

HUAWEI

Airbridge cBTS3612 CDMA Base Station
Installation Manual

Hardware Installation

HUAWEI

Airbridge cBTS3612 CDMA Base Station
Installation Manual

Software Installation & System Commissioning

Airbridge cBTS3612 CDMA Base Station Installation Manual



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Airbridge cBTS3612 CDMA Base Station

Installation Manual

HUAWEI

1. Hardware Installation
2. Software Installation & System
Commissioning

Airbridge cBTS3612 CDMA Base Station
Installation Manual

V100R002

Airbridge cBTS3612 CDMA Base Station

Installation Manual

Manual Version T2-030448-20030125-C-1.21

Product Version V100R002

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About This Manual

Version

The product version corresponds to the manual is Airbridge cBTS3612 CDMA Base Station V100R002.

Contents

The manual introduces the insulation methods and procedure of cBTS3612. It is divided into two modules:

- Module 1: Hardware Installation

This module describes in detail the installation procedure of the hardware system, including preparations, equipment room, antenna & feeder, and the inspection after installation.

- Module 2: Software Installation & System Commissioning

This part introduces the installation procedure of BTS maintenance terminal software and the BTS system software, as well as the testing and commissioning of the system.

Environmental Protection

This product has been designed to comply with the requirements on environmental protection. For the proper storage, use and disposal of this product, national laws and regulations must be observed.

Target Readers

The manual is intended for the following readers:

- Installation engineers & technicians
- Operation & maintenance personnel

Conventions

This document uses the following conventions:

I. General conventions

Convention	Description
Arial	Normal paragraphs are in Arial.
Arial Narrow	Warnings, cautions, notes and tips are in Arial Narrow.
Terminal Display	Terminal Display is in Courier New; message input by the user via the terminal is in boldface .

II. Command conventions

Convention	Description
boldface font	Command keywords (which must be input unchanged) are in boldface .
<i>italic</i> font	Command arguments for which you supply values are in <i>italics</i> .
[]	Elements in square brackets [] are optional.
{ x y ... }	Alternative keywords are grouped in braces and separated by vertical bars. One is selected.
[x y ...]	Optional alternative keywords are grouped in square brackets and separated by vertical bars. One (or none) is selected.
{ x y ... }*	Alternative keywords are grouped in braces and separated by vertical bars. A minimum of one and maximum of all can be selected.
[x y ...]*	Optional alternative keywords are grouped in square brackets and separated by vertical bars. Many (or none) are selected.
!	A line starting with an exclamation mark is comments.

III. GUI conventions

Convention	Description
< >	Message entered via the terminal is within angle brackets.
[]	MMIs, menu items, data table and field names are inside square brackets [].
/	Multi-level menus are separated by forward slashes (/). Menu items are in boldface. For example, [File/Create/Folder].

IV. Keyboard operation

Format	Description
<Key>	Press the key with key name expressed with a pointed bracket, e.g. <Enter>, <Tab>, <Backspace>, or <A>.
<Key1+Key2>	Press the keys concurrently; e.g. <Ctrl+Alt+A> means the three keys should be pressed concurrently.

Format	Description
<Key1, Key2>	Press the keys in turn, e.g. <Alt, A> means the two keys should be pressed in turn.
[Menu Option]	The item with a square bracket indicates the menu option, e.g. [System] option on the main menu. The item with a pointed bracket indicates the functional button option, e.g. <OK> button on some interface.
[Menu1/Menu2/Menu3]	Multi-level menu options, e.g. [System/Option/Color setup] on the main menu indicates [Color Setup] on the menu option of [Option], which is on the menu option of [System].

V. Mouse operation

Action	Description
Click	Press the left button or right button quickly (left button by default).
Double Click	Press the left button twice continuously and quickly.
Drag	Press and hold the left button and drag it to a certain position.

VI. Symbols

Eye-catching symbols are also used in this document to highlight the points worthy of special attention during the operation. They are defined as follows:



Caution, Warning, Danger: Means reader be extremely careful during the operation.



Note Comment, Tip, Knowhow, Thought: Means a complementary description.

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Safety Precautions

1 Overview

This section covers part of the safety precautions to be observed during the installation, maintenance, and the related operation of Huawei-developed network equipment.



Caution:

Before any operation, please carefully go through the operation instructions and precautions so as to prevent accidents. The signs such as "Caution, Attention, Warning and Danger" in manuals are merely the supplements to safety precautions in operations rather than all the safety precautions to be observed. Therefore, personnel engaged in the installation and maintenance of Huawei-developed products should have basic knowledge of safe operation, undergo relevant training and be qualified for related operations.

Please abide by local safety regulations during the operation. The safety precautions in this manual only serve as supplements to local safety regulations.

When operating Huawei-developed products and equipment, please strictly abide by the precaution points and specific safety instructions concerning the equipment provided by Huawei. The safety warnings listed in this manual only show the precaution points that Huawei are aware of. Huawei Company does not bear any consequence resulting from violation against universal regulations for safety operation, or violation against the safety codes in designing, production and equipment using.

The personnel responsible for the installation and maintenance of Huawei-developed products should undergo strict training, command the correct operation methods and get acquainted with various safety precautions before performing any operation such as equipment installation, maintenance, etc.

1.1 Symbol Explanation

The signs shown in Table 1 in this manual, are intended to remind readers of the safety precautions to be observed during the operations of equipment installation and maintenance.

Safety prompts are divided into the following levels: Danger, Warning, Attention and Caution. The format is shown in the following: The text note of the safety level is indicated to the right of the symbol. And the detailed explanations of the safety precautions are shown below the symbol.



Danger:

Indicating that casualties or serious accident may occur if this safety instruction is ignored.



Warning:

Indicating that serious or major injuries may occur or equipment may be damaged if this safety instruction is ignored.



Attention:

Indicating that major injuries may occur or equipment may be damaged if this safety instruction is ignored.



Caution:

Indicating that injuries may occur or equipment may be damaged if this safety instruction is ignored.

The types and meanings of safety signs are shown in the following table.

Table 1 Types and meanings of safety signs

Safety symbol	Meaning
	Common warning symbol: Indicates general safety precautions.
	Anti-static symbol: Indicates that the equipment is sensitive to static electricity.
	Liveline symbol: Indicates dangerous voltage.
	Microwave symbol: Indicates powerful electromagnetic field.
	Laser symbol: Indicates powerful laser beam.
	Scald symbol: Indicates that the equipment surface with high temperature, which might cause scald or burns on the personnel. Upon this warning, people should not touch the surface, so as to avoid any scald or burn.

2 Toxic Articles

2.1 Beryllium Oxide



Warning:

Some equipment components carrying toxic beryllium oxide are chosen unavoidably.

- Only when the components carrying beryllium oxide are damaged may the beryllium oxide do harm to human body. The personnel who contact or handle the components should be aware of the component peculiarity and take corresponding preventive measures beforehand.
- To dispose of the component, the personnel should make necessary chemical treatment or special waste processing for the component carrying beryllium in accordance with related local regulations. The components carrying beryllium should not be discarded freely.

2.2 Hydrochloride



Warning:

Some components of the equipment carrying hydrochloride are used as it is unavoidable. Toxic gases will be generated by these components when burned.

- Toxic gases will be generated when burning these components. Preventive measures should be taken beforehand so that the components will not get burned, and even if the burning occurs, the toxic gases will not be inhaled into human body. The components should not be discarded freely. To dispose of the component, the personnel should make necessary chemical treatment or special waste processing for the component carrying hydrochloride in accordance with related local regulations.

2.3 Hydrofluoride



Warning:

Some equipment components carrying hydrofluoride are chosen unavoidably. Toxic gases will be generated when burning these components.

- Preventive measures should be taken beforehand so that the components will not get burned, and even if the burning occurs, the toxic gases will not be inhaled into human body. The components should not be discarded freely. To dispose of the component, the personnel should make necessary chemical treatment or special waste processing for the component carrying hydrofluoride in accordance with related local regulations.

3 Electrical Safety

3.1 High Voltage



Danger:

High voltage power supply provides electricity for equipment operation. Direct contact or indirect contact via damp objects and conductors with high-voltage wires or mains supply may be fatal.

- Installation of AC power supply equipment must be implemented in compliance with local safety regulations, and the personnel engaged in AC power supply must be qualified for high-voltage and AC operations.
 - Electrical conductors such as watches, bracelets and rings must be removed before operation.
 - If the cabinet is found to be wet, please turn off power supply immediately.
 - Keep the equipment dry upon operation under humid environment.
-



Warning:

Improper high-voltage operations may result in fire accidents and electric shocks. Therefore, AC power cables must be laid in compliance with local codes and regulations. High-voltage operators should be trained and qualified.

3.2 Power Cables



Caution:

Live installation and removal of power cables are prohibited. Electric sparks or arcs may be generated when power cables get in touch with conductors, which may cause fire accidents or eye injuries.

- Power must be switched off before installation and removal of the power cable.
- Before connecting a cable, make sure that the cable and cable label to be used should match actual installation requirements.

3.3 Tools



Warning:

High-voltage and AC operations require special tools instead of general-purpose or makeshift tools.

3.4 Drilling



Warning:

Unauthorized drilling on the cabinet is strictly prohibited. Improper drilling may damage the connections and cables inside the cabinet and the metal filings produced during the drilling may cause short-circuits of the circuit boards if they fall into the cabinet.

- Wear protective insulation gloves and remove the cables inside the cabinet before drilling holes on the cabinet.
- Take care of your eyes when drilling holes. As the splashing metal burrs & scraps may hurt your eyes.
- Prevent metal scraps from entering the cabinet inside.
- Improper drilling will damage the electromagnetic shielding performance of the cabinet.
- Clean up the metal scraps after drilling.

3.5 Thunderstorms



Danger:

High-voltage and AC operations and operations on the steel towers and masts are strictly prohibited in a stormy weather.

- Thunderstorms can generate powerful electromagnetic field in the atmosphere. Therefore, equipment should be grounded properly in order to prevent the equipment from being thunderstruck.

3.6 Static Electricity



Caution:

Static electricity generated by the human body may damage the electrostatic-sensitive parts on the circuit boards, such as large-scale integrated circuit (IC).

- The grating generated between human activities and the components is the rootage for electrostatic charge accumulation. In dry climate, the

electrostatic charge carried by human body may go up to 30 kV, which will remain on the human body for a rather long period of time. The operator's contact with the sensitive component and the resultant electric discharge will cause damage to the component.

- Before contacting/touching any equipment such as holding plug-in boards, circuit boards and IC chips, put on the anti-static wrist strap with one end well grounded so as to prevent sensitive parts from getting damaged by static electricity on the human body.
- Before operators touch the board or module, they should release the electrostatic charge in their body. That is, before the operator touches a board or a module, he or she must wear the anti-static grounded wrist strap. The connecting line between the wrist and the grounding point should connect in series with a resistance greater than $1\text{ M}\Omega$, to protect people from being accidentally shocked. The resistance value greater than $1\text{ M}\Omega$ is rather low in terms of electrostatic voltage discharging. The anti-static wrist strap should be checked regularly. Using other cable to replace the cable of anti-static wrist strap is strictly prohibited.
- Electrostatic-sensitive board or module should not be in contact with the object with static electricity or the object that may easily generate static electricity. For instance, packaging bags, delivery boxes and conveyor belts made of insulating materials will generate static electricity by themselves, and can cause electrostatic charging when in contact with human body or the earth and might thus bring forth damages.
- Electrostatic-sensitive boards or modules can only contact quality discharging materials, such as anti-static packing bags. The board in stock or in the course of transportation should be packaged with anti-static packing bag.
- Before the measurement device is connected to boards or modules, first discharge its static electricity, that is, the measurement device should be grounded first.
- The single board or module should not be placed near strong DC magnetic field, for instance, near the cathode ray tube of the oscilloscope. The safety distance should be at least 10 cm.
- Damage caused by static electricity is accumulative. If the damage is slight, the component will not malfunction. However, as the number of damages increase, the components may suddenly fail. The electrostatic discharging damage to the component is of two types: obvious damage and hidden damage. Hidden damage is not shown when the damage occurs, whereas the component may become vulnerable and easily get damaged under the condition of over-voltage and of high-temperature.

The correct way of wearing anti-static wrist strap is shown in Figure 1.

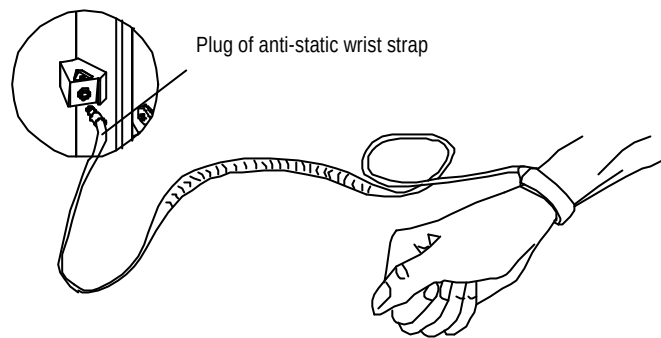


Figure 1 Wearing the anti-static wrist strap

3.7 Power Labels



Caution:

Before connecting the cables, check the correctness of labels and then make the connection.

3.8 Leakage Current



Warning:

To avoid the occurrence of large leakage current, the equipment must be grounded before connecting to the power supply.

- Before connecting the AC input power supply, the operation and maintenance personnel should first connect the protection-grounding terminal of the equipment housing to the earth. The purpose of doing so is to avoid electric shock on human body resulting from leakage current, which is usually caused by the earth capacitance of the EMI wave filter at the AC power supply input terminal of the equipment or the Y capacitance of the primary power supply.

3.9 Flammable Air Environment



Danger:

The equipment should not be placed in an environment where flammable, explosive air or smog exists. No operation should be performed under such an environment.

- The operation on any electronic equipment under such an environment will pose absolute threat to the equipment & the operating personnel.

4 Batteries

4.1 General Operations



Danger:

Before undertaking the battery operations, the personnel should carefully read the safety precautions for handling batteries and the correct connection of batteries.

- Improper operation of batteries will be dangerous. Guard against short-circuits of batteries or electrolyte spillover in operation, which may pose a potential threat to equipment, corrode metal articles and circuit boards, damage equipment and result in short circuit of circuit board.
- Before installation and maintenance of batteries, take the following measures to ensure safety:
- The batteries should be handled with care. Avoid strenuous vibration when handling them.
- Metal articles such as watches, bracelets and rings must be removed.
- Use special insulated tools.
- Wear eye protection gears and take preventive measures.
- Wear rubber gloves and apron in case of electrolyte spillover.
- Hold the positive pole of batteries upright during handling. Do not handle them upside down or in slant position.

4.2 Short Circuit



Caution:

Short-circuit of the battery will cause personal injury. Although the voltage of ordinary battery is not high, the powerful instantaneous current generated by short-circuit may release immense energy.

- Prevent short-circuits of batteries caused by metal articles, such as short-circuit caused by improper use of tools. If allowed, first disconnect the batteries and then proceed with other operations.

4.3 Harmful Gases



Caution:

Unsealed lead acid batteries should not be used, as the gas released from the batteries may cause fires or equipment corrosion. Batteries should be fixed horizontally.

- Batteries may release inflammable gases in operation, so the place where the batteries are placed should be well ventilated and fire prevention measures should be taken.

4.4 High Temperature



Caution:

Excessively high temperature of batteries will cause deformation and damage to batteries and spillover of acid liquid.

- When the temperature of battery is over 60°C, check and see whether there is spillover of acid liquid.
- In case of acid liquid spillover, **please** make proper and timely treatment of acid spillover.

4.5 Acid Liquid



Caution:

In case of acid liquid spillover, make sure that the spillovers are absorbed and neutralized.

- To move leaking batteries, bear in mind the possible damages that may be caused by the acid liquid. Once acid liquid is found to have spilt over, absorb and neutralize it with the following materials.

Bicarbonate: NaHCO_3

Barilla: Na_2CO_3

Soda: $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

- Consult the battery manufacturers as regards materials used to absorb and neutralize acid liquid.

4.6 Battery Replacement



Warning:

Operation and maintenance personnel should not replace the batteries of specified model with that of other model. Otherwise, possible explosion may incur.

5 Microwave and Magnetic Field

5.1 Introduction

The equipment antenna in service will generate electromagnetic radiation. Standing too close to the antenna violates the safety codes. The equipment can only be installed and maintained by trained professional personnel. The radiation design of the equipment should meet the IEEE C95.1-1991 recommendation. When working near the full-power transmitting antenna, one should first read the following safety working requirements.

5.2 Definition of the Environment

The uppermost level limit of the environment that can be exposed to radio magnetic radiation is of two kinds: one is "controlled environment" and the other is "uncontrolled environment " with less radiation.

- **Controlled Environment**

Controlled environment refers to a certain location where the personnel who enter the area are aware of the potential threat of exposing themselves to the radio frequency radiation environment. Generally, the personnel enter such areas for the profession requirements and they get acquainted with this danger or they just pass by the areas where possible radiation exists. The magnetic field level of the area is higher than that of "uncontrolled environment" but no greater than that of "controlled environment" listed in the table.

- **Uncontrolled Environment**

"Uncontrolled environment" refers to a certain location where the personnel who enter the area are not aware of the potential threat of exposing themselves to the radio frequency radiation environment, and they cannot control the environment where they are situated. This location may include living environment or working environment. The magnetic field level of the location cannot be greater than the uppermost level under the "uncontrolled environment" listed in the table.

5.3 Operation Codes



Warning:

When operating on the high intensity radio frequency signal equipment, bear in mind that the high-intensity microwave is detrimental to human health.

6 Laser



Warning:

Laser beams inside optical fibers may do harm to your eyes.

- During the installation and maintenance of optical fibers, keep eyes away from, or avoid direct look at the optical fiber or optical transceiver outlet.

7 High Temperature



Warning:

It is unavoidable that the temperatures of some equipment parts are rather high. Please do not touch the surface as you wish, else scalding may occur.

