

Regulatory Compliance Statement
pRRU3901, pRRU3901 AWS+PCS+WIFI

Issue: 02

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HUAWEI TECHNOLOGIES CO., LTD.



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1 Regulatory Compliance Statement

About This Chapter

1.1 Declaration of Conformity to European Directives

1.1 Declaration of Conformity to European Directives

Figure 1-1 Declaration of Conformity to European Directives

Doc NO.: CE-01372135

Declaration of Conformity For EU Directives and Regulations

For the following equipment

Product : pico Remote Radio Unit
 Model/Trademark : pRRU3901 / HUAWEI
 Manufacturer's Name : Huawei Technologies Co., Ltd.
 Manufacturer's Address : Administration Building, Headquarters of
Huawei Technologies Co., Ltd., Bantian,
Longgang District, Shenzhen, 518129, P.R.C

is herewith confirmed to comply with the requirements which are set out in 1999/5/EC(R&TTE Directive), 2002/95/EC & 2011/65/EU (RoHS Directive), 2002/96/EC&2012/19/EU (WEEE Directive) and 2006/1907/EC(REACH Regulation). For the evaluation of the compliance with these Directives and Regulations, the following standards/requirements were applied:

Safety	EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013	
EMC	ETSI EN 301 489-1 V1.9.2	ETSI EN 301 489-17 V2.2.1
	ETSI EN 301 489-23 V1.5.1	
	EN 55022:2010 EN 55024:2010	CISPR 22:2008 CISPR 24:2010
Radio & Health	ETSI EN 301 908-1 V6.2.1	ETSI EN 301 908-3 V6.2.1
	ETSI EN 301 908-14 V6.2.1	EN 62311:2008
	EN 300 328 V1.8.1	EN 301 893 V1.7.1
	Council Recommendation 1999/519/EC	EN 50385:2002
RoHS	2002/95/EC, 2011/65/EU, EN 50581: 2012	
REACH	EC NO. 1907/2006	
WEEE	2002/96/EC, 2012/19/EU	

Responsible for making this declaration is the:

Manufacturer Authorised representative established within the EU

Person responsible for making this declaration

Name/Title:

Zhang Xing Wei

Regulation Compliance Manager

Place/Date Shenzhen, China

June 17, 2014

2 Regulatory Compliance Information

About This Chapter

- 2.1 Regulatory Compliance Standards
- 2.2 European Regulatory Compliance
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2.1 Regulatory Compliance Standards

The Product complies with the standards listed in Table 2-1.

Table 2-1 Regulatory compliance standards

Discipline	Standards
EMC	<ul style="list-style-type: none"> • CISPR22 Class B • CISPR24 • EN55022 Class B • EN50024 • ETSI EN 301 489 Class B • CFR 47 FCC Part 15 Class B • ICES 003 Class B • AS/NZS CISPR22 Class B • GB9254 Class B • VCCI Class B • CNS 13438 Class B • IEC/EN61000-3-2 • IEC/EN61000-3-3 • IEC/EN61000-6-1 • IEC/EN61000-6-3
RF	<ul style="list-style-type: none"> • ETSI EN 301 908-1 • ETSI EN 301 908-3 • ETSI EN 301 908-14 • ETSI EN 300 328 • ETSI EN 301 893
Heath	<ul style="list-style-type: none"> • ICNIRP Guideline • 1999-519-EC • EN 50385 • OET Bulletin 65 • IEEE Std C95.1 • EN 60215 • EN 62311
Safety	<ul style="list-style-type: none"> • IEC/EN 60950-1 • IEC/EN41003 • EN 60950-1 • UL 60950-1 • CSA C22.2 No 60950-1 • AS/NZS 60950.1 • BS EN 60950-1 • IS 13252 • GB4943

