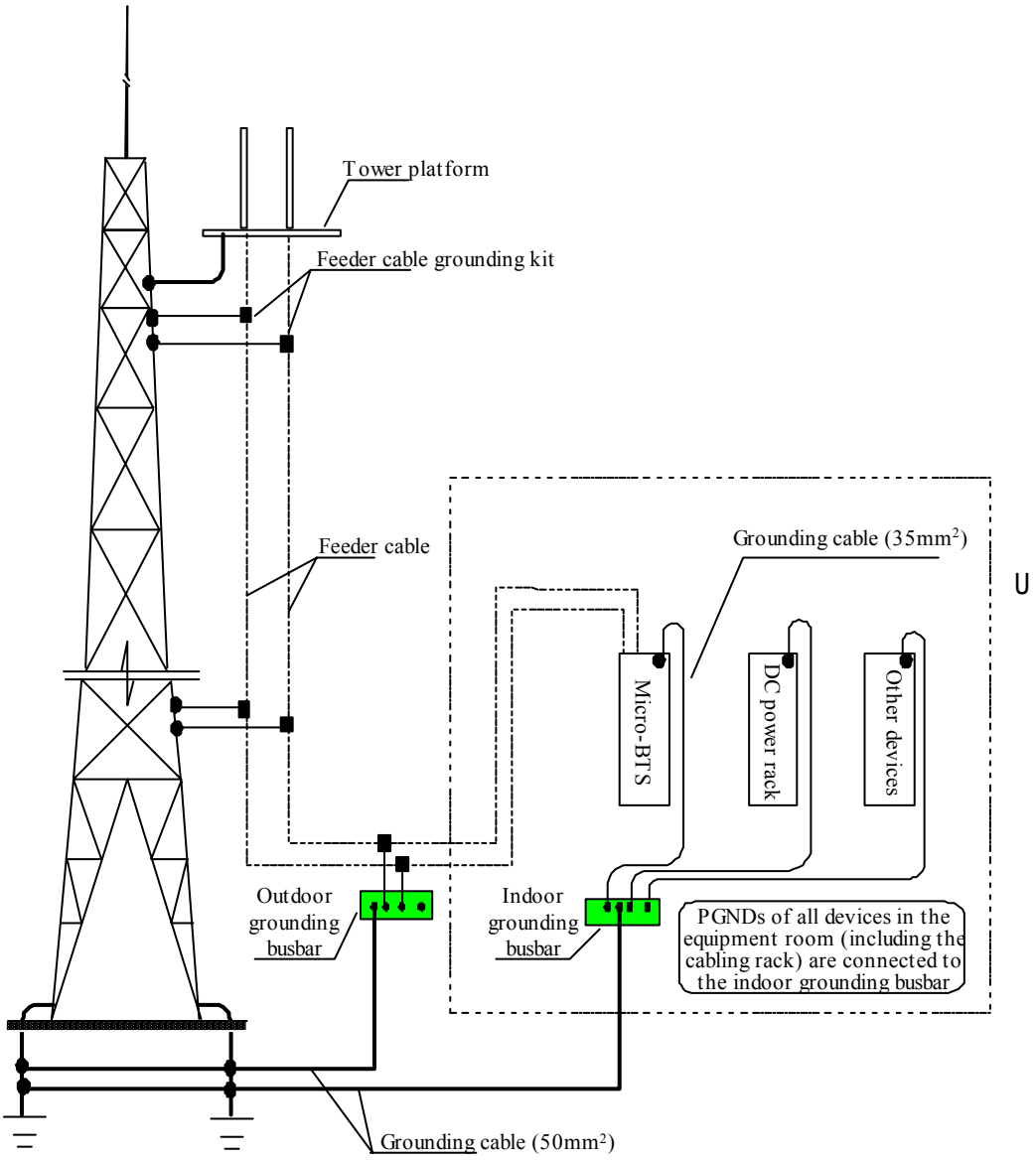


Fig. 6.1-1 Schematic Diagram of Grounding Connections

6.2 Installing Grounding System

6.2.1 Installing Outdoor Grounding Copper Busbar

The outdoor grounding copper busbar functions in lightning protection. It is usually installed on the wall outside the equipment room, and the best position is right under the feeder cable window or on the rain-proof wall of the feeder cable well on the top of a building.

In actual installation, first determine the position for the copper busbar based on the engineering design drawing, and then install the busbar on the wall with expansion bolts. See Fig. 6.2-1 for the appearance of the grounding copper busbar.

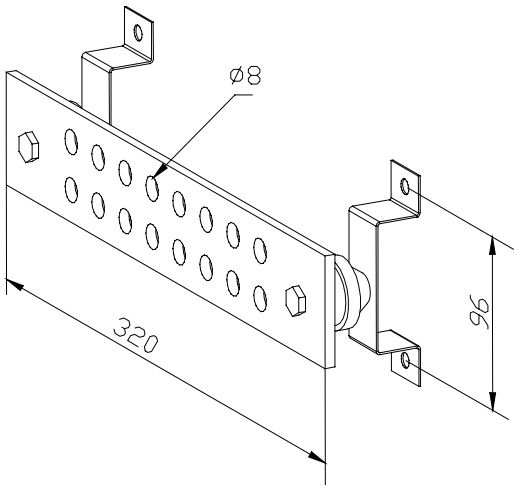


Fig. 6.2-1 Appearance of a Grounding Copper Busbar

6.2.2 Installing the Grounding System of Micro-BTS

The cabinets of ultra-wide coverage micro-BTS/remote stations are equipped with PGND terminals, as shown in Fig. 6.2-2. The PGND terminal is connected to the indoor grounding copper busbar via the 16mm^2 yellow or olivine conducting wire. If the equipment is installed outdoors, the PGND terminal is connected with the grounding cable from the tower or from the top of the building in the crimping connection mode.

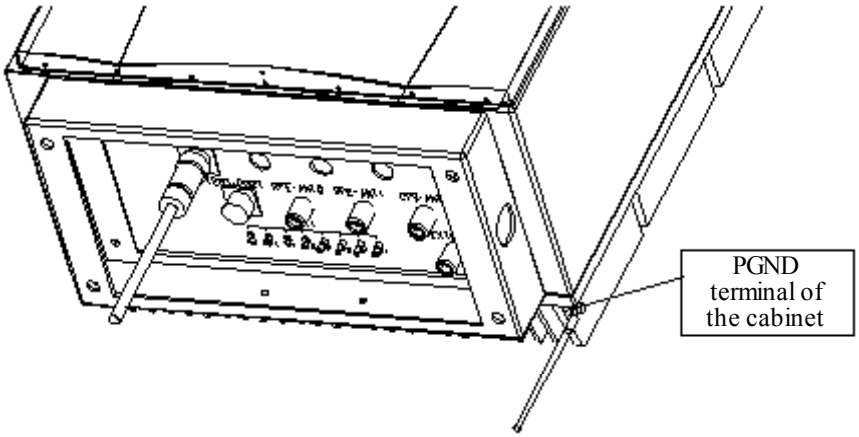


Fig. 6.2-2 Connection of Power Cable and PGND Cable at the Bottom of a Cabinet

6.2.3 Installing Feeder Cable Grounding Kit

Caution:
It is prohibited to install the grounding kit in thunderstorm weather; otherwise, the installation personnel might be hurt.
When installing the grounding kit, be sure to keep the feeder cable at the joint straight.

6.2.3.1 Grounding Principles of Primary Feeder Cable

1. Generally, each primary feeder cable should be grounded at least three times for lightning protection, that is, on the tower platform, between the tower and the outdoor cabling rack, and on the wall before the feeder cable is led into the equipment room. If the primary feeder cable is more than 60 meters long, a lightning grounding kit should be installed every 20 meters.
2. The antenna feeder system, antenna mount and newly-installed cabling rack should all be welded to the lightning protection net of the building. The feeder cable should also be grounded at three points, that is, on the antenna pole, on the rooftop, and on the wall before the feeder cable is led into the equipment room.
3. Before leading the primary feeder cable along the outdoor cabling ladder from the top of the building to the equipment room, check whether the cabling ladder is grounded. If not, request the network operator to accomplish it as soon as possible.

6.2.3.2 Procedures to Install a Grounding Kit

1. Prepare such tools as paper knife, straight screwdriver, spanner and sharp nose pliers.
2. Choose a suitable position for installing the grounding kit, and cut the sheath off the 7/8" feeder cable based on the size of the grounding kit. The structure of a grounding kit is shown in Fig. 6.2-3.

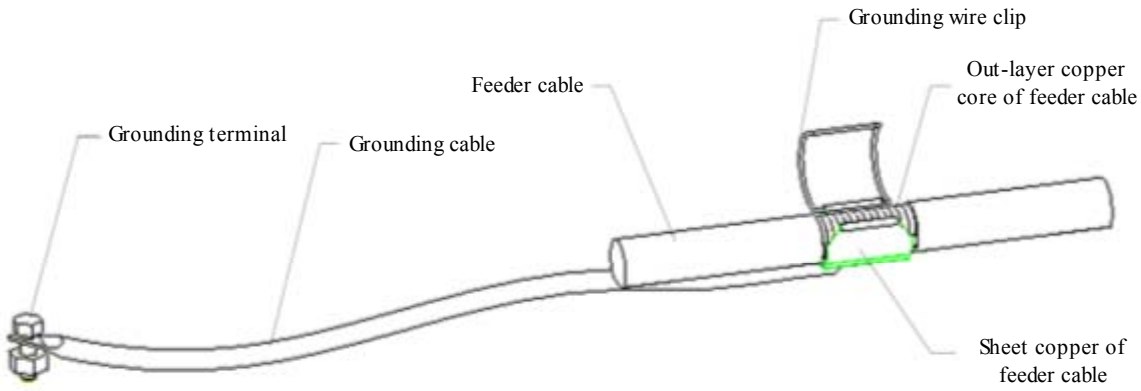


Fig. 6.2-3 Structure of a Grounding Kit

3. Lead the grounding cable of the lightning grounding kit to the grounding net. Keep the angle between the grounding cable and the primary feeder cable no more than 15°.

   If the antenna feeder system is installed on a tower, lead the grounding cable downward along the tower.

   If the antenna feeder system is installed on the top of a building, lead the grounding cable to the lightning protection net.
4. Before installing the grounding kit, wrap the waterproof adhesive tape around the grounding cable near the grounding copper for sealing, as shown in Fig. 6.2-4.

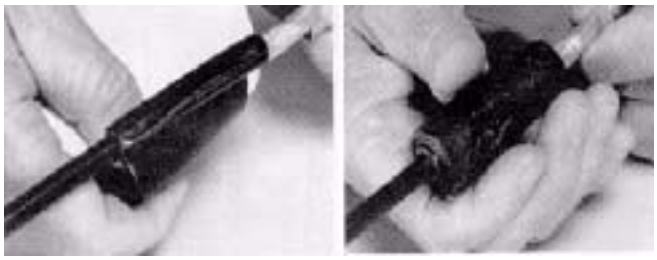


Fig. 6.2-4 Schematic Diagram of Wrapping Waterproof Adhesive Tape Around the Grounding Cable

5. Clamp the external conductor with the grounding copper and clip tightly.
6. Seal the joint between the grounding kit and the feeder cable as follows:

- First wrap the waterproof adhesive tape and then the PVC tape around the joint.
- Wrap the waterproof adhesive tape circularly from bottom upward, and then from top downward, finally from bottom upward again. Note that the next circle covers 1/2 of the previous circle.

7. Connect the grounding terminal of the grounding kit to the tower body or the cabling rack on the top of the building (the cabling rack is connected to the lightning protection net). Remove the paint and oxide at the junction within the radius of 13mm and then coat the clean area with antioxidant cream. After the connection, paint the area with antirust paint.
8. Before the primary feeder cable is led into the equipment room, connect the grounding terminal of the grounding kit to the outdoor grounding busbar.

7 Connection of Cables

🕮 Summary

- Describing the connection of internal cables.
- Describing the connection of external cables.

7.1 Checking Internal Cable Connections

7.1.1 Type and Configuration of Internal Cables

There are 422 or 485 internal cables totally. Refer to Table 7.1-1 for the types and configurations of internal cables in micro-BTS/remote stations.

Table 7.1-1 List of Types and Configurations of Internal Cables

Type	Name	Applied Equipment
RF cables	RF21	Single-carrier 800M micro-BTS/remote stations
	RF22	Single-carrier and double-carrier 800M micro-BTS/remote stations
	RF23	Single-carrier and double-carrier 800M micro-BTS/remote stations
	RF24	Single-carrier and double-carrier 800M micro-BTS/remote stations
	RF25	All micro-BTS/remote stations
	RF26	Single-carrier and double-carrier 800M micro-BTS/remote stations
	RF27	Single-carrier and double-carrier 800M micro-BTS/remote stations
	RF28	Single-carrier and double-carrier 800M micro-BTS/remote stations
	RF32	Single-carrier 1.9G micro-BTS/remote stations
	RF33	Single-carrier and double-carrier 1.9G micro-BTS/remote stations
	RF34	Single-carrier and double-carrier 1.9G micro-BTS/remote stations
	RF35	Single-carrier 1.9G micro-BTS/remote stations
	RF36	Single-carrier and double-carrier 1.9G micro-BTS/remote stations
	RF37	Single-carrier 1.9G micro-BTS/remote stations
	RF38	Single-carrier and double-carrier 1.9G micro-BTS/remote stations
	RF42	All double-carrier micro-BTS/remote stations

Type	Name	Applied Equipment
	RF43	All double-carrier micro-BTS/remote stations
Clock cables	RF29	All single-carrier and double-carrier micro-BTS
	RF30	Single-carrier and double-carrier 800M micro-BTS
	RF31	Single-carrier and double-carrier 800M micro-BTS
	RF39	Single-carrier and double-carrier 1.9G micro-BTS
	RF40	All single-carrier and double-carrier remote stations
	RF41	All single-carrier and double-carrier remote stations
	BDM-GPS	All single-carrier and double-carrier micro-BTS
Communication cables	MPA CONTL	All micro-BTS/remote stations
	RXTDX	All micro-BTS/remote stations
Power cables	DCDX01	All micro-BTS/remote stations
	DCDX02	All micro-BTS/remote stations
	DCDX03	All micro-BTS/remote stations
	ACDX01	All AC-powered micro-BTS/remote stations
	ACDX02	All AC-powered micro-BTS/remote stations
	ACDX03	All micro-BTS/remote stations configured with heater
	ACDX04	All AC-powered micro-BTS/remote stations
	F-DC PWR-001	All DC-powered micro-BTS/remote stations
	F-DC PWR-002	All DC-powered micro-BTS/remote stations
	F-DC PWR-003	All DC-powered micro-BTS/remote stations
Fan cables	F-FAN-004	All single-carrier and double-carrier micro-BTS
	F-FAN-005	Single-carrier and double-carrier 20W micro-BTS/remote stations
	F-FAN-006	Single-carrier and double-carrier 20W micro-BTS/remote stations
Grounding cables	DX01	All micro-BTS/remote stations
	DX02	All micro-BTS/remote stations
	DX03	All micro-BTS/remote stations
Alarm cables	MONDX01	All micro-BTS/remote stations
	MONDX02	All micro-BTS/remote stations
	DX04	All single-carrier and double-carrier micro-BTS
	DX05	All single-carrier and double-carrier remote stations
	DX06	All micro-BTS/remote stations

Among these cables, only ACDX04 (AC power cable) and F-DC PWR-002 (DC power cable) are delivered with the equipment, and other cables have been connected in the equipment before delivery.

7.1.2 Connection of Internal Cables

Refer to Appendix B for the connection of internal cables.

7.2 Connecting External Cables

7.2.1 Connecting Optical Fiber

> **Note**
> **The optical fiber connectors of micro-BTS/remote stations are SC connectors. The ODF or optical connection box provided is equipped with FC connectors by default. If there are special requirements on the connectors, contact ZTE for customization.**

7.2.1.1 Selecting Optical Fiber

Different optical fibers are used for the connections between macro-/micro-BTS and remote stations.

1. If a remote station is near to a relative micro-BTS, optical fiber is used directly. The optical fiber adopts waterproof pigtail cable, and both ends are equipped with waterproof blockers and SC connectors. See Fig. 7.2-1 for the structure of the optical fiber.

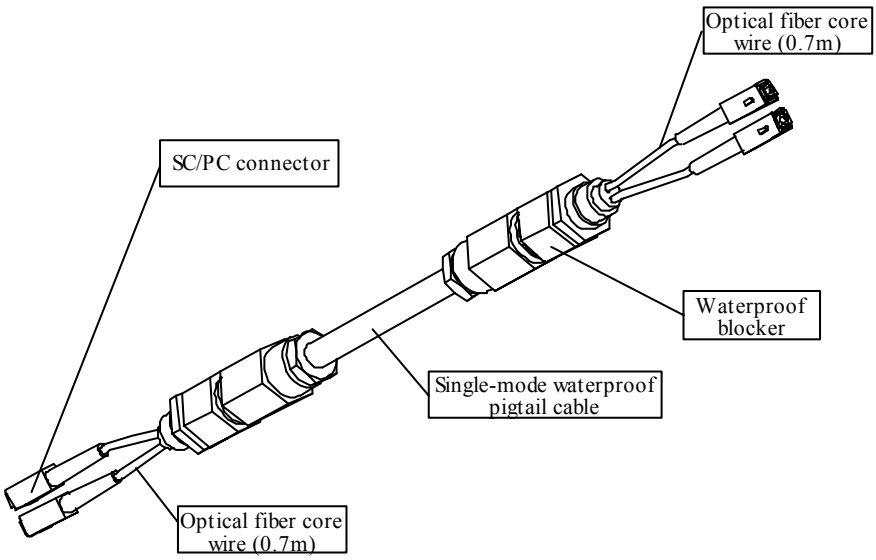


Fig. 7.2-1 Structure of Optical Fiber (1)

The core wires at both ends are 0.7m long. Both ends of the optical fiber can connect either a micro-BTS or a remote station.

You can choose 10m/20m/50m/100m-long optical fiber for this connection based on the actual situation.

2. If an outdoor remote station is near to a relative indoor macro-BTS, optical fiber is used for connecting them directly. The optical fiber adopts waterproof pigtail cable, with both ends being SC connectors. In addition, one end is equipped with a waterproof blocker. See Fig. 7.2-2 for the structure of the optical fiber.

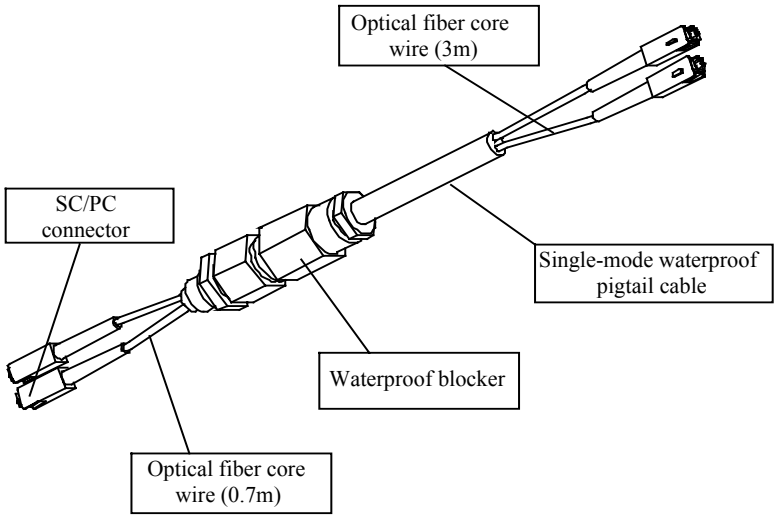


Fig. 7.2-2 Structure of Optical Fiber (2)

The core wires of the end equipped with a waterproof blocker are 0.7m long, and those of the other end are 3m long. The end with a waterproof blocker is to be connected with the remote station, and other end is used to connect the macro-BTS.

You can choose 50m/100m-long optical fiber for this connection based on the actual situation.

3. If a remote station is far from a relative macro-BTS and an ODF or optical connection box is required, two pieces of optical fiber should be used for connecting the macro-BTS with the ODF and the ODF with the remote station respectively.

1） Connection between the macro-BTS and the ODF

The indoor-type optical fiber is adopted, with one end being SC/PC connectors and the other end being FC/PC connectors. See Fig. 7.2-3 for the structure of the optical fiber.

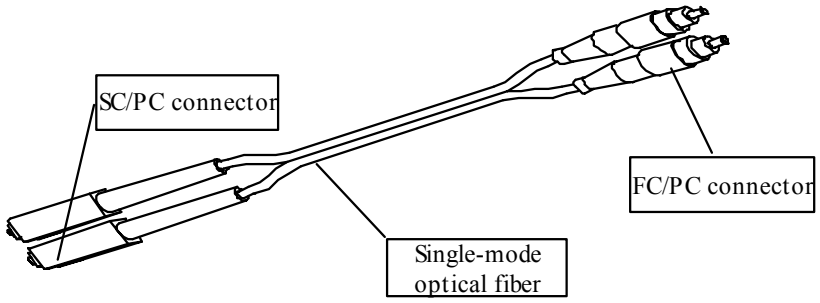


Fig. 7.2-3 Structure of Optical Fiber (3)

The SC/PC connectors are used to connect the macro-BTS, and the FC/PC connectors are used to connect the ODF.

There is only one option for this connection: 30m-long optical fiber.

2） Connection between the ODF and the remote station

The optical fiber adopts waterproof pigtail cable. The end equipped with a waterproof blocker uses SC/PC connectors, and the other end offers FC/PC connectors. See Fig. 7.2-4 for the structure of the optical fiber.

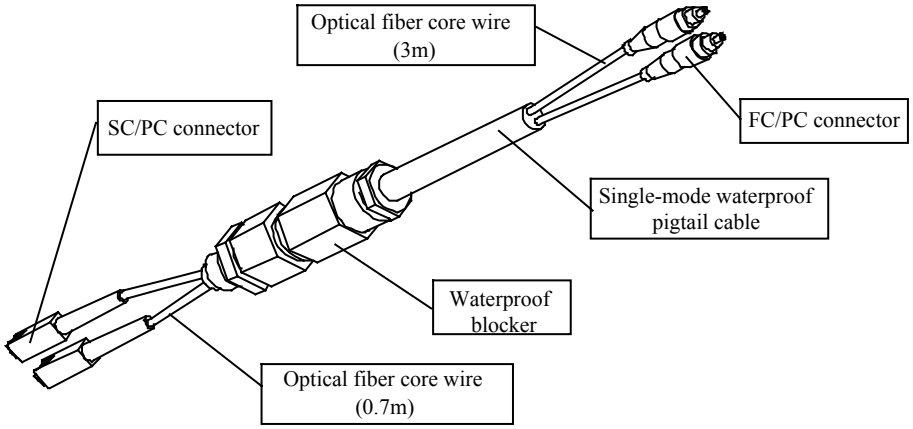


Fig. 7.2-4 Structure of Optical Fiber (4)

The core wires of the end equipped with a waterproof blocker are 0.7m long, and those of the other end are 3m long. The end with a waterproof blocker is to be connected with the remote station, and the other end is to be connected with the ODF.

You can choose 50m/100m-long optical fiber for this connection based on the actual situation.

Caution: If the ODF uses cubical connectors, contact ZTE in advance.

7.2.1.2 Laying Optical Fiber

1. Connecting optical fiber for a micro-BTS/remote station

   Because the end of the optical fiber for connecting a micro-BTS/remote station is equipped with a waterproof blocker, you need to remove the cover of the optical interface at the bottom of a micro-BTS/remote station first, insert the pigtail fiber into the cabinet, and then screw down the waterproof blocker into the optical interface, as shown in Fig. 7.2-5.

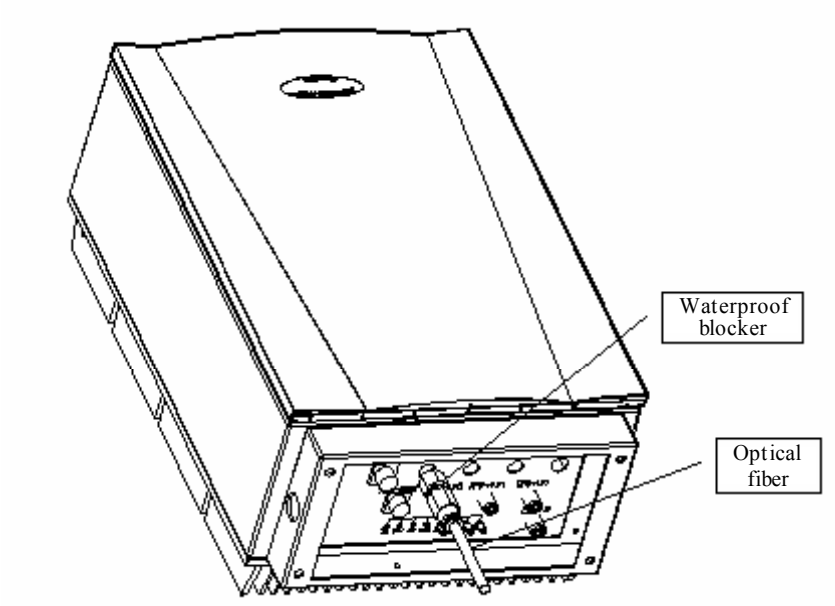


Fig. 7.2-5 Schematic Diagram of Connecting Optical Fiber

2. Connecting optical fiber for a macro-BTS

   If the optical fiber is used to connect the Local Fiber Module (LFM) of a macro-BTS, first insert the optical fiber into an interface on the front panel of

the LFM, lay the optical fiber along the horizontal cabling trough on the top of the TRX layer, and then along the vertical cabling trough on the left of the shelf; next, open the cover of the standby interface marked with "BTM ANT" on the top of the macro-BTS, pull the optical fiber out of the shelf and then lay it onto the cabling rack on top.

3. Requirements for laying optical fiber

   The optical fiber should be arranged in order, with the interval for cable ties less than 0.5m.

   The minimum bending radius of the outdoor-type optical fiber is 90mm, and that of the indoor-type optical fiber is 30mm.

7.2.2 Connecting Multi-carrier Interconnection RF Cables

If a double-carrier & single-sector micro-BTS/remote station is required, two cabinets need be configured. These two cabinets should be connected by cables to achieve transmission of diversity antenna signals.

When a micro-BTS cabinet and a remote station cabinet form a double-carrier & single-sector micro-BTS system, two pieces of RF cables need be added to cross-connect the RFE-ANT0 interface with the EXTEND interface at the bottom of the two cabinets respectively.

Similarly, when two double-carrier remote station cabinets form a double-carrier remote station and it is used in cooperation with a double-carrier macro-BTS, two pieces of RF cables need be added to cross-connect the RFE-ANT0 interface with the EXTEND interface at the bottom of the two cabinets respectively.

Refer to Appendix B for the configuration of internal cables in a double-carrier system.

The interconnection RF cable is 3m long, with both ends being RF N connectors. It is a finished product delivered with cabinets. It is named as "F-RF05-009". See Fig. 7.2-6 for the cable connections between two cabinets.

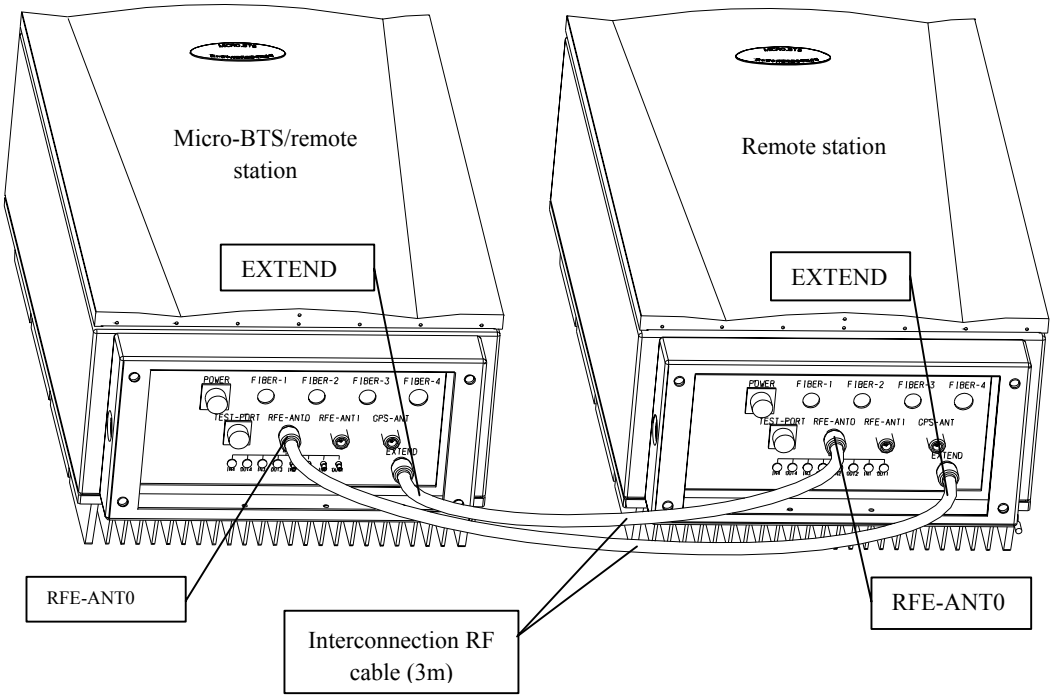


Fig. 7.2-6 Connection of Interconnection RF Cables

7.2.3 Waterproof Processing of Joints

In case of double-carrier configuration, the joints between the sockets at the bottom of the cabinets and the connectors of the interconnection RF cables should be wrapped with waterproof adhesive tape. In addition, the joint between the socket at the bottom of a 20W micro-BTS (M802T micro-BTS) cabinet and the connector of the external fan cable should also be wrapped with the adhesive tape. You need to do the following:

1. Secure the relative connectors and sockets.
2. Implement waterproof processing to the joints.

1) Wrap the joints with the waterproof adhesive tape from the top of the connectors. The first layer should be wrapped in the same direction as for fastening the cable connectors.