- When the equipment is running in the tropical environment, the temperature benchmark of the parts is 45⁰C and the maximum range of temperature rise allowed is 30⁰C under normal working conditions. When fault occurs, the maximum temperature rise allowed is 55⁰C. So when the parts work at the high temperature of 45⁰C under normal working conditions, their highest temperature should not exceed 75⁰C, and when fault occurs, the highest temperature should not exceed 100⁰C.

8 Fans



Warning:

To dismount the fan which is running, never dip the finger or tool into the fan that is running before the fan is powered off or stops running to avoid damage to the equipment or injuries to human body.

- Dipping the finger into the fan while it is running may cause injuries.
 - When replacing related parts, place the objects such as the parts, screws, and tools properly. Make sure that they would not fall into the running fan, otherwise they will damage the fan or the related equipment.
 - When replacing the peripheral equipment of the fan, never dip the finger or board into the fan to avoid any possible injuries to the equipment or the hands.
-



Warning:

Keep your hands and body away from the dangerous running parts to avoid possible injuries.

9 Working at High Altitudes

9.1 General Operations



Warning:

When working at heights, beware of falling objects.

Working at heights must be in accordance with the related national regulations:

- Personnel working at heights must have undergone appropriate training.
- Take care of the mechanical devices and tools and prevent them from falling down.
- Follow safety precautions and wear helmet and safety belt.
- Put on cold-proof clothes before working at heights in cold areas.
- Check and approve all the lifting devices before working at heights.

9.2 Safety Codes for Using Ladders

- Before using the ladder, first check and see whether the ladder is damaged. Make sure the ladder is safe for use. Overload on the ladder is strictly prohibited.
- When operating under the conditions that the leaning distance of the ladder is over 5m, and that of the erected ladder with two-foot is over 3m, and other dangerous environment, the ladder should be held by somebody or relevant safe measures should be effected. The A-shaped ladder should be completely stretched for using, as shown in Figure 2 below.

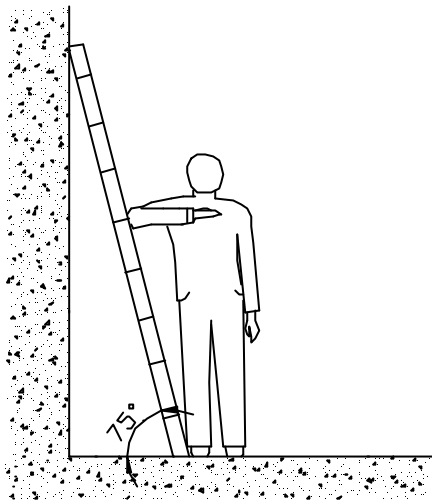


Figure 2 The angle at which the ladder should be leaned

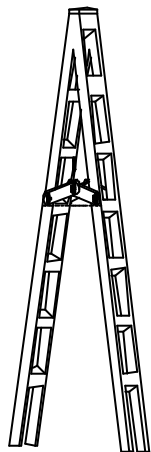


Figure 3 Stretching the A-shaped ladder

- It is recommended that the slope of the ladder be 75° . The slope can be measured with angle square or with arm, as shown in the Figure 3. When using the ladder, the wider end of the ladder should be placed against the ground or protective measures should be taken at the bottom of the ladder for the purpose of skid resistance. Place the ladder against a stable ground and do not place the ladder against those objects that are easy to lean and slide themselves such as paper box, stone and so on.

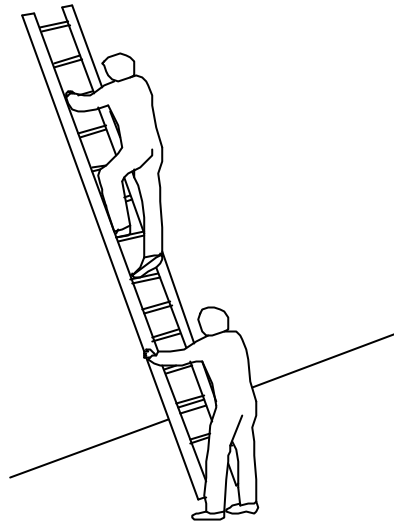


Figure 4 Climbing and using the long ladder in a safe way

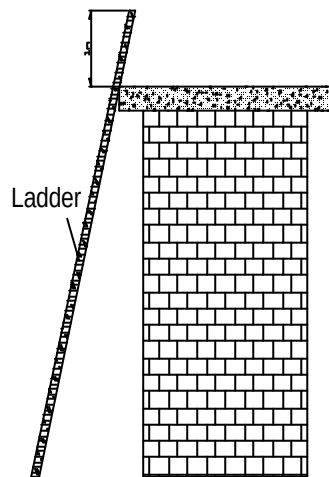


Figure 5 Placing the ladder with the top 1 meter higher above the edge of the roof-top

- When climbing the ladder, one's center of gravity should not deviate from the ladder edge. To avoid danger and ensure safety, make sure that three parts of the body should be kept on the ladder, that is, the feet should be pressed against the ladder and one hand fast grips the ladder, as shown in Figure 4. Never climb the topmost four rungs of a ladder. If one is about to climb to the roof, the length of the ladder should be at least 1 meter higher above the eave, as shown in Figure 5.

10 Other Items

10.1 Hoisting of Heavy Objects



Warning:

Walking under the gib arm or hoisted objects are strictly prohibited when hoisting heavy objects.

- Lifting operators should undergo related training and be qualified. The lifting devices should be checked and must be intact. Make sure that only when the lifting devices are firmly fixed onto the weight-bearing object or onto the main wall may lifting operations be undertaken. Use concise command to avoid wrong operations.
- The angle between the straps at the point where they are attached to the lifting hook should not be greater than 90° to prevent them from getting broken, as shown in Figure 6.

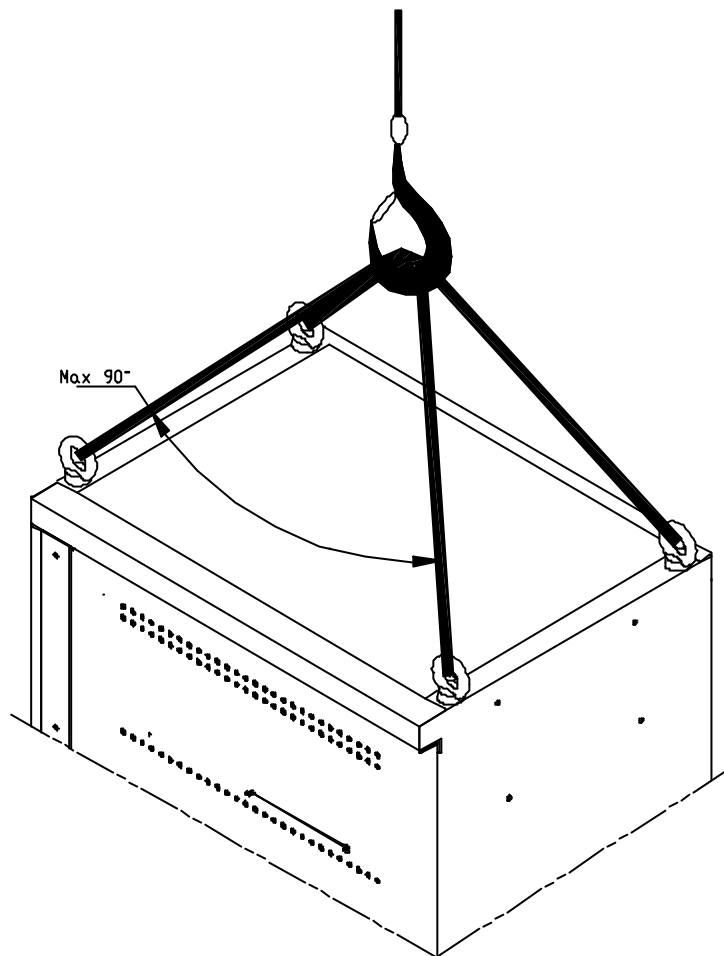


Figure 6 Hoisting of the heavy objects

10.2 Handling of Heavy Objects



Caution:

When carrying heavy object such as the cabinets, please get everything well prepared for bearing to avoid bruises and wounds by the heavy object.

- The installation and maintenance of BSC cabinet should be done by 2 to 3 persons at best. The operations of leaning, tilting, and erecting the cabinet should also be undertaken with the cooperation of 2 to 3 persons. Note that the cabinet may fall down on account of the center of gravity when the tilt angle of the center of gravity exceeds 10 degrees.

The process of laying down and erecting a cabinet is shown as Figure 7.

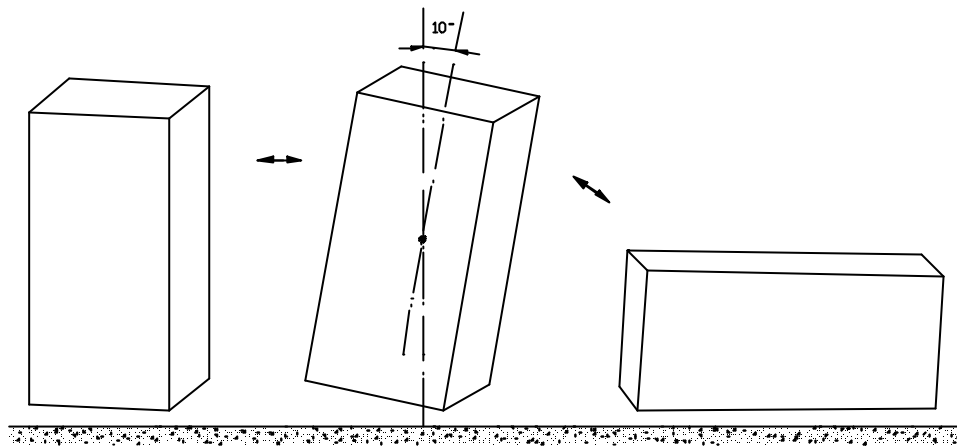


Figure 7 The process of laying down and erecting a cabinet

10.3 Sharp Edges



Warning:

When conveying equipment by hand, please wear protective gloves to prevent cuts and injuries caused by sharp edges.

10.4 Inserting & Drawing Out the Boards



Caution:

Do not apply too much force when inserting the boards to avoid bending of the pins on the backplane.

Insert the board along the slot to avoid short-circuit resulting from their surfaces contacting each other.

Keep hands off the board circuit, elements, connectors or wiring trough when holding a board by hand.

10.5 Bundling the Signal Cables



Caution:

Signal cables should be tied separately from strong current or high voltage cables, and the spacing between adjacent cable ties should be at least 150mm.

10.6 Maintenance and Commissioning by a Single Person is not Allowed



Caution:

One should not attempt to perform the maintenance or commissioning in the areas of the equipment interior unless another qualified professional who can give instructions and is capable of self-saving is present.

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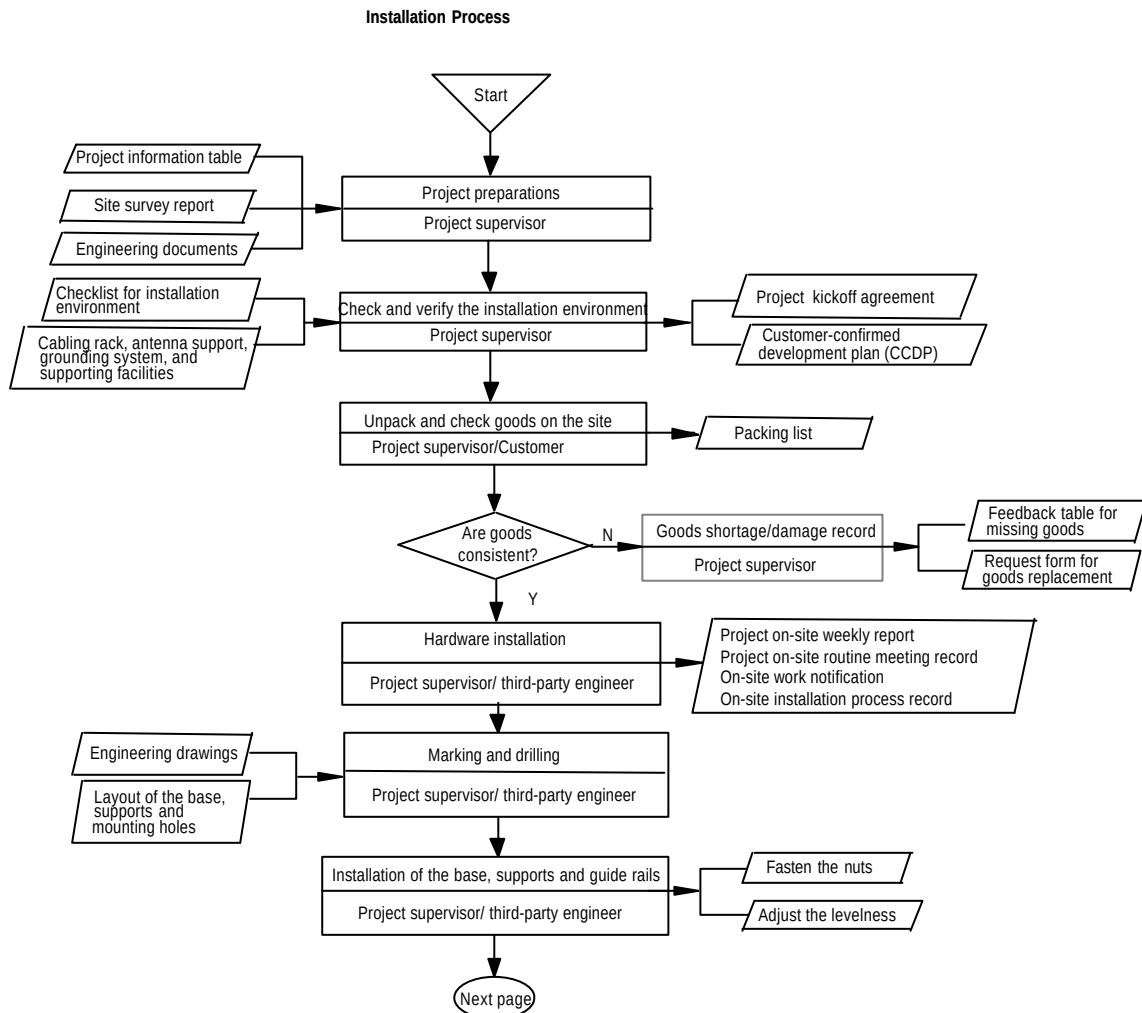
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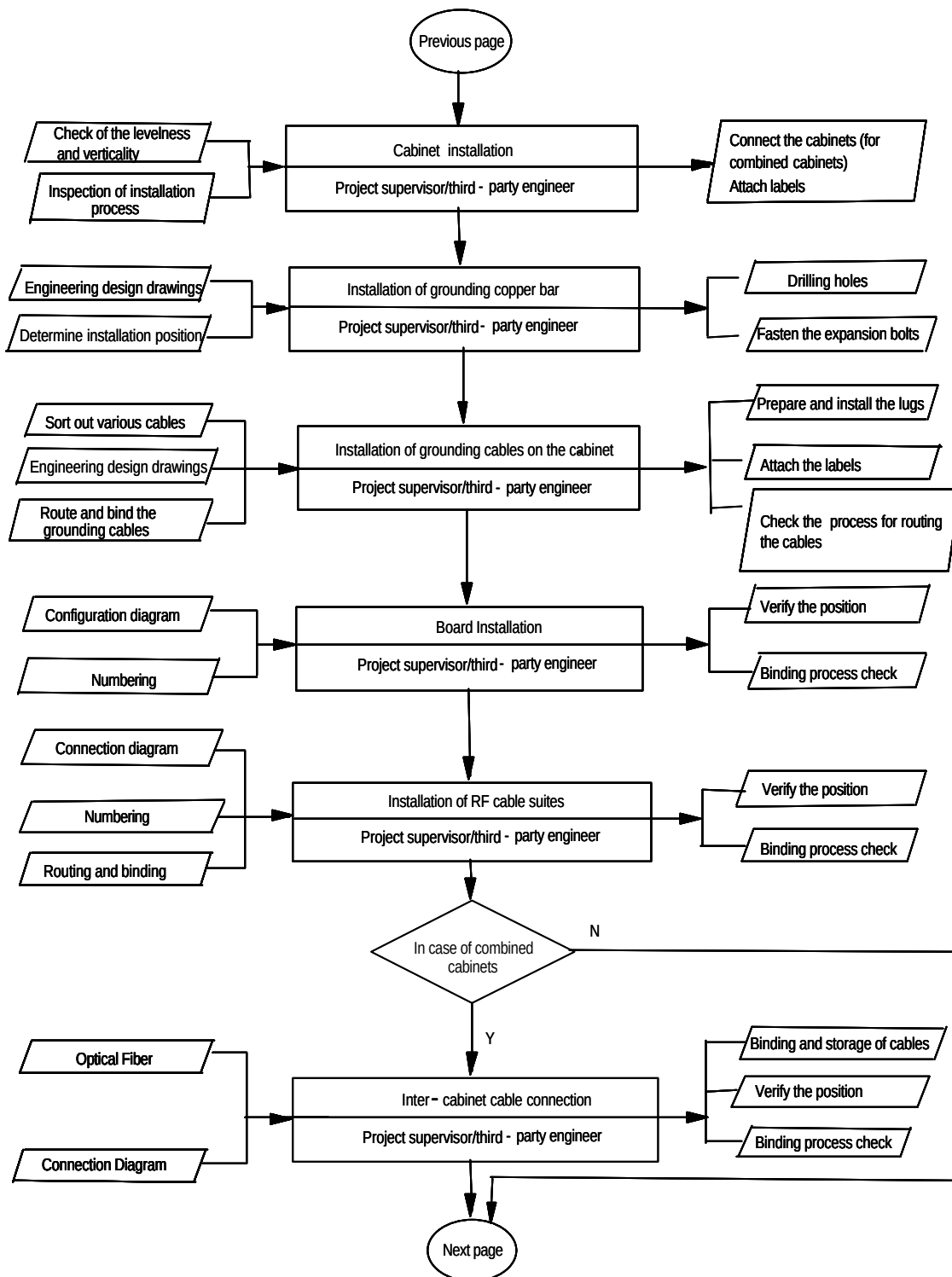
1 Overview of Installation Process