Discipline	Standards
Environmental protection	<ul style="list-style-type: none"> • 2011/65/EU (RoHS) • EC NO. 1907/2006 (REACH) • 2002/96/EC (WEEE)
Grounding	<ul style="list-style-type: none"> • ITU-T K.27 • ETSI EN 300 253
<p>NOTE</p> <p>EMC: electromagnetic compatibility</p> <p>NEBS: Network Equipment Build Standard</p> <p>RF: radio frequency</p> <p>CISPR: International Special Committee on Radio Interference</p> <p>EN: European Standard</p> <p>ETSI: European Telecommunications Standards Institute</p> <p>CFR: Code of Federal Regulations</p> <p>FCC: Federal Communication Commission</p> <p>IEC: International Electrotechnical Commission</p> <p>AS/NZS: Australian/New Zealand Standard</p> <p>VCCI: Voluntary Control Council for Interference</p> <p>CNS: Chinese National Standard</p> <p>UL: Underwriters Laboratories</p> <p>CSA: Canadian Standards Association</p> <p>BS: British Standard</p> <p>IS: Indian Standard</p> <p>GR: General Requirement</p> <p>FDA: Food and Drug Administration</p> <p>BTS: Base Transceiver Station</p> <p>GSM: Global System for Mobile communications</p> <p>WLAN: wireless local area network</p> <p>ICNIRP: International Commission on Non-Ionizing Radiation Protection</p> <p>OET: Office of Engineering Technology</p> <p>IEEE: Institute of Electrical and Electronics Engineers</p> <p>RoHS: restriction of the use of certain hazardous substances</p>	

2.2 European Regulatory Compliance

The Product complies with the following European directives and regulations.

- 2004/108/EC (EMC)
- 2006/95/EC (low voltage)
- 1999/5/EC (R&TTE)
- 2011/65/EU (RoHS)
- EC NO. 1907/2006 (REACH)

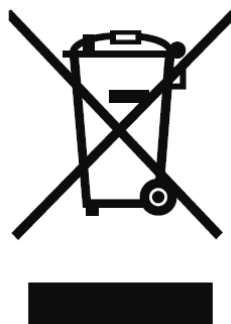
- 2002/96/EC (WEEE)

Product complies with Directive 2002/95/EC, 2011/65/EU and other similar regulations from the countries outside the European Union, on the RoHS in electrical and electronic equipment. The device does not contain lead, mercury, cadmium, and hexavalent chromium and brominated flame retardants (Polybrominated Biphenyls (PBB) or Polybrominated Diphenyl Ethers (PBDE)) except for those exempted applications allowed by RoHS directive for technical reasons.

Product complies with Regulation EC NO. 1907/2006 (REACH) and other similar regulations from the countries outside the European Union. Huawei will notify to the European Chemical Agency (ECHA) or the customer when necessary and regulation requires.

Product complies with Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Huawei is responsible for recycling its end-of-life devices, and please contact Huawei local service center when recycling is required. Huawei strictly complies with the EU Waste Electrical and Electronic Equipment Directive (WEEE Directive) and electronic waste management regulations enacted by different countries worldwide. In addition, Huawei has established a system for recycling and reuse of electronic wastes, and it can provide service of dismantling and recycling for WEEE. By Huawei recycling system, the waste can be handled environmentally and the resource can be recycled and reused fully, which is also Huawei WEEE stratagem in the word. Most of the materials in product are recyclable, and our packaging is designed to be recycled and should be handled in accordance with your local recycling policies.

In accordance with Article 11(2) in Directive 2002/96/EC (WEEE), products were marked with the following symbol: a cross-out wheeled waste bin with a bar beneath as below:



2.3 U.S.A Regulatory Compliance

2.3.1 FCC Part 15

The Product complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device does not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

If this device is modified without authorization from Huawei, the device may no longer comply with FCC requirements for Class B digital devices. In that a case, your right to use the device may be limited by FCC regulations. Moreover, you may be required to correct any interference to radio or television communications at your own expense.

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This device generates, uses and radiates radio frequency energy. If it is not installed and used in accordance with the instructions, it may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this device does cause harmful interference to radio or television reception, which can be determined by turning the device off and on, the user may take one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Reinforce the separation between the device and receiver.
- Connect the device into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or TV technician for assistance.

This product may contains FCC ID QISPRU01B02 or FCC ID QISPRU01B04 or QISPRU01WLAN or their combination both or three transmitters

2.4 Canada Regulatory Compliance

2.4.1 RSS-Gen statement

This device complies with Industry Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radio électrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

2.4.2 RSS-102 statement

This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by Industrial Canada and meets the requirements for radiation exposure limits set forth for an uncontrolled environment.