2) Stretch the tape with force and wrap it circularly for three layers totally. Note that the next circle covers 1/2 of the previous circle, and the wrap stops at the position about 10cm away from the joint.

3) Grip the joint with force to make the tape stuck firmly with the joint.

4) Wrap two layers of PVC tape around the waterproof adhesive tape in the same way as for wrapping the waterproof adhesive tape.

5) Finally wrap a layer of anti-ultraviolet tape.

7.2.4 Connection of Trunk Cables

There are T1 interfaces at the bottom of the primary cabinet of a micro-BTS for connecting T1 cables (100-ohm coaxial cables), as shown in Fig. 7.2-7.

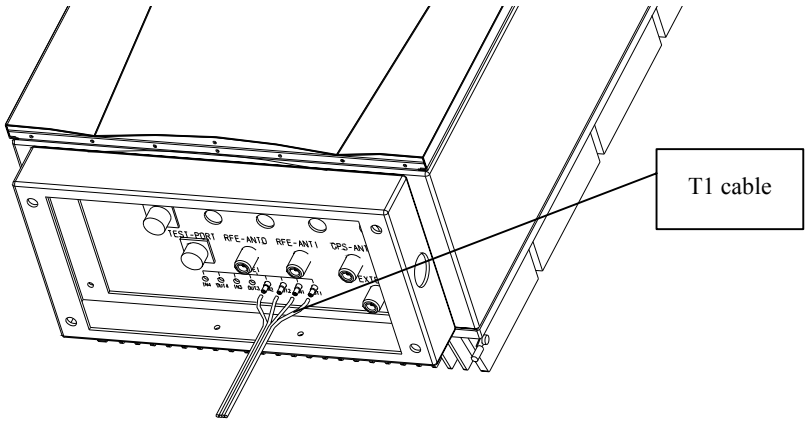


Fig. 7.2-7 Connection of T1 Cables

1. Select T1 cables.

   Micro-BTS can be installed outdoors, so PE-sheath T1 cables are used generally. If common T1 cables are used in an outdoor micro-BTS, PVC pipe should be added for protection.

2. Lay the T1 cables in order. Keep T1 cables and AC power cables separate with distance of more than 200mm.

3. When laying T1 cables on a tower, the space between two cable ties should be less than 0.5m to prevent friction with the tower upon swing of cables and avoid damage of T1 cable sheath.

8 Installation of Primary Antenna Feeder System

🕮 Summary

- Describing the composition of the primary antenna feeder system.
- Describing the procedures to install the primary antenna feeder system.

8.1 Preparations

Before installing the primary antenna feeder system, check the qualification of the installation personnel for working at heights, installation environment, security measures, installation tools and system components, for the purpose of ensuring the successful installation.

8.1.1 Installation Personnel

The antenna feeder system is installed by the professional installation personnel under the monitoring of the installation supervisor.

The installation supervisor should be familiar with the materials, tools and operations for the installation, who is responsible for assigning suitable work for the installation personnel and recording the actual engineering data.

The installation personnel should be skillful and healthy. Those who work at heights should have obtained the corresponding qualification, have no acrophobia, observe the security regulations, and have purchased the personal accident insurance. In addition, they are prohibited from drinking alcohol when working.

8.1.2 Installation Environment

Check if the outdoor lightning grounding cable is well grounded and if its cross-section area is more than 50mm^2. Check if the distance between the antenna pole and the lightning rod/lightning grounding point/outdoor cabling rack, the firmness and wind-resistant ability of the pole meet the design requirements. In addition, check if the necessary tools and assisting materials are prepared, and if the route for laying the primary feeder cables is determined through negotiation.

The equipment provider presents the requirements on the installation of the antenna mount based on the structure and size of the antenna, and the network operator should install the antenna mount as required.

The network operator is also responsible for the installation of the outdoor cabling rack, lightning rod, lightning grounding point and outdoor lightning grounding cable. Moreover, the network operator needs to drill holes on wall or rooftop for installing the feeder cable window as one of the equipment room conditions.

8.1.3 Security Measures

Caution

The installation personnel working at heights must wear the safety belt, and those working on ground must wear the safety helmet. They must wear working clothes and shoes causing no slips when climbing up the tower.

1. Safety precautions should be stressed to the installation personnel.
2. The outdoor installation should be conducted in sunny days without strong wind.
3. Obvious signs should be set in the installation site to notify irrelative people to keep away from the site. The installation personnel working on ground are obligate to keep irrelative people, esp. children away from the site. The tools used on the tower and some metal components might slip to cause casualties, so they must be put in a canvas tool bag when not used, and the bag must be sealed immediately after you open it for a tool or component.

8.1.4 Installation Tools

1. Measurement tools: A compass, multimeter, inclinometer and tape measure;
2. Communication tools: Two mobile phones;

3. Raising tools: Pulley block and rope;
4. Special tools: Cutter for cutting primary feeder cables and tools for assembling connectors;
5. General tools: Adjustable wrench, sharp nose pliers, diagonal pliers, electrical knife, file and hacksaw;
6. Protection tools: Safety belt, safety helmet, safety rope, thick working clothes, RF prevention clothes, canvas tool bag, gloves, and multi-purpose sockets;
7. Other tools: Herringbone ladder and the wooden wheel axis for uplifting the primary feeder cable (which can be borrowed locally).

8.2 Composition and Installation Requirements of Antenna Feeder System

8.2.1 Composition

The antenna feeder system is composed of antennae, antenna jumper cables, primary feeder cables, lightning arrester, jumper cables on top and grounding parts, as shown in Fig. 8.2-1.

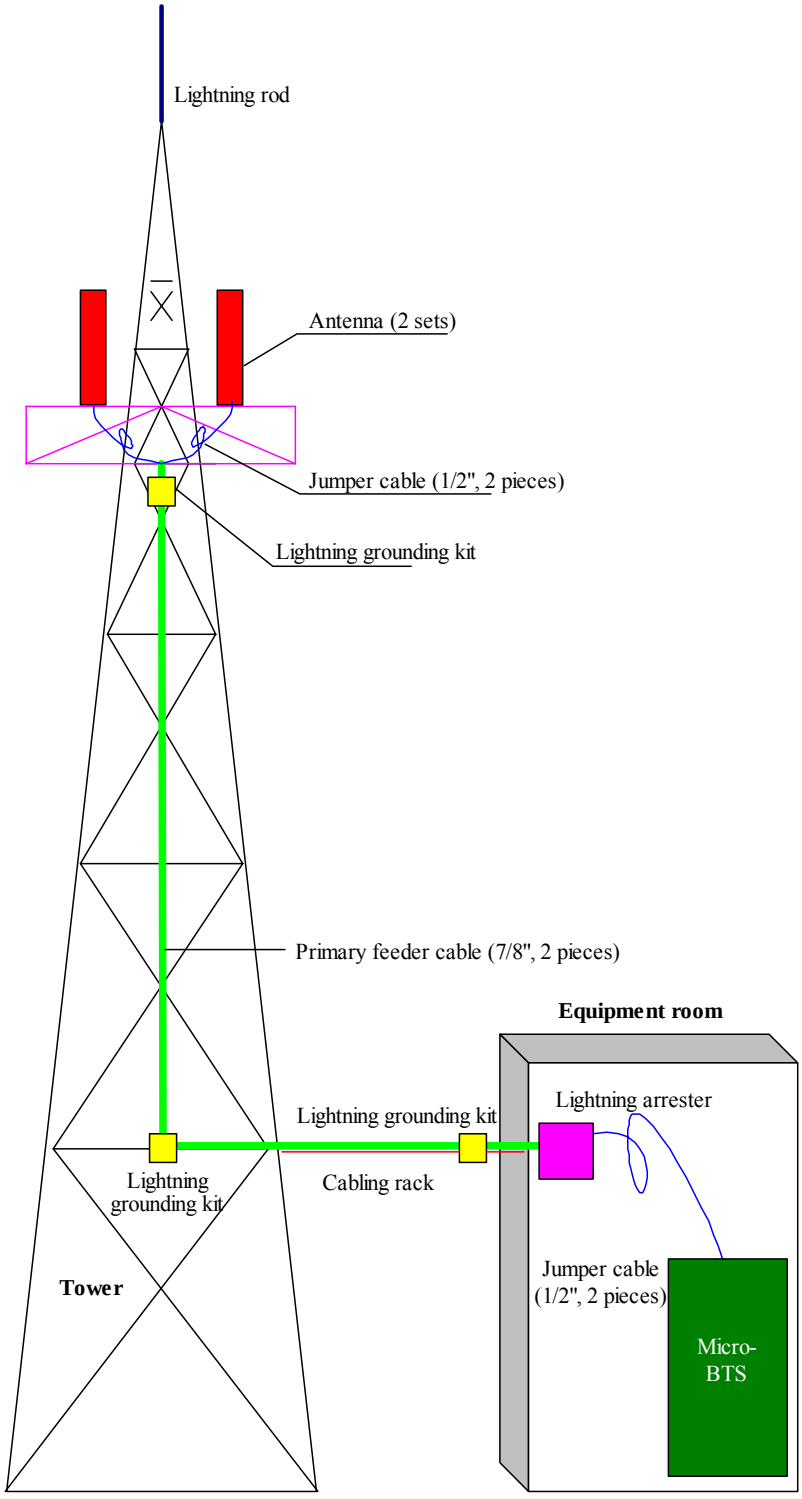


Fig. 8.2-1 Typical Structure of the Antenna Feeder System

8.2.2 Technical Parameters

1. Height of antenna

   It depends on the networking plan.

2. Azimuth angle of antenna

   It depends on the networking plan.

3. Pitch angle of antenna

   It depends on the networking plan. Generally, it is between 0° and 10° (adjustable).

4. Pointing direction of antenna

   It depends on the azimuth angle of the antenna. Two antennae of the same sector must point to the same direction.

5. Distance between two diversity antennae

   Two antennae of one sector are diversity reception antennae to each other. They have the same height, but they should be distanced as much as possible. If the following formula is met, the installation requirement is met.

   $d \geq 10\lambda \sim 20\lambda$ (or H/d=11)d: Distance between two diversity antennae; H: Height from the antenna to the ground. If the carrier is 1.9GHz, the diversity distance should be more than 1.5m. If the carrier is 800MHz, the diversity distance should be more than 3.5m.

8.3 Installation Flow

The antenna installation flow is as shown in Fig. 8.3-1.

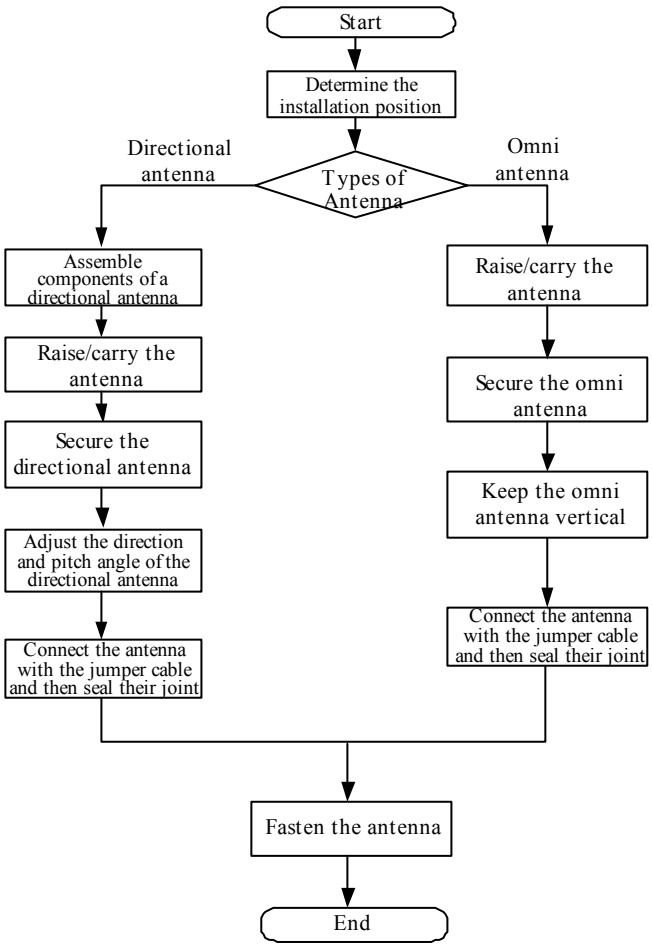


Fig. 8.3-1 Antenna Installation Flow

8.4 Installation of Antenna

Caution:

1. Be cautious during the installation to prevent personal injury or equipment damage.

2. Measures should be taken to protect human body against the radiation when adjusting the antenna, for example, the installation personnel should wear the anti-radiation clothes.

8.4.1 Determining Installation Location

The location for installing the antenna should be determined based on the engineering design drawing. If the actual location of the antenna mount is different from the engineering design, the installation engineers, customer representative and design unit should negotiate to complete the second design according to the requirements of the

BTS on network coverage, space diversity, azimuth angle and pitch angle, thus ensuring desirable network coverage in future.

8.4.2 Installing Accessories of Directional Antenna

Some fasteners need be installed on a directional antenna first. For example, the KATHREIN antenna need be installed with the fasteners "738516" and "737974". Before fastening the antenna, first install the fastener "737974" with angle adjustment setting onto the top and bottom of the antenna (as shown in Fig. 8.4-1), and then connect the fastener "737974" and the pole fastener "738516" with short bolts. During the installation, spring washers and flat washers are used. Please refer to the guide book delivered with the equipment for the information of specific fasteners to be used.

Assemble the fasteners and angle adjustment accessories onto the antenna in advance before installing the antenna on the tower.

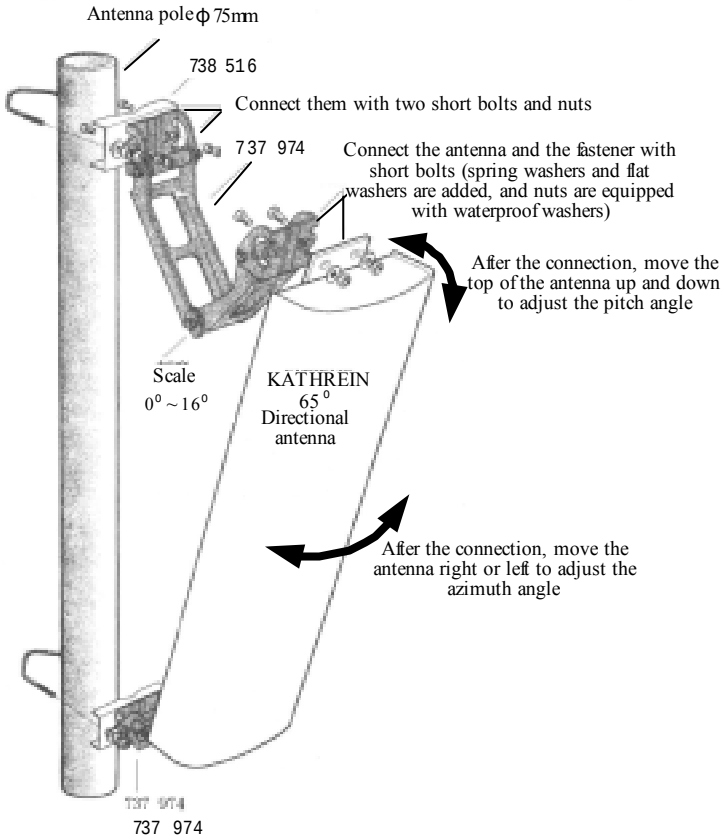


Fig. 8.4-1 Installation of the KATHREIN Antenna

8.4.3 Transporting and Raising Antenna

> **Caution:**
> **Both the installation personnel working on tower and those working under tower should cooperate to raise the antenna onto the tower with rope. Note to keep the antenna away from the tower body to prevent any damage to the antenna when pulling it up the tower.**

Use rope and pulley block to raise the antenna, 3-m antenna jumper cable and other accessories (including tools, safety belt, adhesive tapes and cable ties) up to the tower platform, and then put them in a safe place to avoid falling. Note that the fasteners and other metal tools must be put in a canvas tool bag before pulling them up. When raising a directional antenna or an omni antenna, tie a knot at each end of the antenna to facilitate the cooperation between the installation personnel on and under the tower, as shown in Fig. 8.4-2.

If an antenna is to be installed on the top of a building, carry the antenna and other accessories to the installation site manually.

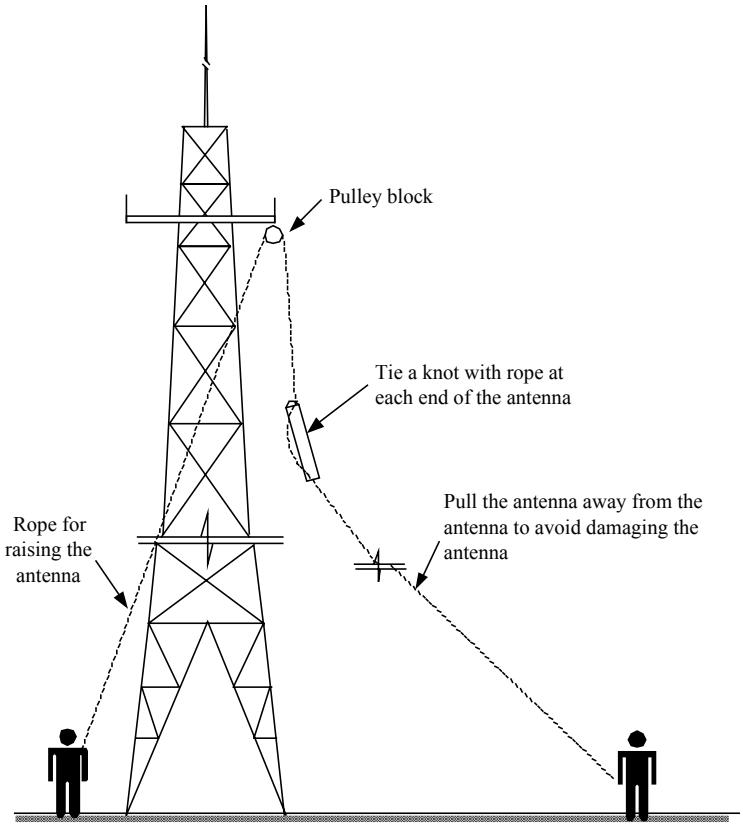


Fig. 8.4-2 Schematic Diagram of Raising the Antenna to the Tower Top

8.4.4 Installing and Adjusting Directional Antenna

> 🕮 **Note:**
> **The antennae of different providers require different installation modes. This section takes the installation of the KATHREIN antenna as an example. Before the installation, read the installation manual delivered with the antenna carefully.**

Install a directional antenna by the following steps:

1. Fastening the directional antenna onto the pole

   Fasten the fastener of the directional antenna with the pole. Do not screw the screws too tight or too loosely. If they are too loose, the antenna might fall off; if they are too tight, it is inconvenient to adjust the azimuth angle and pitch angle of the antenna later.

2. Adjusting the azimuth angle of the antenna

1) Measure the azimuth angle of the antenna with a compass. Then check the engineering design drawing for the antenna direction.

2) Adjust the orientation of the antenna by twisting it slightly, as shown in Fig. 8.4-1. At the same time, measure the orientation of the antenna with the compass. Keep adjusting until the deviation is within the design requirement, that is, less than or equal to 5° generally.

3) After the adjustment, fasten the fastener 738516 tight.

3. Adjusting the pitch angle of the antenna

1) Adjust the bubble inclinometer to the angle as required in the engineering design.

2) Adjust the pitch angle of the antenna slightly until the bubble of the inclinometer is located in the middle when you measure the pitch angle with it, as shown in Fig. 8.4-3.

3) After the adjustment, fasten the fastener 737974 tight.

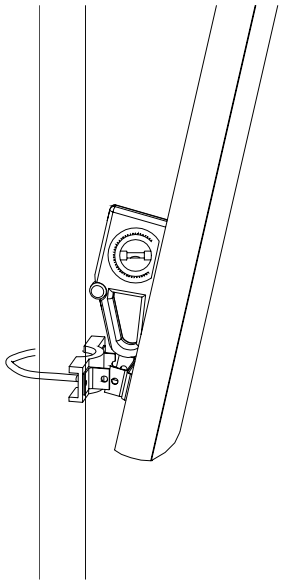


Fig. 8.4-3 Schematic Diagram of Adjusting the Pitch Angle of the Antenna

8.4.5 Installing and Adjusting Omni Antenna

Install an omni antenna by the following steps:

1. Fasten the antenna (the part with jacket) onto the antenna mount with two fixing clips. Do not fasten it too tight or too loosely. If too tight, the jacket might be damaged; if too loosely, the requirements on weight-bearing and wind-resistant abilities cannot be met.
2. Check if the antenna is vertical. If so, fasten the antenna with the pole tight.
3. Protrude the antenna mount installed with the antenna out of the tower platform. Adjust the mount to make the antenna vertical.

8.4.6 Connecting Jumper Cable with Antenna and Sealing Their Joint

> 🕮 **Note:**
> **You can connect the jumper cable with the antenna and seal their joint before installing the antenna onto the pole, which can shorten the time for working at heights and reinforce the connection and waterproof performance of the joint.**

The operations are as follows:

1. Insert the jumper cable connector into the antenna interface and then screw them tight.

2. Implement waterproof processing to the joint between the antenna and jumper cable.

1) Wrap the joint with the waterproof adhesive tape from top download. The first layer should be wrapped in the same direction as for fastening the antenna jumper cable.

2) Wrap the waterproof tape circularly for three layers totally. Note that the next circle covers half of the previous circle, and the wrap stops at the position 10cm away from the joint.

3) Grip the joint with force to make the tape stuck firmly with the joint.

4) Wrap two layers of PVC tape around the waterproof adhesive tape in the same way as for wrapping the waterproof adhesive tape.

5) Finally wrap a layer of anti-ultraviolet tape.

8.5 Installation of Feeder Cable Window

> 🕮 **Note:**
> **The size of the feeder cable window provided by ZTE is 400mm×400mm. It is a four-hole window and 12 pieces of feeder cables can pass through it. A 300mm×300mm hole should be drilled on the wall for the installation of this feeder cable window. If a special feeder cable window is used, a hole should be drilled based on the actual size of it.**
> **No feeder cable window is needed when a micro-BTS is installed outdoors.**

The feeder cable window is usually installed on the outside wall of the equipment room, right between the indoor and outdoor cabling racks.

If the primary feeder cable window is installed on the rooftop, you need to take measures to make it waterproof. For example, you can seal it with asphaltum or glass cement.

The feeder cable window has four holes and can be connected with 12 pieces of feeder cables at most, as shown in Fig. 8.5-1. Follow the steps below to install a feeder cable window:

1. Determine the installation location based on the engineering design drawing.

2. Drill a hole on the wall according to the size of the feeder cable window used.

3. Drill holes for installing expansion bolts with a percussive drill, and then secure the main board of the feeder cable window with the expansion bolts.
4. Install the sealing pad and gasket when leading the primary feeder cables into the equipment room.
5. In cold and sandy places, install a wooden board in the equipment room to block sand blown by the wind and preserve heat.

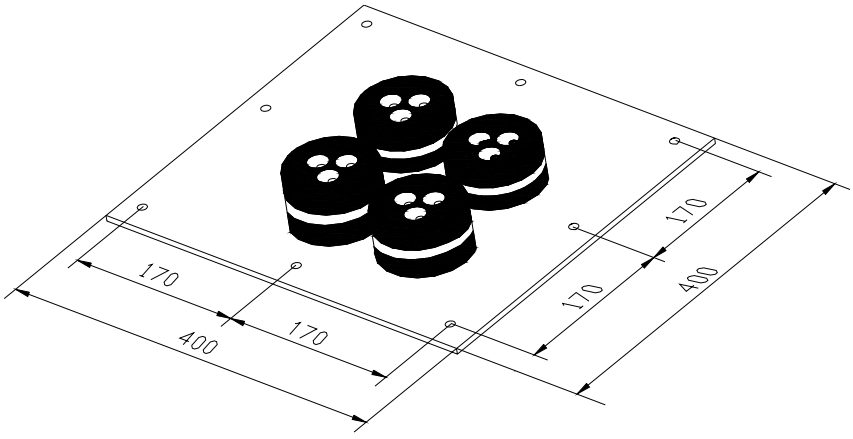


Fig. 8.5-1 Structure of a Feeder Cable Window

8.6 Connection of Feeder Cable

This section describes how to assemble the 7/8" feeder cable connectors, how to connect the jumper cable & the primary feeder cable/antenna and seal their joint, and how to lay and fasten the feeder cables.

The complete structure of a feeder cable of a micro-BTS/remote station is shown in Fig. 8.6-1. If a micro-BTS is installed outdoors and it is near to the antenna, the 1/2" feeder cable can be used for the primary feeder cable.

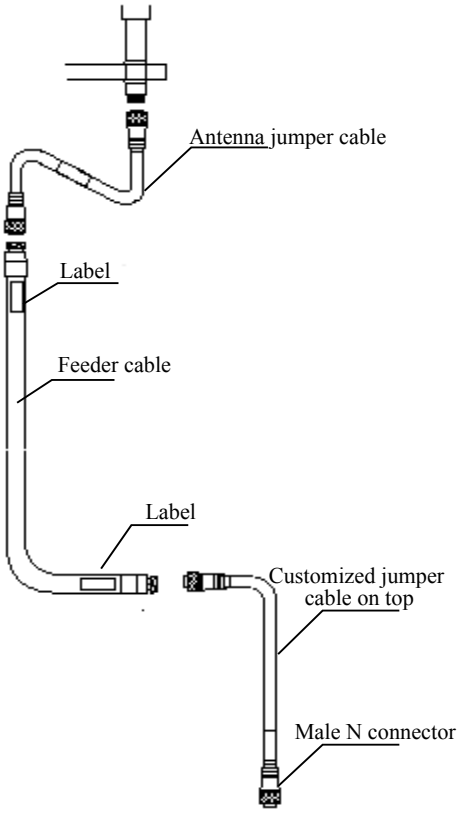


Fig. 8.6-1 Structure of the Feeder Cable of a Micro-BTS/Remote Station

8.6.1 Determining Route for Feeder Cable

The cabling route of the feeder cables should be determined according to the engineering design drawing. If an alteration is necessary, negotiate with the customer representative for solution. Note that the primary feeder cables should be as short as possible.

8.6.2 Assembling Connectors of Primary Feeder Cable

Caution:

Assembling feeder cable connectors is the most important procedure in the installation of the antenna feeder system, for the quality of them directly affects the performance of both equipment and network.

Be cautious when using the cutter, for it is very sharp.

This section describes how to assemble connectors for the ROSENBERGER 7/8" feeder cable. For the assembly of connectors for other types of feeder cable or feeder cable of other manufacturers, refer to the specific installation manual.

1. The cutter used is shown in Fig. 8.6-2.

Fig. 8.6-2 Cutter for Assembling 7/8" Feeder Cable Connectors

2. Pull the feeder cable straight (about 150mm long) at the end to be installed with a connector, and then strip 50mm-long sheath off the cable with the cutter.
3. Put the feeder cable on the trough of the cutter EASIAX, reserve four corrugations at the end of the blade, and then press down the handle. The main blade should point to one wave crest.
4. Screw to shut the cutter closely. In this way, the internal and external copper conductors of the feeder cable are severed, and at the same time the cable sheath is severed by the assisting blade, as shown in Fig. 8.6-3.

Fig. 8.6-3 Schematic Diagram of Cutting the Feeder Cable with the Cutter

5. Check if the cutting position is correct, as shown in Fig. 8.6-4.

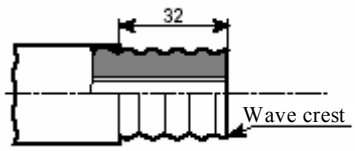


Fig. 8.6-4 Schematic Diagram of Correct Cutting Size

6. Disassemble the feeder cable connector into two parts: front part and back part. And then insert the feeder cable into the back part until it contacts the first corrugation of the cable.
7. Insert the tube expander of the cutter into the feeder cable and then screw left and right to expand the external copper conductor, as shown in Fig. 8.6-5.

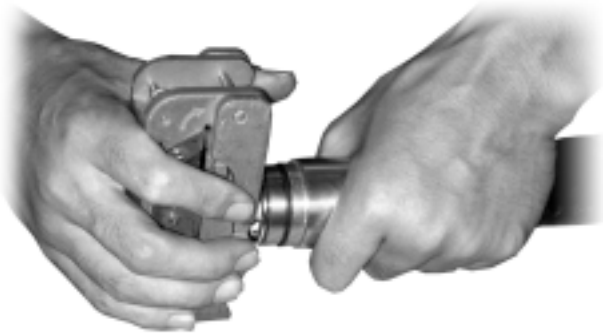


Fig. 8.6-5 Schematic Diagram of Expanding the External Copper Conductor

8. Check if there are copper bits left in the conductor and if the conductor is expanded evenly. Pull the back part of the connector with force to check if it is connected firmly with the cable. If any requirement cannot be met, redo the above steps.
9. Connect the front part with the back part, as shown in Fig. 8.6-6.