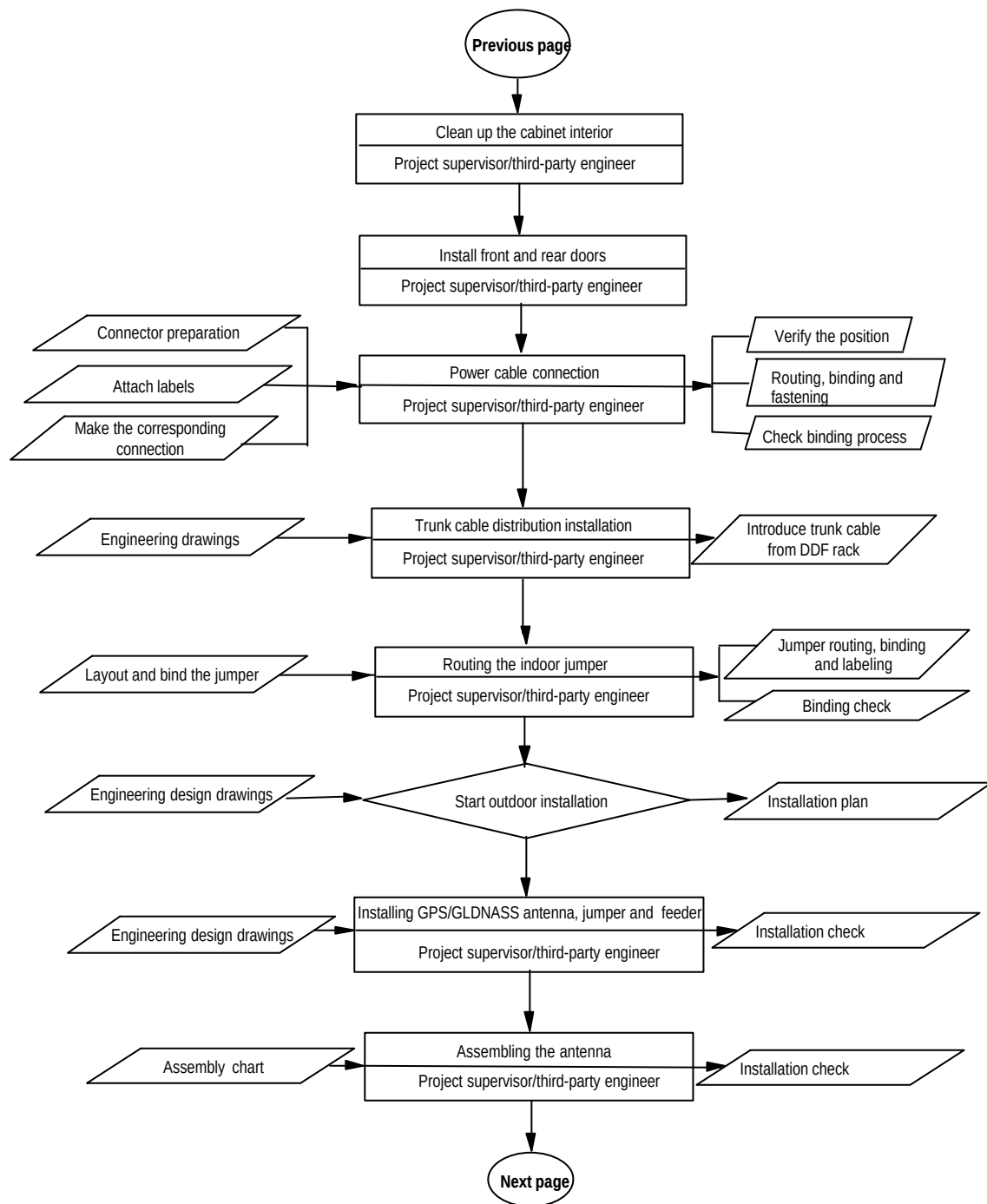
This chapter introduces the hardware installation process of BTS in detail. It can be used as a basic operation specification for cBTS3612 Base Station (shortened as BTS in the following) hardware installation and commissioning personnel.

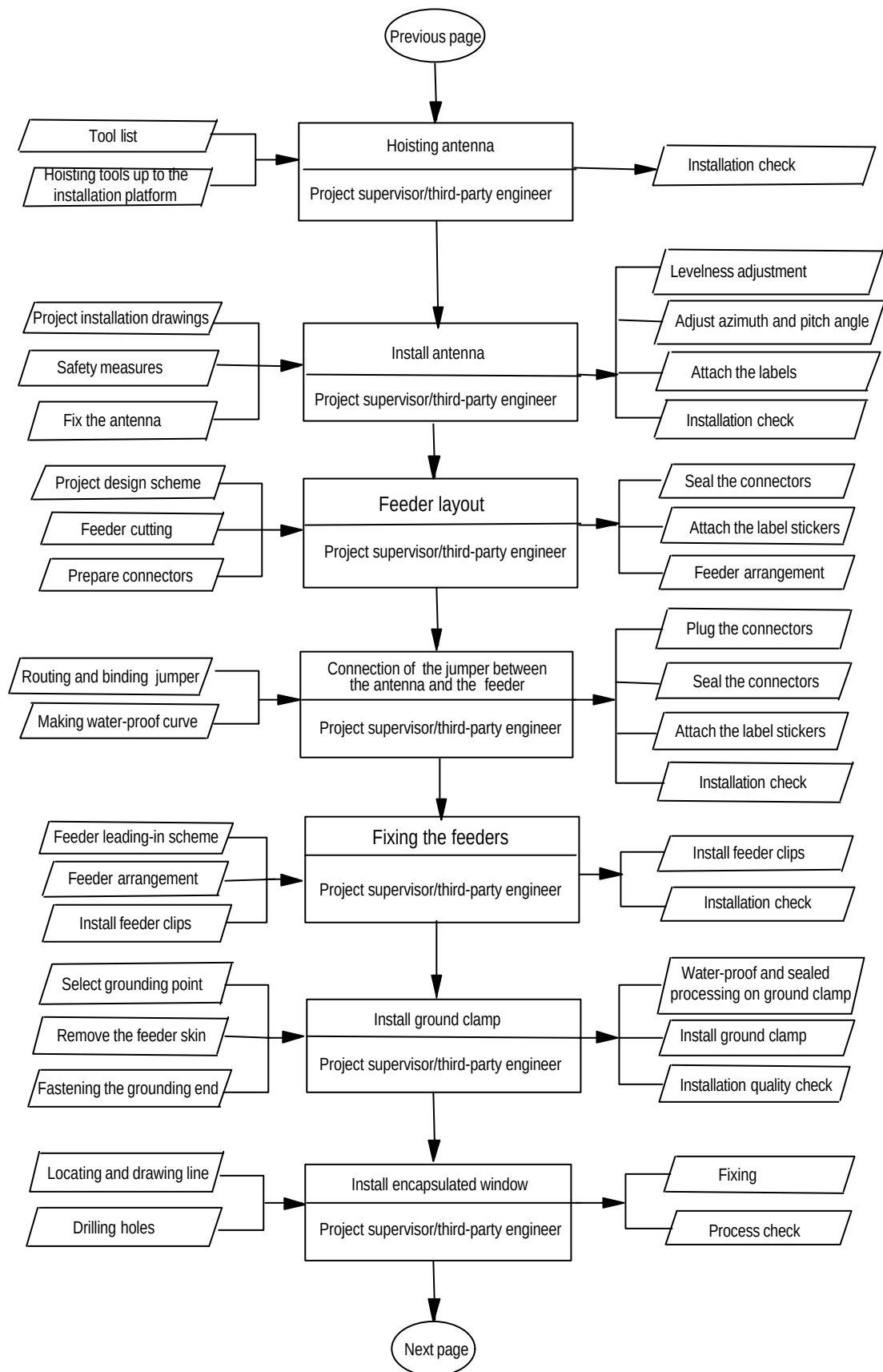
1.1 Installation Flow

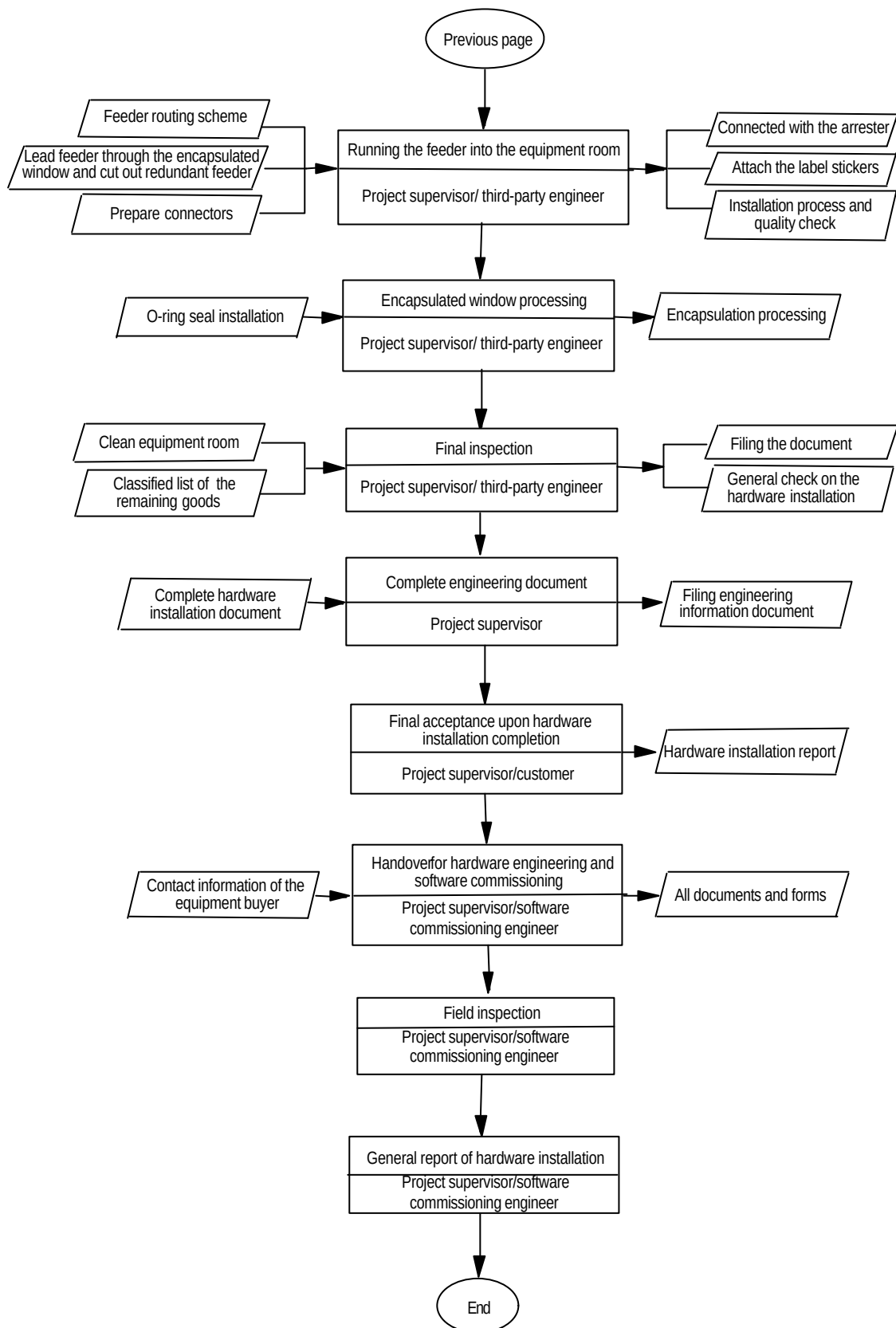
The hardware installation process is illustrated as follows:











1.2 Descriptions for the Flow

The complementarity of hardware installation flow is as follows:

I. Cabinet reinforcement

This step is to position the cabinet base, mark lines and drill holes on the floor, fix and level the cabinet as well as adjust the verticality of the cabinet.

II. Connection of cabinet-top grounding cables

This step is to implement the connection of grounding cables.

III. Board installation

This step is to implement board installation and fixing.

IV. Module installation

This step is to implement installations and fixings of fan module, power module, radio frequency module, RLDU module, CDU (Combiner and Duplexer Unit) module, and DFU (Duplexer and Filter Unit) module.

V. Cable connection and routing

The suites of RF cable in the related cabinet are connected and routed in place.

For multiple cabinets, fiber distribution between them should be completed here.

VI. Leading in the power

The BTS cabinet power cables are led in along the cabling rack according to the project design/plan.

VII. DDF trunk distribution installation

Trunk cable distribution runs from the transmission equipment to DDF along the cabling rack, then from DDF to the BTS cabinet. Quantity of trunk cables are determined by the project design.

VIII. Installation of the sealed window

The sealed window for leading in the feeder is installed in this step according to the location defined in the project design.

IX. Cabling of indoor jumpers

This step is to implement the cabling of indoor jumpers.

X. Installations of GPS/GLONASS antennae, jumpers and feeders

This step is to implement the installation of GPS/GLONASS antenna, the fixing of the antenna support and the cabling of the jumpers and feeders.

XI. Installation of radio frequency antenna

According to the project design, this step is to implement the fixing of RF antenna on the antenna support and the adjustment of sector azimuth and pitch angle. The number of antennae is configured according to the actual project design.

XII. Feeder routing

The routing, leading-in and fixing of the feeder as well as the preparation of connectors are completed in this step.

XIII. Installation and routing of outdoor jumpers

This step is to implement the routing of outdoor jumpers and the connection from the jumper to the feeder as well as waterproof treatment.

XIV. Installation of grounding clamp for lightning-protection

The grounding clamp for lightning protection is installed and grounded in this step.

XV. Attachment of engineering labels

This step is to attach engineering labels on the related equipment (including cabinet, sealed window and antenna, etc.) and the connection lines (including power cables, grounding cables, feeders, jumpers and so on).

XVI. Installation record

This step is to record the length of each jumper and feeder, the azimuth and pitch angel of the receiving/transmitting antenna for each sector. The data are kept for serving the commissioning and maintenance.

XVII. Completion of engineering documents

The related engineering documents are to be written or filled during the installation.

XVIII. Inspection of equipment installation

An overall inspection of the equipment installation is carried out in this step, particularly the inspection of cable connections and routing.

XIX. Check of the standing wave ratio of antenna feeder

This step is to check installation conditions of all antenna feeders through the test of standing wave ratio and backward & forward power.

XX. Equipment power-on

Power on the equipment after confirming that there is no abnormal short-circuit in the equipment. Observe the status of each board.



Note:

This chapter aims to introduce the BTS hardware installation flow. For the detailed installation process, please make adjustments according to the actual configuration and environment and perform the process referring to relevant processes of Huawei.

2 Installation Preparations

This chapter aims to introduce the initial stage of project preparations, goods unpacking and verification.

2.1 Engineering Personnel

2.1.1 Basic Requirements for Personnel

- 1) If the project is cooperated with other parties, engineers from cooperation parties should play the key role in installation, engineers from the user shall provide necessary assistance, and the engineers from the vendor supervise the whole installation process.
- 2) If the project is not cooperated with other parties, engineers from the vendor shall play the key role in installation, and the engineers from the user shall provide assistance.
- 3) Engineers from the cooperation party shall be strictly trained and examined by the vendor. Only after they have mastered the installation and testing methods, and obtained the qualification certificates, can they implement the installation and commissioning under the supervision of vendor engineers.
- 4) Engineers from the user shall receive some training given by the vendor to master the installation and construction methods prior to the installation.

2.1.2 Requirements for Antenna and Feeders Installation Personnel

The antenna and feeders should be installed by installation personnel under the supervision of the project supervisor. Thus, the project supervisor and personnel should be strictly trained, examined and obtain the qualification certificates.

- 1) The "Safety First" principle should be followed for the supervisor to arrange appropriate personnel for the appropriate work, especially for the tower-top installation. In addition, the supervisor must record the actual project data.
- 2) Installation personnel: They are required to be proficient in operations under the supervision of the supervisor. Particularly those working at heights must be acrophobia-free, in well health conditioned, and observe the instrument safety procedures. Additionally, they should have the certificates for working at heights, and be provided with the guaranty of security insurance and prohibited from drinking.
- 3) The number of installation personnel should be determined according to installation environment. Respectively, at least 5 persons are required for

hoisting antenna and feeder to the tower top, and at least 3 persons for feeder distributing on the rooftop.

2.2 Technical Document Preparations

- 1) *Airbridge cBTS3612 CDMA Base Station Network Planning.*

Airbridge cBTS3612 CDMA Base Station Project Design.

Airbridge cBTS3612 CDMA Base Station Detailed Drawing of equipment room and Relevant Environment

Project Design and Engineering Drawing.

The designated unit of the user should compile the above documents and submit copies to the vendor before delivery.

- 2) *Airbridge cBTS3612 CDMA Base Station User Manual and Airbridge cBTS3612 CDMA Base Station Installation Manual and Airbridge cBTS3612 CDMA Base Station Acceptance Manual* should be provided by the vendor to the user along with the equipment delivery.
- 3) In the case of cooperation with other parties, documents such as *Airbridge cBTS3612 CDMA Base Station User Manual and Airbridge cBTS3612 CDMA Base Station Installation Manual* should be provided by the vendor to cooperation parties before installation.
- 4) Engineers from the vendor should complete *Airbridge cBTS3612 CDMA Base Station Site Survey Report* after the site survey. If the survey cannot be performed in time, the form shall be sent to the user who will perform the site survey and send the report back to the vendor.

2.3 Tools and Instruments

2.3.1 General Installation Tools

Please prepare the installation tools and instruments listed in Table 2-1.