In order to avoid the possibility of exceeding the Industrial Canada radio frequency exposure limits, human proximity to the equipment shall not be less than 0.25m

Cet appareil est conçu et fabriqué pour ne pas dépasser les limites d'émission pour l'exposition à la fréquence radio (RF) de l'énergie fixée par l'Industrie Canada et répond aux exigences en matière de limites d'exposition aux rayonnements définies pour un environnement non contrôlé.

Afin d'éviter la possibilité de dépasser les limites d'exposition aux fréquences radio industrielle du Canada, la proximité humaine pour l'appareil ne doit pas être inférieure à 0.25m

This product may contain IC 6369A-PRU01B02 or IC 6369A-PRU01B04 or 6369A-PRU01WLAN or their combination both or three transmitters

2.5 Japanese Regulatory Compliance

2.4.1 VCCI

The Product complies with VCCI Class B by Information Technology Equipment (ITE).

The preceding translates as follows:

This is a Class B product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this product is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

この装置は、クラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。 VCCI-B

2.6 CISPR 22 Compliance

The Product complies with CISPR 22 for Class B by the ITE.

2.7 China RoHS hazardous substance table

This products described in this guide complies with “the Administration on the Control of Pollution Caused by Electronic Information Products” which is also called China RoHS

部件名称	产品中有害物质或元素的名称及含量					
	镉	铅	汞	六价铬	多溴联苯	多溴联苯醚
Alloy Parts	○	×	○	○	○	○
Metal Fittings	○	○	○	○	○	○
PCBA	○	×	○	○	○	○
Capacitor	○	×	○	○	○	○
Other electronics	○	×	○	○	○	○
Solder	○	×	○	○	○	○
Cable	○	○	○	○	○	○
Plastic and Polymer	○	○	○	○	○	×

○：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下。
 ×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求。

2.8 India RoHS hazardous substance table

This products described in this guide complies with the “e-waste (Management and Handling) Rules, 2011” of India which is also called India RoHS.

Part Descriptions	Restricted Substances in Product					
	Cd	Pb	Hg	Cr(VI)	PBBs	PBDEs
Alloy Parts	○	×	○	○	○	○
Metal Fittings	○	○	○	○	○	○
PCBA	○	×	○	○	○	○
Capacitor	○	×	○	○	○	○

2 Regulatory Compliance Information

Other electronics	○	×	○	○	○	○
Solder	○	×	○	○	○	○
Cable	○	○	○	○	○	○
Plastic and Polymer	○	○	○	○	○	×