Fig. 8.6-6 Schematic Diagram of Connecting the Front Part with the Back Part of the Connector

10. Clamp the front part of the connector with a wrench and use another wrench to clamp the back part. Twist the back part but keep the front part unmoved until they are connected firmly.

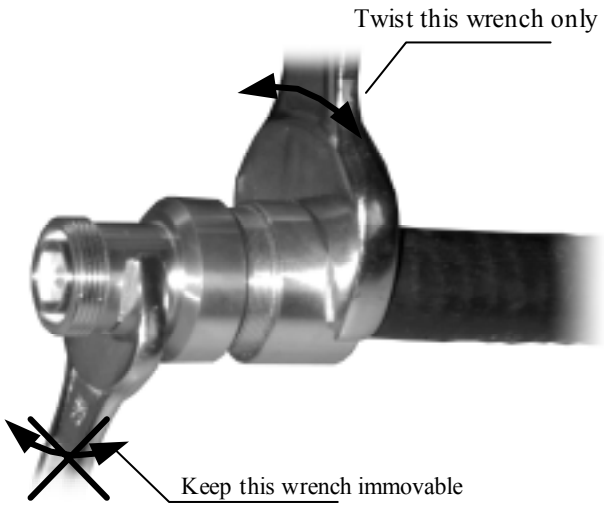


Fig. 8.6-7 Schematic Diagram of Fastening the Front Part with the Back Part of the Connector

8.6.3 Cutting Feeder Cable

Caution:
Stick temporary labels at both ends of the primary feeder cables after cutting them. Labels can also be stuck in the middle part of the feeder cables but they must be the same; otherwise, wrong connections might be caused.

On the installation site, measure the cabling route of the primary feeder cables accurately and then cut the cables as needed. The operations are as follows:

1. When the antenna feeder system is to be installed on the top of a building:

1) Measure the cabling route with a tape measure to determine the length of the primary feeder cables needed by each sector.

2) Add some margin (1m~2m) to the measured lengths when cutting the cables.

3) After cutting a piece of primary feeder cable, stick temporary labels at both ends of the cable, for example, ANT1, ANT2, ANT3, ANT4, ANT5, ANT6.

4) Carry the feeder cables having been cut to the top of the building. Ensure that the cables are not squeezed or damaged during the conveyance.

2. When the antenna feeder system is to be installed on a tower:

1) Pull one end of the feeder cable to the tower top with the roller support, pulley block and rope. Then the installation personnel under the tower cut the cable based on the length needed (with a certain margin). Stick a temporary label at

the lower end of the cable. Stick a formal label after the cable is led into the equipment room.

2) Assemble the connectors before raising the primly feeder cables, thus shortening the time for working at heights and ensuring the quality of the connectors.

8.6.4 Raising Primary Feeder Cable

When the antenna feeder system is to be installed on a tower, the pulley block will be used to raise the primary feeder cables, as shown in Fig. 8.6-8. The operations are as follows:

1. Check the labels at both ends of the primary feeder cable to ensure that it is the right cable.
2. Wrap the feeder cable connector with a piece of flax cloth or an antistatic plastic bag filled with foam, and then bundle it tight.
3. Tie a knot with the rope on the feeder cable at the place 0.4m away from the connector and then another knot about 3.4m away from the connector, for the purpose of facilitating the cooperation between the installation personnel on and under the tower to raise the cable and preventing the feeder cable and its connector from being damaged due to hit with the tower.
4. After the primary feeder cable is pulled to the tower top, fasten it tight.

Caution:
Raise the primary feeder cable with care to avoid damaging the sheath of it. If not, the whole piece of the cable will be wasted.
Mind your own safety also when raising the cable.

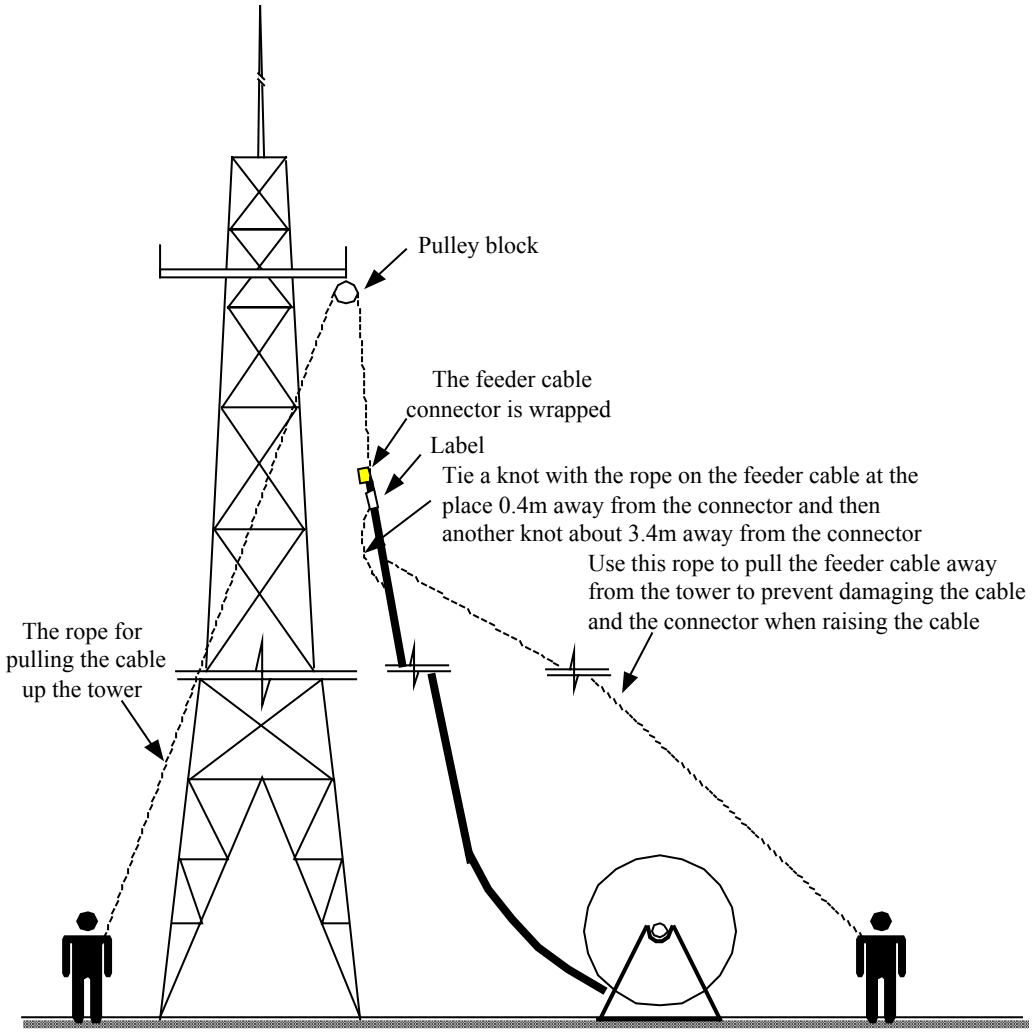


Fig. 8.6-8 Schematic Diagram of Pulling the Feeder Cable Up the Tower

8.6.5 Laying and Fastening Primary Feeder Cable

1. Cabling principles

1) The primary feeder cables should be laid in order on the cabling rack after being led into the equipment room through the feeder cable window.

2) The primary feeder cables should be laid without crossings along the outdoor cabling rack and the cabling ladder of the tower.

3) Be familiar with the cabling route of the primary feeder cables and draw it on paper in advance to ensure there are no crossings during the actual cabling.

4) The minimum bending radius of the primary feeder cable should be no less than 20 times of its semi-diameter. The minimum one-time bending radius is 90mm, and the minimum repeated bending radius is 200mm.

5) The maximum interval between hangers is 1.65m.

2. Cabling procedures:

1) In principle, a hanger should be installed on the tower or cabling rack every about 1.5m. For onsite installation, the interval can be lengthened or shortened depending on the actual situation, but the maximum interval cannot exceed 1.65m. Install the hangers with even distance in the same direction. If two rows of hangers are installed on one cabling ladder, keep them in parallel and in order. See Fig. 8.6-9 for the appearance of a hanger.

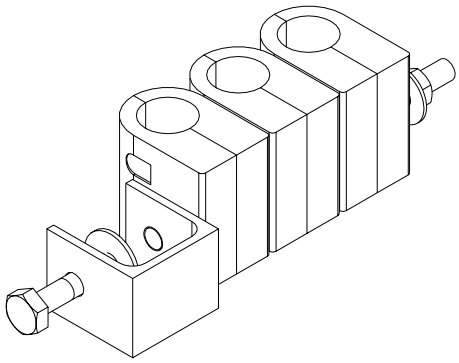


Fig. 8.6-9 Appearance of a Hanger

2) Arrange the primary feeder cables before leading them into the equipment room.

3) Fasten the primary feeder cables from top downward with hangers. Keep the cables straight all the way. Do not fasten the feeder cables at both ends simultaneously.

4) If the antenna feeder system is installed on the top of a building, the network operator should install the cabling ladder on the wall. In this case, fasten the primary feeder cables with hangers along the ladder before leading them into the equipment room.

8.6.6 Connecting Jumper Cable with Feeder Cable and Sealing Their Joint

> **Caution:**
> **Pay attention to the sealing of the joint between the feeder cable and the jumper cable, which is critical in the installation of the antenna feeder system. Use waterproof adhesive tape for the sealing.**

Generally, the 3m-long 1/2" jumper cable is used to connect the antenna and the primary feeder cable. Connect the 1/2" jumper cable with the primary feeder cable and then seal their joint as follows:

1. Connect the antenna jumper cable with the connector of the primary feeder cable and then screw down the connector.
2. Treat connectors with waterproof measures. The procedures are as follows:

1) Wrap the waterproof adhesive tape around the joint from the sunk area upward (fill the area with the tape), as shown in Fig. 8.6-10.

Fig. 8.6-10 Schematic Diagram of Wrapping Waterproof Adhesive Tape (1)

2) Stretch the tape with force and wrap it in the same direction as for fastening the cable connector.

3) Wrap circularly in the reverse direction for the second layer, as shown in Fig. 8.6-11. Note that the next circle covers 1/3 of the previous circle for the purpose of preventing inleakage of rain. Wrap the joint for three layers totally. Do not cut the adhesive tape during the wrapping. The length of the cable wrapped with the tape should be 20mm longer than that of the connector.

Fig. 8.6-11 Schematic Diagram of Wrapping Waterproof Adhesive Tape (2)

4) After the wrapping, grip the joint with both hands to make the tape stuck tight with the joint, as shown in Fig. 8.6-12.

Fig. 8.6-12 Schematic Diagram of Wrapping Waterproof Adhesive Tape (3)

5) Wrap two layers of PVC tape around the waterproof adhesive tape. Note that the next circle covers half of the previous circle.

6) Grip the joint again.

7) Use ties to fasten the wrapped part at both ends to prevent the tape from falling off due to aging.

8.6.7 Leading Primary Feeder Cable into Equipment Room

1. Precautions

1) See Fig. 8.6-13 and Fig. 8.6-14 for the modes of leading the primary feeder cables into the equipment room. It must be ensured that no rainwater will be led in along the feeder cable. If necessary, the water-blocking curve can be made.

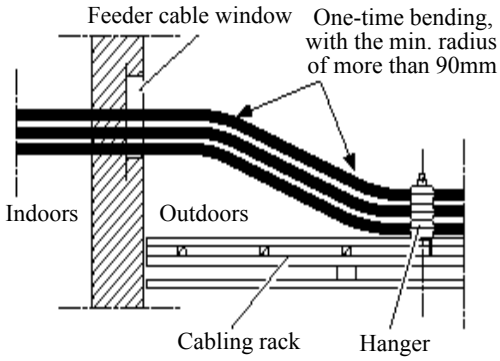


Fig. 8.6-13 Leading the Feeder Cable into the Equipment Room - Mode 1

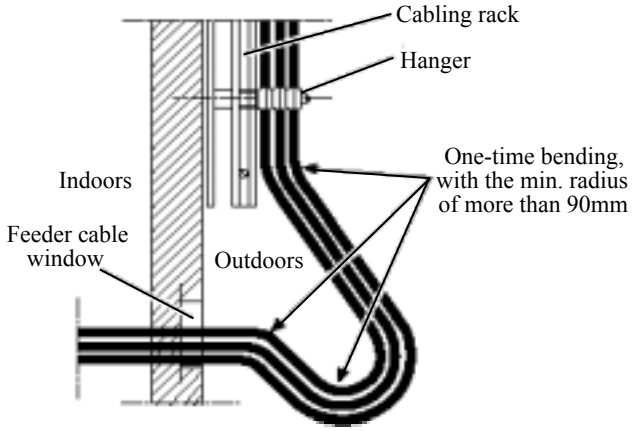


Fig. 8.6-14 Leading the Feeder Cable into the Equipment Room - Mode 2

2) The feeder cables are led into the equipment room through the feeder cable window. The outdoor and indoor cabling racks are used for leading them.

2. Procedures

1) Loosen the fasteners on the feeder cable window and remove the cover from the holes.

2) Lead the feeder cables into the equipment room. Two people in and out of the room respectively should cooperate when leading the cables to prevent damaging both the equipment and the cable. Screw down the fastening hoop after the feeder cables are pulled in position.

3) Cut the feeder cables. The following should be done before cutting them:

- Checking labels

  Check if the temporary labels are stuck on the cables. Without the labels, you might misconnect the cables.

- Determining the cutting position

  Determine the cutting position based on the installation position of the shelf and the lightning arrester, length of jumper cable on top, and the bending radius of the feeder cables.

4) Assemble the indoor connectors of the primary feeder cables.

8.6.8 Connecting Indoor Jumper Cable

The indoor jumper cable on top is connected between the primary feeder cable and the antenna interface at the bottom of a micro-BTS. Customize a jumper cable on site based on the actual situation. One end of the jumper cable is a male N connector, which is directly connected to the bottom of the cabinet. The other end is a female DIN connector, which is connected to the 7/8" primary feeder cable. See Fig. 8.6-1.

8.7 Grounding System of Micro-BTS

Grounding aims to protecting both the human being and the equipment against lightning shock and electromagnetic interference.

The grounding system of a micro-BTS includes protection grounding on the chassis, lightning arrester for RF components in the cabinet, for GPS antenna, for T1 cables, for 120V AC power and for feeder cable grounding kit.

1. Grounding principles of primary feeder cables

1) Generally, each primary feeder cable should be grounded at least three times for lightning protection, that is, on the tower platform, between the tower and the outdoor cabling rack, and on the wall before the feeder cable is led into the equipment room. If the primary feeder cable is more than 60 meters long, a lightning grounding kit should be installed every 20 meters. If the primary feeder cable is shorter than 5m, one grounding point is enough. If the feeder cable is shorter than 20m but longer than 5m, it can be grounded at two points.

2) The antenna feeder system, antenna mount and newly-installed cabling rack should all be welded to the lightning protection net of the building. The feeder

cables should also be grounded at three points, that is, on the antenna pole, on the rooftop, and on the wall before the cables are led into the equipment room.

3) Before leading the primary feeder cable along the outdoor cabling ladder from the top of the building to the equipment room, check whether the cabling ladder is grounded. If not, request the network operator to accomplish it as soon as possible.

2. Procedures to install the grounding kit

Caution:
It is prohibited to install the grounding kit in thunderstorm weather; otherwise, the installation personnel might be hurt.
When installing the grounding kit, be sure to keep the feeder cable at the joint straight.

1) Prepare such tools as paper knife, straight screwdriver, spanner and sharp nose pliers.

2) Choose a suitable position for installing the grounding kit, and cut the sheath off the 7/8" feeder cable based on the size of the grounding kit. The structure of a grounding kit is shown in Fig. 8.7-1.

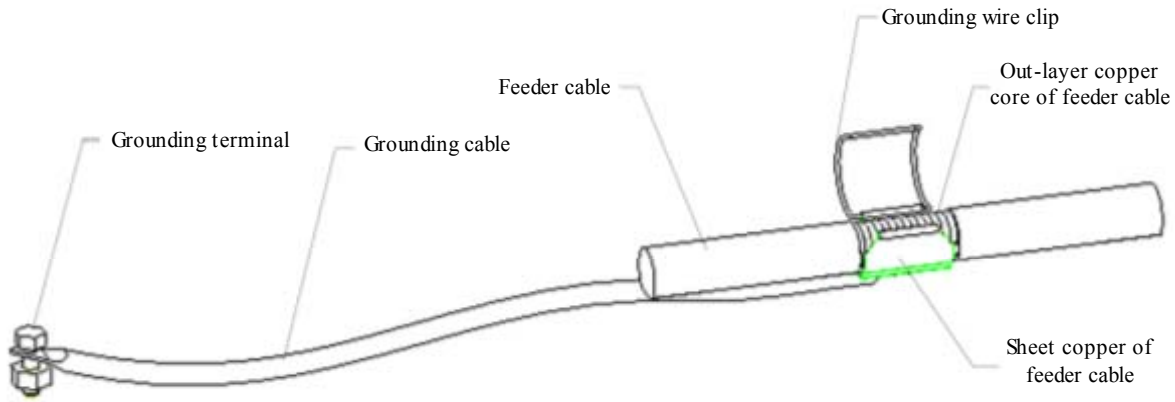


Fig. 8.7-1 Structure of a Grounding Kit

3) Lead the grounding cable of the lightning grounding kit to the grounding net. Keep the angle between the grounding cable and the primary feeder cable no more than 15°.

If the antenna feeder system is installed on a tower, lead the grounding cable downward along the tower.

If the antenna feeder system is installed on the top of a building, lead the grounding cable to the lightning protection net.

4) Before installing the grounding kit, wrap the waterproof adhesive tape around the grounding cable near the grounding copper for sealing, as shown in Fig. 8.7-2.

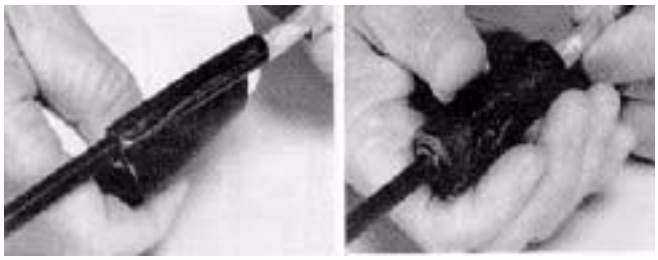


Fig. 8.7-2 Schematic Diagram of Wrapping Waterproof Adhesive Tape Around the Grounding Cable

5) Clamp the external conductor with the grounding copper and clip tightly.

6) Seal the joint between the grounding kit and the feeder cable as follows:

- First wrap the waterproof adhesive tape and then the PVC tap around the joint.
- Wrap the waterproof adhesive tape circularly from bottom upward, and then from top downward, finally from bottom upward again. Note that the next circle covers half of the previous circle.

7) Connect the grounding terminal of the grounding kit to the tower body or the cabling rack on the top of the building (the cabling rack is connected to the lightning protection net). Remove the paint and oxide at the junction within the radius of 13mm and then coat the clean area with antioxidant cream. After the connection, paint the area with antirust paint.

8) Before the primary feeder cable is led into the equipment room, connect the grounding terminal of the grounding kit to the outdoor grounding busbar.

8.8 Test of Antenna Feeder System

1. After the antennae are installed and all feeder cables are connected, measure the standing wave ratio of them.
2. Measure one end of the indoor 1/2" jumper cable, which is to be connected with the cabinet, with the tester. The standing wave ratio should be lower than 1.5. It is best to be lower than 1.3.
3. Record the Voltage Standing Wave Ratio (VSWR) value and provide the VSWR testing diagram.

8.9 Waterproof Processing of Connectors

Follow the steps below to seal the joints between two cables:

1. Fasten the relative joints.
2. Implement waterproof processing to the joints.

1) Wrap the joints with the waterproof adhesive tape from the top of the connectors. The first layer should be wrapped in the same direction as for fastening the cable connectors.
2) Stretch the tape with force and wrap it circularly for three layers totally. Note that the next circle covers half of the previous circle, and the wrap stops at the position about 10cm away from the joint.
3) Grip the joint with force to make the tape stuck firmly with the joint.
4) Wrap two layers of PVC tape around the waterproof adhesive tape in the same way as for wrapping the waterproof adhesive tape.
5) Finally wrap a layer of anti-ultraviolet tape.

9 Installation of GPS Antenna Feeder System

Summary

- Describing the composition of the GPS antenna feeder system.
- Describing the procedures to install the GPS antenna feeder system.

9.1 Preparations

9.1.1 Installation Personnel

Before installing the GPS antenna feeder system, check the qualification of the installation personnel for working at heights, installation environment, security measures, installation tools and system components.

The antenna feeder system is installed by the professional installation personnel under the monitoring of the installation supervisor.

The installation supervisor should be familiar with the materials, tools and operations for the installation, who is responsible for assigning suitable work for the installation personnel and recording the actual engineering data.

The installation personnel should be skillful and healthy. Those who work at heights should have obtained the corresponding qualification, have no acrophobia, observe the security regulations, and have purchased the personal accident insurance. In addition, they are prohibited from drinking alcohol when working.

9.1.2 Installation Environment

Check if the outdoor lightning grounding cable is well grounded and if its cross-section area is more than 50mm^2. Check if the distance between the antenna pole and the

lightning rod/lightning grounding point/outdoor cabling rack, the firmness and wind-resistant ability of the pole meet the design requirements. In addition, check if the necessary tools and assisting materials are prepared, and if the route for laying the primary feeder cable are determined through negotiation.

The equipment provider presents the requirements on the installation of the antenna mount based on the structure and size of the antenna, and the network operator should install the antenna mount as required.

The network operator is also responsible for the installation of the outdoor cabling rack, lightning rod, lightning grounding point and outdoor lightning grounding cable. Moreover, the network operator needs to drill holes on wall or rooftop for installing the feeder cable window as one of the equipment room conditions.

9.1.3 Security Measures

Caution:
The installation personnel working at heights must wear the safety belt, and those working on ground must wear the safety helmet. They must wear working clothes and shoes causing no slips when climbing up the tower.

1. Safety precautions should be stressed to the installation personnel.
2. The outdoor installation should be conducted in sunny days without strong wind.
3. Obvious signs should be set in the installation site to notify irrelative people to keep away from the site. The installation personnel working on ground are obligate to keep irrelative people, esp. children away from the site. The tools used on the tower and some metal components might slip to cause casualties, so they must be put in a canvas tool bag when not used, and the bag must be sealed immediately after you open it for a tool or component.

9.1.4 Installation Tools

1. Measurement tools: A compass, multimeter, inclinometer and tape measure;
2. Communication tools: Two mobile phones;
3. Raising tools: Pulley and rope;
4. Special tools: Cutter for cutting primary feeder cables and tools for assembling connectors;

5. General tools: Adjustable wrench, sharp nose pliers, diagonal pliers, electrical knife, file and hacksaw;
6. Protection tools: Safety belt, safety helmet, safety rope, thick working clothes, RF prevention clothes, canvas tool bag, gloves, and multi-purpose sockets;
7. Other tools: Herringbone ladder and the wooden wheel axis for uplifting the primary feeder cable (which can be borrowed locally).

9.2 Composition of GPS Antenna Feeder System

See Fig. 9.2-1 for the composition of the GPS antenna feeder system.

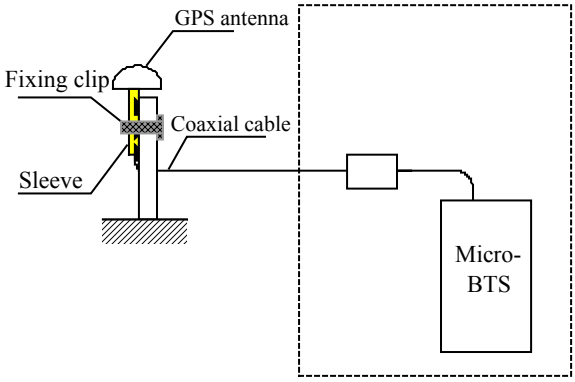


Fig. 9.2-1 Composition of the GPS Antenna Feeder System

9.3 Installation Procedures

As the CDMA clock and frequency reference, GPS plays a very important role. The GPS antenna receives navigation and position signals of GPS satellites, demodulates frequency and clock signals through a GPS signal receiver and provides these signals to related elements of CDMA BTSs.

1. Requirements on GPS antenna installation

   The GPS antenna should be installed in an open and high place, so that it can trace more satellites, for example, on the top of a building or on a tower. Make the GPS feeder cable as short as possible to minimize the attenuation.

   The GPS antenna should be installed in the lightning protection area of the tower; otherwise, a lightning rod should be customized and installed for the GPS antenna.

2. Assembly of a GPS coaxial cable connector

1) Strip the a segment of sheath off the GPS coaxial cable as required in Fig. 9.3-1.

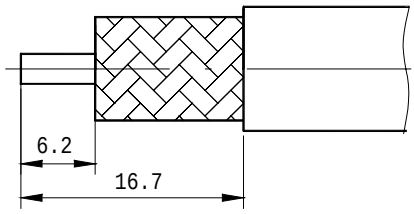


Fig. 9.3-1 Schematic Diagram of Length of Cable Sheath to be Stripped

2) Assemble the components onto the cable as shown in Fig. 9.3-2. And then solder the core wire with the pin. Unfold the shielding layer and wrap it around the bushing.

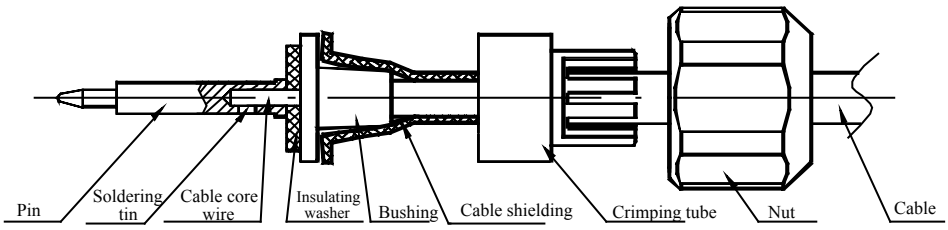


Fig. 9.3-2 Schematic Diagram of Soldering the Core Wire with the Pin

3) Assemble the components into the shell, as shown in Fig. 9.3-3.

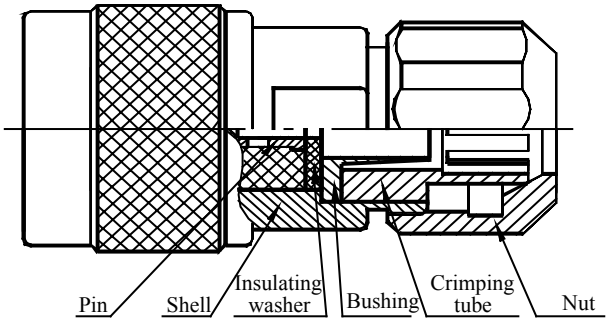


Fig. 9.3-3 Structure of N-J7A

3. Procedures to install the GPS antenna feeder system

1) Assemble an outdoor coaxial cable connector following the same steps mentioned above.

2) Insert the connector through the sleeve (a GPS accessory), and then lay the coaxial cable from the GPS antenna to the GPS lightning arrester.

3) Screw to connect the outdoor coaxial cable connector with the GPS antenna connector.

4) Screw the sleeve onto the GPS antenna, keeping the GPS antenna unmoved.

5) Secure the tube on the antenna pole with a fixing clip.

6) Cut the coaxial cable based on the installation position of the GPS lightning arrester. Assemble the indoor cable connector and then connect it with the lightning arrester. Do not wrongly connect the equipment terminal and antenna feeder terminal of the GPS lightning arrester.

7) Lay the coaxial cable from the GPS lightning arrester to the GPS port of a micro-BTS.

9.4 Test of Antenna Feeder System

1. After the antennae are installed and all feeder cables are connected, measure the standing wave ratio of them.
2. Measure one end of the indoor 1/2" jumper cable, which is to be connected with the cabinet, with the tester. The standing wave ratio should be lower than 1.5. It is best to be lower than 1.3.
3. Record the VSWR value and provide the VSWR test diagram.

10 Installation of Internal Modules

🕮 Summary

- Describing the modules in a micro-BTS/remote station.
- Describing the functions of the modules.
- Describing the flow of installing the modules.

10.1 Overview

10.1.1 Logical Positions of Equipment Modules

The modules and boards in M800T/M801T/M802T/M190T/M191T/M192T micro-BTS are positioned as shown in Fig. 10.1-1.