Table 2-1 General installation tools and instruments

Serial number	Universal Tools					Special Tools	Instruments
	Measuring and marking tools	Concrete-drilling tools	Fastening tools	Locksmith tools	Auxiliary tools		
1	50m tape measure	1 percussion drill	Cross screwdriver (4', 6' and 8')	1 hacksaw (several spare saw blades)	A pair of nippers	1 non-inductive screwdriver	A multimeter
2	5m tape measure	Several drilling bits	flat head screw driver (4', 6' and 8')	1 tap wrench, several spare screw taps (M4 and M5)	One paintbrush	Anti-static wrist strap	Antenna and feeder analyser (Site Master)
3	1 400 mm level bar	1 vacuum cleaner	Adjustable wrench (6', 8', 10', 12')	1 nipper pliers (8')	A pair of scissors	A pair of feeder scissors	Portable computer (optional)
4	1 angle display	1 patch panel (3 two-phase sockets and 3 three-phase sockets, current capacity over 15A)	Combination wrenches (17' and 19')	1 diagonal pliers (8')	1 300 W soldering iron	1 guarded knife	1 Power meter
5	1 compass		Socket head wrench	1 slip joint pliers (8')	1 40 W soldering iron	Cable cutter (matching the feeder)	Optional for testing mobile phone
6	Marker pen		Box end spanner	1 cutting nippers (8')	Tin wire	Cable stripper (matching the feeder)	
7			1 5 kg nail hammer	1 set of broach file (middle size)	1 heat blower	75 ohm coaxial cable stripper	
8			Torque wrench (over 50N·measurement)		1 solder absorber	Feeler crimping tool for 75 ohm coaxial cable connector	
9					One hydraulic pliers (or use a Hercules crimping pliers as a replacement)	1 multifunctional crimping tool	
10					Fork truck		
11					Ladder		
12					Assembly pulley		
13					Rope		

2.3.2 Tools for Antenna Feeder Installation

Table 2-2 Tools and instruments for antenna feeder installation

Serial number	Special tools for antenna feeder installation					
	Measuring and marking tools	Hoisting tools	Special tools for feeder	Safety protection tools	Tools that can be borrowed from the local customer	Other tools
1	1 angle display	Assembly pulley	1 feeder cutter	Safety belt (for those working on the tower)	A-type ladder	canvas tool bags
2	1 compass	Rope (1 coarse rope and 1 twine, with the length of 150 meters)	A cutting nipper (matching the feeder type)	Safety helmet	lifting tools for the wood axis of the feeder	Gloves
3		Feeder lasso	Special tools for preparing feeder connectors (1/2" and 7/8")	Safety rope		a pair of walkie-talkie
4			Brazing torch (only used to heat the waterproof materials in cold weather to soften the material so that the material can be tightly pressed and achieve a good waterproof effect)	Thick uniform		multipurpose power socket
5				RF protective clothing		

2.4 Project Plan and Coordination

2.4.1 Project Plan

Before the project kick-off, the project supervisor should keep contact with the representative of the user, develop the project plan according to the actual conditions and preparations and inform the user of the plan, which includes the following items:

I. Division of responsibilities

- 1) The user should complete infrastructure construction related to the equipment room.
- 2) The user should coordinate to complete the installation of auxiliary equipment.
- 3) Engineers of the vendor are responsible for the installation of the equipment provided by the vendor.
- 4) The project responsibilities are determined through negotiation of both sides on the basis of contract and project documents.

II. Project coordination

- 1) Personnel

As the project responsible person, the project supervisor should provide the user with the names and contact means of the project principal and the principal of each project subdivision. It is recommended that the user should provide a name list of the concerned technical support engineers and contact means to the vendor.

- 2) Tools

Inform the user to prepare tools that are not convenient to be carried or not available for the time being, and then confirm the preparation.

III. Project schedule

Make a schedule for the project proceeding in line with the preparations, and present it to the user for confirmation. The schedule should include the following items:

- 1) Delivery date and expected arrival date
- 2) Date on which engineers arrive at the venue of the user
- 3) Schedule for the installation and commissioning.

2.4.2 Project Coordination Meeting

After arriving at the site, the project supervisor should organize a project coordination meeting with the user, create a project plan and implementation program, and designate the related persons in charge.

2.5 Checking Installation Environment

2.5.1 Checking Indoor Environment

In the project preparation phase, the project supervisor should provide *Project Kick-off Condition Checking List* to the user who should fill in the list faithfully, and send it back to the project supervisor prior to the project kick-off so as to ensure that the conditions for the project kick-off are available. Please perform the check based on the following items:

I. Construction

- 1) Check the area, height of the equipment room, the height and width of the door, bearing, floor and trench, etc. If there is any item not complying with the requirements, it is recommended that the customer should reconstruct it.
- 2) Check the height and dimensions of the feeder window, and check whether the measured data complies with that on the blue print.
- 3) Verify the height, position and dimension of the cabling rack to check whether they comply with those on the blue print.

II. Environment

- 1) Check whether the illumination of the equipment room meets the requirements; and whether daily lighting, standby lighting and emergency lighting are available.
- 2) Check whether the air-conditioning and ventilation system can ensure ideal temperature and humidity conditions in the room.
- 3) Check whether effective antistatic measures are prepared.
- 4) Check whether adequate fire-fighting equipment is available in the room.
- 5) Check whether lightning protection devices are prepared.

III. Power supply

- 1) Check whether the AC power supply equipment is complete, the output voltage is within the specified range and the power meets the requirements.
- 2) Check whether the DC power supply meets the BTS requirements, the power supply voltage is stable, the output voltage is within the specified range and whether the power meets the requirement.
- 3) Check whether the battery capacity is enough to guarantee the proper operation of BTS when AC power supply fails.
- 4) Check whether the AC power distribution system has its independent AC safety grounding mechanism.

IV. Support equipment

Check whether the transmission equipment is available and meets requirements.

V. Supplementary equipment

Check whether tables, chairs, power sockets, and telephones are available.

VI. Grounding for lightning-protection

- 1) Check whether the indoor and outdoor grounding bars are installed in the right place.
- 2) Check whether the earth resistance at the grounding points meets the requirements of project design and grounding specifications.

2.5.2 Checking Outdoor Environment

The project supervisor should contact the user in advance to make sure that the necessary preparations and tools are available, such as cabling routes and holes. Then employees from the user should be reminded to have the door keys of the rooms in the course of the cabling or the keys of the door to the building top.

The project supervisor should check the site environment to see whether it meets related requirements of the BTS engineering design. The emphasis should be put on the lightning arrester of the antenna, grounding point of the arrester and the feeder, outdoor cabling rack, distance between the antenna supports, firmness and wind resistibility of the support. Check the installation environment of the antenna and feeder system for any difference from the original surveyed design environment and any modification accordingly.

2.6 Checking Safety Measures

I. Checking cabinet safety measures

- Check whether the parts containing beryllium oxide and hydrochloride are damaged. If any damage is observed, the relevant parts should not be discarded at will, but handled via chemical processing or in a special way as scrap according to the local rules.
- The installation of AC power supply equipment must follow the local safety regulations. Check the working environment for power supply to prevent water invasion into equipment.
- Before connecting the AC input power supply, the operation and maintenance personnel should first connect the protection-grounding terminal of the equipment chassis to the earth. The purpose of doing so is to avoid electric shock on human body resulting from leakage current, which is usually caused by the EMI filter earth capacitance of the AC power supply input terminal of the equipment or the Y capacitance of the primary power supply.

II. Checking Antenna and Feeder safety measures

- 1) The site survey and project design has been finished. Necessary implementation conditions are ready. Detailed and complete project design documents are available.
- 2) Outdoor construction should be performed in clear weather with no strong wind.
- 3) Important safety cautions.



Caution:

Workers on the tower should be secured with safety belts, and workers under the tower should wear safety helmet. Firstaid kits should be available for the work team. The persons working on the tower should carry handy bandages with themselves in the case of wound and not wear casual clothes or shoes that are easy to skid.

Remarkable signs should be set up to warn irrelevant personnel away. Persons under the tower have the responsibility to urge those irrelevant personnel, especially children, to be away from the site. Tools that are prone to fall down and cause casualties should be handled with care. Such tools on the tower should be secured with bolts and kept in proper position. And those tools and metal installation parts not used temporarily should be kept in tool bags. The tool bags should be sealed after use and be kept within the reach.

2.7 Unpacking and Checking of Equipment

2.7.1 Verifying the Packing List and Checking the Equipment

I. Checking common goods

The project supervisor and the engineers from the user shall perform this task. First verify the quantity of equipment against the packing list attached on each package; then check whether the package is actually addressed to the site and the exterior of the package is intact. If everything above is perfect, unpack and check the package. There is a "Packing List" in the package with red label and the project supervisor should check the goods item by item according the packing list. If any equipment is found missing, deficient, wrong, extra or damaged upon unpacking and check, stop unpacking and find out the cause. Then the project supervisor has to fill in the *Equipment Problem Feedback Table* and send it timely to the customer service center of Huawei in the region and the center will handle the problem accordingly.

Shipping packages consist of wooden cases and cartons. Different unpacking tools on site shall be used according to different packages .

II. Checking antenna goods

Because the antenna and feeder system consists of various parts provided by different suppliers, and the goods are different on such aspects of vendors, dates, and locations, the project supervisor is responsible for checking those parts. The installation personnel is required to read the installation manual to gain a clear understanding first and then commence the installation. Put the index description document in a noticeable place so that the engineers can turn to the document for reference.

Fill *Equipment Problem Feedback Table* according to goods errors and submit it to the related departments of Huawei by the project supervisor.

2.7.2 Unpacking Wooden Case

Heavy installation equipment such as racks, feeder clip and power supply module are usually shipped in wooden cases. The wooden case packing is shown in Figure 2-1.

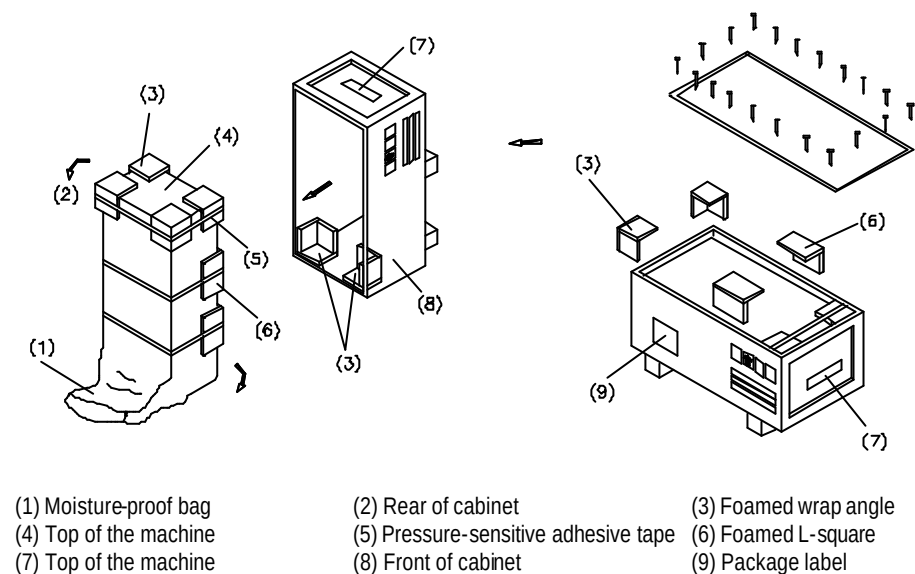


Figure 2-1 Wooden case packing

I. Unpacking the cabinet

The BTS packing box consists of the package, foamed packing angles and the plastic bag etc. It is recommended to unpack the box in or near the equipment room (if the space allows) to prevent the damage during portage.

Unpack the box in the following steps:

- 1) Remove the metal strap of the box and open the cover of the box with a nail hammer, pliers, flat-head screwdriver and crowbar.
- 2) Insert the flat-head screwdriver into the gap of the top cover and loosen the wood panel. Then use the crowbar to completely remove the panel.
- 3) Take out the rack (do not remove the plastic bag before it is completely taken out).
- 4) Remove the plastic bag from the rack.

Unpack other cases in the same way described above.

There are wheels on the base of the BTS cabinet so it is convenient to move the cabinet. When moving the cabinet between different floors, please hold the base or other solid parts to avoid damage or accident.

II. Checking the cabinet

The appearance check is to ensure that there is no damage on the surface of the rack. The front door and the back door are complete, the cover is well installed, marks are clear and complete, the board name strip of the alarm box and the decorating plate are complete, and there is no deformity in the cabinet. In addition, the inside sanitation should be checked.

2.7.3 Unpacking Carton

Carton is generally used to pack various circuit boards and terminal equipment. Circuit boards are transported in anti-static bags. When unpacking goods, anti-static protective measures should be taken to avoid damage to the equipment. Pay attention to the influence of the environment temperature and humidity. There is drying agent in the anti-static bag to absorb the moisture in the bag.



Caution:

When the equipment is moved from a dry place with low temperature to a wet place with high temperature, please wait at least 30 minutes before sealing off the equipment. Otherwise, it would result in condensation of moisture on the surface of the equipment and damage the equipment.

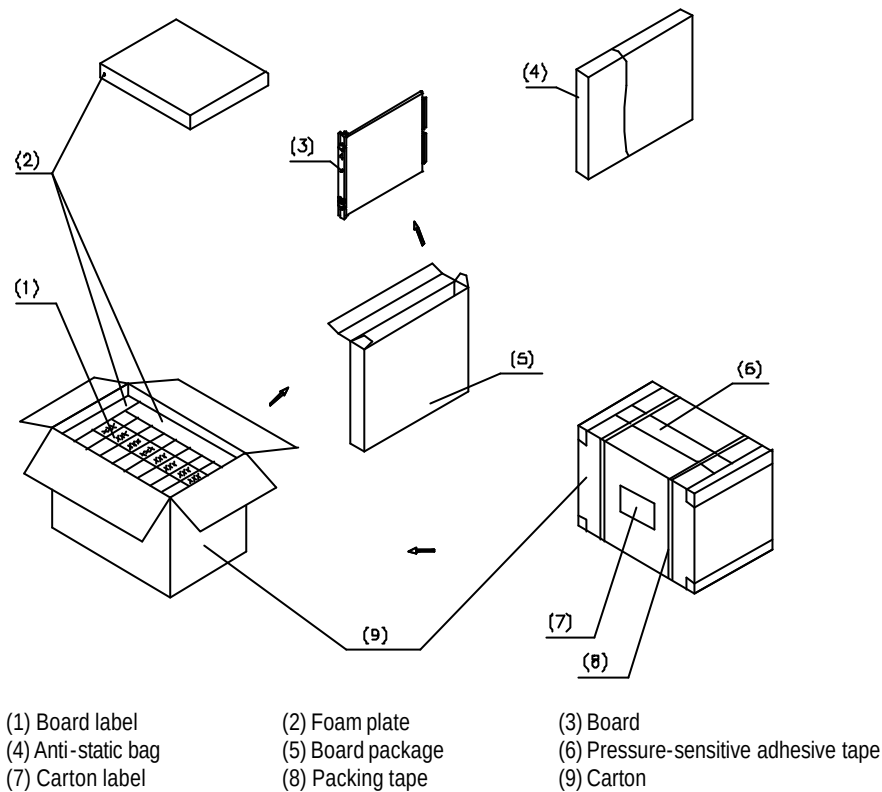


Figure 2-2 Carton packing and board packing package unpacking

Unpack the package in the following way:

- 1) Check the label on the carton, the amount and type of boards in the carton in the presence of the relevant people.
- 2) Cut the strap with an angle pliers.
- 3) Cut the adhesive tape along the gap of the cover of the carton box (great care must be taken not to insert the knife too deep to avoid any damage on the interior of the board).
- 4) Unpack the carton and take out the foamed plate.
- 5) Check the number of the board box to see whether it is the same as that marked on the label of the carton, then take out the board box.
- 6) Open the board box and take out the circuit board from the anti-static bag.

After unpacking of the box, there is still a layer of packing bag and an anti-static bag around the board. Keep the boxes and anti-static bags for the possible future use, say, for keeping spare board and for keeping the faulty board in times of repairing.

I. Checking the boards

Check the board and the software.

If the inner packing is damaged, it should be recorded in the report in detail. If the inner packing is not damaged, engineer from the vender should take the main

responsibility for the completeness of the equipment, especially the check on the components that are prone to result in bad electrical contact.

Check the boards and software according to the packing list. Should any problem occur, please contact the supplier in time.



Caution:

It is recommended that a specific person be assigned for opening each packing box to avoid the case that a box containing the boards would be discarded, which may bring trouble to the construction. Before unpacking the next box, check the opened one and make sure that each board box is empty to avoid any component from being discarded by mistake.

2.7.4 Acceptance and Handover

Upon finishing the acceptance, both parties should sign the *Packing List* and if there are any problems during unpacking, both parties should sign the *Unpacking Memo*. The equipment is then handed over to the customer. Both sides shall hold one copy of the memo. The project supervisor should send the memo in time to the goods keeper at the office in that area for filing the documents.

The equipment should be stored in special rooms and the specific person should be assigned to take care of the goods. The storeroom should meet the following requirements: appropriate temperature and humidity, small vibration, low dust intensity, low electromagnetic interference, protection against rats and insects. If the damage or loss of the equipment is caused by improper care of the customer, the responsibility should be taken by the customer.

3 Cabinet Installation

3.1 Overview

Cabinet installation is of great importance to the whole installation process. The installation process varies with the installation environment. Besides the structure of the cabinet, installation process, layout principles, This part introduces the structure, installation process and layout principles of a cabinet, and the actual installation process of the cabinet on cement floor, on cement floor without sufficient bearing capacity and on anti-static floor. The last is the combined installation.

3.1.1 Cabinet Structure

I. Apperance dimensions

The design of cBTS3612 cabinet complies with IEC297 Standard.

Dimensions of a cBTS3612 cabinet:

Height×width×depth=1800mm×800mm×650mm

II. Layout

Sequence of the subracks in cBTS3612 cabinet (from top to bottom):

- 1) Switch box
- 2) Baseband data subrack
- 3) Fan subrack
- 4) Power supply subrack
- 5) RF subrack
- 6) RLDU/CDU subrack
- 7) RF subrack

The detailed locations of individual parts in the cabinet are shown in Figure 3-1.