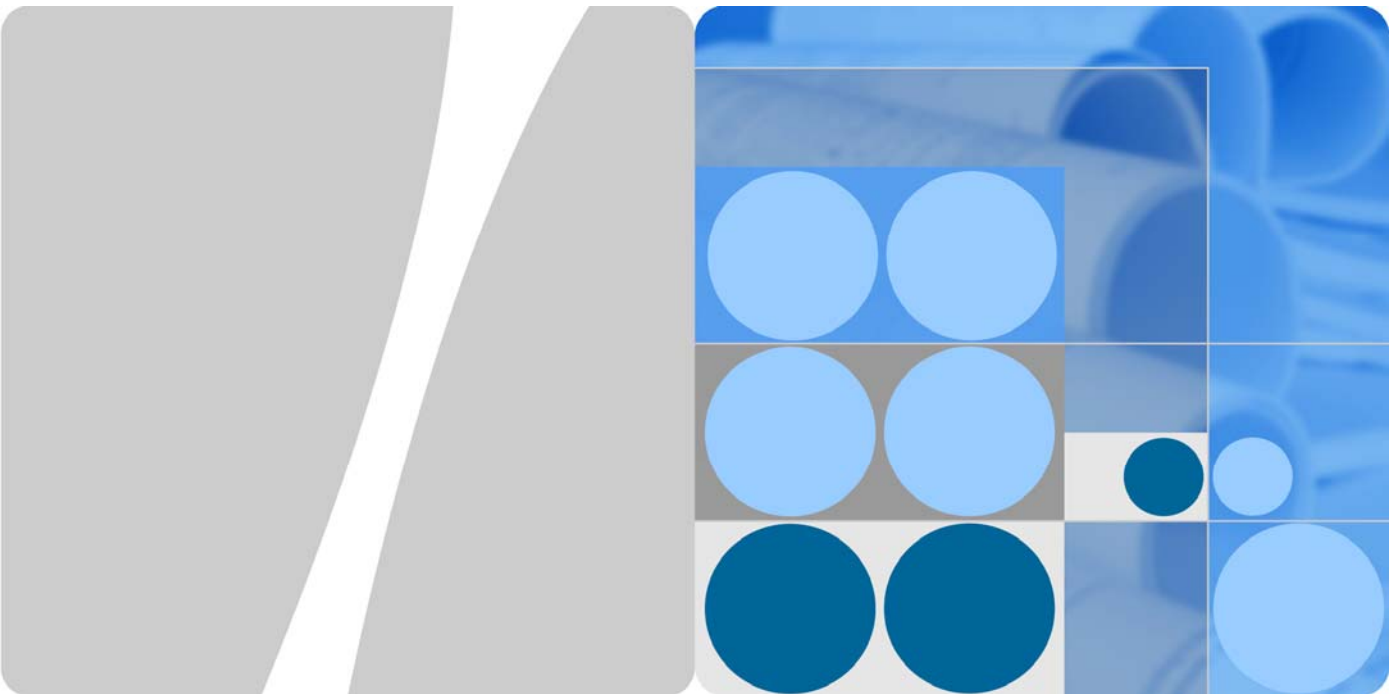
○: indicates that the content of the toxic and hazardous substance in all the Homogeneous Materials of the part is below the concentration limit requirement as described in the e-waste (Management and Handling) Rules, 2011.

×: indicates that the content of the toxic and hazardous substance in at least one Homogeneous Material of the part exceeds the concentration limit requirement as described in S in the e-waste (Management and Handling) Rules, 2011.

2.9 Other Markets

For relevant compliance information/documentation for markets not mentioned above,

Please contact Huawei representative



Compliance and Safety Manual

pRRU3901, pRRU3901 AWS+PCS+WIFI

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1 Safety

About This Chapter

- 1.1 [Health and Safety](#)
- 1.2 [Equipment Safety](#)
- 1.3 [Electromagnetic Field exposure](#)

1.1 Health and Safety

- 1.1.1 [Overview](#)
- 1.1.2 [Electrical Safety](#)
- 1.1.3 [Inflammable Environment](#)
- 1.1.4 [Working at Heights](#)
- 1.1.5 [Mechanical Safety](#)
- 1.1.6 [Bundling Signal Cables](#)

1.1.1 Overview

Introduction

This section describes the safety precautions you must take before installing or maintaining Huawei equipment.

- To ensure safety of humans and the equipment, pay attention to the safety symbols on the equipment and all the safety instructions in this document.
- The "NOTE", "CAUTION", and "WARNING" marks in other documents do not represent all the safety instructions. They are only supplements to the safety instructions.
- Installation and maintenance personnel must understand basic safety precautions to avoid hazards.
- When operating Huawei equipment, in addition to following the general precautions in this document, follow the specific safety instructions given by Huawei.

- Only trained and qualified personnel are allowed to install, operate, and maintain Huawei equipment.

Local Safety Regulations

When operating Huawei equipment, you must follow the local laws and regulations. The safety instructions in this document are only supplements to the local laws and regulations.

General Requirements

To minimize risk of personal injury and damage to equipment, read and follow all the precautions in this document before performing any installation or maintenance.

Ensure that the instructions provided in this document are followed completely. This section also provides guidelines for selecting the measuring and testing devices.

Installation

- The device (or system) must be installed in an access-controlled location.
- The device can be mounted only on concrete or non-combustible surfaces.
- The device must be fixed securely on the floor or to other immovable objects such as walls and mounting racks before operation.
- When installing the unit, always make the ground connection first and disconnect it at the end.
- Tighten the thumbscrews by using a tool after initial installation and subsequent access to the panel.