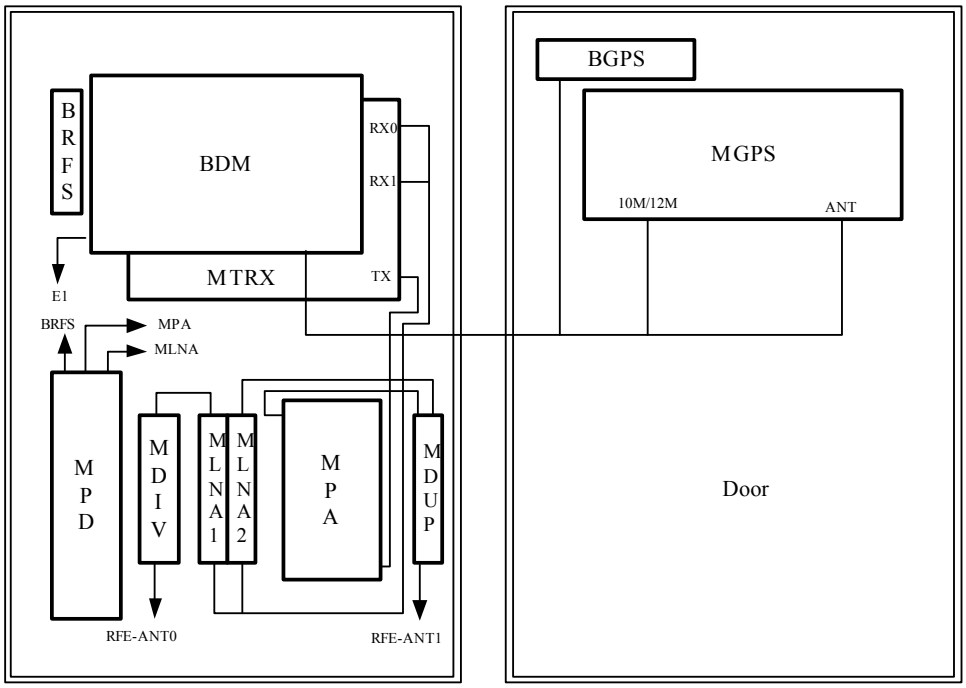


Fig. 10.1-1 Modules and Boards in M800T/M801T/M802T/M190T/M191T/M192T Micro-BTS

The modules and boards in R800T/R801T/R802T/R190T/R191T/R192T remote stations are positioned as shown in Fig. 10.1-2.

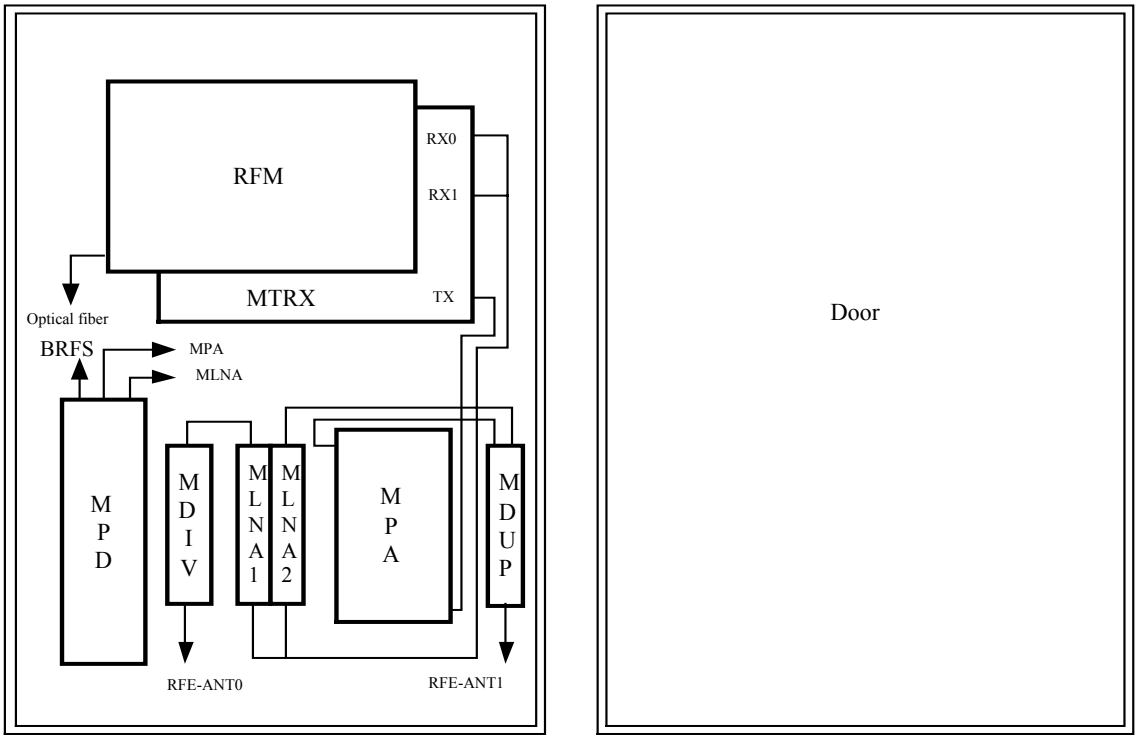
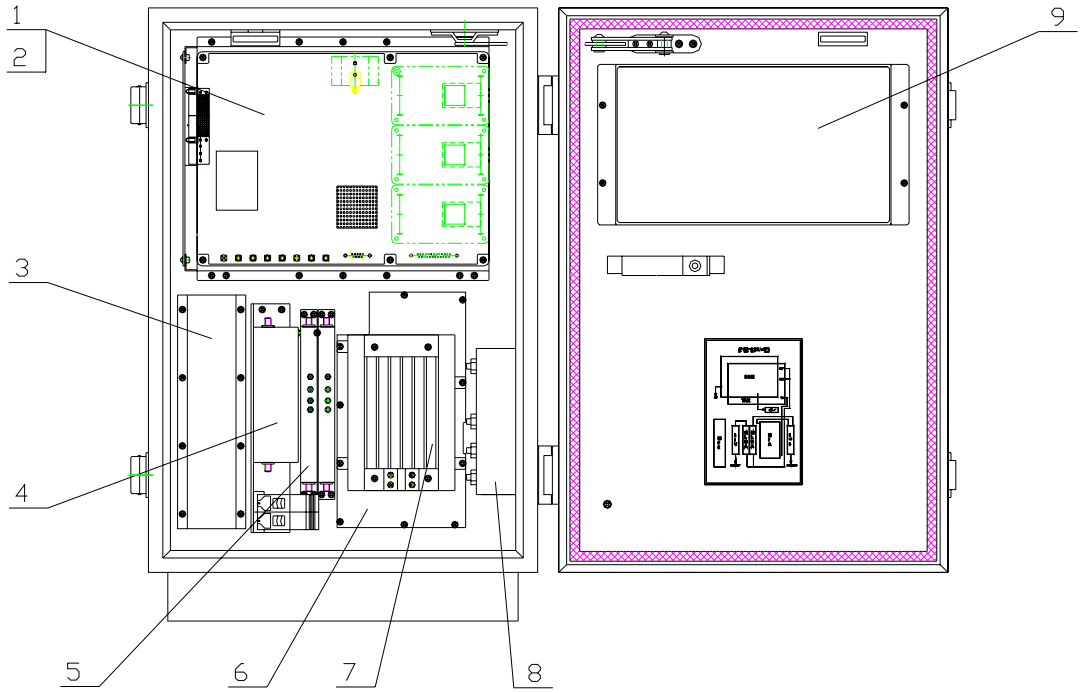


Fig. 10.1-2 Modules and Boards in R800T/R801T/R802T/R190T/R191T/R192T

10.1.2 Layout of Internal Modules

A ZXCBTS micro-BTS is composed of Micro Transmitter & Receiver (MTRX) module, Micro Low Noise Amplifier (MLNA) module, Baseband Digital Module (BDM) module, Micro GPS (MGPS) module, Micro-BTS Power Distribution (MPD) 400W module, DIVersity (DIV) module, DUPlexer (DUP) module and Micro Power Amplifier (MPA) module, as shown in Fig. 10.1-3.

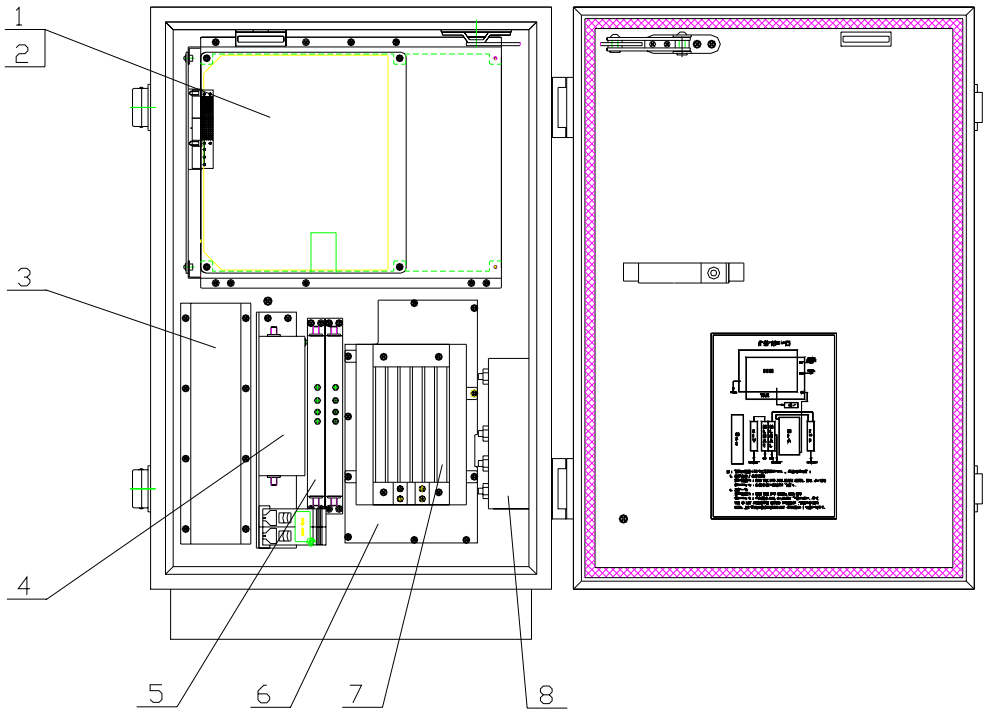


1 MTRX 2 BDM 3 MPD400W 4 DIV

5 MLNA 6 MPA 7 Heater 8 DUP 9 MGPS

Fig. 10.1-3 Layout of Modules in a ZXCBTS Micro-BTS

A ZXCBTS remote station is composed of MTRX module, MLNA module, Remote Fiber Module (RFM), MPD 400W module, DIV module, DUP module and MPA module, as shown in Fig. 10.1-4.



1 MTRX 2 RFM 3 MPD400W 4 DIV

5 MLNA 6 MPA 7 Heater 8 DUP

Fig. 10.1-4 Layout of Modules in a ZXCBTS Remote Station

10.1.3 Functions of the Modules

The following modules and accessories need be installed:

1. BDM

   BDM is the core module of a ZXCBTS micro-BTS, which completes the modulation & demodulation of baseband data, signaling processing, resources management and operation & maintenance functions.

2. MTRX

   MTRX provides interfaces to BDM and sends transmitted or received basedband data as well as the information on configuration, control, status and alarms. It achieves up conversion, intermediate frequency bandpass filter, transmit link gain control and signal amplification on forward links. Moreover, it

accomplishes down conversion, signal amplification and bandpass filter on reverse links.

MTRX800 is used in M800T/M802T micro-BTS/remote stations, whereas M190T/M191T/M192T micro-BTS/remote stations adopt MTRX190.

3. MPA

MPA receives CDMA signals transmitted by MTRX and then amplifies the power of the signals, which are finally emitted to a cell through the antenna after being processed by a duplexer filter.

M800T micro-BTS/remote stations adopt MPA800; M802T micro-BTS/remote stations adopt MPA802; M190T/M191T micro-BTS/remote stations adopt MPA190T; M192T micro-BTS/remote stations adopt MPA192.

4. RFE

Receive Front Element (RFE) consists of MDUP (Duplex), MDIV (Diversity) and MLNA.

On reverse links, the signals received by the antenna are filtered by the duplexer filter and then amplified.

On forward links, the signals outputted by MPA are filtered by the duplexer filter and then emitted to the cell through the antenna.

5. MPD

MPD directly converts the 120V AC power into the power with suitable voltage and supply the power to all modules in a micro-BTS/remote station. Moreover, it controls the heater in a micro-BTS/remote station to maintain the internal environment stable. It also supports the monitoring of the power supply status.

6. Optical interface module

There are two kinds of optical interface modules used: OIM and RFM, which are respectively installed in a micro-BTS and a remote station. They accomplish the following functions:

1) Connecting BDS and RFS, providing channel for multiplexing and demultiplexing forward/reverse data and signaling, and carrying out optical-electrical conversion.

2) Multiplexing and demultiplexing LVDS signals.

3) Providing 12MHz (800MHz) or 10MHz (1.9GHz) analog signals to the RF subsystem.

4) Measuring the transmission delay of LFM (OIM) and RFM, and reporting the signal to RF Control Module (RFCM) through Integrated Circuit Interface Circuit (IIC) bus CM to compensate the transmission delay on Channel Processing Module (CHM).

5) Reporting the alarm signals about temperature, humidity, and access control generated in a remote station to RFCM.

6) Offering communication links between MPA and RFCM.

7) Monitoring important signal, for example, 16chip.

7. GPSTM

   GPSTM functions in providing 16chip or pp2s clock signal, 10MHz reference signal and TOD messages.

10.2 Module Installation Flow

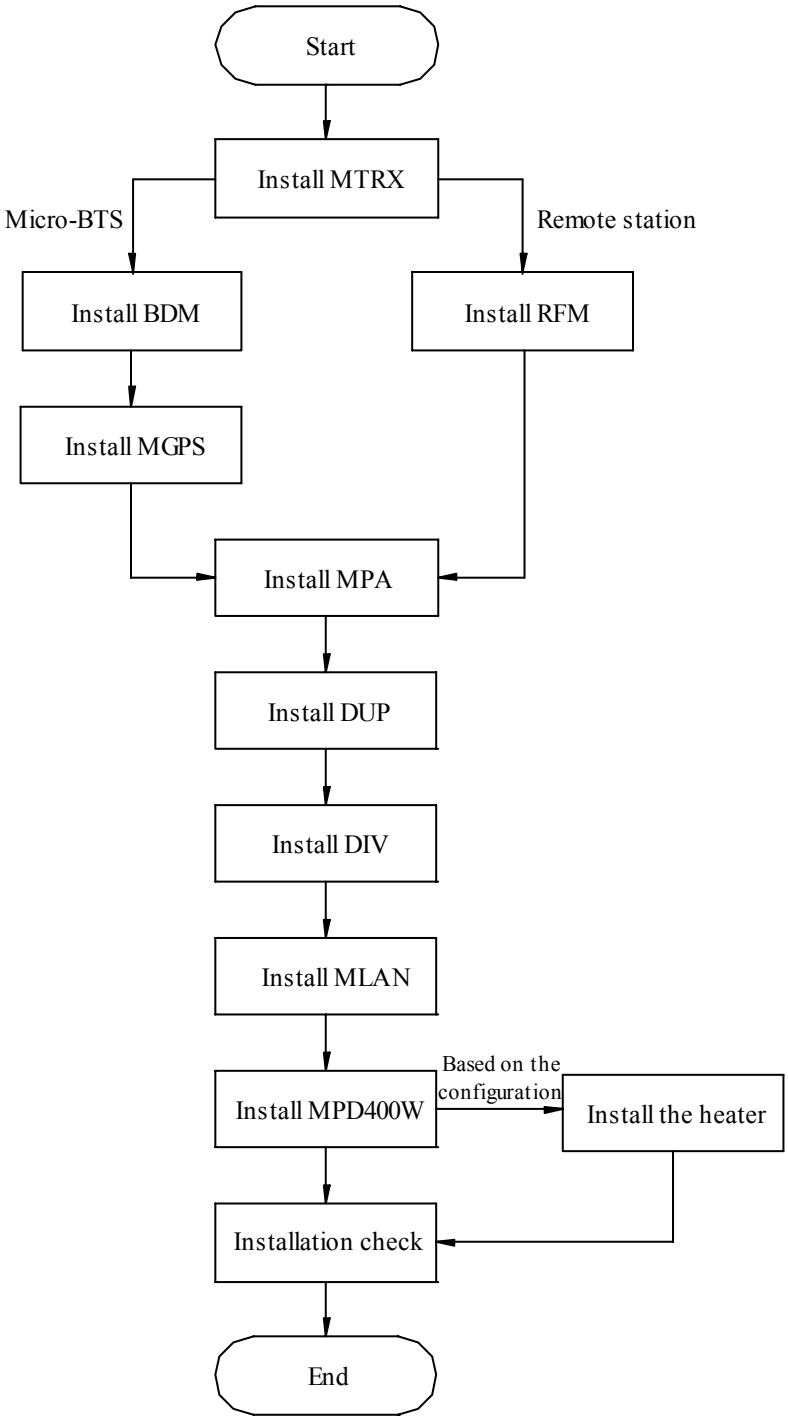


Fig. 10.2-1 Module Installation Flow Diagram

10.3 Installation and Replacement of Modules

> **Note**
> **The modules and cables in Micro-BTS/remote stations have been installed, connected and tested before delivery. Before commissioning, you only need to check if they are loose due to conveyance.**
> **According to the configuration requirement, you might need to add optical fiber modules or CSM5000 expansion modules in the expansion slots of the corresponding BDM board.**
> **If any fault occurs, the maintenance personnel can refer to this manual for simple maintenance.**

10.3.1 Installation Sequence

> **Note**
> **This section describes the sequence of module installation and cable connection in an M800 micro-BTS. Refer to this sequence for the installation in M801T/M802T/M190T/M191T/M192T/R800T/R190T/R191T/R192T micro-BTS.**

1. Install MTRX, BDM and BRFS.
2. Install T1 lightning arrester and lay T1 cables.
3. Connect Terminal B of DCDX02 and RSTDX to MPA and BRFS respectively, and bundle the cables with cable ties on the cable tie bases.
4. Install MPD, BGPS, MGPS, MDIV, MLNA, MPA, RF and GPS lightning arrester.
5. Lay interconnection cables between modules, access control cable and door grounding cable, and connect the antistatic wrist strap.
6. Connect Terminal B of the RF cable RF27 to MDUP_ANT loosely. Next, install MDUP in the cabinet and then fasten it. Finally, connect the other two RF connectors on MDUP.
7. Install the heater, power lightning arrester and connect the relative cables (including ACDX01).

10.3.2 Table of Cable Connections

Refer to Appendix B.

10.3.3 Fastening and Bundling of Internal Cables

1. Fastening coaxial cables

   For semi-rigid coaxial cables, connect both ends to the corresponding terminals firmly.

2. Bundling of GPS-BDM conductive wires and RF cables RF29/RF30

   See Fig. 10.3-1.

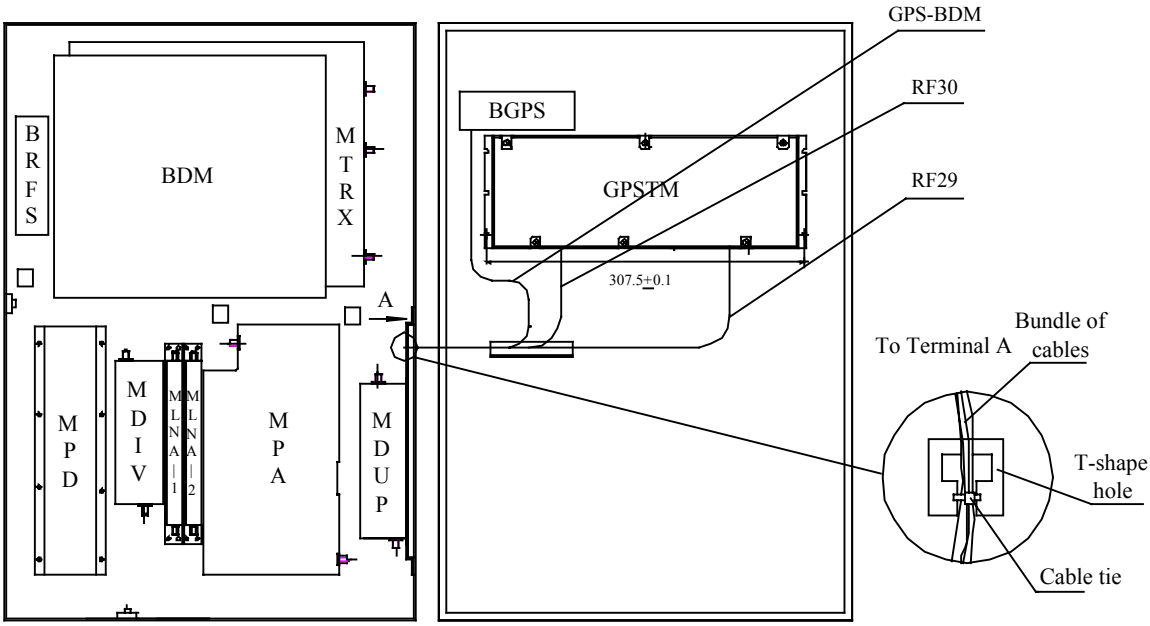


Fig. 10.3-1 Schematic Diagram of Bundling Internal Cables (1)

Bundle the cables RF29 and RF30 on the door and the grounding cable of the antistatic wrist strap in the inner side of the bundling plank, while bundle the GPS-BDM cables in the outer side of it, as shown in Fig. 10.3-2.

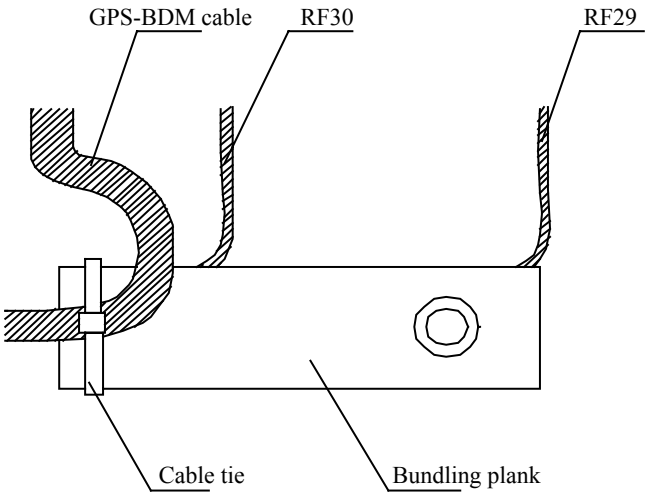


Fig. 10.3-2 Schematic Diagram of Bundling Internal Cables (2)

3. Bundling of DCDX01, DCDX02, RSTDX, MONDX01 and MONDX02 cables

Bundle the cables DCDX01, DCDX02, RSTDX, MONDX01 and MONDX02 with cable ties on the cable tie bases, as shown in Fig. 10.3-3.

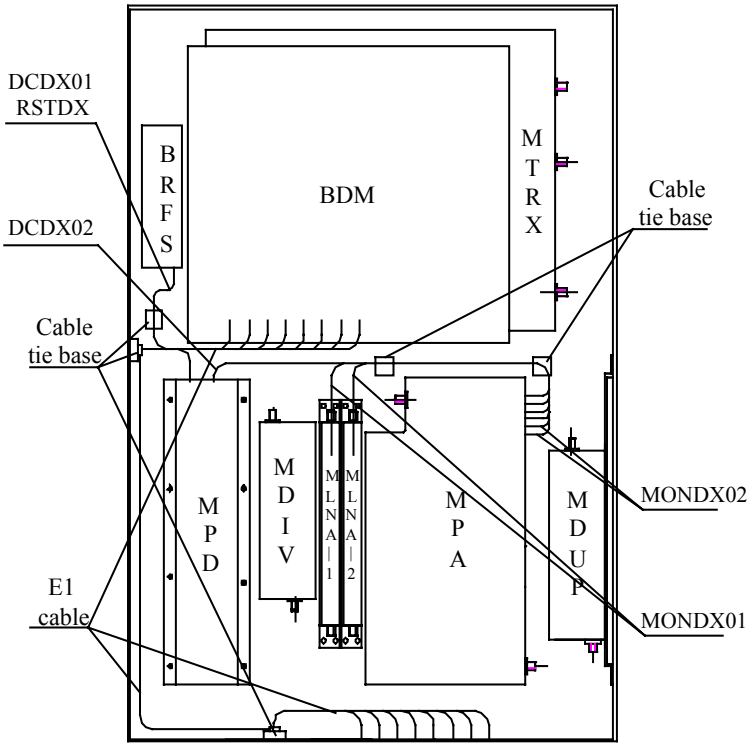


Fig. 10.3-3 Schematic Diagram of Bundling Internal Cables (3)

4. Cabling of T1 cables in the cabinet

The T1 lightning arrester is equipped with two T1 cables. Before connecting the T1 lightning arrester with the cabinet, label the T1 cables at the position near the connectors with “OUT#” or “IN#” (#=1, 2, 3 or 4”).

“OUT#” and “IN#” should be the same as “OUT” or “IN” marked on the cable outlets at the back of the lightning arrester. When installing the T1 lightning arrester, ensure that the serial number “#” marked on the T1 cables is consistent with the silk-screen at the bottom of the BDM and the cabinet.

To facilitate recabling the T1 cables connected with the lightning arrester, these T1 cables should be laid along the upper edge inside the cabinet, and the cable tie bases should be installed at the positions convenient for uninstallation. See Fig. 11-8. It is suggested to bundle the T1 cables with cable ties every 150mm.

10.3.4 Installation of OIM

If a micro-BTS need be configured as a remote station, an OIM should be added on the BDM of the micro-BTS.

See Fig. 10.3-4 for the corresponding relations between the OIM expansion slots in BDM and the sectors.

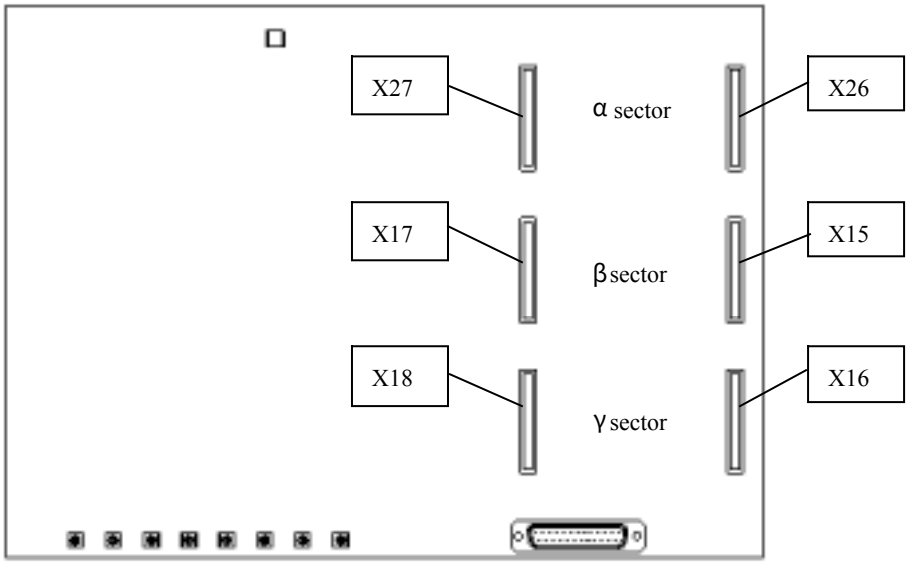


Fig. 10.3-4 Corresponding Relations between OIM Expansion Slots in BDM and Sectors

When inserting the OIM into the BDM, make the interface of the optical module on the OIM face outward to ensure that optical fibers can be inserted into the optical module of the OIM from the right side of the BDM, as shown in Fig. 10.3-5.

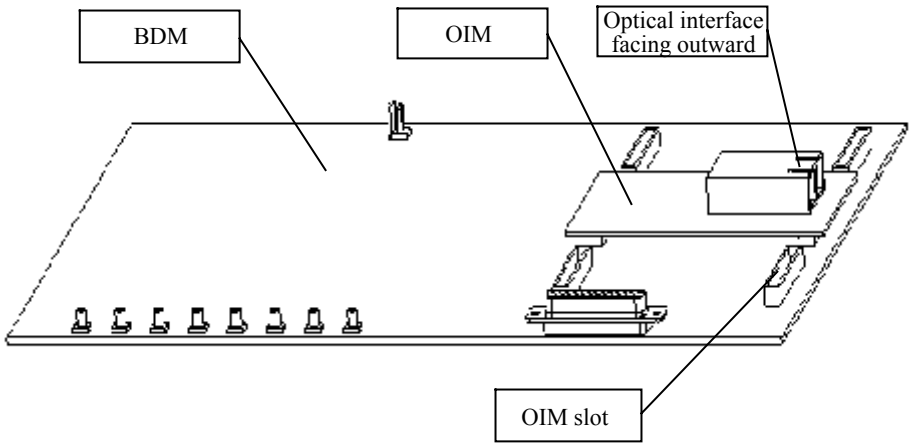


Fig. 10.3-5 Schematic Diagram of Inserting the OIM into the BDM

10.3.5 Installation of LFM

If a remote station need be configured for a macro-BTS, it is only necessary to replace TRX of a sector with LFM by just inserting LFM into the TRX slot in the TRX layer of the macro-BTS without changing any cable connections on the backplane. The RF modules such as TRX, HPA and RFE need not be installed in the macro-BTS.

Refer to “7.2.1 Connecting Optical Fiber” for the connection with LFM and the cabling of optical fibers in a macro-BTS.

10.4 Points for Attention

1. Main tool: Philips screwdriver.
2. When installing MPA and MPD400W, cover the place between the MPA/MPD400W and the main radiator with silicon.
3. The modules should be installed firmly and reliably.

11 Hardware Installation Check

🕮 Summary

- Describing the hardware installation check items

11.1 Checking Components in the Cabinet

Check if:

1. The RF cables between the modules are connected correctly and firmly.
2. The bolts of all modules are screwed down to ensure reliable connections between the modules and the backplane.
3. The unused connectors are screwed with matching terminals.
4. The RF cables are not cross-connected or pulled too tight. Some margin is reserved at the turning corner and the connectors are connected firmly.