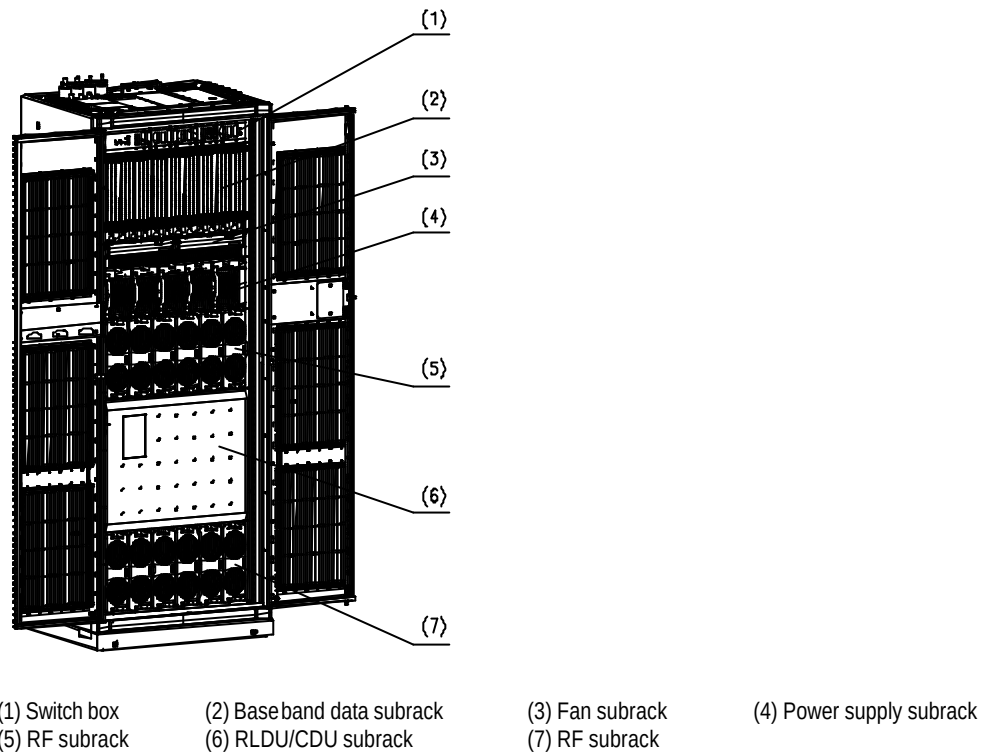


Figure 3-1 The structure of a cBTS3612 cabinet

III. Introduction to the base

Base assembly is adopted in the installation of cBTS3612 cabinets, regardless of the installation mode used. Figure 32 shows the composition of a cBTS3612 cabinet base assembly. The base assembly consists of an upper support and a lower support. The former has already been fixed on the lower part of the cabinet in delivery, and the latter is to be fixed on the cement ground or anti-static floor (delivered separately) during installation. To fix the cBTS3612 cabinet, join the upper and lower supports firmly..

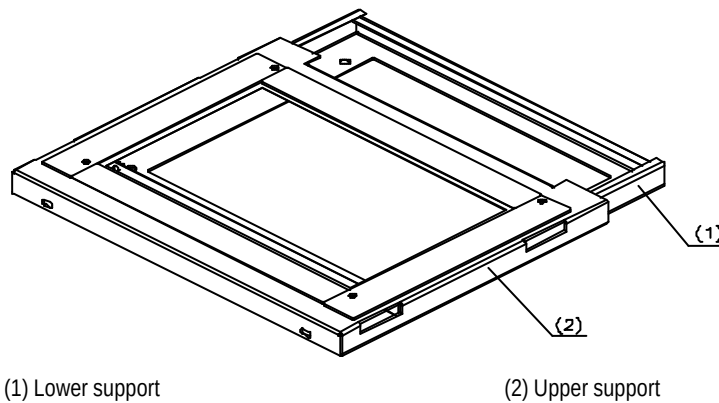


Figure 3-2 Base assembly

IV. Insulation

The insulating washer should be placed below the lower support regardless of the installation mode. Add an insulating washer to the fixture of the fixed lower support, make sure that the whole set of equipment is not connected with the ground before grounding cables are connected, so as to meet the insulation requirements effectively.

3.1.2 Cabinet Installation Process

The installation of cBTS3612 cabinets varies to different types of equipment rooms, cBTS3612 cabinets may be installed in an equipment room with anti-static floor or with cement floor. Based on the evenly distributed bearing capacity (5.5kN/m^2) of the floor, the installation on cement floor is further divided into two types: installation on cement floor and installation on the floor without sufficient bearing capacity. The cabinet installation process is shown in Figure 3-3.

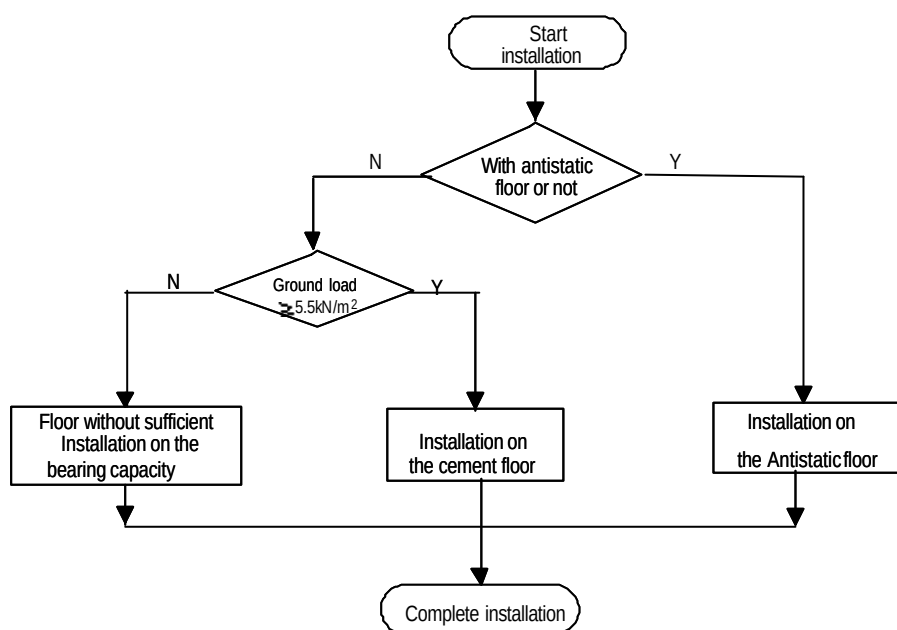


Figure 3-3 Cabinet installation process

3.1.3 Cabinet Layout Principle

It is recommended to lay the cabinets in the single row for the BTS with three cabinets, as shown in Figure 3-4, one as the main cabinet, the rest as auxiliaries. The following plans are available for cabinet layout:

- The space between the cabinet back and the wall should be not less than 0.6m.
- The cabinet side can be installed against the wall.

- The path with the width no less than 0.8m should be left in front of the cabinet.
- The cabinet should be positioned as close as possible to the feeder window to reduce the length of the feeder cable.

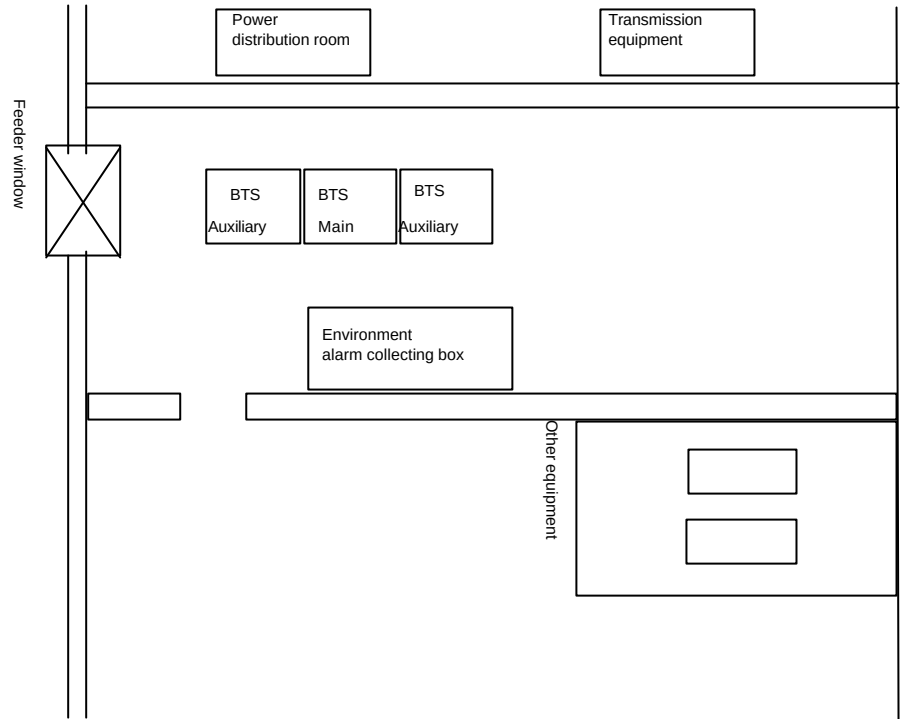


Figure 3-4 The layout ichnography of the equipment room

3.2 Installation on Cement Floor

3.2.1 Cabinet Installation

Figure 3-5 shows the installation of cBTS3612 cabinets on cement floor.

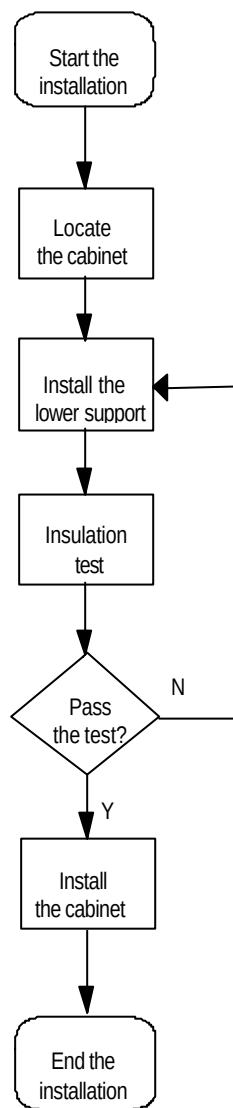


Figure 3-5 Installation on cement floor

3.2.2 Locating Cabinet

I. Determining the installation position

Determine the installation position of the cabinet according to the benchmark dimensions specified in the *project design and construction blueprint*.

II. Marking

Place the lower support of cabinet on the floor according to the cabinet layout. Pay attention to the direction of the subrack, and mark the positions of four connecting holes of the cabinet (Each cabinet has four connecting holes).

III. Drilling

Drill holes on the floor at the marks of the cabinet connecting holes with a percussion drill. The drill bit size should be $\phi 14$ or $\phi 16$.



Caution:

1. Generally, the selected drill bit is bigger than the expansion bolt. If the hole diameter is too small for the F14 drill bit, enlarge the hole diameter by technical means.
 2. Hold the drilling bit vertical to the floor during drilling. Hold tight the drillsbck with two hands to keep it in the right direction, as vibrations of the drill may damage the floor or produce a slanting hole.
 3. The hole depth should be the length of the expansion bolt stem plus the drill bit. All holes should share the same. Before measuring the hole depth, remove the dust inside the hole with a vacuum cleaner, then drill again if necessary.
 4. If the ground is too hard and smooth to settle the drill bit, punch out a pit with a chisel before drilling.
-

3.2.3 Installing Lower support

I. Installing the expansion bolt

- 1) Before the installation, remove the dust inside and outside the holes with a vacuum cleaner, and then check the hole distance. Whenever big errors occur, the concerned hole must be re-located and re-drilled.
 - 2) Unfix the spring washer, nut and the big plain washer, put the bolt into the hole and strike it with a hammer (such as nail hammer) until the bolt is completely driven into the hole. To avoid the vibration of the bolt in the hole, put the nut on the bolt and screw the nut until the bolt is slightly exploded in the hole.
-



Caution:

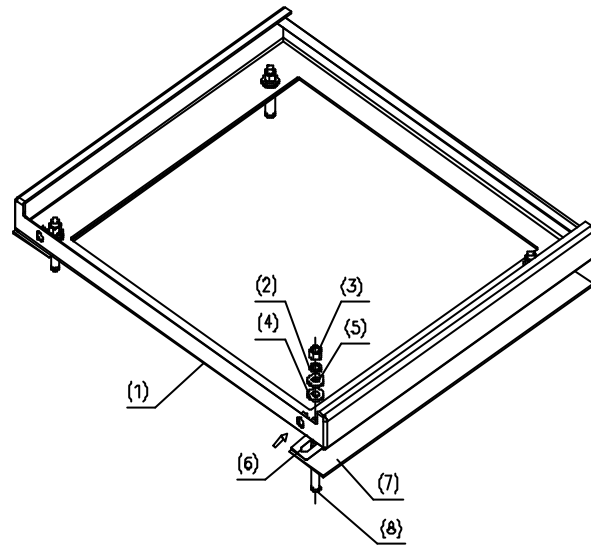
Take off the spring washer before installation, otherwise the washer will get invalid when the expansion bolt is knocked. Carefully knock the bolt into the hole so as to avoid damaging the bolt thread.

II. Installing the lower support

- 1) Place the insulating plate and the lower support in turn aligning with the four expansion bolts.
- 2) Put insulating covering, big plain washers, spring washers $\phi 12$ and nuts M12 onto the four expansion bolts in turn; make the nuts cross-fastened one by one;

tighten the nuts to 45N·m so as to pull the expansion bolt until it expands completely.

A board should be plugged into its slot in order as shown in Figure 3-6.



- | | | | |
|------------------------------------|-----------------------|----------------------|-------------------------|
| (1) Lower support | (2) Spring washer Ø12 | (3) Nut | (4) Insulating covering |
| (5) Big plain washer Ø12 | (6) Washer | (7) Insulating plate | |
| (8) Exploded expansion bolt M12×80 | | | |

Figure 3-6 Lower support installation

3.2.4 Leveling

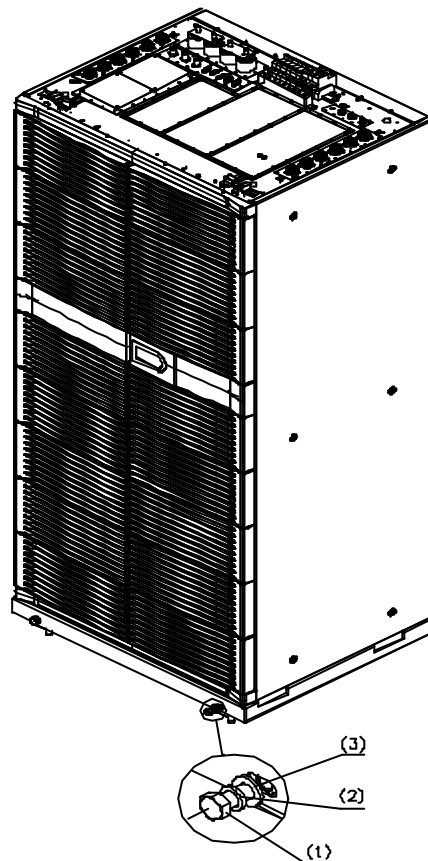
Place a level bar in vertical direction on the top-plane of the lower support to check the levelness of the lower support. When errors occur, adjust the levelness by adding washers beneath the lower support as shown in Figure 3-6.

3.2.5 Insulation Test

Set the multi-meter at the resistance measurement position. Contact the cabinet and expansion bolts respectively with the two measuring probes of the multi-meter to measure the resistance. If the circuit is disconnected, complete the installation. Otherwise, it indicates that the cabinet is not insulated. In this case, check whether any insulating covering or insulating washer is missing, or whether any insulating covering is damaged. Repeat the installation of the lower support and perform the insulation test again.

3.2.6 Cabinet Installation

Place the upper support (being fixed already at the lower part of the cabinet upon delivery) at the lower support and push the cabinet into the lower support and fasten it with bolts to complete the installation of the cabinet. The process is shown in Figure 3-7.



(1) Bolt M12x30

(2) Spring washer Ø12

(3) Plain washer Ø12

Figure 3-7 cBTS3612 Cabinet installation on the cement floor

3.3 Installation on Anti-static Floor

Supports of A600 series are adopted for cBTS3612 cabinet installation in the equipment room with anti-static floor.

3.3.1 Brief Introduction to Supports

I. Support Profile

The appearance of A600 series support is shown in Figure 3-8.

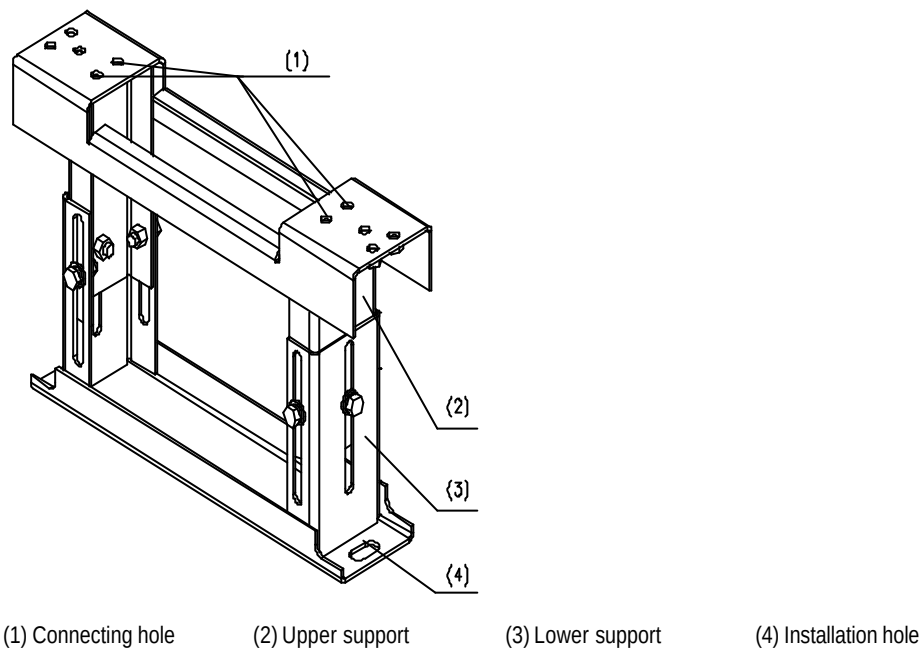


Figure 3-8 Profile of A600 series supports

II. Support assemblies

There are four types of assemblies in A600 series: three height-adjustable types and one height-fixed type. For their range of adjustable heights, please see Table 3-1.

