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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.
	Live-line 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.

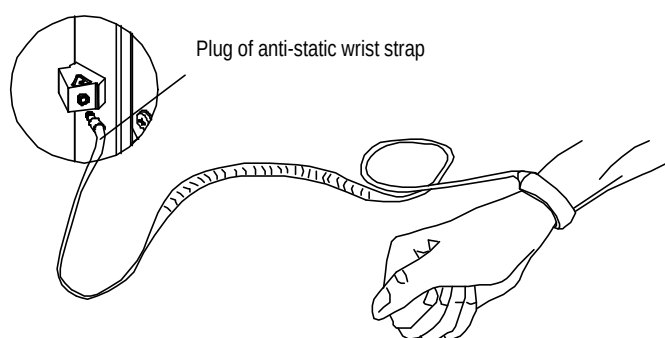


Figure 1 Wearing the anti-static wrist strap

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 45°C and the maximum range of temperature rise allowed is 30°C under normal working conditions. When fault occurs, the maximum temperature rise allowed is 55°C. So when the parts work at the high

temperature of 45°C under normal working conditions, their highest temperature should not exceed 75°C, and when fault occurs, the highest temperature should not exceed 100°C.

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.

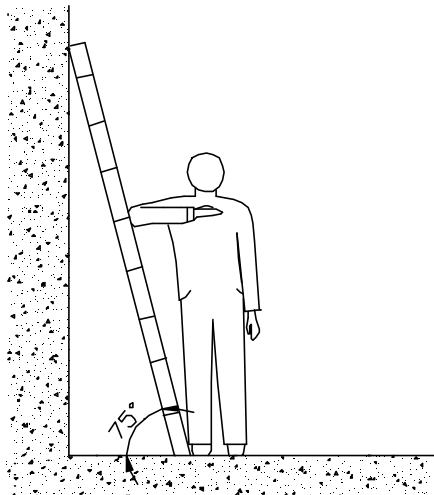


Figure 2 The angle at which the ladder should be leaned

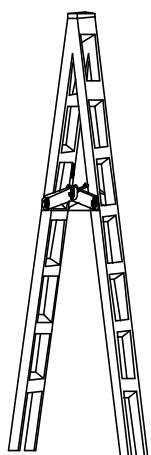


Figure 3 Stretching the A-shaped ladder

- 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.

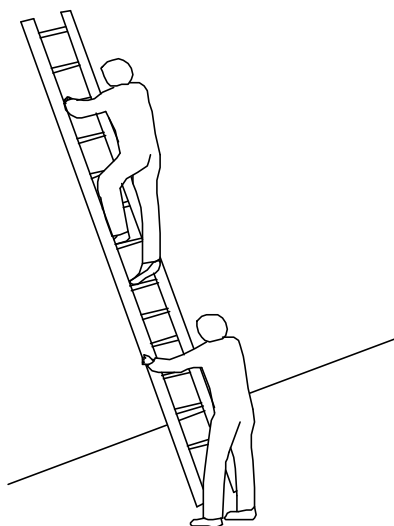


Figure 4 Climbing and using the long ladder in a safe way

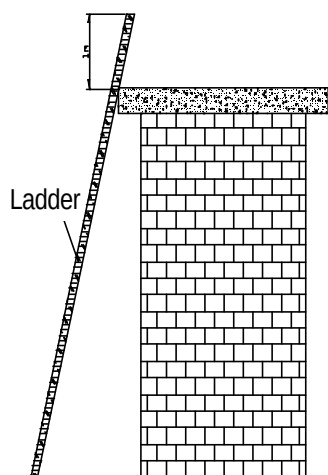


Figure 5 Placing the ladder with the top 1 meter higher above the edge of the roof-top

- 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.

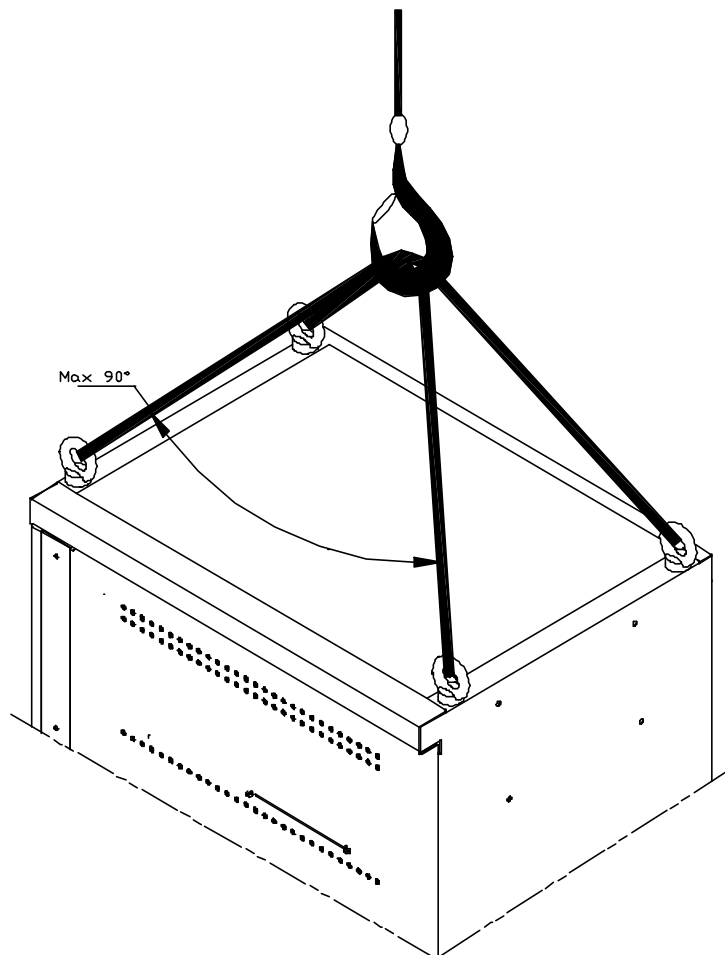


Figure 6 Hoisting of the heavy objects

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.

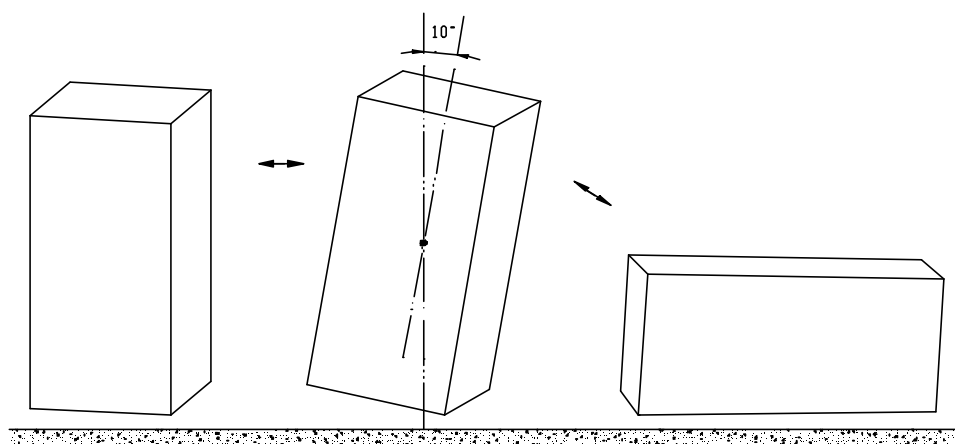


Figure 7 The process of laying down and erecting a cabinet

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.