11.2 Checking the Cabinet

Check if:

1. The installation position of the cabinet complies with the design requirement.
2. After the shelf is fixed, it is stable enough to resist earthquake of 7 in Richter scale.
3. No part of the shelf is loose or damaged. The shelf is well painted and the indications on the shelf are complete, correct and clear.
4. No metal scraps or useless wires are left in the cabinet.
5. All bolts are screwed down, and flat washers and spring washers are installed without inversion.

6. The cable outlet at the bottom of the cabinet has been covered with the cover plate after the cables are connected.
7. The combined cabinets are arranged in order and the connecting pieces on the top of the cabinets are fastened firmly.
8. The surface of the cabinet is clean, the paint has no blemishes, and various indications on the surface are correct, clear and complete.
9. The front door can be opened or closed flexibly.

11.3 Checking Cables

Check if:

1. All cables are laid straight and there are no cross-connections. Surplus cables are coiled, bundled and put in the cabling trough.
2. The cables are turned smoothly.
3. Power cables and signal cables are laid separately with a distance of more than 150mm.
4. All cables are labeled clearly at both ends to avoid wrong or missed connections.
5. The joints are reliable and well contacted without breaks or bends.
6. The cables are tied with proper tightness, and the cable ties are distanced evenly.
7. Surplus part of the cable ties for indoor cables has been cut.
8. Some margin is reserved when the cable ties used on outdoor cables are cut.
9. No cable tie has spininess part after being cut.
10. All cables are stuck with labels indicating the usage, and the contents in the labels at both ends are the same.
11. Stick the labels with transparent adhesive tape to prevent them from falling off.

11.4 Checking Power Cables and Grounding Cables

Check if:

1. The cabling of power cables and grounding cables conforms to the design requirements.

2. The PGND cable of the micro-BTS adopts the olivine or yellow copper-core cable with the cross-section area of 35mm^2, which is connected to the indoor PGND copper busbar reliably. The GND/BGND cable adopts the black copper-core cable with the cross-section area of 25mm^2. The -48V power cable adopts the blue copper-core cable with the cross-section area of 25mm^2. All these cables are laid straight and connected reliably.
3. The grounding bus wire is directly connected to the indoor grounding busbar. The cross-section area of the grounding bus wire is more than 50mm^2.
4. Each terminal of the grounding copper busbar is connected with only one device.
5. PGND cables and AC neutral cables are laid separately.
6. AC neutral cables are grounded independently in the power room.
7. The indoor grounding resistance is less than 5 ohm.
8. Each cable is marked correctly and clearly.
9. Power cables are not bundled with other cables but separately.
10. The surplus part of the grounding and power cables are cut.
11. The copper lugs at both ends of power cables and grounding cables are welded or crimped well.
12. There is no joint (between two pieces of cables) for a piece of power cable or grounding cable.
13. The grounding copper busbar is insulated from the wall, and the grounding path is as short as possible.
14. The primary power supply is connected to the power terminal on the shelf correctly.
15. The opening lug of power cables are welded or crimped firmly.
16. Power cables are well contacted with the copper lugs and sealed with adhesive tape. The copper lugs are reliably connected with the power cabinet or BTS shelf.
17. The power terminals on the top of the shelf are equipped with insulation tubes.
18. No power cable, grounding cable, trunk cable or RF cable is broken.

19. The labels at both ends of the power cable and ground cable should be clear and correct.
20. The naked wires at the wiring terminals and the handles of cable lugs are wrapped with insulation adhesive tape or heat-shrink tube.
21. Each wiring terminal is installed with a flat washer and a spring washer.

11.5 Checking T1 Cables

Check if:

1. T1 cables are not short-circuited and the connectors are not damaged.
2. T1 cables are connected correctly and stuck with clear labels.
3. T1 cable connectors are firmly connected. Use the multimeter to test if the connectors are well connected with the grounding system. If the test result is negative, it might be caused by the poor contact between the flange of the connectors and the chassis.
4. T1 cables are laid loosely to ensure firm connection with the connectors of the shelf when the cabling rack moves up and down.
5. T1 cables are connected firmly and reliably.

11.6 Checking Indoor 1/2” Jumper Cables

Check if:

1. The primary feeder cable is connected with the 1/2” jumper cable, which is then connected to the wiring terminal on the top of the shelf.
2. The indoor 1/2” jumper cables are stuck with labels indicating the corresponding sector and the length of the primary feeder cable.
3. The indoor jumper cables are cabled and bundled neatly.
4. The cabling is convenient for future maintenance and expansion.
5. The jumper cables are laid in different layers and sectors.
6. The jumper cable at the joint with the lightning arrester keeps straight for 30cm long.

11.7 Checking Primary Feeder Cables and GPS Feeder Cables

Check if:

1. The primary feeder cables are cut by a dedicated cutter. The cross-section is smooth and no copper scraps are left in the copper pipe of the primary feeder cable. The connectors of the primary feeder cables are installed firmly.
2. The 7/8” feeder cable connectors are installed firmly to ensure normal standing wave ratio.
3. The feeder cables are grounded at least three times as required (Refer to 6.2.3.1). The grounding points are connected firmly and sealed well. The end of the cable grounding kit for connecting the grounding cable is downward so that rainwater will not flow into the feeder cable along the grounding cable.
4. One feeder cable grounding kit is installed in the middle of the tower if the tower is more than 60m high.
5. One lightning grounding kit is installed on the top of a building or on the cabling rack if the length of the feeder cable after leaving the tower before entering the equipment room is more than 20m.
6. The terminals of the feeder cable grounding kit are fixed separately onto the tower.
7. The outdoor grounding copper busbar is connected with the underground grounding net by the dedicated cable whose cross-section area is more than $50mm^2$.
8. The antenna feeder system on the top of a building is connected to the nearby lightning grounding net.
9. The cabling ladder for leading the feeder cable from the building top along the wall to the equipment room is grounded.
10. The inclination between the feeder cable and its grounding cable is less than 15°.
11. The feeder cables are laid neatly, neither cross-connected nor broken or twisted. The connections with the sectors are correct.
12. The minimum bending radius of feeder cables is 20 times of the semi-diameter of feeder cables or more. The bending radius of the primary feeder cables is larger than 0.3m.

13. The primary feeder cables of one sector are arranged in one row and they are queued the same in each row.
14. No copper part of the feeder cable connectors is exposed. Same labels are stuck at both ends of a feeder cable with the cable length recorded.
15. The GPS core wire is not falsely soldered.
16. The GPS copper core is not short-circuited with the outer layer, and the core pins of the GPS feeder cable connectors are not exposed.
17. The GPS feeder cable connectors are fastened tight.

11.8 Checking Water-blocking Curve for Feeder Cable Window and Primary Feeder Cables

Check if:

1. The feeder cable window is fixed on the wall in the equipment room, and the protruding holes of the feeder cable window are outward faced.
2. The glue-injecting hole on sealing gasket of the feeder cable window is sealed upward. The window boards are installed in the indoor side of the window.
3. The feeder cable window installed on the top of a building is well sealed.
4. The lowest point of the water-blocking curve is at the place 10cm-20cm under the feeder cable window.
5. The minimum bending radius of feeder cables is 20 times of the semi-diameter of feeder cables or more. The bending radius of the primary feeder cables is more than 0.3m.
6. Keep a minimum length of 0.5m of straight feeder cable both in and out of the equipment room. There should be at least 0.3m of straight feeder cable in length through the lightning arrester.

11.9 Checking Hangers

Check if:

1. The hangers are fastened firmly on the outdoor cabling rack.
2. The fixing clips installed are evenly distanced.

3. The hangers are installed on the primary feeder cables every 1.5m..

11.10 Checking Outdoor 1/2” Jumper Cables

Check if:

1. The connections between the antenna and the 1/2” jumper cable as well as the 1/2” jumper cable and the primary feeder cable are correct. Their joints are tightened.
2. The jumper cable connected with the antenna is laid along the beam of the antenna mount and bound to the tower.
3. The joints between the antenna and the 1/2” jumper cable as well as the 1/2” jumper cable and the primary feeder are sealed as required (Refer to 9.4.6 and 9.6.6).
4. The jumper cable keeps straight with the antenna for 30cm long at their joint.
5. All the connectors of outdoor jumper cables are sealed and water-blocking curve is made for jumper cables.

11.11 Checking Antenna

Check if:

1. The antenna mount is connected firmly with the tower.
2. The type of the antenna installed meets the requirement of the networking plan.
3. The height from the center of the antenna to the ground and the installation position of the antenna comply with the networking plan.
4. The RF antenna and the GPS antenna are installed in the area protected by the lightning rod.
5. The azimuth angle of each single-polarized directional antenna conforms to the networking plan. Two antennae of one sector are oriented to the same direction. The deviation of the azimuth angle of a directional antenna is within +/-5°.
6. The pitch angle of each single-polarized antenna conforms to the networking plan. The deviation of the pitch angle of a directional antenna is within +/-0.5°. The pitch angle of two single-polarized antennae is the same.

7. There are two types of antenna: the pointer-modulated antenna and digital-modulated antenna. Adjust the former with a spanner and modulate the latter by setting the exact value in the equipment room. When the control line connecting the antenna is broken, you must adjust the antenna with a spanner. You must measure every single-polarized antenna. For digital-modulated antenna, keep the lower obliquity the same as planned, and keep consistency between the two single-polarized antennae.
8. All antenna poles are installed stably and grounded well. They are vertical to the ground, with the deviation within 2°.
9. The transceiving distance of omni antennae is no less than 3.5m.
10. The distance between an omni antenna and the tower is more than 1.5m, and that between a directional antenna and the tower is more than 1m.
11. The top of the jacket of an omni antennae is level with or higher than the antenna mount.
12. The distance between an omni antenna and the antenna lightning rod is no less than 2.5m when the antenna situates on the rooftop.
13. An omni antenna can cover all areas when it is installed on the rooftop.
14. The diversity antenna of each sector corresponds with the jumper cables on top of the shelf.
15. The diversity distance between two antennae of one sector refers to the vertical distance between two antennae. The diversity distance is more than 3.5m for a 800M micro-BTS/remote station; the diversity distance for a 1.9G micro-BTS/remote station is more than 1.5m; the diversity distance is more than 6.7m for a 450M micro-BTS/remote station.
16. The vertical distance between two directional antennae of different sectors installed on the same antenna mount is more than 0.6m.
17. The antennae are separated from G-network antennae, distancing more than 1m vertically and more than 2m horizontally.
18. The GPS antenna is installed in an open, low and safe place. It is vertical and its solid angle is bigger than 90°.
19. A lightning rod is installed specially for the GPS antenna situated on rooftop.

11.12 Checking Standing Wave Ratio of Feeder Cables

1. After the antennae are installed and all feeder cables are connected, measure the standing wave ratio of them.
2. Measure one end of the indoor 1/2” jumper cable, which is connected with the cabinet, with the tester. The standing wave ratio should be lower than 1.5. It is best to be lower than 1.3.
3. Record the VSWR value and provide the VSWR test diagram.

11.13 Checking Indoor and Outdoor Environment

Check if:

1. All waste materials are cleared, and the outdoor environment is clean.
2. The equipment room is clean and neat, and all things needed are arranged in order.
3. No waste materials such as cable ties, cables and desiccant bags are left around/under the shelf and under the raised floor.
4. The front door, rear door and side panels are cleaned so that no touch prints can be seen. There is no dust or scrap in the cabinet.

12 Power-on and Power-off

🕮 Summary

- Describing the power-on check items
- Describing the procedures to power on/off a micro-BTS/remote station

12.1 Checking Components in the Cabinet before Power-on

Open the cabinet to check if the modules are installed firmly and the cables are connected reliably.

Insert the OIM and the CSM5000 into the cabinet.

Set the PATH ID by setting the DIP switch on the BDM based on the T1 cable connections with the CDSU of the BSC. See Fig. 12.1-1 for the setting of the DIP switch.

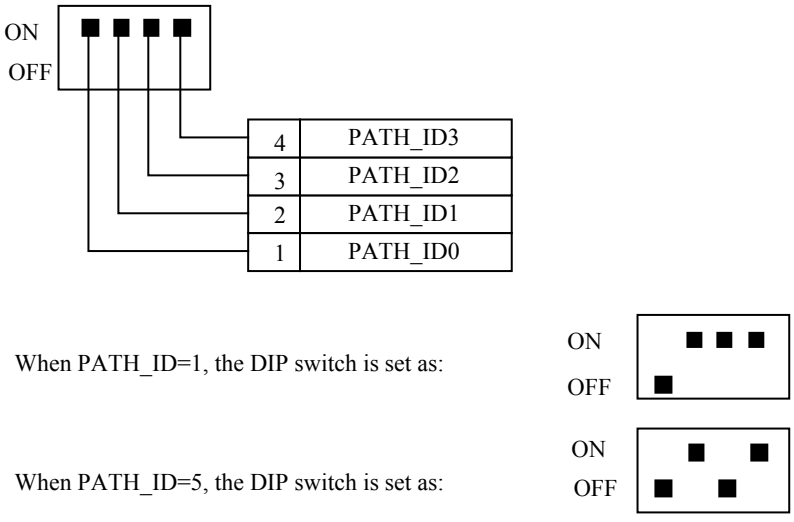


Fig. 12.1-1 Setting of S1

12.2 Checking External Cables before Power-on

1. Use the multimeter to measure if the 120V AC power meets the requirement.
2. Check if the connector of the 120V AC power cable is connected firmly.
3. Check if T1 cable connectors are connected tight.
4. Check if the optical fibers are connected correctly.
5. Use the tester to check if the standing wave ratio of the antenna feeder system is lower than 1.5. It should be lower than 1.3 generally. Check if feeder cable connectors are assembled correctly, and if the feeder cables and antennae are in good condition.
6. Check if correct labels are stuck on the cables firmly.

12.3 Powering on/off the Cabinet

No power switch is configured in micro-BTS or remote stations, so you need to power on/off them by plugging/unplugging the power connector or powering on/off the power supply equipment.

After power-on, debug the BTS through the BSC.

13 Installing the Integrated Micro-BTS

🕮 Summary

- Describing the installation of the integrated built-in SDH of the micro-BTS
- Describing the installation of the integrated UPS of the micro-BTS

13.1 Introduction to the Solution of Micro-BTS Integration

13.1.1 Implementation of the Micro-BTS Integration

The micro-BTS integration solution integrates the transmission, power and micro-BTS technologies and devices to provide users with an integrated networking solution. The core of the CDMA micro-BTS integration of ZTE Corporation lies in the built-in SDH. Through improvement on the structure and cabling process of the micro-BTS and change of related boards, the SDH board is built into the micro-BTS. In addition, the integrated UPS is added to the micro-BTS to provide the micro-BTS with the interfacing and monitoring functions over the backup power supply (UPS power supply and combinational power supply) and other devices. Meanwhile, the functions of secondary power-off and dry contact monitoring are added to address new requirements. The built-in SDH and integrated UPS are optional for micro-BTS configuration. The following modifications to the micro-BTS are required if this function is to be added to the micro-BTS:

1. BDM modification: Add the half-duplex RS485 monitoring interface and three dry contacts (input), no longer support the RS232 monitoring interface;
2. RFM modification: Add six dry contacts (input), not to support the RS485 and RS232 monitoring interface;
3. SDH selection: For the consistency of internal cabling, the CC4 connector is to be used for the T1 interface on the built-in SDH board, corresponding to the

indoor T150 board for the transmission of this part. The indoor and outdoor T150 boards are the same except for the interface connector, that is to say, they are basically the same in terms of performance and reliability. Support of power supply: 24V and –48V input;

4. Improvement on cabling process: Consistent internal T1 cabling, that is, the same cabling can be inserted either to the BDM or the to built-in SDH to make upgrade and networking configuration more more convenient and flexible; internal cabling for the monitoring part;
5. Improvement on pinboard (bottom plate): Add a standalone built-in SDH power connector interface. The type of pinboard is settled on the 10W and 20W micro-BTS pinboard, 40W micro-BTS main cabient pinboard and 450M micro-BTS pinboard;
6. Add the lightning protection (class II) function for the monitoring part inside the cabinet with some lightning protection design on the board; furthermore, install an additional RS485/dry contact lightning protection board at the monitoring interface of the cabinet;
7. Modification of T1 lightning arrester: Because of the changed T1 cabling inside the cabinet, a longer coaxial cable may be needed for the T1 lightning arrester; in addition, codes of the T1 lightning arrester needs changing;
8. Improve the door panel structure of the micro-BTS, to build the SDH into the door panel of the micro-BTS.

13.1.2 Micro-BTS Integration Solution

Thanks to above improvements on the micro-BTS, the integration solution now poses as an even simpler one with more flexible configuration available. With the solution of the micro-BTS integrated with the backup power supply and transmission, the user's requirements are taken as the first priority. There comes two basic integration solutions for selection:

1. AC micro-BTS+UPS+built-in SDH, as shown in Fig. 13.1-1.

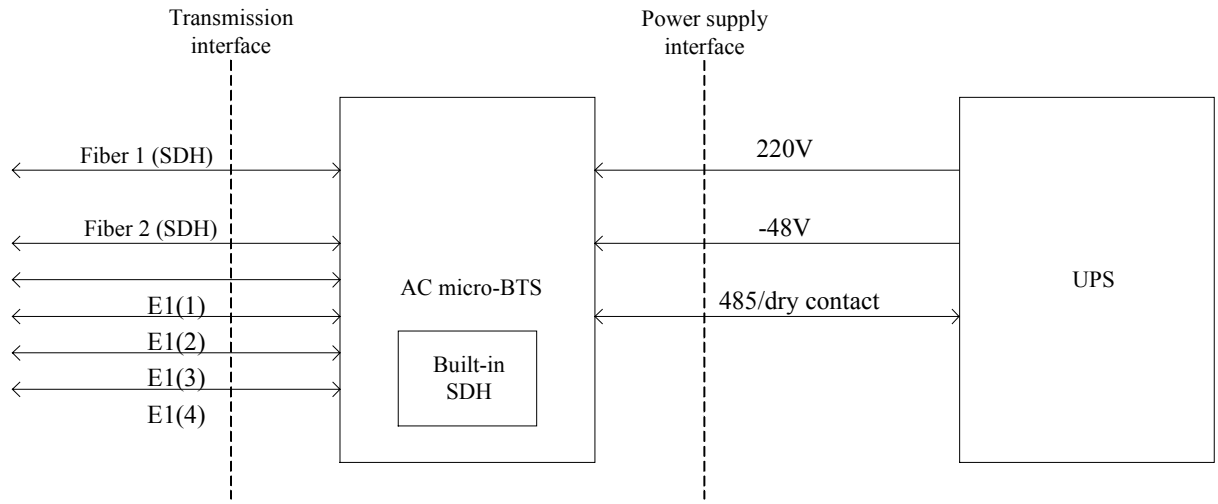


Fig. 13.1-1 Solution (I) of Micro-BTS Integration

In this solution, a ZTE ZXSM T150 transmission system serves as the built-in SDH system, and a ZTE ZXUPS L010 UPS power system serves as the UPS power supply.On the power interface, the UPS provides 120V and -48V power outputs to supply power for the micro-BTS and built-in SDH. Furthermore, the UPS provides secondary power-off function to guarantee the power supply of the built-in SDH in precedence.485 or dry contact are supported for the monitoring. There is only one monitoring interface at the micro-BTS side and this interface is compatible with the 485 and dry contact input, that is, it supports either the 485 or dry contact for the monitoring part. On the transmission interface side, two STM-1 optical interfaces are supported and a maximum of four T1 interfaces can be provided. In addition, the built-in SDH or BDM board can be selected according to the actual requirements.

2. DC micro-BTS+combinational power+built-in SDH, as shown in Fig. 13.1-2.

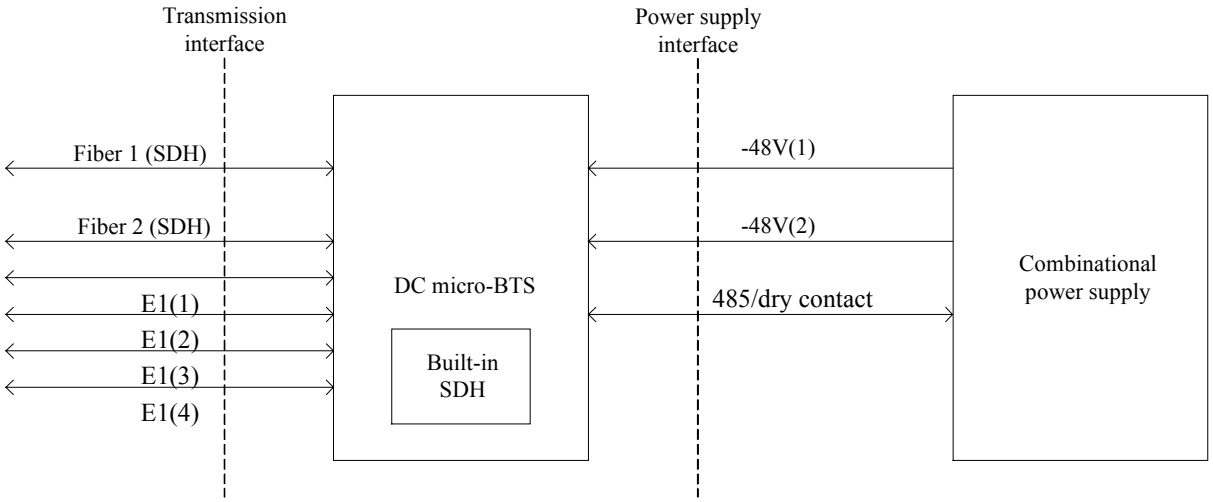


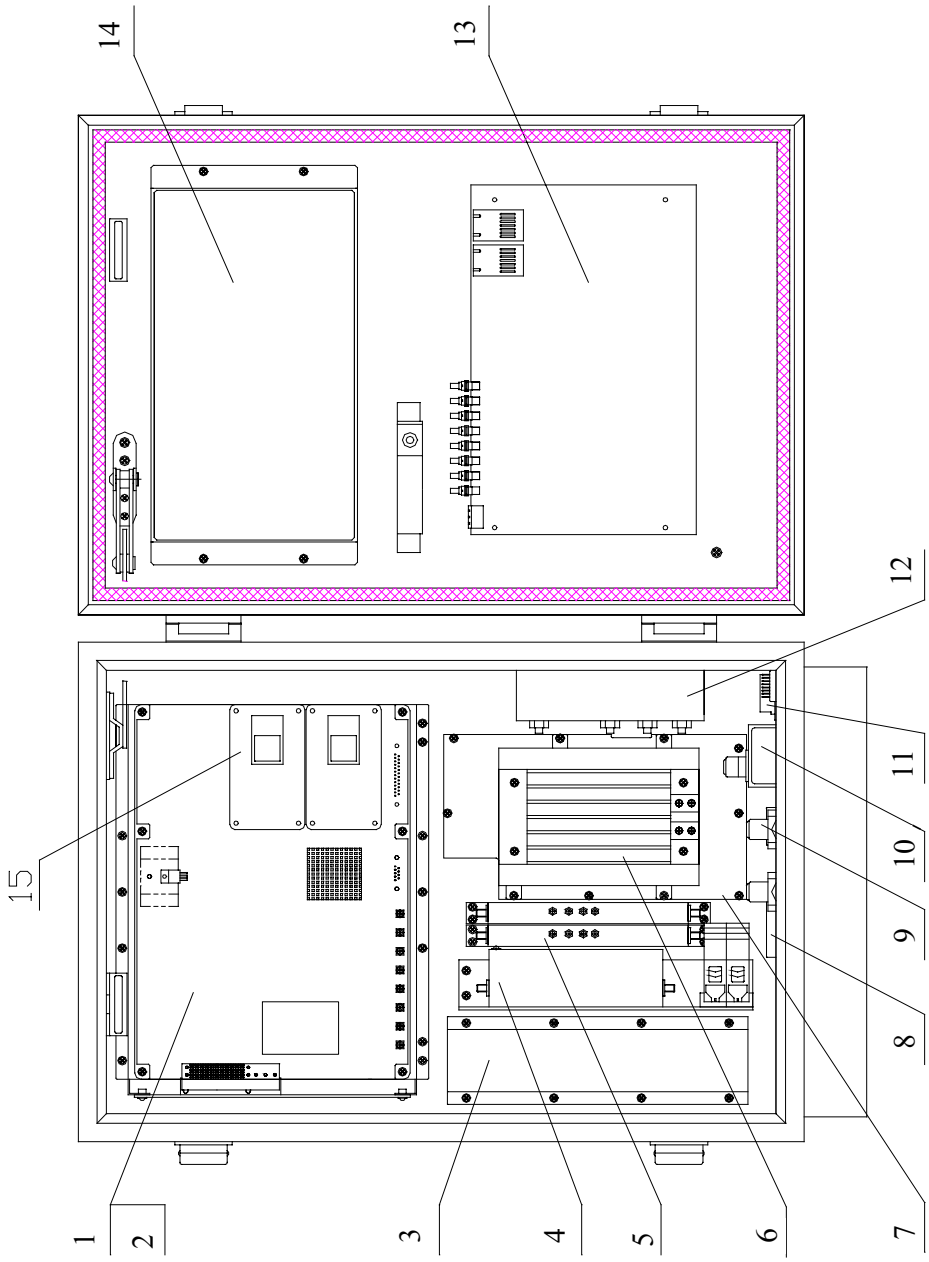
Fig. 13.1-2 Solution (II) of Micro-BTS Integration

In this solution, a ZTE ZXSM T150 transmission system serves as the built-in SDH system, and a suitable ZTE power system model may serve as the outdoor combinational power supply. On the power interface side, the combinational power provides two -48V power outputs to supply power for the micro-BTS and the built-in SDH, Furthermore, the combinational power system provides the secondary power-off function to guarantee power supply for the built-in SDH in precedence. The monitor part and the transmission interface part are the same as those in Solution I.

If the backup power is not available, the built-in SDH is also supported. However, the secondary power-off function cannot be implemented. To reduce power interfaces, the power of the built-in SDH can be supplied by the micro-BTS. In this case, a built-in 24V power and an SDH board are needed. Without the support of the backup power, if the electric power network is of poor quality, to reduce the influence of transmission interruption on the network due to power failure, it is recommended the configuration be used in a single station application only to avoid complicated SDH transmission networking.

13.1.3 Module Layout of the Integrated Micro-BTS and RF Remote Station

Fig. 13.1-3 shows the module layout inside the ZXCBTS integrated micro-BTS:



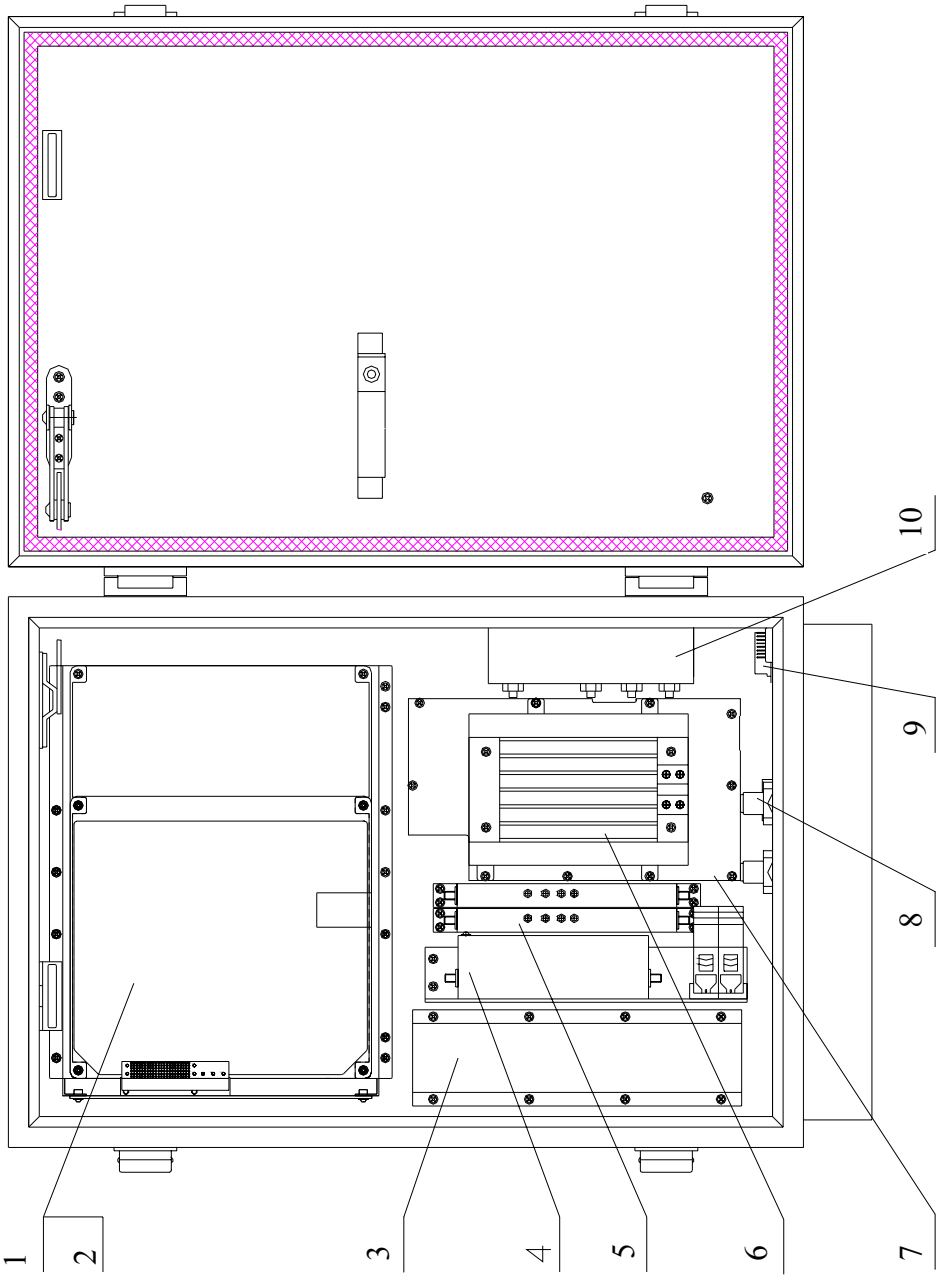
1 BDM module (top layer) 2 MTRX module (bottom layer) 3 power module 4 MDIV module 5 MLNA module 6. Heater

7 MPA module 8 T1 arrester 9 RF lightning arrester 10 MGPSTM lightning arrester 11 MTPB1 lightning-protection plate (the external 48VUPS should be built internally)

12 MDUP module 13 SDH board (if built-in SDH is necessary) 14 MGPSTM module 15 OIM board

Fig. 13.1-3 Layout of Modules in the ZXCBTS micro-BTS

Fig. 13.1-4 shows the module layout inside the ZXCBTS integrated RF remote station:



1 RFM module (top layer) 2 MTRX module (bottom layer) 3 power module 4 MDIV module 5 MLNA module

6 Heater 7 MPA module 8 RF arrester 9 MTPB1 lightning protection plate (the external 48VUPS should be built internally)

10 MDUP module

Fig. 13.1-4 Layout of Internal Modules of the ZXCBTS RF Remote Station

13.1.4 Networking Modes of the Integrated SDH

The built-in SDH technology is employed to make even more flexible networking of the micro-BTS and to address basically various networking requirements. The built-in SDH is a standard SDH STM-1 optical interface, which supports independent networking or networking with cooperation of an SDH device. The built-in SDH also supports directly fiber networking and has ring network protection capability. The built-in SDH cooperates with the SDH transmission equipment via standard T1 interfaces to flexibly support different networking modes such as point-to-point, chain, T-type, cross and ring modes and other hybrid networking modes. The built-in SDH micro-BTS supports independent networking or networking with cooperation of a standard SDH device.