Table 3-1 Heights of A600 series supports assemblies

Assembly	Adapted anti-static floor heights (mm)
I	195~230
II	231~300
III	301~445
IV	Customized according to the floor height (min height: 140mm)

 Note:

The anti-static floor height refers to the distance between the upper surface of the anti-static floor and the concrete floor.

The heights of A600 series support assemblies I, II and, III can be adjusted steplessly within their adjustable ranges. The heights are adjusted by moving the upper and lower supports.

Type IV assembly is a height-fixed support. It is mainly suitable for ultra-high and ultra-low floors. The minimum applicable floor height of this assembly is 140mm.

III. Support installation

The support is installed in the floor-bracketing mode. Namely, bracket the floor between the cabinet and the support, then run the bolts through the anti-static floor to fix the cabinet and the support. In this way, the cabinet can be firmly fixed and supported.

IV. Number of supports

2N installation supports are used to install the cabinets, i. e., N cabinets should be supported with 2N supports. Figure 3-9 is the schematic diagram of cabinet installation on anti-static floor.

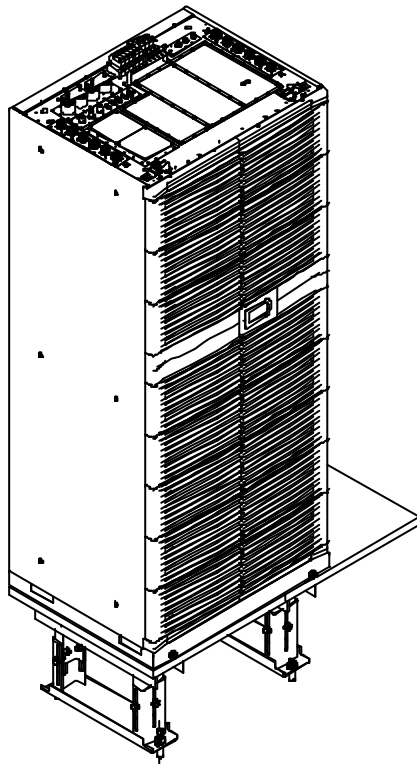


Figure 3-9 Cabinet installation on anti-static floor

3.3.2 Cabinet Installation Process

The installation process on the anti-static floor is shown in Figure 3-10.

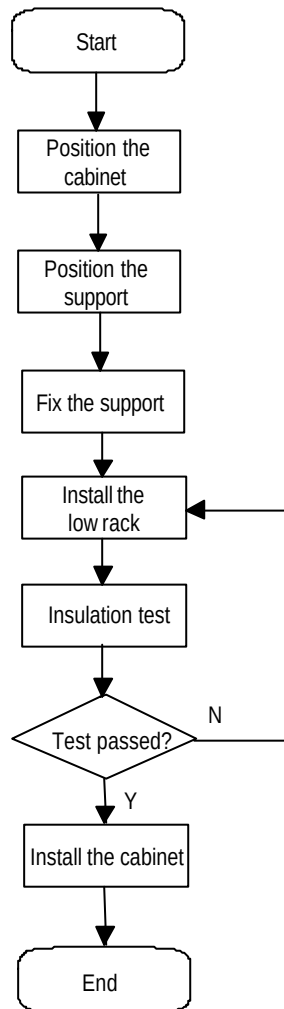


Figure 3-10 Installation process on anti-static floor

3.3.3 Locating Cabinet

I. Determine the cabinet location

The installation position of the cabinet should be determined based on the predefined benchmark dimensions in project plane design. When doing this, try to avoid the interference between the installation supports and the anti-static floor framework. Try as much as possible to keep the intactness of the framework. If the interference is unavoidable, remove the floor framework at the place where the interference occurs during the installation. The first cabinet should be aligned with the floor edge.

II. Marking

Place the lower support of the cabinet on the ground as per the cabinet layout (make sure it is in correct direction). Mark the positions for all connecting holes (each cabinet has four connecting holes) of the cabinet on the floor.

III. Drilling

Remove the lower support and drill a hole through the marked place for each connecting hole on the anti-static floor with a $\phi 20$ drill bit.

3.3.4 Locating Support

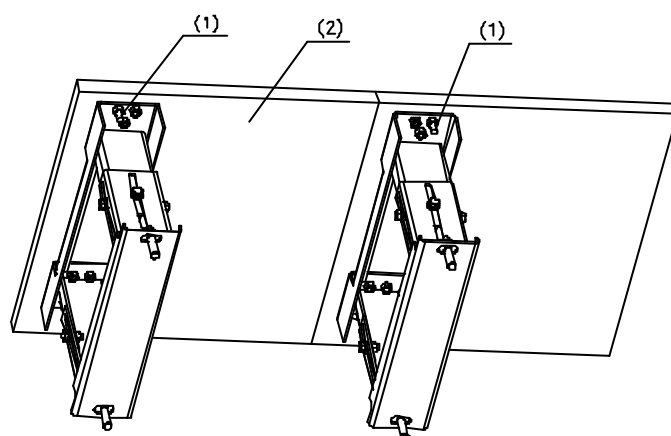
I. Positioning and marking for support

Place the support below the anti-static floor. Align the connecting holes of the support with the holes on the anti-static floor. Take the installation hole of the support as the template. Mark positions for the expansion bolts on the concrete floor.



Caution:

The support should be installed strictly based on the blueprint shown in Figure 3-11. The connecting holes at the outer side of the support should be aligned with the floor holes to prevent the support extruding out of the cabinet.



(1) Connecting hole (for outer use)

(2) Anti-static floor

Figure 3-11 The connection between the support connecting holes and the floor holes

II. Drilling

Use a $\varnothing 14$ or $\varnothing 16$ bit to drill holes at the marked places.



Caution:

1. Generally the size of the selected bit is bigger than the expansion bolt. If the hole diameter is too small for the $\varnothing 14$ drill bit, enlarge the hole diameter by technical means.
 2. Hold the drilling bit vertical to the floor during drilling. Hold tight the drillstock with two hands to keep it in the right direction, as vibrations of the drill may damage the floor and enlarge the size of the hole or produce a slanting hole.
 3. The hole depth should be the length of the expansion bolt stem plus the length of the drill bit. All bolts should share the same depth. Before measuring the hole depth, remove the dust inside the hole with a vacuum cleaner, and then drill again if necessary.
 4. If the floor is too hard and smooth to settle the drill bit, punch a pit with a chisel to help positioning the hole.
-

Marking and drilling are the fundamental steps for the hardware installation. If the result is not accurate, it will bring trouble to the future work. Thus the quality at the initial stage is the prerequisite of the whole project.

III. Installing expansion bolts

- 1) Before fixing the expansion bolts, clean the dust inside and outside the hole with a vacuum cleaner, then measure the distance between holes. For the hole with intolerable error, it should be re-located and drilled again.
 - 2) Unfix the spring washers, nuts and plain washers; put the expansion bolts perpendicularly into the installation holes; carefully knock the bolts with a hammer (nail hammer) into the floor. To avoid the bolts getting loose in the hole, install and tighten the nuts. Pull the expansion bolt until it slightly expands.
-



Caution:

Take off the spring washer before installation, otherwise the washer will get invalid when the expansion bolt is knocked. Carefully knock the bolt into the hole so as to avoid damaging the bolt thread.

IV. Adjusting support height

Adjust the support to the predefined height, finely adjust the height-lock bolts on the upper support to such an extent that they will not slip down by itself. Put the support

back to its installation position and run the expansion bolt through the installation hole of the support.

3.3.5 Fixing Support

- 1) Align the hole on the anti-static floor with the connecting holes of the support. Screw the M12×70 bolts from the top to bottom. Meanwhile, place the plain washer, spring washer and insulating covering (for the purpose of increasing the contact area) as is shown in Figure 3-12.
- 2) Gently knock the support to adjust the height so that the anti-static floor falls on its original place on the framework. Make sure that the upper plane presses against the anti-static floor. Then, screw the tightening bolts on the anti-static floor.
- 3) Make the expansion bolts cross fastened to 45Nm with a Torque wrench one by one to reduce the stress between the bolts and the support.
- 4) Tighten the height-lock bolts to 45Nm with a Torque wrench. The bolts in the middle should be tightened first and then those on both sides. Figure 3-12 is the diagram of bolt position.



Caution:

Fasten the three bolt sets in strict accordance with the above-mentioned procedures.

i.e.: anchor bolt for the floor→expansion bolt→height-lock bolt (first in the middle, then on both sides).

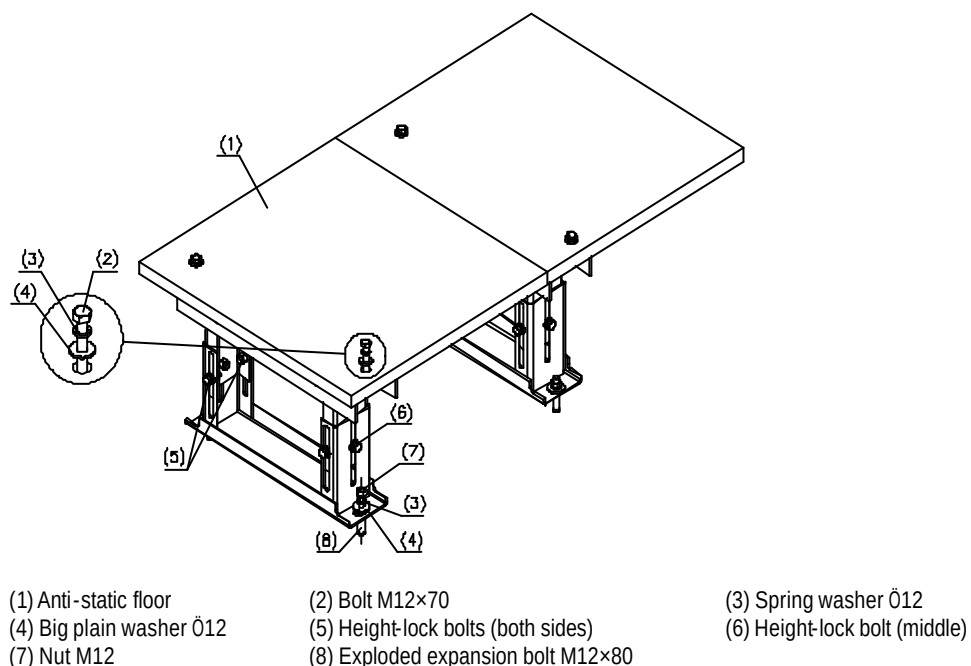


Figure 3-12 The position of fastening bolts

3.3.6 Installing Lower support

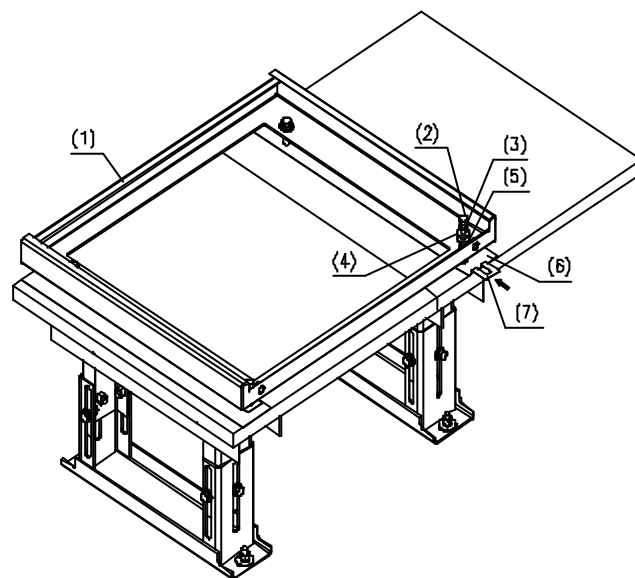
- 1) Remove four bolts and their washers of anti-static floor, which are connected to the support.
- 2) Place the insulating plate, lower support on one by one, level the sections of the subrack (both in landscape direction and longitudinal direction) with a level bar, and see whether the level vial is in the middle. If the error is small, adjust the levelness by striking the joint between the lower support and the support with a rubber mallet while measuring; If the error is big, add washers between the lower support and the insulating plate to adjust the levelness.
- 3) When the levelness is adjusted, put the insulating covering, big plain washer, spring washers 12 and bolts M12x70 into the four expansion bolts one by one. Cross-fasten the nuts one by one; tighten the nuts to 45N·m so as to pull the expansion bolts until they are fully expanded.

The installation process is shown in Figure 3-13.



Caution:

Install the insulating plate, insulating covering and the big plain washer as shown in Figure 3-13 to make sure that the cabinet is insulated from earth.



- | | | | |
|-------------------------|----------------------|-----------------------|--------------------------|
| (1) Lower support | (2) Bolt M12×70 | (3) Spring washer Ø12 | (4) Big plain washer Ø12 |
| (5) Insulating covering | (6) Insulating plate | (7) Washer | |

Figure 3-13 Lower support installation

3.3.7 Leveling

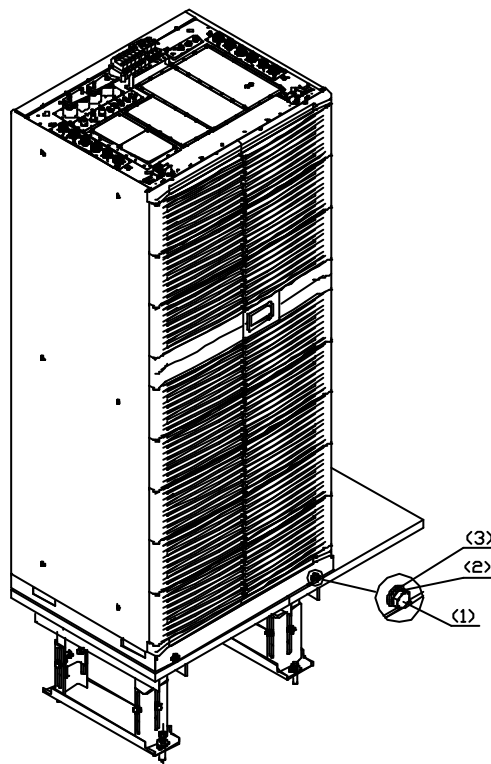
Place a level bar vertical on the top-plane of the lower support to check the levelness. When errors exist, adjust the levelness by adding washers beneath the lower support, as shown in Figure 3-13.

3.3.8 Insulation Test

Set the multimeter to the megohm range, and measure the resistance between the expansion bolt and the lower support. If the resistance is greater than 5 megohms, the circuit is an open circuit and the installation thus ends. Otherwise, the lower support is not insulated from the ground. In this case, remove all installation parts and check whether the insulating covering is missing or damaged. Repeat the installation procedures of the lower support and perform the insulation test again.

3.3.9 Cabinet Installation

Place the upper support (being fixed already at the lower part of the cabinet upon delivery) to the lower support, push in and fix cabinet with bolts to complete the installation. The process is shown in Figure 3-14.



(1) Bolt M12x30

(2) Spring washer Ø12

(3) Plain washer Ø12

Figure 3-14 Cabinet installation on the anti-static floor

3.3.10 Resetting Floor

Incise the floor around the cabinet then reset it according to the requirements.

3.4 Installation on Cement Floor without Sufficient Bearing Capacity

When the even load lower than 5.5kN/m^2 is allowed for the floor, it is recommended to use big base to reduce the load to the floor from the cabinet.

Table 3-2 The relations among the maximum allowable distance between the wall and the cabinet rear door, the ground load and the floor span

Max allowable distance between the cabinet rear door to the wall (mm)		Allowable even load of floor (kN/m^2)				
		1.5	1.8	2.0	2.5	3.0
Floor span (measurement)	3.0	--	100	110	230	380
	3.3	100	110	190	360	570
	3.6	110	230	300	630	810
	3.9	200	330	430	710	1130



Caution:

When installing the combined cabinet in a building constructed with precast slabs, select the right installation direction. It is forbidden to install two or more than two cabinets on the same precast slab, as shown in Figure 3-15.

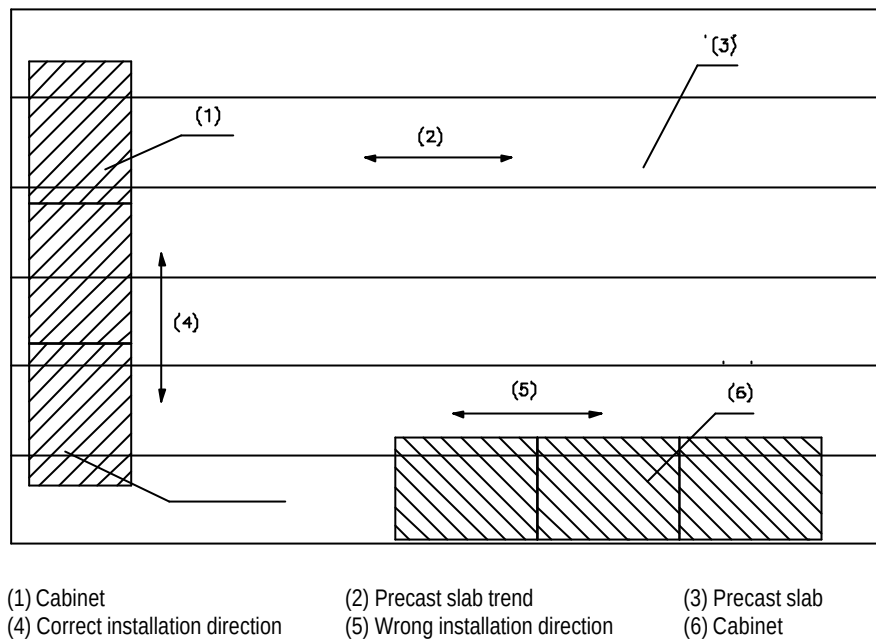


Figure 3-15 Installation direction of combined cabinet

3.4.1 Installation Process

The installation process on the cement floor without sufficient bearing capacity is shown in Figure 3-16.

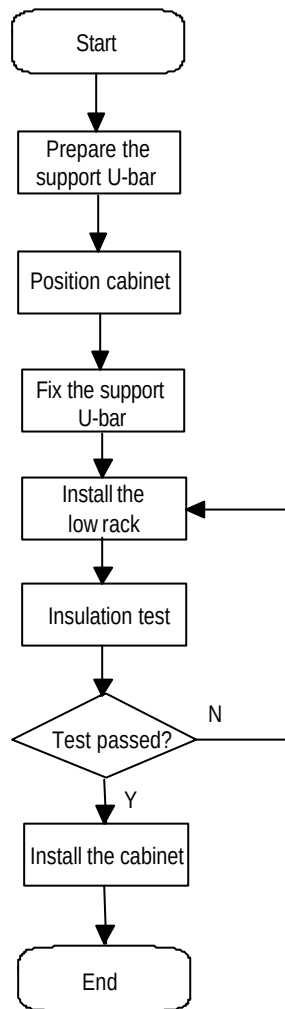
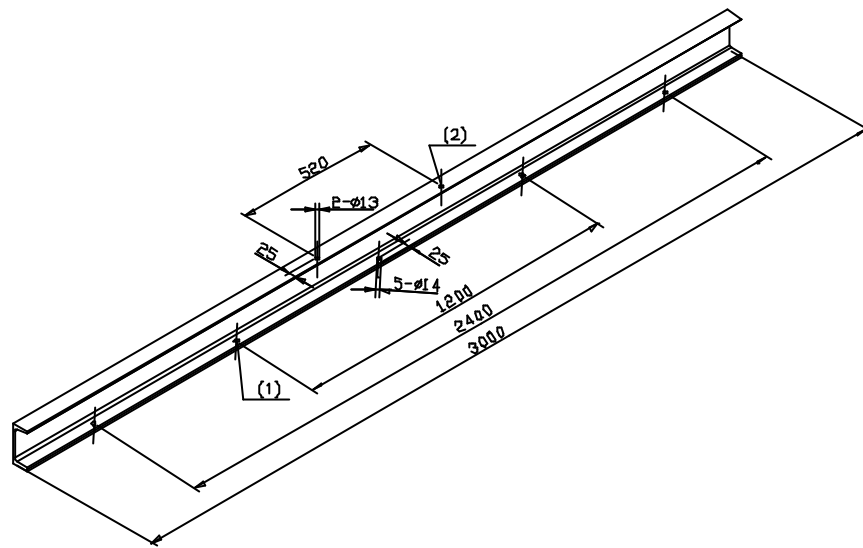


Figure 3-16 Installation process on the cement floor without sufficient bearing capacity

3.4.2 Preparing U-bar Supports

When the allowable even load of the ground is lower than 5.5kN/m^2 , and the cabinet can not be installed against the wall, U-bar supports should be adopted to reduce the load to the floor from the cabinet. The recommended material for the support is the 14b-3000 type of GB707-88 hot-rolled U-bar. The length is based on the actual situation (The total length of the U-bar shown in the figure is 3000mm), Drill installation holes for and fixing holes on the U-bar as shown in and Figure 3-18. Remove all burrs and sharp edges; Finally paint the whole support with rustproof coat and top-coat (The color of the coat should be the same with or similar to that of the cabinet). Thus, the fabrication of U-bar support is completed.



(1) U-bar fixing hole

(2) Installation hole of the base

Figure 3-17 Hole fabricating process for U-bar support



Caution:

When preparing the U-bar support, remove all burrs and the sharp edges.

3.4.3 Locating Cabinet

I. Determine the installation position

The installation position of the cabinet should be determined based on the predefined benchmark dimensions in project plane design.

II. Marking

Determine the installation positions of U-bar supports according to the installation position of the cabinet. Mark several points with a tap and draw two straight paralleling benchmark lines with a marker. The spacing between the two straight lines is 630mm. Then determine the first hole position for the support U-bar on the two lines according to the design requirement. Take this hole as the benchmark point to mark the rest installation holes of the support one by one. Then re-measure the lines to confirm the accuracy of each hole. The installation hole positions for U-bar supports are shown in Figure 3-18.

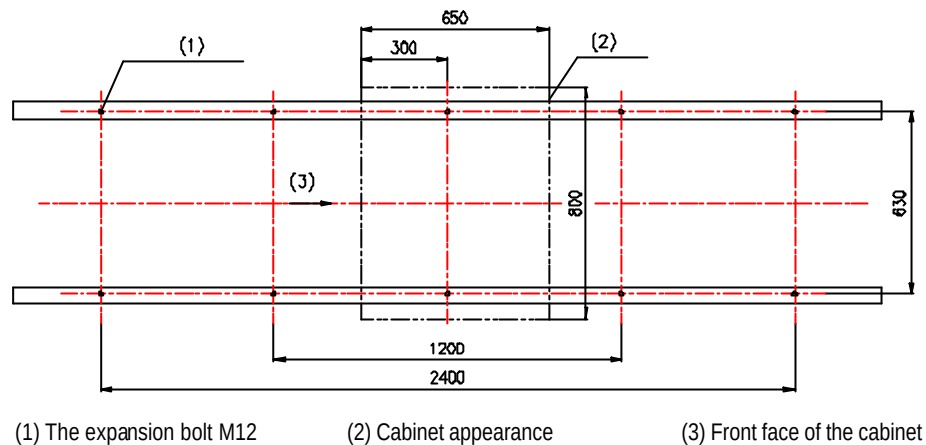


Figure 3-18 Installation hole positions of U-bar supports

III. Drilling

Use $\varnothing 14$ or $\varnothing 16$ drill bit to drill holes at the marked points on the floor.



Caution:

1. Generally, the selected drill bit is bigger than the expansion bolt. If the hole diameter is too small for the F14 drill bit, enlarge the hole diameter by technical means.
2. Hold the drilling bit vertical to the floor during drilling. Hold tight the drillstock with two hands to keep it in the right direction, as vibrations of the drill may damage the floor or produce a slanting hole.
3. The hole depth should be the length of the expansion bolt stem plus the drill bit. All holes should share the same. Before measuring the hole depth, remove the dust inside the hole with a vacuum cleaner, then drill again if necessary.
4. If the ground is too hard and smooth to settle the drill bit, punch out a pit with a chisel before drilling.

Marking and drilling hole are fundamental to the hardware installation. If the result is not accurate, it will bring trouble for the future work. Thus the quality at the initial stage is the prerequisite for the whole project.

3.4.4 Fixing U-bar Supports

I. Installing expansion bolts

- 1) Before the installation, remove the dust inside and outside the holes with a vacuum cleaner, and then check the distance among holes. Whenever big errors occur, the relevant hole must be located and drilled again.
- 2) Unfix the spring washer, nut and plain washer. Put the expansion bolt into the hole and knock directly on the bolt with a hammer (such as nail hammer) until

the bolt is completely driven into the floor. Then, put the nut on the bolt and tighten it until the bolt is expanded slightly so as to avoid it getting loose.

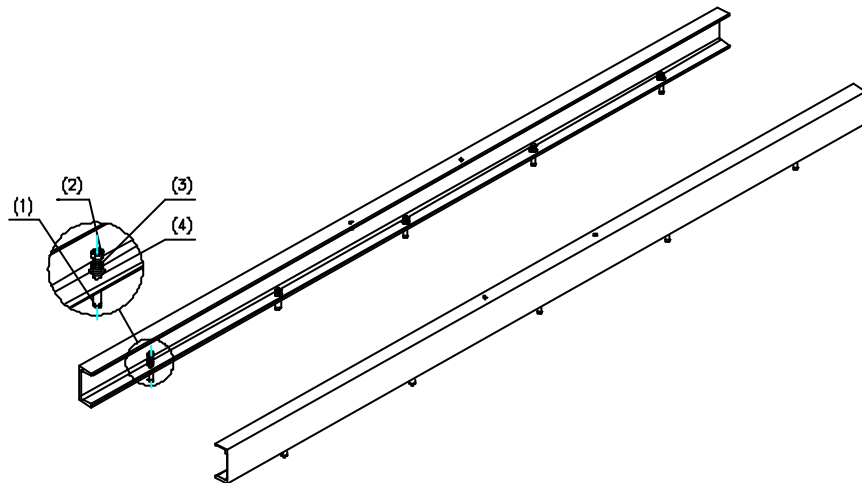


Caution:

Take off the spring washer first before installation, otherwise, it will get invalid when the expansion bolt is knocked. Carefully knock the bolt into the hole and avoid damaging the threads on the bolt.

II. Installing U-bar Supports

Install and fix the U-bar support as shown in Figure 3-19. Cross-fasten the nuts of the lower support one by one so as to reduce the stress between the bolts and the lower support.



(1) Exploded expansion bolt M12x80
(3) Spring washer Ø12

(2) Bolt M12x80
(4) Plain washer Ø12

Figure 3-19 Installation of support U-bar



Caution:

The orientation of U-bar support must be correct as shown in Figure 3-19.

3.4.5 Installing Lower support

- 1) When placing the insulating plate and the lower support of the cabinet on the U-bar support, four holes in the insulating plate and four holes in the lower

support should respectively align with the four holes in the upper plane of the support U-bar.

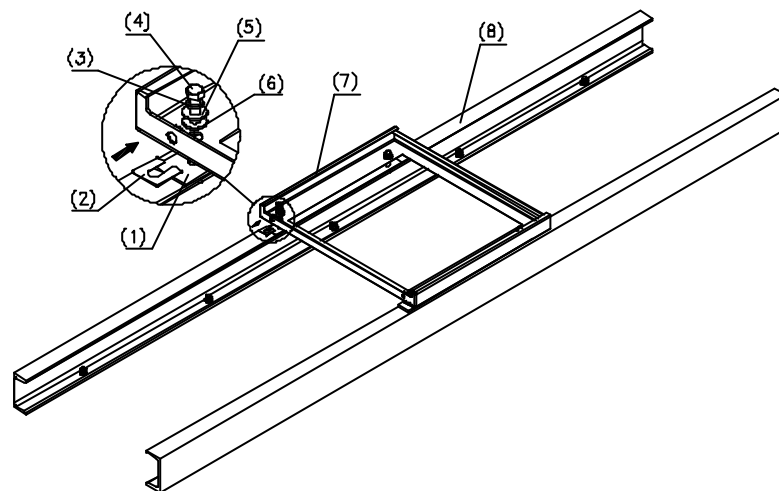
- 2) Put the spring washer, big plain washer and the insulating washer on the M12×45 bolts one by one.
- 3) Place the bolts with fixed fittings into the four holes and tighten them slightly.
- 4) Confirm the levelness of the frame, then cross-fasten the nuts of the lower support, then tighten the nuts to 45 N×m with a torque wrench.

The schematic drawing of the installation is shown in Figure 3-20.



Caution:

Install the insulating plate, insulating covering and the big plain washer as shown in the following figure to make sure that the cabinet is insulated from the ground.



- | | | | |
|--------------------------|-------------------------|-----------------------|-------------------|
| (1) Insulating plate | (2) Washer | (3) Spring washer Ø12 | (4) Bolt M12x45 |
| (5) Big plain washer Ø12 | (6) Insulating covering | (7) The lower support | (8) Support U-bar |

Figure 3-20 Installation of the lower support

3.4.6 Leveling

Place a level bar vertical on the top-plane of the lower support to check the levelness of the lower support. Whenever errors exist, add washers beneath the lower support to adjust the levelness, as shown in Figure 3-20.

3.4.7 Insulation Test

Set the multimeter to the megohm range, and measure the resistance between the lower support and the U-bar support. If the resistance is greater than 5 megohms, the circuit is an open circuit, and the installation thus ends. Otherwise, the lower support is not insulated from the U-bar support. In this case, remove all the installation parts and check whether the insulating covering is missing or damaged. Repeat the installation of the lower support, and perform insulation test again.

3.4.8 Installing Cabinet

Place the upper support (being fixed already at the lower part of the cabinet upon delivery) on the lower support, push in and fix the cabinet with bolts to complete the installation, as shown in Figure 3-21.

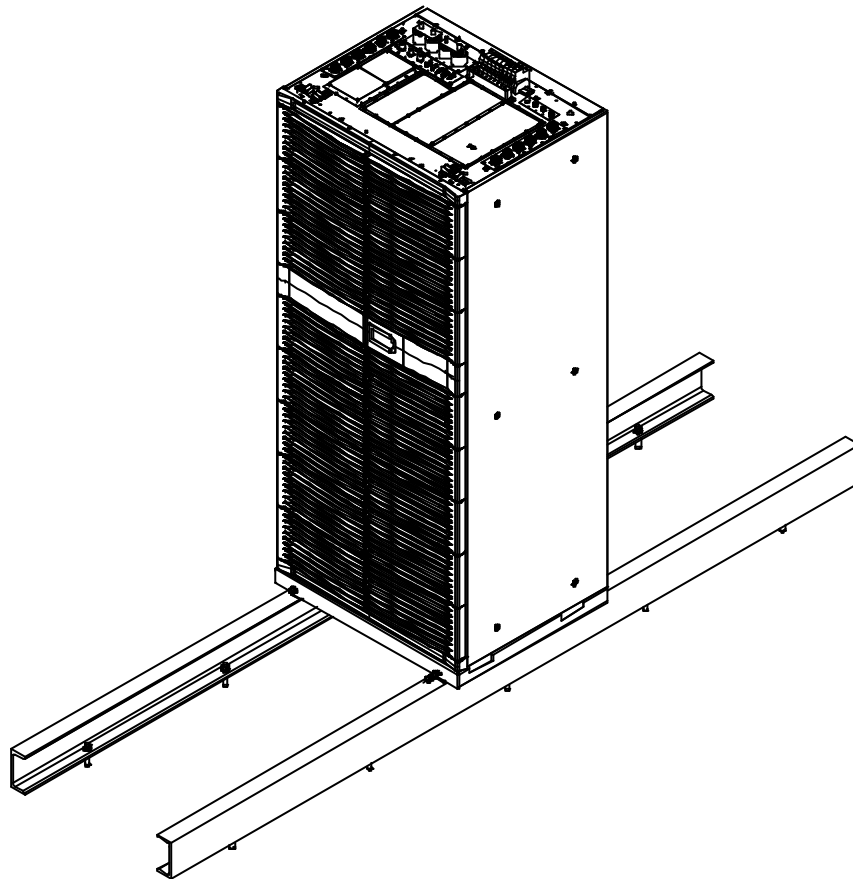


Figure 3-21 Installation on the cement ground with insufficient bearing capacity

3.5 Connecting and Fixing Combined Cabinets

Place the cabinets to be combined side by side and connect their tops with joints as shown in Figure 3-22.

During the installation, make sure to protect the cabinets from being damaged or scratched by tools.

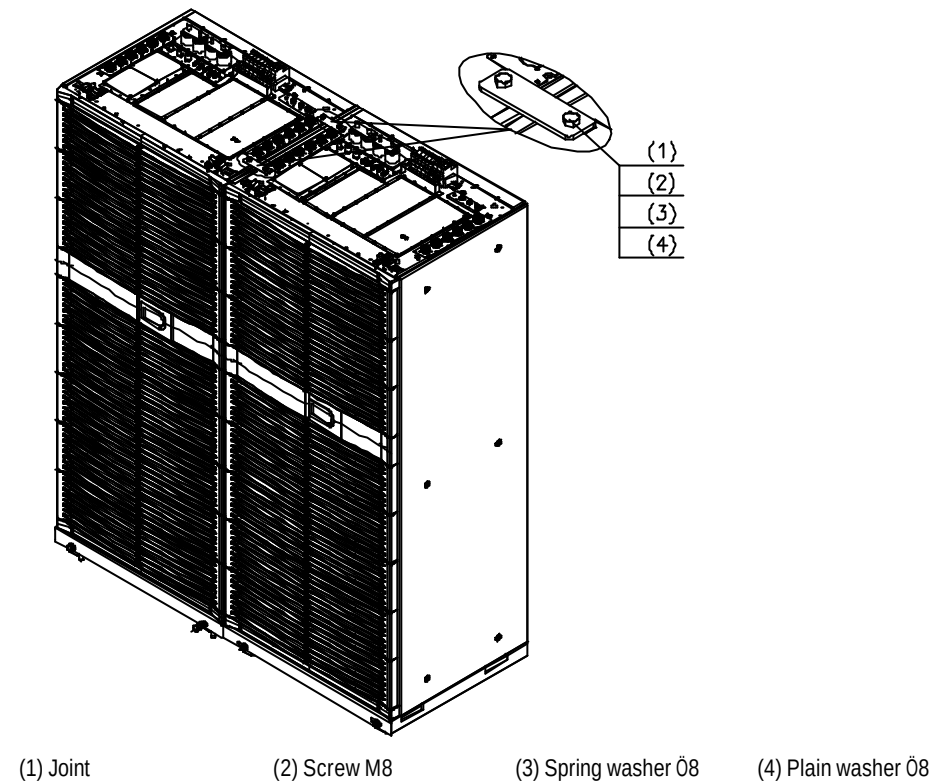


Figure 3-22 Connection of the tops of the combined cabinet

4 Installation of Cabinet Modules and Parts

4.1 Installing Boards of Baseband Subrack

The baseband subrack is located at the cabinet—uppermost part. The boards inserted in this subrack are common boards. One connector is equipped at the rear of a board and used to connect to the backplane. On the front of the board are two metal handles with spanners used to pull out and plug in the board.