13.2 Installing the Built-in SDH of Micro-BTS

13.2.1 Position and Internal Connection of the Built-in SDH in the Micro-BTS

13.2.1.1 Connections of the Built-in SDH

Table 13.2-1 gives the cable connections of the built-in SDH in the CDMA micro-BTS.

Table 13.2-1 Cable Connection of the Built-in SDH inside the CDMA Micro-BTS

No.	Cable Name	Length (mm)	To End A	To End B
1	Power cables	950	SDH-POWER (at the bottom of the cabinet)	SDH-X22
2	RF cable	850	BDM_OUT1	SDH-R1
		850	BDM_IN1	SDH-T1
		850	BDM_OUT2	SDH-R2
		850	BDM_IN2	SDH-T2
3	F-DC PWR-002	5000	SDH-POWER (at the bottom of the cabinet)	UPS power supply
4	Fiber cable	As required on site	FIBER-3 (at the bottom of the cabinet)	SDH-D43
			FIBER-4 (at the bottom of the cabinet)	SDH-D44

13.2.1.2 Schematic Diagram of Internal Cable Connection

Fig. 13.2-1 gives the cable layout of the built-in SDH in the CDMA micro-BTS.

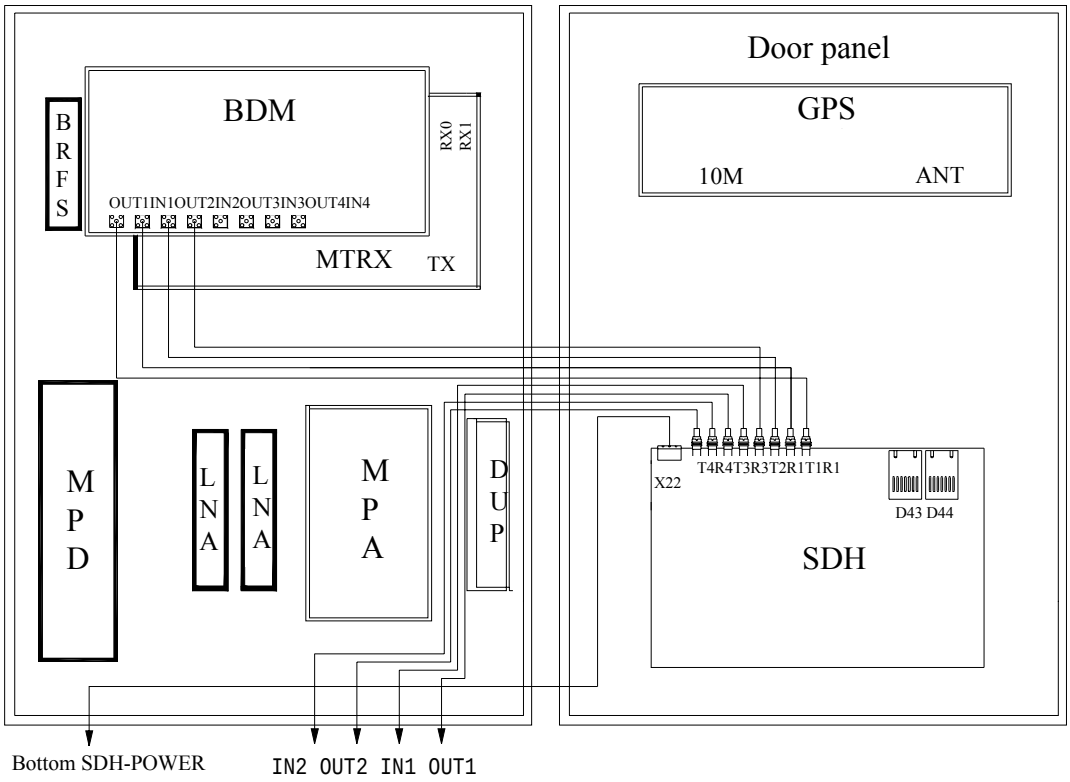


Fig. 13.2-1 Cable Layout of the Built-in SDH in the CDMA Micro-BTS

13.2.2 Connecting the External Optical Fibers and Cables During Installation

13.2.2.1 Description of the Cabinet-Bottom Interfaces

Fig. 13.2-2 shows all the cabinet-bottom interfaces of the micro-BTS:

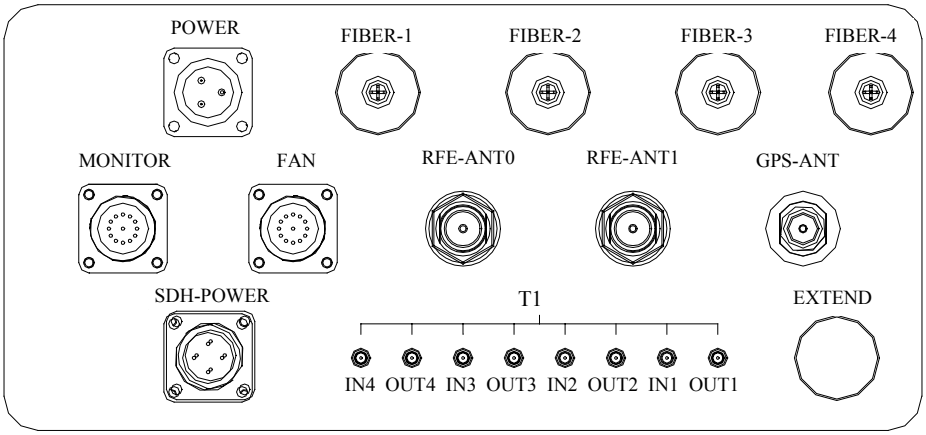


Fig. 13.2-2 Cabinet-bottom Interfaces of the CDMA Micro-BTS

See below for the meaning of each connector:

POWER——Power input of the micro-BTS;

FIBER-1\-2——Extension fiber interface of the RF remote station;

FIBER-3\-4——Input/output of the built-in SDH fiber interface of the micro-BTS;

MONITOR——Communication interface of the external UPS of the micro-BTS;

FAN——Fan interface for external heat dissipation of the high-power (over 20W) micro-BTS;

RFE-ANT0——Diversity reception antenna interface of the micro-BTS;

RFE-ANT1——Main reception / transmission antenna interface of the micro-BTS;

GPS-ANT——GPS antenna interface;

SDH-POWER——Built-in SDH power supply interface of the micro-BTS;

T1——Four 2M signal interfaces;

EXTEND——RF extension interface of the multi-carrier micro-BTS.

13.2.2.2 Description of the Fiber Installation

Here the interfaces related with the built-in SDH are FIBER-3 and FIBER-4. FIBER-3 is the optical transmission input interface and FIBER-4 is the fiber transmission output interface used for networking with the adjacent BTS.

Fig. 13.2-3 shows the position for installing the water-proof fiber at the bottom of the micro-BTS cabinet and that for connecting and laying out the water-proof fiber inside the cabinet.

The water-proof connector of the fiber is connected with the cabinet body in the similar way to the fiber connection when the micro-BTS connects with the RF remote station. The fiber is laid out in a naturally way after it goes into the cabinet and is connected with the optical module on the SDH.

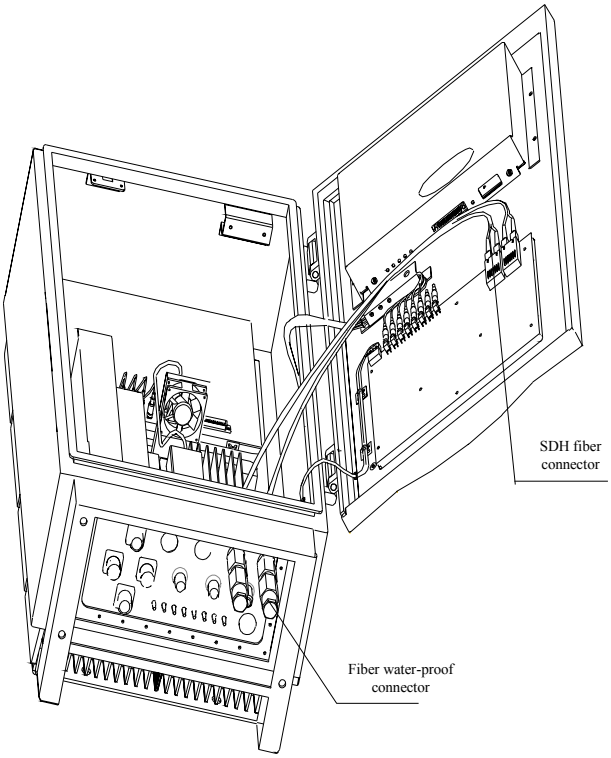


Fig. 13.2-3 Connection of the Optical Fiber

13.3 Installing the Integrated UPS of Micro-BTS/RF Remote Station

13.3.1 Introduction to ZXUPS L010

Currently, the integrated CDMA micro-BTS employs the ZXUPS L010 as its UPS. Fig. 13.3-1 shows the appearance of the ZXUPS L010 series products.

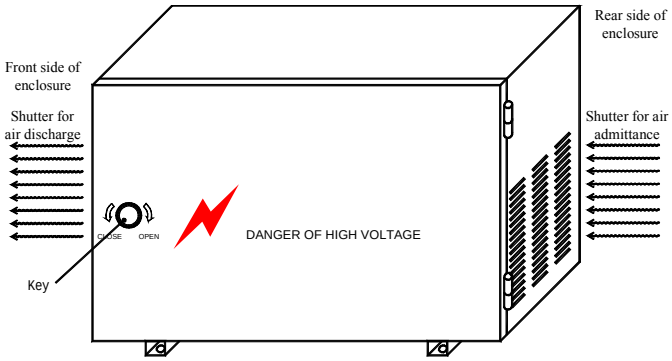


Fig. 13.3-1 Appearance of the ZXUPS L010 Series

Fig. 13.3-2 shows the inner structure of the ZXUPS L010 series.

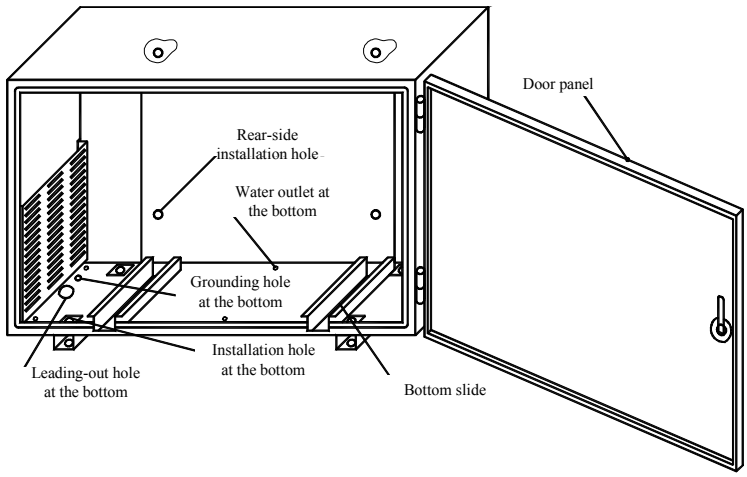


Fig. 13.3-2 Inner Structure of the ZXUPS L010 Series

13.3.2 Precautions for UPS Installation

The following rules should be followed if the micro-BTS (800M or 1.9G) is to be configured with an additional UPS:

1. The UPS must be kept within two meters away from the micro-BTS. Because current micro-BTS uses the BDM for monitoring the UPS and the RS-232 specification for communication, the communication distance is limited to 10 meters generally. To ensure correct communication, no more than two meters should better be kept between two cabinets. As the UPS is relatively close to the micro-BTS, lightning-protection may be ignored for between them.

2. Improvement on the power connector of the micro-BTS. As the output of UPS is screwed with the bolt, the power supply of the current micro-BTS cannot be plugged. To improve this situation, a connector board may be used. Cut off the input 3-core connector on the connector board, divide by L-N-PE and connect respectively to the L-N-PE of the UPS' output end. Be careful not to make any mistakes in this operation. In most cases, the brown line is for the live line (L), the blue line for neutral line (N) and the yellow-green line for protection grounding line (PE).

3. At present, the UPS employs the 232 communication mode and its RS232 interface differs from other standards. There are six pins in total — Pin 6: RXD (blue); Pin 7: GND (green); Pin 9: TXD (black), useful signal. The backup 232 interface of the BDM board is defined as: Pin 2: RXD; Pin 3: TXD; Pin 4: GND. Therefore, the 232 connector of UPS has to be changed, that is: Connect RXD (blue) to Pin 3 of DB9, TXD (black) to Pin 2 of DB9, and GND (green) to Pin 4 of DB9. Remember that the DB9 connector must be a "male" one.

4. Precautions for installation

1) Good ventilation for heat dissipation;

2) Keep from the place with corrosive gas;

3) The top of UPS must not be occupied by any objects, nor could it be taken by a sitting person, lest the air vent might be blocked;.

13.3.3 Structural Feature and Installation Mode of UPS

The ZXUPS L010UPS features a compact structure and boasts functions of dust-proof, water-proof, thermal insulation, anti-burglary, damp-proof, mildew-proof and corrosion protection. It is suitable for the outdoor environment in a remote area with formidable natural conditions. With the modular design, the enclosure is not only neat-looking but also rust-proof with excellent performance. This device can be installed easily and if it is for outdoor use, it can be set up on the flat ground along with other delivery-attached fittings, that is, the floor-type installation.

Fig. 13.3-3 shows the floor-type installation of ZXUPS L010UPS.

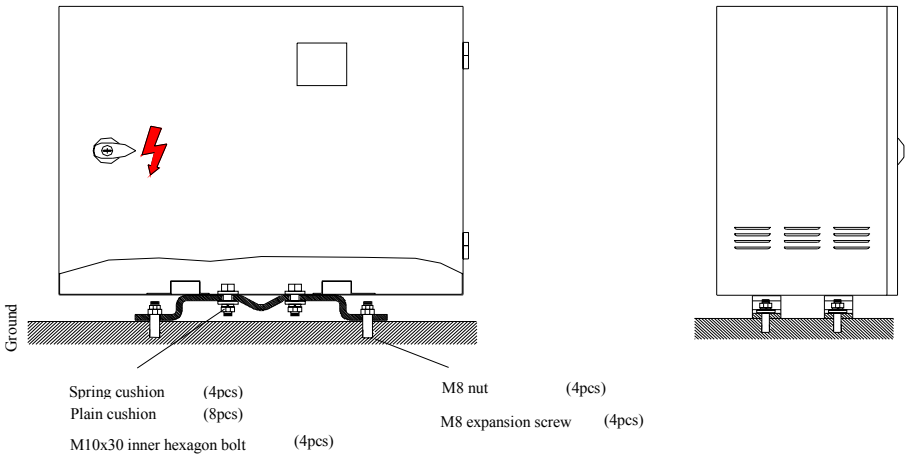


Fig. 13.3-3 Frontal and Lateral Faces of the UPS's Floor-type Installation

13.3.4 Installing the Engineering Cables of L010UPS

13.3.4.1 From-to-list

Table 13.3-1 shows the connections of the CDMA micro-BTS 485 / dry contact supplementary cables.

Table 13.3-1 From-to-list of the CDMA Micro-BTS 485/dry contact supplementary cables

No.	Cable Name	Length (mm)	To End A	To End B
1	Monitoring cable	800	BDM-RS485	MTPB1-X2
2	Monitoring cable	800	BDM-JOINT	MTPB1-X1
3	Monitoring cable	470	MTPB1-X3	MONITOR at the cabinet bottom
4	Monitoring grounding cable	170	MTPB1	Grounding hole at the right side of the cabinet
5	Monitoring cable	3000	MONITOR at the cabinet bottom	DB9 socket of UPS

13.3.4.2 Layout of Cabling

Fig. 13.3-4 shows the layout of the monitoring cables of the CDMA micro-BTS 485/dry contact:

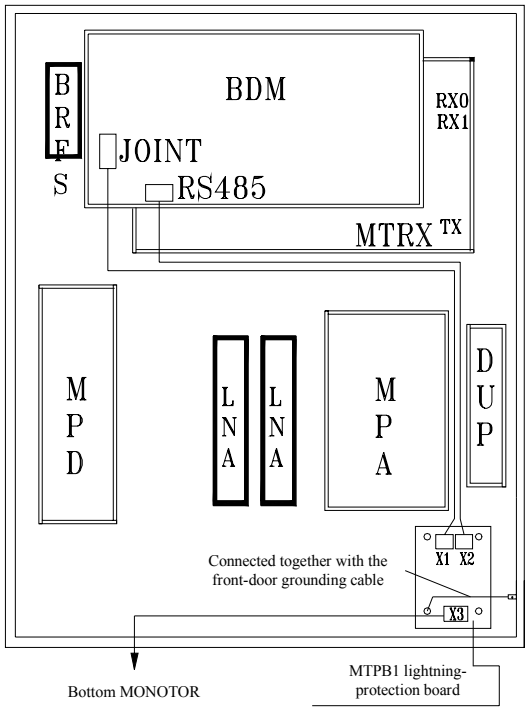


Fig. 13.3-4 Layout of the Monitoring Cables of the CDMA Micro-BTS 485/Dry Contact

Here three interfaces, namely POWER, MONITOR and SDH-POWER are related to the external UPS.

Where,

One cable end of POWER interface is connected with the POWER interface, and the other end is a standard 3-core power plug. To connect with the UPS, the 3-pin plug should be cut off first, then the three core wires (yellow-green, blue and brown, corresponding respectively to the ground line, neutral line and live line) should be connected with the output terminal of UPS properly;

For the cable connection of the MONITOR interface, refer to the above-mentioned from-to-list.

One end of the cable for the SDH-POWER interface is connected with this interface, and the other with the secondary power-off output connecting terminal of UPS, with the red and blue core wires connecting with the -48V, and the black and yellow-green ones with the ground.

13.3.5 Installing UPS

As a product of ZTE, the ZXUPSL010 is delivered with the proper user's manual

attached, and this manual gives detailed instructions on the installation of the product.

13.4 Installing the Ancillary Combinational Power Supply of Micro-BTS/RF Remote Station

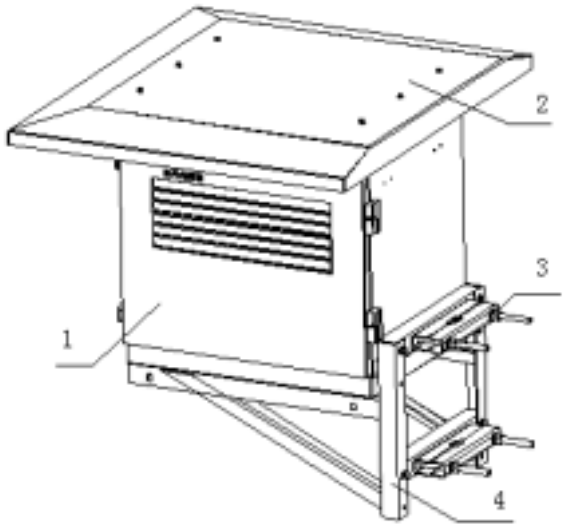
The following ancillary power supply is recommended for the devices of the CDMA cellular system: the ancillary combinational power supply consists of the outdoor power box and outdoor battery box (model: ZXDU28). The outdoor power box may be installed with a pole, on the wall or on the ground; while the outdoor battery box may only be installed on the ground.

Given below is the brief introduction of the installation method and connection of the outdoor power box and outdoor battery box.

13.4.1 Installing the Outdoor Power Box

13.4.1.1 Installing the Outdoor Power Box with a Pole

Fig. 13.4-1 shows how the outdoor power box is installed on the pole.



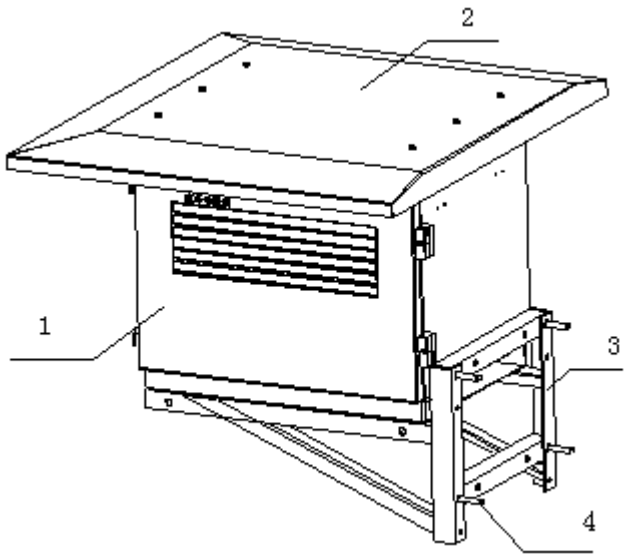
1——Outdoor power box 2——Sunshade unit 1 (used for installation with a pole or on the wall)

3——Mechanical part of pole (used for installation with a pole) 4——Installation support (used for installation with a pole or on the wall)

Fig. 13.4-1 Schematic Diagram of Installing the Outdoor Power Box with a Pole

13.4.1.2 Installing the Outdoor Power Box on the Wall

Fig. 13.4-2 shows how to install the outdoor power box on the wall.



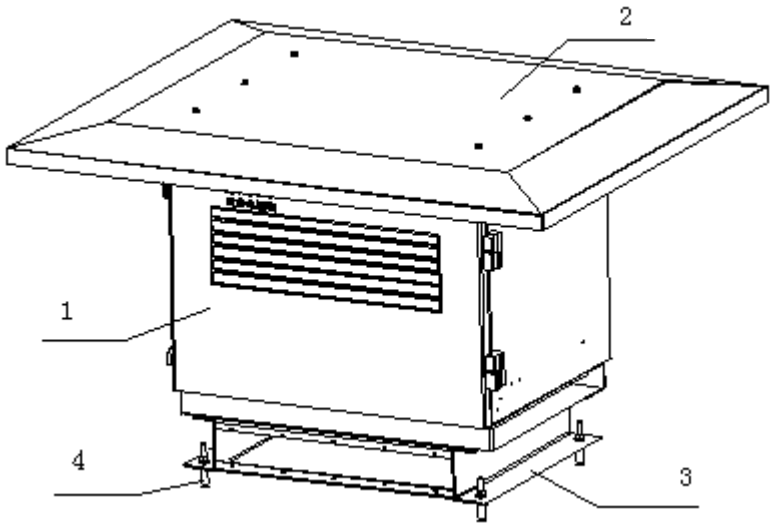
1——Outdoor power box 2——Sunshade unit 1 (used for installation with a pole or on the wall)

3——Installation support (used for installation with a pole or on the wall) 4——Expansion bolt M10X50

Fig. 13.4-2 Schematic Diagram of Installing the Outdoor Power Box on the Wall

13.4.1.3 Installing the Outdoor Power Box on the Ground

Fig. 13.4-3 shows how to install the outdoor power box on the ground.



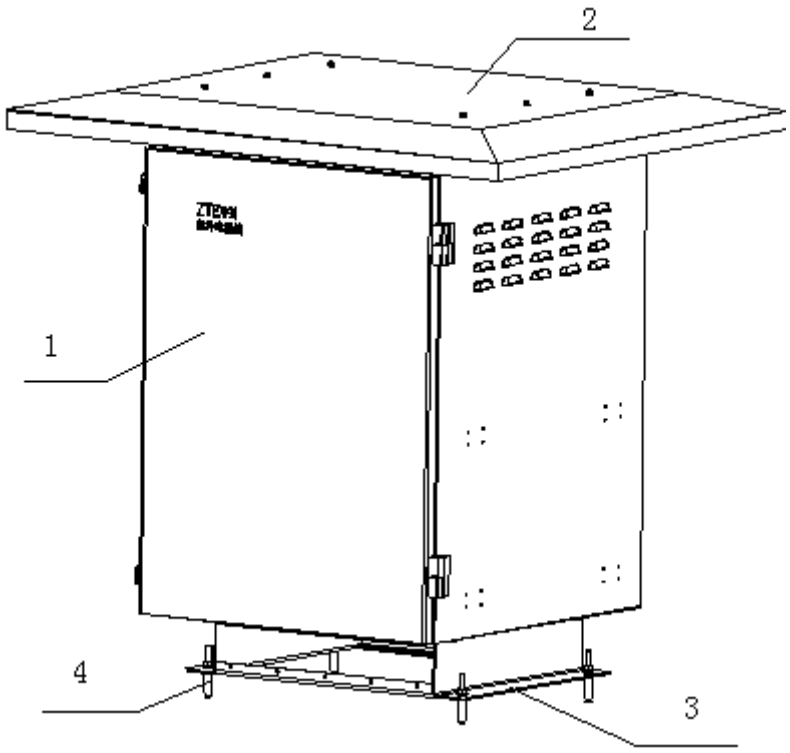
1——Outdoor power box 2——Sunshade unit 2 (used for installation on the ground)

3——Base (used for installation on the ground) 4——Expansion bolt M10X50

Fig. 13.4-3 Schematic Diagram of Installing the Outdoor Power Box on the Ground

13.4.2 Installing the Outdoor Battery Box

The outdoor can only be installed on the ground, which is shown in Fig. 13.4-4.



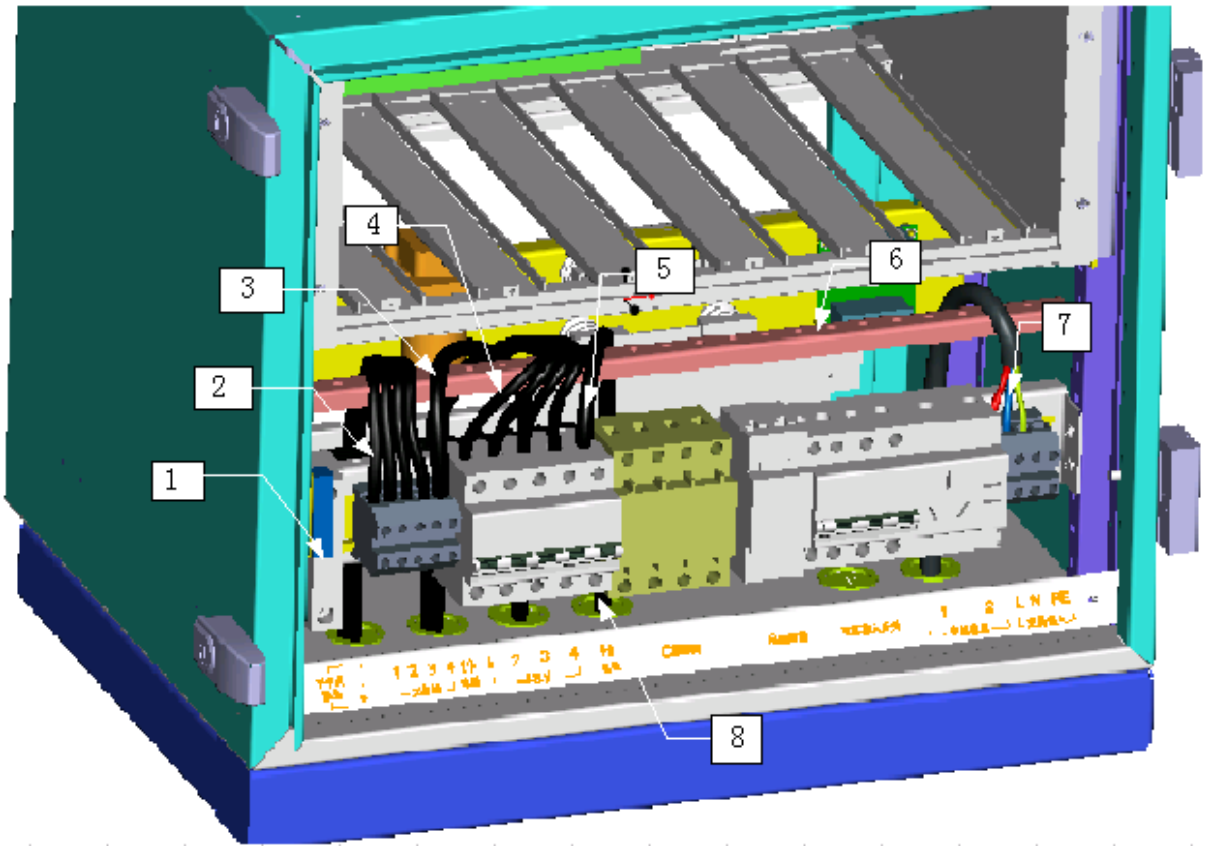
1——Outdoor battery box 2——Sunshade unit 2 (used for the installation on the ground)

3——Base (used for installation on the ground) 4——Expansion bolt M10X50

Fig. 13.4-4 Schematic Diagram of Installing the Outdoor Battery Box on the Ground

13.4.3 Cable Connection for Outdoor Power Box

The cable connection for the outdoor power box is presented in Fig. 13.4-5.



1. Dry contact output connecting terminal 2. Load output working ground 3. Battery input working ground 4. –48V load output line

5. (-48V) battery input line 6. Cable holder 7. External AC input line 8. System's cable access hole

Fig. 13.4-5 Schematic Diagram of the Cable Connection for the Outdoor Power Box

The function of dry contact monitoring is available with the combinational power supply of the micro-BTS. The actual definition of the dry contact's output connecting terminal is (from top down): 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10, as shown in Fig. 13.4-6.

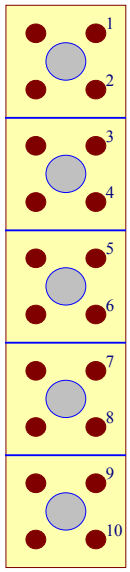


Fig. 13.4-6 Output Connecting Terminal of the Dry Contact

Precautions for the cable connection of the combinational power supply:

1. Description of dry contact pairs: As shown in the above figure, 1 and 2 are a pair of dry contacts (for the mains status alarm); 3 and 4 are a pair of dry contacts (for the battery under-voltage alarm); 5 and 6 are a pair of dry contacts (for the rectifier fault alarm); 7 and 8 are a pair of dry contacts (for the access control alarm). The micro-BTS monitors only the first three, that is, the access control monitoring is excluded. Between the dry contacts of the micro-BTS and the combinational power supply, a 7-core monitoring cable attached with delivery is used for the connection.
2. The cross-section area of the system's AC input cable should be no smaller than $6mm^2$.
3. The cross-section area of the battery's input cable should be no smaller than $16mm^2$.
4. The cross-section area of the DC load output cable should be no smaller than $10mm^2$.
5. There are clear silk-screen prints for the connecting terminals and the switch definitions under the corresponding devices. Please check them out before you go on with the connection or operation.

As the outdoor power box and outdoor battery box of the ancillary combinational

power supply are products of ZTE, proper user's manual will be attached with the product delivery. Detailed instructions are covered in these manuals for user's reference during the installation.

Appendix A Packaging, Storage and Transportation

🕮 Summary

- Describing how a micro-BTS/remote station is packed.
- Describing how a micro-BTS/remote station should be stored.
- Describing how a micro-BTS/remote station should be transported.

A.1 Packaging

The packaging of all components of micro-BTS, ultra-wide micro-BTS, and remote station are properly proofed against quakes during transportation. They are divided into two groups in packaging:

1. Cabinets
2. Cables and delivery-attached document

Each item has been identified with model, name, placement direction, number of layers, together with signs of “No damping”, and “Fragile” etc.

A.2 Storage

Keep all components in the original package. Keep the storeroom in order, and mark the number of equipment sets in stock. The range of temperature is -40°C ~+75°C, and the range of relative humidity is 5%~100%. Adopt measures of anti-moisture, anti-dust, quake-proof, and anti-erosion. It is recommended to equip air-conditioner and lighting equipment. The stock duration should be less than six months.

A.3 Transportation

Use designated containers.

All items should be placed closely, neatly, orderly and safely in the container to avoid any possible damage during transportation. There should be three layers of wooden box or four layers of cartons at maximum. Cables and delivery-attached document should be placed in the lower half and the cabinet should be placed in the upper half.

Never put the equipment in open freight cars or ships. Never leave the equipment in open warehouses. Never transport the equipment with flammable, explosive or erosive chemicals. Keep the equipment away from being washed by rains and snow, or any physical damage.

Keep the equipment away from electromagnetic or radiant substance during transportation.

Ensure that all items are in the correct placement direction before being lifted during transportation.

Appendix B Table of Cable Connections

🕮 Summary

- Refer to the following tables for the cable connections in micro-BTS and remote stations.

B.1 Cable Connections in M800T Single-carrier Micro-BTS

Table B.1-1 Cable Connections in M800T Single-carrier Micro-BTS

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA800	
3	DCDX03	MPD_X7	MLNA800	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA800	MONDX02_B	
6	MONDX02	MLNA800-1,-2	MONDX01_B	
7	MPA CONTL	MPA800	MTRX800	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX04	BDM800_X39	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	is supplied
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF21	MDIV800_RX	MLNA800-1_IN	
21	RF22	MLNA800-2_IN	MDUP800_RX	
22	RF23	MTRX800_RX0	MLNA800-1_RFOUT1	
23	RF24	MTRX800_RX1	MLNA800-2_RFOUT1	
24	RF25	MTRX800_TX	MPA800_IN	
25	RF26	MDIV800_ANT	RFE-ANT0 (at the bottom of the cabinet)	
26	RF27	RFE-ANT1 (at the bottom of the cabinet)	MDUP800_ANT	
27	RF28	MPA800_OUT	MDUP800_TX	
28	RF29	GPS-ANT at the bottom of the cabinet	MGPS_ANT	
29	RF30	MGPS_10M	BDM800_X7	
30	RF31	BDM800_X8	Middle hole of BRFS_X1	
31	GPS-BDM	BDM800_X3	BGPS_X2	

B.2 Cable Connections in M800T Double-carrier Micro-BTS

Table B.2-1 Cable Connections in M800T Double-carrier Micro-BTS

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA800	
3	DCDX03	MPD_X7	MLNA800	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA800	MONDX02_B	
6	MONDX02	MLNA800-2	MONDX01_B	
7	MPA CONTL	MPA800	MTRX800	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX04	BDM800_X39	Door status switch	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF22	(Black) MPD_V+	MDUP800_RX	
21	RF24	MTRX800_RX1	MLNA800-2_RFOUT1	
22	RF25	MTRX800_TX	MPA800_IN	
23	RF27	RFE-ANT1 (at the bottom of the cabinet)	MDUP800_ANT	
24	RF28	MPA800_OUT	MDUP800_TX	
25	RF29	GPS-ANT (at the bottom of the cabinet)	MGPS_ANT	
26	RF30	MGPS_10M	BDM800_X7	
27	RF31	BDM800_X8	Middle hole of BRFS_X1	
28	RF42	MLNA800-2_RFOUT2	RFE-ANT0 (at the bottom of the cabinet)	
29	RF43	MTRX800_RX0	EXTEND (at the bottom of the cabinet)	
30	GPS-BDM	BDM800_X3	BGPS_X2	

Note: Please refer to precautions listed in Table B-1.

B.3 Cable Connections in R800T Single-carrier Remote Stations

Table B.3-1 Cable Connections in R800T Single-carrier Remote Stations

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA800	
3	DCDX03	MPD_X7	MLNA800	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA800	MONDX02_B	
6	MONDX02	MLNA800-1, -2	MONDX01_B	
7	MPA CONTL	MPA800	MTRX800	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF21	MDIV800_RX	MLNA800-1_IN	
21	RF22	MLNA800-2_IN	MDUP800_RX	
22	RF23	MTRX800_RX0	MLNA800-1_RFOUT1	
23	RF24	MTRX800_RX1	MLNA800-2_RFOUT1	
24	RF25	MTRX800_TX	MPA800_IN	
25	RF26	MDIV800_ANT	RFE-ANT0 (at the bottom of the cabinet)	
26	RF27	RFE-ANT1 (at the bottom of the cabinet)	MDUP800_ANT	
27	RF28	MPA800_OUT	MDUP800_TX	
28	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
29	RF41	RFM_X7	Middle hole of RFM_X3	

B.4 Cable Connections in R800T Double-carrier Remote Stations

Table B.4-1 Cable Connections in R800T Double-carrier Remote Stations

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA800	
3	DCDX03	MPD_X7	MLNA800	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA800	MONDX02_B	
6	MONDX02	MLNA800-2	MONDX01_B	
7	MPA CONTL	MPA800	MTRX800	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF22	MLNA800-2_IN	MDUP800_RX	
21	RF24	MTRX800_RX1	MLNA800-2_RFOUT1	
22	RF25	MTRX800_TX	MPA800_IN	
23	RF27	RFE-ANT1 (at the bottom of the cabinet)	MDUP800_ANT	
24	RF28	MPA800_OUT	MDUP800_TX	
25	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
26	RF41	RFM_X7	Middle hole of RFM_X3	
27	RF42	MLNA800-2_RFOUT2	RFE-ANT0 (at the bottom of the cabinet)	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
28	RF43	MTRX800_RX0	EXTEND (at the bottom of the cabinet)	

B.5 Cable Connections in M190T Single-carrier Micro-BTS

Table B.5-1 Cable Connections in M190T Single-carrier Micro-BTS

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA800	
3	DCDX03	MPD_X7	MLNA800	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA800	MONDX02_B	
6	MONDX02	MLNA800-1, -2	MONDX01_B	
7	MPA CONTL	MPA800	MTRX800	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF21	MDIV800_RX	MLNA800-1_IN	
21	RF22	MLNA800-2_IN	MDUP800_RX	
22	RF23	MTRX800_RX0	MLNA800-1_RFOUT1	
23	RF24	MTRX800_RX1	MLNA800-2_RFOUT1	
24	RF25	MTRX800_TX	MPA800_IN	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
25	RF26	MDIV800_ANT	RFE-ANT0 (at the bottom of the cabinet)	
26	RF27	RFE-ANT1 (at the bottom of the cabinet)	MDUP800_ANT	
27	RF28	MPA800_OUT	MDUP800_TX	
28	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
29	R41	RFM_X7	Middle hole of RFM_X3	

B.6 Cable Connections in M190T Double-carrier Micro-BTS

Table B.6-1 Cable Connections in M190T Double-carrier Micro-BTS

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA800	
3	DCDX03	MPD_X7	MLNA800	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA800	MONDX02_B	
6	MONDX02	MLNA800-2	MONDX01_B	
7	MPA CONTL	MPA800	MTRX800	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
20	RF22	MLNA800-2_IN	MDUP800_RX	
21	RF24	MTRX800_RX1	MLNA800-2_RFOUT1	
22	RF25	MTRX800_TX	MPA800_IN	
23	RF27	RFE-ANT1 (at the bottom of the cabinet)	MDUP800_ANT	
24	RF28	MPA800_OUT	MDUP800_TX	
25	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
26	RF41	RFM_X7	Middle hole of RFM_X3	
27	RF42	MLNA800-2_RFOUT2	RFE-ANT0 (at the bottom of the cabinet)	
28	RF43	MTRX800_RX0	EXTEND (at the bottom of the cabinet)	

B.7 Cable Connections in R190T Single-carrier Remote Stations

Table B.7-1 Cable Connections in R190T Single-carrier Remote Stations

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA800	
3	DCDX03	MPD_X7	MLNA800	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA800	MONDX02_B	
6	MONDX02	MLNA800-2	MONDX01_B	
7	MPA CONTL	MPA800	MTRX800	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF22	MLNA800-2_IN	MDUP800_RX	
21	RF24	MTRX800_RX1	MLNA800-2_RFOUT1	
22	RF25	MTRX800_TX	MPA800_IN	
23	RF27	RFE-ANT1 (at the bottom of the cabinet)	MDUP800_ANT	
24	RF28	MPA800_OUT	MDUP800_TX	
25	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
26	RF41	RFM_X7	Middle hole of RFM_X3	
27	RF42	MLNA800-2_RFOUT2	RFE-ANT0 (at the bottom of the cabinet)	
28	RF43	MTRX800_RX0	EXTEND (at the bottom of the cabinet)	

B.8 Cable Connections in R190T Double-carrier Remote Stations

Table B.8-1 Cable Connections in R190T Double-carrier Remote Stations

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA1900	
3	DCDX03	MPD_X7	MLNA1900	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA1900	MONDX02_B	
6	MONDX02	MLNA1900-2	MONDX01_B	
7	MPA CONTL	MPA1900	MTRX1900	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown) Grounding point (black)	The configuration in case that AC power is supplied
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF25	MTRX1900_TX	MPA1900_IN	
21	RF33	MLNA1900-2_IN	MDUP1900_RX	
22	RF34	MPA1900_OUT	MDUP1900_TX	
23	RF36	MTRX1900_RX1	MLNA1900-2_RFOUT1	
24	RF38	RFE-ANT1 (at the bottom of the cabinet)	MDUP1900_ANT	
25	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
26	RF41	RFM_X7	Middle hole of RFM_X3	
27	RF42	MLNA1900-2_RFOUT2	RFE-ANT0 (at the bottom of the cabinet)	
28	RF43	MTRX1900_RX0	EXTEND (at the bottom of the cabinet)	

B.9 Cable Connections in M802T Single-carrier Micro-BTS

Table B.9-1 Cable Connections in M802T Single-carrier Micro-BTS

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	MLNA800	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	MLNA800-1, -2	MONDX01_B	
7	MPA CONTL	MPA	MTRX800	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
10	DX03	Cabinet	Door	
11	DX04	BDM802_X39	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	F-FAN-004	MPD	Internal fan rack	
21	F-FAN-005	COMMAN (at the bottom of the cabinet)	MPD	
22	F-FAN-006	COMMAN (at the bottom of the cabinet)	External fan rack	
23	RF21	MDIV800_RX	MLNA800-1_IN	
24	RF22	MLNA800-2_IN	MDUP800_RX	
25	RF23	MTRX800_RX0	MLNA800-1_RFOUT1	
26	RF24	MTRX800_RX1	MLNA800-2_RFOUT1	
27	R25	MTRX800_TX	MPA_IN	
28	RF26	MDIV800_ANT	RFE-ANT0 (at the bottom of the cabinet)	
29	RF27	RFE-ANT1 (at the bottom of the cabinet)	MDUP800_ANT	
30	RF28	MPA_OUT	MDUP800_TX	
31	RF29	GPS-ANT at the bottom of the cabinet	MGPS_ANT	
32	RF30	MGPS_10M	BDM802_X7	
33	RF31	BDM802_X8	Middle hole of BRFS_X1	
34	GPS-BDM	BDM802_X3	BGPS_X2	

B.10 Cable Connections in M802T Double-carrier Micro-BTS

Table B.10-1 Cable Connections in M802T Double-carrier Micro-BTS

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	MLNA800	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	MLNA800-2	MONDX01_B	
7	MPA CONTL	MPA	MTRX800	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX04	BDM802_X39	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	F-FAN-004	MPD	Internal fan rack	
21	F-FAN-005	COMMAN (at the bottom of the cabinet)	MPD	
22	F-FAN-006	COMMAN (at the bottom of the cabinet)	External fan	
23	RF22	(Black) MPD_V+	MDUP800_RX	
24	RF24	MTRX800_RX1	MLNA800-2_RFOUT1	
25	RF25	MTRX800_TX	MPA_IN	
26	RF27	RFE-ANT1 (at the bottom of the cabinet)	MDUP800_ANT	
27	RF28	MPA_OUT	MDUP800_TX	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
28	RF29	GPS-ANT at the bottom of the cabinet	MGPS_ANT	
29	RF30	MGPS_10M	BDM802_X7	
30	RF31	BDM802_X8	Middle hole of BRFS_X1	
31	RF42	MLNA800-2_RFOUT2	RFE-ANT0 (at the bottom of the cabinet)	
32	RF43	MTRX800_RX0	EXTEND (at the bottom of the cabinet)	
33	GPS-BDM	BDM802_X3	BGPS_X2	

B.11 Cable Connections in R802 Single-carrier RF Remote Stations

Table B.11-1 Cable Connections in R802T Single-carrier Remote Stations

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	MLNA800	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	MLNA800-1, -2	MONDX01_B	
7	MPA CONTL	MPA	MTRX800	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
20	RF21	MDIV800_RX	MLNA800-1_IN	
21	RF22	MLNA800-2_IN	MDUP800_RX	
22	RF23	MTRX800_RX0	MLNA800-1_RFOUT1	
23	RF24	MTRX800_RX1	MLNA800-2_RFOUT1	
24	RF25	MTRX800_TX	MPA_IN	
25	RF26	MDIV800_ANT	RFE-ANT0 (at the bottom of the cabinet)	
26	RF27	RFE-ANT1 (at the bottom of the cabinet)	MDUP800_ANT	
27	RF28	MPA_OUT	MDUP800_TX	
28	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
29	RF41	RFM_X7	Middle hole of RFM_X3	
30	F-FAN-005	COMMAN (at the bottom of the cabinet)	MPD	
31	F-FAN-006	COMMAN (at the bottom of the cabinet)	External fan	

B.12 Cable Connections in R802T Double-carrier Remote Stations

Table B.12-1 Cable Connections in R802T Double-carrier RF Remote Stations

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	MLNA800	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	MLNA800-2	MONDX01_B	
7	MPA CONTL	MPA	MTRX800	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown) Grounding point (black)	The configuration in case that AC power

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
15	ACDX02	MPD_X1	Power lightning arrester	is supplied
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF22	MLNA800-2_IN	MDUP800_RX	
21	RF24	MTRX800_RX1	MLNA800-2_RFOUT1	
22	RF25	MTRX800_TX	MPA_IN	
23	RF27	RFE-ANT1 (at the bottom of the cabinet)	MDUP800_ANT	
24	RF28	MPA_OUT	MDUP800_TX	
25	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
26	RF41	RFM_X7	Middle hole of RFM_X3	
27	RF42	MLNA800-2_RFOUT2	RFE-ANT0 (at the bottom of the cabinet)	
28	RF43	MTRX800_RX0	EXTEND (at the bottom of the cabinet)	
29	F-FAN-005	COMMAN (at the bottom of the cabinet)	MPD	
30	F-FAN-006	COMMAN (at the bottom of the cabinet)	External fan	

B.13 Cable Connections in M191T Single-carrier Micro-BTS

Table B.13-1 Cable Connections in M191T Single-carrier Micro-BTS

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	LNA	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	LNA-1, -2	MONDX01_B	
7	MPA CONTL	MPA	TRX	
8	DX01	Door grounding point	Cabinet grounding point	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX04	BDM_X39	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF25	TRX_TX	MPA_IN	
21	RF29	GPS-ANT at the bottom of the cabinet	MGPS_ANT	
22	RF32	DIV_RX	LNA-1_IN	
23	RF33	LNA-2_IN	DUP_RX	
24	RF34	MPA_OUT	DUP_TX	
25	RF35	TRX_RX0	LNA-1_RFOUT1	
26	RF36	TRX_RX1	LNA-2_RFOUT1	
27	RF37	DIV_ANT	RFE-ANT0 (at the bottom of the cabinet)	
28	RF38	RFE-ANT1 (at the bottom of the cabinet)	DUP_ANT	
29	RF39	MGPS_10M	Middle hole of BRFS_X1	
30	GPS-BDM	BDM_X3	BGPS_X2	

B.14 Cable Connections in M191T Double-carrier Micro-BTS

Table B.14-1 Cable Connections in M191T Double-carrier Micro-BTS

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	LNA	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	LNA-2	MONDX01_B	
7	MPA CONTL	MPA	TRX	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX04	BDM_X39	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF25	TRX_TX	MPA_IN	
21	RF29	GPS-ANT at the bottom of the cabinet	MGPS_ANT	
22	RF33	LNA-2_IN	DUP_RX	
23	RF34	MPA_OUT	DUP_TX	
24	RF36	TRX_RX1	LNA-2_RFOUT1	
25	RF38	RFE-ANT1 (at the bottom of the cabinet)	DUP_ANT	
26	RF39	MGPS_10M	Middle hole of BRFS_X1	
27	RF42	LNA-2_RFOUT2	RFE-ANT0 (at the bottom of the cabinet)	
28	RF43	TRX_RX0	EXTEND (at the bottom of the cabinet)	
29	GPS-BDM	BDM_X3	BGPS_X2	

B.15 Cable Connections in R191T Single-carrier Remote Stations

Table B.15-1 Cable Connections in R191T Single-carrier Remote Stations

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	LNA	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	LNA-1, -2	MONDX01_B	
7	MPA CONTL	MPA	TRX	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF25	TRX_TX	MPA_IN	
21	RF32	DIV_RX	LNA-1_IN	
22	RF33	LNA-2_IN	MDUP1900_RX	
23	RF34	MPA_OUT	MDUP1900_TX	
24	RF35	TRX_RX0	LNA-1_RFOUT1	
25	RF36	TRX_RX1	LNA-2_RFOUT1	
26	RF37	DIV_ANT	RFE-ANT0 (at the bottom of the cabinet)	
27	RF38	RFE-ANT1 (at the bottom of the cabinet)	MDUP1900_ANT	
28	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
29	RF41	RFM_X7	Middle hole of RFM_X3	

B.16 Cable Connections in R191T Double-carrier Remote Stations

Table B.16-1 Cable Connections in R191T Double-carrier Remote Stations

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	LNA	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	LNA-2	MONDX01_B	
7	MPA CONTL	MPA	TRX	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF25	TRX_TX	MPA_IN	
21	RF33	LNA-2_IN	MDUP1900_RX	
22	RF34	MPA_OUT	MDUP1900_TX	
23	RF36	TRX_RX1	LNA-2_RFOUT1	
24	RF38	RFE-ANT1 (at the bottom of the cabinet)	MDUP1900_ANT	
25	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
26	RF41	RFM_X7	Middle hole of RFM_X3	
27	RF42	LNA-2_RFOUT2	RFE-ANT0 (at the bottom of the cabinet)	
28	RF43	TRX_RX0	EXTEND (at the bottom of the cabinet)	

B.17 Cable Connections in M192T Single-carrier Micro-BTS

Table B.17-1 Cable Connections in M192T Single-carrier Micro-BTS

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	MLNA	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	MLNA-1, -2	MONDX01_B	
7	MPA CONTL	MPA	TRX	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX04	BDM_X39	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	F-FAN-004	MPD	Internal fan rack	
21	F-FAN-005	COMMAN (at the bottom of the cabinet)	MPD	
22	F-FAN-006	COMMAN (at the bottom of the cabinet)	External fan rack	
23	RF25	TRX_TX	MPA_IN	
24	RF29	GPS-ANT at the bottom of the cabinet	MGPS_ANT	
25	RF32	DIV_RX	LNA-1_IN	
26	RF33	LNA-2_IN	DUP_RX	
27	RF34	MPA_OUT	DUP_TX	
28	RF35	TRX_RX0	LNA-1_RFOUT1	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
29	RF36	TRX_RX1	LNA-2_RFOUT1	
30	RF37	DIV_ANT	RFE-ANT0 (at the bottom of the cabinet)	
31	RF38	RFE-ANT1 (at the bottom of the cabinet)	DUP_ANT	
32	RF39	MGPS_10M	Middle hole of BRFS_X1	
33	GPS-BDM	BDM_X3	BGPS_X2	

B.18 Cable Connections in M192T Double-carrier Micro-BTS

Table B.18-1 Cable Connections in M192T Double-carrier Micro-BTS

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	MLNA	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	MLNA-2	MONDX01_B	
7	MPA CONTL	MPA	TRX	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
		Cabinet	BDM	
10	DX03	Cabinet	Door	
11	DX04	BDM_X39	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
20	F-FAN-004	MPD	Internal fan rack	
21	F-FAN-005	COMMAN (at the bottom of the cabinet)	MPD	
22	F-FAN-006	COMMAN (at the bottom of the cabinet)	External fan	
23	RF25	TRX_TX	MPA_IN	
24	RF29	GPS-ANT at the bottom of the cabinet	MGPS_ANT	
25	RF33	LNA-2_IN	DUP_RX	
26	RF34	MPA_OUT	DUP_TX	
27	RF36	TRX_RX1	LNA-2_RFOUT1	
28	RF38	RFE-ANT1 (at the bottom of the cabinet)	DUP_ANT	
29	RF39	MGPS_10M	Middle hole of BRFS_X1	
30	RF42	LNA-2_RFOUT2	RFE-ANT0 (at the bottom of the cabinet)	
31	RF43	TRX_RX0	EXTEND (at the bottom of the cabinet)	
32	GPS-BDM	BDM_X3	BGPS_X2	

B.19 Cable Connections in R192T Single-carrier Remote Stations

Table B.19-1 Cable Connections in R192T Single-carrier Remote Stations

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	LNA	
4	RSTDX	MPD_X5	BRFS_X6	
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	LNA-1, -2	MONDX01_B	
7	MPA CONTL	MPA	TRX	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown)	The configuration in case that AC power is supplied
			Grounding point (black)	
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF25	TRX_TX	MPA_IN	
21	RF32	DIV_RX	LNA-1_IN	
22	RF33	LNA-2_IN	MDUP1900_RX	
23	RF34	MPA_OUT	MDUP1900_TX	
24	RF35	TRX_RX0	LNA-1_RFOUT1	
25	RF36	TRX_RX1	LNA-2_RFOUT1	
26	RF37	DIV_ANT	RFE-ANT0 (at the bottom of the cabinet)	
27	RF38	RFE-ANT1 (at the bottom of the cabinet)	MDUP1900_ANT	
28	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
29	RF41	RFM_X7	Middle hole of RFM_X3	
30	F-FAN-005	COMMAN (at the bottom of the cabinet)	MPD	
31	F-FAN-006	COMMAN (at the bottom of the cabinet)	External fan	

B.20 Cable Connections in R192T Double-carrier Remote Stations

Table B.20-1 Cable Connections in R192T Double-carrier Remote Stations

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
1	DCDX01	BRFS_X5	MPD_X11	
2	DCDX02	MPD_X6	MPA	
3	DCDX03	MPD_X7	LNA	
4	RSTDX	MPD_X5	BRFS_X6	

Serial No.	Cable Name	Connection of Terminal A	Connection of Terminal B	Remarks
5	MONDX01	MPA	MONDX02_B	
6	MONDX02	LNA-2	MONDX01_B	
7	MPA CONTL	MPA	TRX	
8	DX01	Door grounding point	Cabinet grounding point	
9	DX02	Cabinet	Lightning arrester	
10	DX03	Cabinet	Door	
11	DX05	RFM_X24	Door status switch	
12	DX06	MPD_X4	Power lightning arrester	
13	ACDX03	MPD_HP	Heater	
14	ACDX01	POWER (at the bottom of the cabinet)	Power lightning arrester (blue, brown) Grounding point (black)	The configuration in case that AC power is supplied
15	ACDX02	MPD_X1	Power lightning arrester	
16	ACDX04	ACDX01_A	External AC power	
17	F-DC PWR-001	POWER (at the bottom of the cabinet)	Power lightning arrester	The configuration in case that DC power is supplied
18	F-DC PWR-002	F-DC PWR-001_A	External -48V power	
19	F-DC PWR-003	(Blue) MPD_V- (Black) MPD_V+	Power lightning arrester	
20	RF25	TRX_TX	MPA_IN	
21	RF33	LNA-2_IN	MDUP1900_RX	
22	RF34	MPA_OUT	MDUP1900_TX	
23	RF36	TRX_RX1	LNA-2_RFOUT1	
24	RF38	RFE-ANT1 (at the bottom of the cabinet)	MDUP1900_ANT	
25	RF40	Middle hole of BRFS_X1	Middle hole of BRFS_X3	
26	RF41	RFM_X7	Middle hole of RFM_X3	
27	RF42	LNA-2_RFOUT2	RFE-ANT0 (at the bottom of the cabinet)	
28	RF43	TRX_RX0	EXTEND (at the bottom of the cabinet)	
29	F-FAN-005	COMMAN (at the bottom of the cabinet)	MPD	
30	F-FAN-006	COMMAN (at the bottom of the cabinet)	External fan	

Appendix C Equipment Parameters

C.1 Dimension

See Fig. C.1-1 for the appearance of a micro-BTS/remote station cabinet.

Fig. C.1-1 Appearance of a ZXCBTS Cabinet

The dimension of the cabinet is 630mm (height)×400mm (width)×285mm (depth). The weight of one cabinet is 45kg.

C.2 Power Consumption

Refer to the following table for the power consumption of several types of micro-BTS and remote stations supplied with the 120V AC power in case of full load.

Table C.2-1 Power Consumption of Several Types of Micro-BTS and Remote Stations

Model	Power Consumption
M190T	180W
M191T	195W
M192T	290W
M800T	195W
M802T	290W
R190T	180W
R191T	195W
R192T	290W
R800T	195W
R802T	290W

Power factor: 0.5

Refer to the following table for the power consumption of several types of micro-BTS and remote stations supplied with the 120V AC power in case of full load when they are configured with heaters.