The installation procedures of the board are as follows:

- 1) Align the board with the positions marked with corresponding board names and push in the board gently along the guide rail until explicit resistance can be felt, then lock the front panel.
- 2) Fasten all screws one by one in position on the panel with a screwdriver, to ensure that it is seamless between the board panel and the baseband subrack.



Caution:

1. Before installing the board, first check the cleanness of the cabinet and the subrack. Clean the cabinet and the frame if necessary.
 2. Wear antistatic wrist strap (Make sure that the plug of the antistatic wrist strap is inserted in the socket on the sidedoor post of the cabinet) or discharge the static on the body by touching the chassis before touching the board or the module.
 3. Insert the boards strictly according to the labels on the individual nameplates. Do not insert the boards wrong.
 4. Insert the board vertically into the subrack and the boards are interconnected through the system bus on the backplane.
 5. Insert the boards with care so as to prevent the pins from getting bent on the backplane.
-

4.2 Installing Other Functional Modules

Refer to the following procedures for installing the fan box, power supply module, BTRM module, BHPA module, BTRM fan module, RLDU module and the CDU module.

- 1) Align the fan box, power supply module, BTRM module, BHPA module, BTRM fan module, RLDU module, and the CDU/DFU/DDU module respectively with the “fan subrack”, “power supply subrack”, “RF subrack”, “RLDU/CDU subrack”

and so on, then push them in gently along the corresponding guide rails until explicit resistance can be felt.

- 2) Fasten all screws into position on the panel one by one with a screwdriver to ensure that it is seamless between module panel and the cabinet subrack.
-

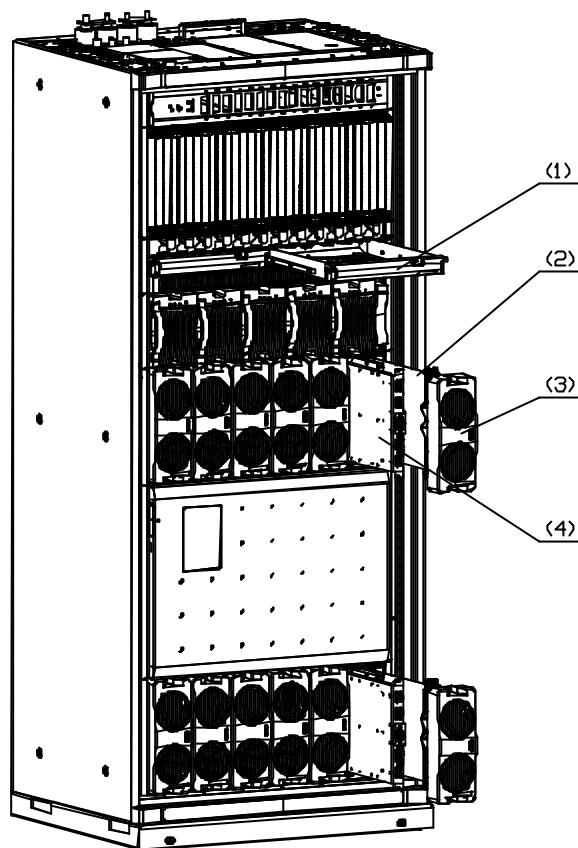


Caution:

1) The transmitting and receiving indexes of the BTS will probably descend if the BTRM, CDU, DFU, DDU, RLDU and other RF modules are not inserted correctly and the screws are not fastened. Meanwhile, the CDU frequency is fixed and not adjustable. Its corresponding upper subrack probably has higher carrier frequency, while the lower subrack has relatively lower carrier frequency. Decide the slot position of the specified carrier frequency module according to the actual frequency in practical configuration, otherwise, it will result in such faults as low transmitting power of the BTS.

2) When DFU and DDU are used, they have no special requirement on frequencies, and are configured from bottom up in the subracks.

Installation processes of fan box, BTRM module, BHPA module, and BTRM fan module are shown in Figure 4-1. And the installation processes of other modules are similar.



(1) Fan box (2) Transceiver module (3) RF fan module (4) High amplification module

Figure 4-1 Installation of the modules



Caution:

Do not force the screw in when the screw is tight and hard to be inserted. Otherwise it may be broken. The correct way is to reinstall the functional module and align the installation holes on the functional module with the installation holes on the subrack.

4.3 Installing and Disassembling the Doors of Cabinets

During the installation and maintenance for cabinets, it may be necessary to install or disassemble the side doors, rear doors, left-front doors and right-front doors.

I. Installing or disassembling side doors

During the installation or disassembly, first install or disassemble protection grounding cables, then align the side door with positioning pin of the lower

enclosure frame at the cabinet side, and finally install or disassemble the six captive screws on the side door; thus, that is the whole process.

II. Installing or disassembling rear doors

For the installation or disassembly of the rear door, align rear door with positioning pin of the lower enclosure frame at the back of the cabinet, and install or disassemble the six captive screws on the rear door. Thus that is the whole process.

III. Installing or disassembling left-front door and right-front door

During the installation for right-front door, align the door with the positioning pin at the right-front of the cabinet, pull the pin at the upper part of the right-front door and align it with the pin hole, thus ending the installation. The process for disassembling the right-front door is exactly reversed.

The process for installing or disassembling left-front door is similar to that for installing or disassembling right-front door.

4.4 Setting BCIM Switches and Jumpers

The DIP switches of the BCIM and jumpers are shown in Figure 4-2.

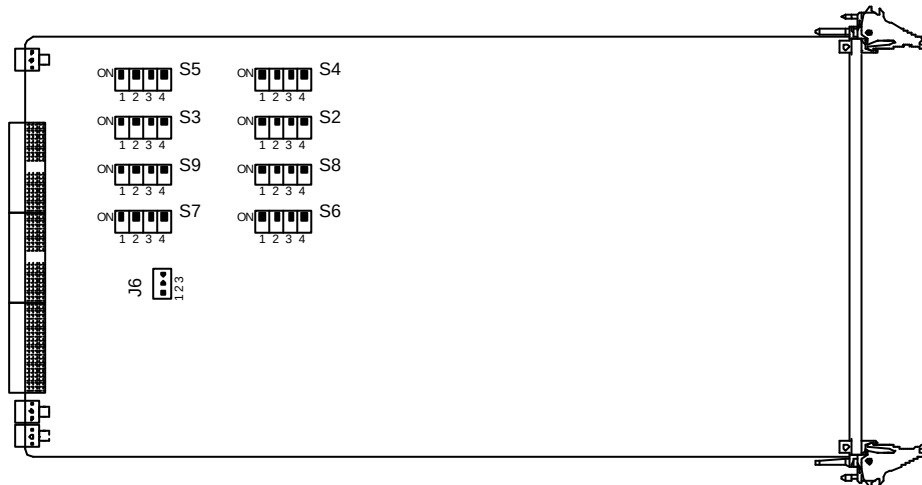


Figure 4-2 BCIM DIP switches and jumpers

Please see Table 4-1 for details of BCIM DIP switch and jumper.

Table 4-1 Description of BCIM DIP switches and jumpers

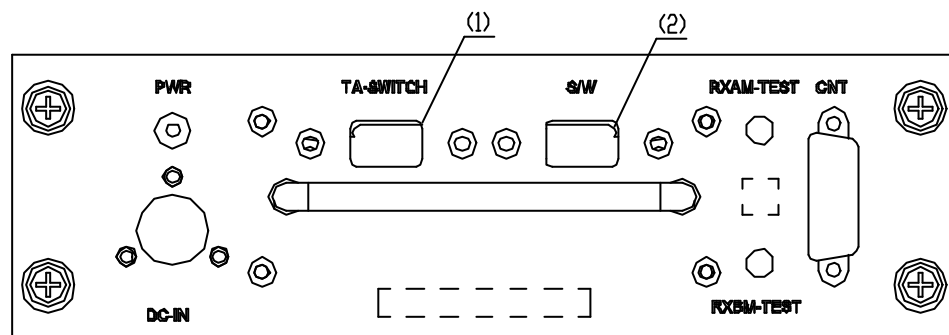
Serial number	Functions	Operation
S2~S9	E1 interface matching impedance (75Ω/120Ω), balanced or unbalanced mode (optional)	DIP switches No.1, 2, 3, 4 are all located at the "OFF" position.120Ω twisted pair. DIP switches No. 1, 2, 3, 4 are all located at the "ON" position.75Ωcoaxial cable with its skin connected with PGND DIP switch No. 12 is on; No. 34 is located at "OFF" position. 75Ω coaxial cable with its skin not connected with PGND. DIP switches No. 1, 2, 3, 4 are located at other position except the above three positions. Undefined
J6	E1 interface matching impedance (75Ω/120Ω) mode for feedback. The program initializes E1 driver chip according to the status of this jumper	Short-circuiting jumper 2, 3.120Ω configuration mode Short-circuiting with others or none.75Ω configuration mode

Note:

The settings of BCIM DIP switches and jumpers have been already prepared before delivery. Please check it.

4.5 Setting RLDU Switches

The RLDU switches and indicators are shown in Figure 4-3.



(1) Tower-top Amplifier Switch (the BTS for 800MHz and 450MHz bands does not have this switch) (2) S/W

Figure 4-3 RLDU Panel

Description for RLDU switches is shown in Table 4-2.

Table 4-2 Description for RLDU switches

Switch name	Function	Operation
S/W	Switch the number of sector carriers corresponding to the RLDU.	Switch S/W to 0: Number of BTS sectors 3, 2 < number of carriers of each sector 4; each sector is configured with 2 CDUs or 1 CDU+1DFU; Switch S/W to 1: Number of carriers in each sector 2; each sector is configured with 1 CDU/DFU/DDU.
TA-SWITCH	Tower-top Amplifier selection switch (for 1900MHz band)	Switch S/W to 0: There is no Tower-top Amplifier in the antenna and feeder system. Switch S/W to 1: There is Tower-top Amplifier in the antenna and feeder system.

4.6 Introducing Typical Configuration of Cabinets

cBTS3612 is able to operate within the 450MHz band, 800MHz band and 1900MHz band. Typical configurations of cBTS3612 in these three bands is listed below:

I. Typical configuration of cBTS3612 in 450MHz band

- 1 carrier omni cell, i.e. O(1).
- 1 carrier × 3 sectors, i.e. S(1/1/1).
- 2 carriers × 3 sectors, i.e. S(2/2/2).
- 3 carriers × 3 sectors, i.e. S(3/3/3).

II. Typical configuration of cBTS3612 in 800MHz band

- 2 carriers omni cell, i.e. O(2).
- 1 carrier × 3 sectors, i.e. S(1/1/1).
- 4 carriers × 3 sectors, i.e. S(4/4/4).
- 2 carriers × 6 sectors, i.e. S(2/2/2/2/2/2).

III. Typical configuration of cBTS3612 in 1900MHz band

- 1 carrier omni cell, i.e. O(1).
- 1 carrier × 3 sectors, i.e. S(1/1/1).
- 2 carriers × 3 sectors, i.e. S(2/2/2).
- 2 carriers × 6 sectors, i.e. S(2/2/2/2/2/2).

4.6.1 Typical Configuration of cBTS3612 in 450MHz Band

The duplex supported currently in this band is CDU and DFU.

I. S(1/1/1) Configuration

The following is the configuration of cBTS3612 for Type S(1/1/1) (i.e.: 1 carrier x 3 sectors):

- 1 BCIM, 1 BRDM, 12 BCKMs, and BCPM can be configured according to actual requirement.
- 2 power supply modules.
- Two single polarization directional antennas or one dual polarization directional antenna for each sector.

The configuration of the RF part is shown in Figure 4-4.

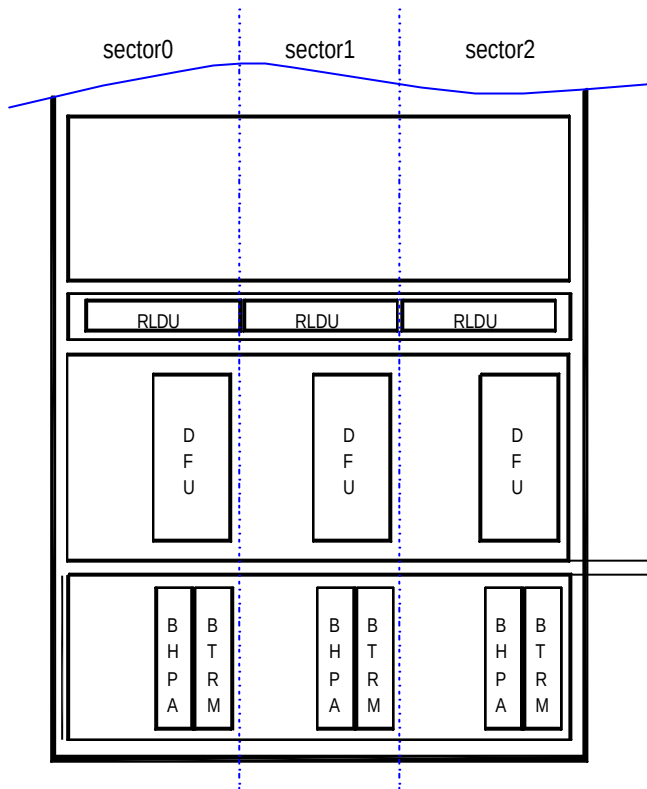


Figure 4-4 S(1/1/1) RF configuration(for 450MHz)

4.6.2 Typical Configuration of cBTS3612 in 800MHz Band

The duplex supported currently in this band is CDU.

I. S(1/1/1) Configuration

The following is the configuration of cBTS3612 for Type S(1/1/1) (i.e.: 1 carrier x 3 sectors):

- 1 BCIM, 1 BRDM, 12 BCKMs, and BCPM can be configured according to actual requirement.
- 2 power supply modules.
- Two single polarization directional antennas or one dual polarization directional antenna for each sector.

The configuration of the RF part is shown in Figure 4-5.

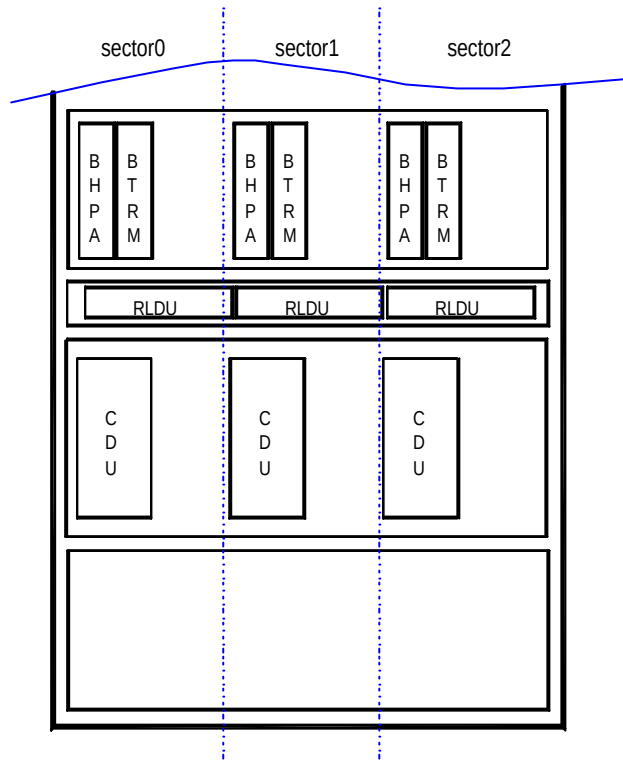


Figure 4-5 S(1/1/1) RF configuration(for 800MHz)

4.6.3 Typical Configuration of cBTS3612 in 1900MHz Band

The duplex supported currently in this band is DDU, and it is expected that CDU be supported also in the future with reference to 1900MHz band planning.

I. S(1/1/1) Configuration

The following is the configuration of cBTS3612 for Type S(1/1/1) (i.e.: 1 carrier x 3 sectors):

- 1 BCIM, 1 BRDM, 12 BCKMs, and BCPM can be configured according to actual requirement.
- 2 power supply modules.
- Two single polarization directional antennas or one dual polarization directional antenna for each sector.

The configuration of the RF part is shown in Figure 4-6.

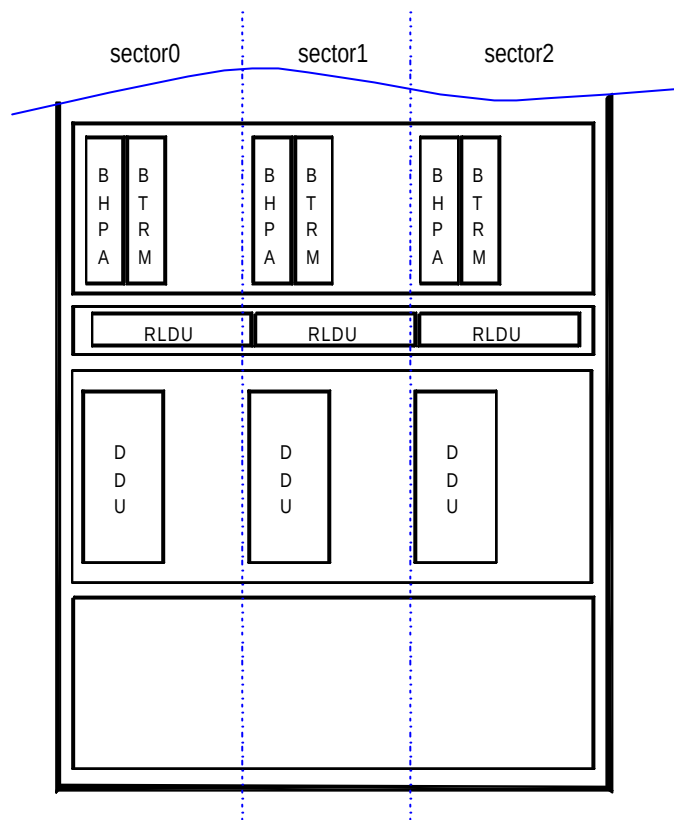


Figure 4-6 S(1/1/1) RF configuration(1900MHz)



Note:

The above typical configurations are just described for your reference; please perform the installation according to engineering documents during actual installation.