Table C.2-2 Power Consumption of Several Types of Micro-BTS and Remote Stations

Model	Power Consumption (Watt)
M190T	280W
M191T	295W
M192T	390W
M800T	295W
M802T	390W
R190T	280W
R191T	295W
R192T	390W
R800T	295W
R802T	390W

Power factor: 0.5

Note: When the temperature is lower than -10°C, a heater can be added. Currently, only the equipment supplied with 120V AC power support this function.

DC equipment does not support this function.

Refer to the following table for the power consumption of several types of micro-BTS and remote stations supplied with the -48V DC power in case of full load.

Table C.2-3 Power Consumption of Several Types of Micro-BTS and Remote Stations

Model	Power Consumption (Watt)
M190T	180W
M191T	195W
M192T	290W
M800T	195W
M802T	290W
R190T	180W
R191T	195W
R192T	290W
R800T	195W
R802T	290W

Appendix D Indicators

D.1 BDM Indicators

See Fig. D.1-1 for the BDM indicators and their meanings.

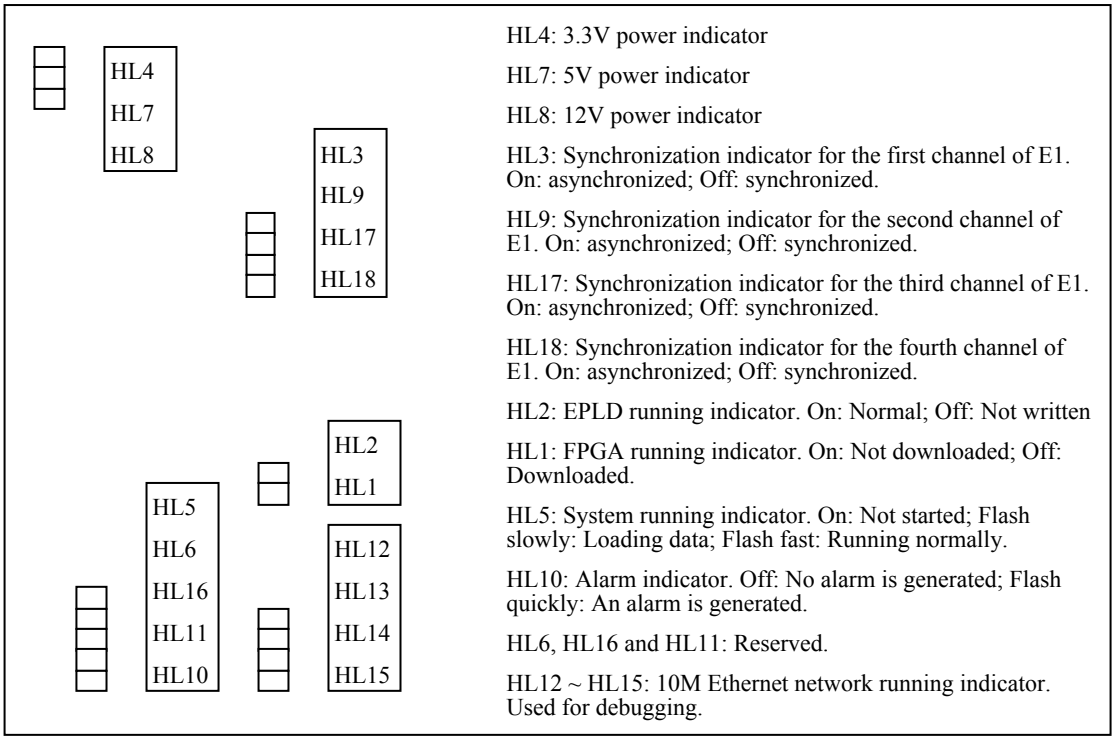


Fig. D.1-1 Indicators of the BDM

D.2 Indicators on Front Panel of MGPS

Refer to Table D.2-1 for the indicators on the front panel of MGPS and their meanings.

Table D.2-1 Indicators on the Front Panel of MGPS

Indicator	Meaning	
	On	Off
RUN (Green)	Indicates that the equipment is working normally.	Indicates that the equipment is abnormal.

Indicator	Meaning	
	On	Off
WARM UP (Green)	Indicates that the equipment is warming up.	Indicates that the equipment is working normally.
GPS ALM (Green)	Indicates that the equipment is in initialization status, unlocked status or in status in which satellite signals cannot be received. If it flashes, it indicates that the GPS antenna is disconnected.	Other causes
1PPS ALM (Green)	Indicates that the 1PPS detection accuracy exceeds the required range (800ns).	Indicates that the 1PPS detection accuracy meets the requirement (800ns).
FAULT (Red)	Indicates that the equipment is faulty. Check TOD messages for the cause.	Indicates that the equipment is working normally.
10MHz (Red)	No output	Output of 10MHz
19.6608MHz (Red)	No output	Output of 19.6608MHz
PP2S (Red)	No output	Output of PP2S

D.3 Indicators of LFM, RFM and OIM

1. Refer to the following table for the LFM indicators and their meanings.

Table D.3-1 Indicators of the LFM

Indicator	Meaning
POWER (Red)	Power indicator. When it is on, it indicates that power is being supplied.
CLKER (Red)	Clock alarm indicator. When it is on, it indicates that no clock signal is recovered in the LFM.
TXCLK (Green)	Tx clock indicator. When it is on, it indicates that the multiplexing chip in the LFM locks the Tx clock.
FIBIN (Green)	Optical signal indicator. When it is on, it indicates that optical signal is entering the optical interface.
RXREADY (Green)	Data receiving indicator. When it is on, it indicates that the LFM is recovering the data from the optical links correctly.

2. Refer to the following table for the RFM indicators and their meanings.

Table D.3-2 Indicators of the RFM

Indicator	Meaning
HL7 ALARMCLK (Red)	Clock alarm indicator. When it is on, it indicates that the RFM cannot recover the 16chip clock signal from the optical links correctly.
HL2 PLLLOST (Red)	Phase-locked loop indicator. When it is on, it indicates that the phase-locked loop of the RFM is unlocked.
HL12 TEMP_INT (Red)	Temperature alarm indicator. When it is on, it indicates that the temperature is too high.
HL11 OPT_DETECT (Green)	PP2S indicator. When it flashes every 2 seconds, it indicates that the links are normal.
HL10 DOOR (Green)	Door control indicator. When it is on, it indicates that the door is opened.
HL9 SD_ALARM (Green)	Optical signal alarm indicator. When it is on, it indicates that no optical signal enters the optical interface.
HL3 3.3V (Green)	3.3V power indicator. When it is on, it indicates that the 3.3V power is supplied normally.
HL1 5V (Green)	5V power indicator. When it is on, it indicates that the 5V power is supplied normally.
HL4 12V (Green)	12V power indicator. When it is on, it indicates that the 12V power is supplied normally.
HL6 1032LOCK (Green)	Tx clock indicator. When it is on, it indicates that the multiplexing chip in the RFM locks the Tx clock.
HL17 1034RDY (Green)	Data receiving indicator. When it is on, it indicates that the RFM is recovering the data from the optical links correctly.
HL8 LVDS_TEST	Test indicator. It is always off.

3. See Fig. D.3-1 for the location of the indicators on the OIM panel.

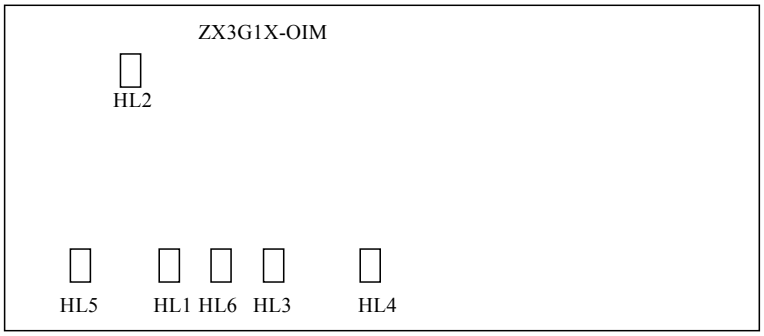


Fig. D.3-1 Location of Indicators on the OIM Panel

Table D.3-3 Indicators on the OIM Panel

Indicator	Meaning
HL1	3.3V power indicator. When it is on, it indicates that the 3.3V power is being supplied normally; when it is off, it indicates that the 3.3V power is not available.
HL2	Tx clock lock indicator. When it is on, it indicates that the Tx clock has been locked; when it is off, it indicates that the Tx clock has not been locked yet.
HL3	Data receiving preparation indicator. When it is on, it indicates that the receiving preparation has been completed; when it is off, it indicates that the receiving preparation has not been completed yet.
HL4	Optical signal indicator. When it is on, it indicates that optical signals are available; when it is off, it indicates that no optical signals are available.
HL5	5V power indicator. When it is on, it indicates that the 5V power is supplied normally; when it is off, it indicates that the 5V power is not available.
HL6	Data receiving error indicator. When it is on, it indicates that errors exist in the currently received data; when it is off, it indicates that the currently received data is correct.

Appendix E Abbreviations

Abbreviation	Full Name
1X EV	1X Evolution
1X EV-DO	1X Evolution Data Only
1X EV-DV	1X Evolution Data & Voice
1X EV-DO	1X Evolution Data Optimized
24PB	24V Power Board
2G BTS	2G Base Transceiver Station
3G BTS	3G Base Transceiver Station
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 BSC--BTS
ABS	Air Break Switch
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
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
ALCAP	Access Link Control Application Protocol
AM	Acknowledged Mode
AMB	Attenuation Matching Board

Abbreviation	Full Name
AMF	Authentication Management Field
AMP	Address Management Protocol
AMR	Adaptive Multi Rate
AN	Access Network
ANID	Access Network Identifiers
AP	Access preamble
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 between BSC and MSC
B	
B-BDS	Backplane of Baseband Digital Subsystem
BBDS	Backplane of BDS
BBS	BTS Baseband Subsystem
BCC	Bear Channel Connect
BCCH	Broadcast Control Channel
BCFE	Broadcast Control Functional Entity
BCH	Broadcast Channel
BCS	BTS 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

Abbreviation	Full Name
BDS	Baseband Digital System
BER	Bit Error Ratio
BGPS	Backplane of GPS
BGT	Block Guard Time
BIM	BDS Interface Module
B-ISDN	Broadband ISDN
BLPA	Backplane of LPA
BMC	Broadcast/Multicast Control
BPD	BDS Power Distribute
BPSK	Binary Phase Shift Keying
BPSN	Backplane of Packet Switching Network
BPWS	Backplane of PWS
BRFE	Backplane of RFE
BRFS	Backplane of TRX and BDM/RFM
BS	Base Station
BSC	Base Station Controller
BSM	Base Station Management
BSP	Board Support Package
BSS	Base Station Subsystem
BSSAP	Base Station Subsystem Application Part
BTM	BTS Test Module
BTRX	Backplane of TRX
BTS	Base Transceiver Station
BUSN	Backplane of Universal Switching Network
BWT	Block Waiting Time
C	
CA	Certificate Authentication
CAMEL	Customized Application for Mobile network Enhanced Logic
CB	Cell Broadcast
CBR	Constant Bit Rate
CBS	Cell Broadcast Service
CC	Control Channel
CC/PP	Composite Capability/Preference Profiles
CCCH	Common Control Channel
CCF	Call Control Function
CCH	Control Channel
CCK	Corporate Control Key
CCM	Communication Control Module

Abbreviation	Full Name
CCP	Compression Control Protocol
CCPCH	Common Control Physical Channel
CDF	Command Dispatch Functions
CDMA	Code Division Multiple Access
CDR	Call Detail Record
CDSU	Channel/Data Service Unit
CE	Channel Element
CEB	Channel Element Board
CES	Channel Element Subsystem
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
CIB	Circuit-bearer Interface Board
CIC	Circuit Identification Code
CLK	Clock
CLKD	Clock Distributor
CLKG	Clock Generator
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
CN	Core Network
CNAP	Calling Name Presentation
CPCH	Common Packet Channel
CPCS	Common Part Convergence Sublayer
CPICH	Common Pilot Channel
CPM	Calling Processing Module
CPP	Core Processor Part
CPU	Central Processing Unit
CR	Change Request
CRC	Cyclic Redundancy Check

Abbreviation	Full Name
CRF	Command Resolution Function
CRNC	Controlling Radio Network Controller
C-RNTI	Cell Radio Network Temporary Identity
CS	Circuit Switched
CSCF	Call Server Control Function
CS-GW	Circuit Switched Gateway
CSM	Cell Site Modem
CSM5000	Cell Site Modem ASIC 5000
CSU/DSU	Channel Service Unit/ Digital Service Unit
CTCH	Common Traffic Channel
CTDMA	Code Time Division Multiple Access
CTML	Common Trunking Message Link
C-TPDU	Command TPDU
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 Address
DBS	Database Subsystem
DC	Dedicated Control (SAP)
DCA	Dynamic Channel Allocation
DCCH	Dedicated Control Channel
DCH	Dedicated Channel
DCM	Dispatching Client Module
DCS	Dispatching Client Subsystem
DDI	Direct Dial In
DECT	Digital Enhanced Cordless Telecommunication
DFSM	Dispatching Frame Selector Module
DHCP	Dynamic Host Configuration Protocol
DHO	Diversity Handover
DIF	Data Intermediate Frequency Module
DIU	Digital Interface Module
DL	Downlink (Forward Link)
DLC	Data Link Control
DN	Destination Network
DNS	Directory Name Service

Abbreviation	Full Name
DO	Data Object
DOI	Domain of Interpretation
DPC	Destination Point Code
DPCCH	Dedicated Physical Control Channel
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	Digital Signature Algorithm
DS-CDMA	Direct Sequence-Code Division Multiple Access
DSCH	Downlink Shared Channel
DSM	Data Service Module
DSS	Dispatching SubSystem
D-CN	Dispatching Control Node
D-SN	Dispatching Serving Node
DTB	Digital Trunk Board
DTCH	Dedicated Traffic Channel
DTI	Digital Trunk Interface Element
DTMF	Dual Tone Multiple Frequency
DTX	Discontinuous Transmission
DUP	Duplexer
E	
EDC	Error Detection Code byte
EF	Elementary File
EHB	Ethernet HUB Board
E-HLR	Enhanced HLR
EIRP	Equivalent Isotropic Radiated Power
EJB	Enterprise Java Beans
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMS	Electromagnetic Susceptibility
ESB	Ethernet Switch Board
ESD	Electrostatic discharge
ESP	Encapsulating Security Payload
ESU	Extended Subscriber Unit

Abbreviation	Full Name
ETSI	European Telecommunications Standards Institute
ETU	Elementary Time Unit
F	
F/R-CCCH	Forward / Reverse Common Control Channel
F/R-DSCH	Forward/Reverse Dedicated Signaling 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	Forward-Dedicated Auxiliary Pilot Channel
F-ATDPICH	Forward-Auxiliary Transmit Diversity Pilot Channel
FAUSCH	Fast Uplink Signaling Channel
FAX	Facsimile
F-BCCH	Broadcast Control Channel
FBI	Feedback Information
F-CACH	Forward-Common Assignment Channel
FCI	File Control Information
FCP	Flow Control Protocol
F-CPCCH	Forward-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
Flexible-Rate	Flexible Data Rate
FLPC	Forward Link Power Control
FM	Fault Management
FN	Frame Number
FNUR	Fixed Network User Rate
FP	Function Point
F-PCH	Forward-Paging Channel
F-QPCH	Forward-Quick Paging Channel

Abbreviation	Full Name
FS	Frequency Synthesizer
FSB	Frequency Synthesizer Board
F-SYNCH	Forward-Synchronous Channel
FTB	Fiber Transceiver Board
FTC	Forward Traffic Channel
F-TDPICH	Forward-Transmit Diversity Pilot Channel
FTP	File Transfer Protocol
G	
GCM	GPS Control Module
GID1	Group Identifier (level 1)
GID2	Group Identifier (level 2)
GMSC	Gateway MSC
GMSK	Gaussian Minimum Shift Keying
GoTa	Global open Trunking Architecture
GP	Guard Period
GPCM	General Purpose Chip-select Machine
GPRS	General Packet Radio Service
GPS	Global Position System
GPSR	Global Position System Receiver
GPSTM	GPS Timing Module
GRE	Generic Routing Encapsulation
GSM	Globe System of Mobile Communication
GSN	GPRS Support Nodes
GTP	GPRS Tunneling Protocol
H	
HA	Home Agent
HCS	Hierarchical Cell Structure
HDLC	High-level Data Link Control
HDR	High Data Rate
HHO	Hard Handover
HIRS	High-speed Interconnect Router Subsystem
HLR	Home Location Register
HN	Home Network
HO	Handover
HPA	High Power Amplifier
HPS	Handover Path Switching
HRPD	High Rate Packet Data
HRR	Handover Resource Reservation

Abbreviation	Full Name
HSCSD	High Speed Circuit Switched Data
HSS	Home Subscriber Server
HWB	HW-signal process Board
I	
I/O	Input/Output
I-Block	Information Block
IC	Intergroup Coordination
ICC	Integrated Circuit Card
ICGW	Incoming Call Gateway
ID	Identifier
IEC	International Electrical Commission
IETF	Internet Engineering Task Force
IF	Intermediate Frequency
IFS	Information Field Sizes
IFSC	Information Field Size for the UICC
IFSD	Information Field Size 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
IMSI	International Mobile Subscriber 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	Internet Security Association and Key Management Protocol
ISCP	Interference Signal Code Power
ISDN	Integrated Services Digital Network
ISO	International Standardization Organization

Abbreviation	Full Name
ISP	Internet Service Provider
ISUP	ISDN User Part
ITU	International Telecommunications Union
IUI	International USIM Identifier
IWFB	InterWorking Function Board
J	
J2EE	Java 2 Platform Enterprise Edition
JAR file	Java Archive File
JD	Joint Detection
JDMK	Java Dynamic Management Kit
JMS	Java Message Service
JNDI	Java Naming Directory Interface
JP	Joint Predistortion
JTAPI	Java Telephony Application Programming Interface
JTS	Java Transaction Service
JVM	Java Virtual Machine
K	
kbps	kilo-bits per second
ksps	kilo-symbols per second
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	Location Services
LFM	Local Fibre Module
LLC	Logical Link Control
LMF	Local Management Function
LMT	Local Management Terminal
LN	Logical Name
LNA	Low Noise Amplifier

Abbreviation	Full Name
LOMC	Local OMC
LPA	Linear Power Amplifier
LPF	Low Pass Filter
LSB	Least Significant Bit
M	
M&C	Monitor and Control
MA	Multiple Access
MAC	Message Authentication Code (encryption context)
MAF	Management Application Features
MAHO	Mobile Assisted Handover
MAP	Mobile Application Part
MCC	Mobile Country Code
MCE	Module Control Element
Mcps	Mega-chips per second
MCU	Media Control Unit
MDIV	Micro Diversity
MDIV800	800M Micro Diversity
MDN	Mobile Directory Number
MDS	Multimedia Distribution Service
MDUP	Micro Duplex
MDUP800	800M Micro Duplex
ME	Mobile Equipment
MEHO	Mobile Evaluated Handover
MER	Message Error Rate
MF	Mediation Function
MGCF	Media Gateway Control Function
MGCP	Media Gateway Control Part
MGPS	Micro GPS
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 Per Second
MIT	MO Instance Tree
MLNA	Micro Low Noise Amplifier

Abbreviation	Full Name
MLNA800	800M Micro Low Noise Amplifier
MM	Mobility Management
MMI	Man Machine Interface
MML	Man Machine Language
MNC	Mobile Network Code
MNIC	Multi-service Network Interface Card
MNP	Mobile Number Portability
MO	Mobile Originated
MOF	MO administration Function
MOHO	Mobile Originated Handover
MONB	Monitor Board
MOS	Mean Opinion Score
MPA	Micro Power Amplifier
MPA800	800M Micro Power Amplifier
MPB	Main Process Board
MPC8260	Motorola Power PC 8260
MPC860	Motorola Power PC 860
MPD	Micro-BTS Power Distribution
MPM	MSC Processing Module
MRB	Media Resource Board
MRF	Media Resource Function
MS	Mobile Station
MSB	Most Significant Bit
MSC	Mobile Switching Center
MSG	Management Steering Group
MSID	Mobile Station Identifier
MSIN	Mobile Station Identification Number
MSM	Message Switching Module
MSP	Multiple Subscriber Profile
MSU	Main Subscriber Unit
MT	Mobile Termination
MTBF	Mean Time Between Failures
MTP	Message Transfer Part
MTP3-B	Message Transfer Part level 3
MTRX800	800M Micro Transmitter & Receiver
MTSI	Master To Slave Interface
MUI	Mobile User Identifier
N	

Abbreviation	Full Name
NAD	Node Address byte
NAI	Network Access Identifier
NAS	Non-Access Stratum
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
NEMF	Network Element Mediation Function
NIM	Network Interface Module
NITZ	Network Identity and Time Zone
NMC	Network Management Center
NMSI	National Mobile Station 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
NW	Network
O	
O&M	Operations and Maintenance
O_AMP	O&M _Alarm Management Part
O_CMP	O&M _Configuration Management Part
O_PMP	O&M _Performance Management Part
O_RMP	O&M _Right Management Part
O_TMP	O&M _Test Management Part
OCCCH	ODMA Common Control Channel
ODCCH	ODMA Dedicated Control Channel
ODCH	ODMA Dedicated Channel
ODMA	Opportunity Driven Multiple Access

Abbreviation	Full Name
ODTCH	ODMA Dedicated Traffic Channel
OIB	Optical 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
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
PC	Power Control
PCB	Protocol Control Byte
PCCC	Parallel Concatenated Convolution Code
PCCH	Paging Control Channel
PCCPCH	Primary Common Control Physical Channel
PCF	Packet Control Function
PCH	Paging Channel

Abbreviation	Full Name
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
PDC	PTT Dispatching Client
PDCP	Packet Data Convergence Protocol
PDF	Detecting of Power Direction Forward
PDN	Public Data Network
PDP	Packet Data Protocol
PDR	Detecting of Power Direction Reverse
PDS	PTT Dispatching Server
PDSCH	Physical Downlink Shared Channel
PDSN	Packet Data Serving Node
PDU	Protocol Data Unit
PERT	Program Evaluation and Review Technique
PG	Processing Gain
PHB	Per Hop Behavior
PHR	PTT Home Register
PHS	Personal Handy phone System
PHY	Physical layer
PhyCH	Physical Channel
PI	Page Indicator
PICH	Pilot Channel
PID	Packet Identification
PIM	Power Amplifier Interface Module
PIN	Personal Identifying Number
PL	Physical Layer
PLMN	Public Land Mobile Network
PM	Project Manager
PMD	Physical Layer Medium Dependent
PMM	Power Monitor Module
PN	Pseudo Noise
PNP	Private Numbering Plan
POMC	Province OMC
POTS	Plain Old Telephone Service

Abbreviation	Full Name
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-amplifying Board
PRM	Power Rectifier Module
PS	Packet Switched
PSB	Power Splitter Board
PSC	Primary Synchronization Code
PSCH	Physical Shared Channel
PSE	Personal Service Environment
PSI	PCF Session ID
PSM	Power Supplier Module
PSN	Packet Switched Network
PSOS	
PSPDN	Public Switched Packet Data Network
PSTN	Public Switched Telephone Network
PTM	Power Transition Module
PTM-G	PTM Group Call
PTM-M	PTM Multicast
PTP	Point to point
PTT	Push to Talk
PUSCH	Physical Uplink Shared Channel
PVD	Power VSWR Detect Board
PWRD	POWER Distributor
PWS	Power System
Q	
QA	Quality Assurance
QAF	Q3 Adaptor Function
QC	Quality Control
QoS	Quality of Service
QPM	Quantitative Process Management
QPSK	Quadrature Phase Shift Keying
QXF	Qx Interface Function
R	
R_CLP	R_Communication Link Part

Abbreviation	Full Name
R_CLP_InSubsystem	
R_CLP_InterSubsystem	
R_CLP_MasterSlave	
R_CLP_TrafficData	
R_FMP	R_File Management Part
R_FMP_Background	
R_FMP_Foreground	
R_RSP	R_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	R_System Control Part
R_SCP_Boot	
R_SCP_MainControl	
R_SCP_StatusControlManagement	
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
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

Abbreviation	Full Name
RFM	Remote Fiber Module
RFM1900	1.9G Remote Fiber Module
RFM800	800M Remote Fiber Module
RFS	Radio Frequency Subsystem
RIM	RF Interface Module
RL	Radio Link
RLC	Radio Link Control
RLCP	Radio Link Control Protocol
RLP	Radio Link Protocol
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
RRP	Mobile IP Registration Reply
RRQ	Mobile IP Registration Request
RSA	Rivest-Shamir-Adleman public key algorithm
RSCP	Received Signal Code Power
R-SGW	Roaming Signaling Gateway
RSM	Reverse Switch Module
RSSI	Received Signal Strength Indicator
RST	Reset
RSVP	Resource Reservation Protocol
RT	Real Time
RTC	Reverse Traffic Channel
RTOS	Real Time Operate System
RTP	Real Time Protocol
R-TPDU	Response TPDU

Abbreviation	Full Name
RU	Resource Unit
RUM	Route Update Message
RUP	Route Update Protocol
RX	Receiver
RXB	Receiver Board
S	
S/N	Signal/Noise
S_BSSAP	SPS Base Station System Application Part
S_CCHSP	SPS Control Channel Signaling Process
S_CEC	SPS Channel Element Controller
S_CEM	SPS Channel Element Modem
S_MTP	SPS Message Transfer Part
S_MTP3	SPS Message Transfer Part3
S_RCM	SPS Radio Channel Control Management
S_SCCP	SPS Signaling Connection Control Part
S_SVLP	SPS Selector Vocoder Low-Layer Process
S_TCHL2P	SPS Traffic Channel Layer2 Process
S_TCHL3P	SPS Traffic Channel Layer3 Process
S_TLH	SPS Traffic Link Handler
S_VIM	SPS Vocoder Interface Module
SA	Security Association
SAAL	Signaling ATM Adaptation Layer
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
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
SCH	Synchronization Channel

Abbreviation	Full Name
SCI	Subscriber Controlled Input
SCM	Sub-BDS Control Module
SCP	Session Configuration Protocol
SCS	System Control Subsystem
SCWLL	Super CDMA Wireless Local Loop
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
SF	Spreading Factor
SHA	Secure Hash Algorithm
SHCCH	Shared Control Channel
SIE	Sector Interface Element
SIM	GSM Subscriber Identity Module
SINR	Signal-to-Interface plus Noise ratio
SIP	Session Initiated Protocol
SIR	Signal-to-Interference Ratio
SLA	Service Level Agreement
SLP	Signaling Link Protocol
SMC	Serial Management Controller
SME	Short Message Entity
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
SPB	Signaling Process Board
SPLL	System Phase Locked Loop
SPS	Signaling Process Subsystem
SQN	Sequence Number
SR1	Spreading Rate 1
SS7	Signaling System No.7

Abbreviation	Full Name
STC	Signaling Transport Converter
STDL	Shared Trunking Data Link
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
T	
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
TE	Terminal Equipment
TFM	Timing Frequency Module
TFS	Timing & Frequency Subsystem
TLLI	Temporary Link Level Identity
TLS	Transport Layer Security
TMB	Traffic Manage Board
TMN	Telecommunication Management Network
TMSI	Temporary Mobile Subscriber Identity
TN	Termination Node
TOD	Time of Date
TPC	Transmit Power Control
TPDU	Transfer Protocol Data Unit
TPTL	Transmission Power Track Loop
TrCH	Transport Channel
TRX	Transmitter and Receiver
T-SGW	Transport Signaling Gateway
TSM	Transmit Switch Module
TSNB	TDM Switch Network Board
TSTD	Time Switched Transmit Diversity

Abbreviation	Full Name
TTI	Transmission Timing Interval
TX	Transmitter
TXB	Transmitter Board
U	
UDP	User Datagram Protocol
UDR	User Data Record
UE	User Equipment
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 between MS and BTS
UNI	User-Network Interface
UPT	Universal Personal Telecommunication
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
USCH	Uplink Shared Channel
UT	Universal Time
UTRA	Universal Terrestrial Radio Access
UTRAN	Universal Terrestrial Radio Access Network
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	Visitor Location Register
VMS	Voice Mail Server
VoIP	Voice Over IP
VPLMN	Visited Public Land Mobile Network

Abbreviation	Full Name
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
WCDMA	Wideband Code Division Multiple Access
WCF	Workstation Control Function
WDP	Wireless Datagram Protocol
WIN	Wireless Intelligent Network
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
X	
XRES	Expected user Response
Z	
ZXCBTS M800T	ZTE CDMA 800M micro base station (10W)
ZXCBTS M802T	ZTE CDMA 800M micro base station (20W)
ZXCBTS M190T	ZTE CDMA 1900M micro base station (5W)
ZXCBTS M191T	ZTE CDMA 1900M micro base station (10W)
ZXCBTS M192T	ZTE CDMA 1900M micro base station (20W)
ZXCBTS R800T	ZTE CDMA 800M RF remote base station (10W)
ZXCBTS R802T	ZTE CDMA 800M RF remote base station (20W)
ZXCBTS R190T	ZTE CDMA 1900M RF remote base station (5W)
ZXCBTS R191T	ZTE CDMA 1900M RF remote base station (10W)
ZXCBTS R192T	ZTE CDMA 1900M RF remote base station (20W)