Ground

- Do not damage the ground conductor or operate the device in the absence of a properly installed ground conductor. Conduct the electrical inspection carefully.
- The device (or system) must be connected permanently to the protection ground before an operation. The cross-sectional area of the protective ground conductor must be at least 16 mm².

Power Supply

- For DC-supplied model: The device applies to DC power source that complies with the Safety Extra-Low Voltage (SELV) requirements in IEC 60950-1 based safety standards.
- Prepared conductors are connected to the terminal block, and only the appropriate AWG/Type of wire is secured with the lug terminals.
- Short-circuit (overcurrent) protection of the device varies according to the building's installation. Ensure that a circuit breaker no larger than 125 VDC, 10 A (fuse) for DC supplied model is used on the phase conductors (all current-carrying conductors).
- For this device, a readily accessible disconnect device must be incorporated in the building installation wiring.

Human Safety

- Do not operate the device or cables during lightning strikes.
- To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telecommunication network voltage (TNV) circuits.

- Move or lift the chassis by holding its lower edge. Do not hold the handles on certain modules such as power supply, fans, and boards because they cannot support the weight of the device.
- Do not look into the optical port without eye protection.
- Do not wear jewelry or watches when you operate the device.

Operator

- Only qualified professional personnel are allowed to install, configure, operate, and disassemble the device.
- Only the personnel authenticated or authorized by Huawei are allowed to replace or change the device or the parts of the device (including the software).
- Any fault or error that might cause safety problems must be reported immediately to a supervisor.
- Only qualified personnel are allowed to remove or disable the safety facilities and to troubleshoot and maintain the device.

1.1.2 Electrical Safety

High Voltage



DANGER

The high voltage power supply provides power for the device operation. Direct or indirect contact (through damp objects) with high voltage and AC mains supply may result in fatal danger.

-
- During the installation of the AC power supply facility, follow the local safety regulations. The personnel who install the AC facility must be qualified to perform high voltage and AC operations.
 - Do not wear conductive articles, such as watches, hand chains, bracelets, and rings during the operation.
 - When water is found in the rack or the rack is damp, switch off the power supply immediately.
 - When the operation is performed in a damp environment, make sure that the device is dry.



WARNING

Non-standard and improper high voltage operations may result in fire and electric shock. Therefore, you must abide by the local rules and regulations when bridging and wiring AC cables. Only qualified personnel are allowed to perform high voltage and AC operations.



WARNING

Before powering on a device, ground the device. Otherwise, personal injury or device damage may be caused by high leakage current.

Thunderstorm



DANGER

Do not perform any operation, including high voltage and AC operations, on a steel tower or mast during a thunderstorm.

Tools



WARNING

Dedicated tools must be used during high voltage and AC operations. Avoid using ordinary tools.

High Electrical Leakage



WARNING

Ground the device before powering it on. Otherwise, personal injury or device damage may be caused by high leakage current.

If a "high electrical leakage" tag is present on the power terminal of the device, you must ground the device before powering it on.

Power Cable



WARNING

Do not install or remove power cables when the device is on. Transient contact between the core of the power cable and the conductor may generate electric arcs or sparks, which may cause fire or hurt human eyes.

- Before installing or removing the power cable, turn off the power switch.
- Before connecting a power cable, check that the label on the power cable is correct.

 **CAUTION**

- If the device is connected with the DC power supply, use 16 mm² minimum power supply cord.
 - Use type H03VV-F or light PVC-sheathed flexible cord according to IEC 60227.
-

1.1.3 Inflammable Environment

Operating the electrical device in an inflammable environment can be fatal.

 **DANGER**

Do not place the device in an environment that has inflammable and explosive air or gas. Do not perform any operation in this environment.

1.1.4 Working at Heights

 **WARNING**

Avoid object falling when you work at heights.

When working at heights, fulfill the following requirements:

- Only trained personnel can work at heights.
- Prevent the devices and tools that you carry from falling down.
- Take safety and protection measures, for example, wear a helm and safety belt.
- Wear warm clothes when working at heights in a cold region.
- Before working at heights, check that all the lifting facilities are in good condition.

Hoisting Heavy Objects

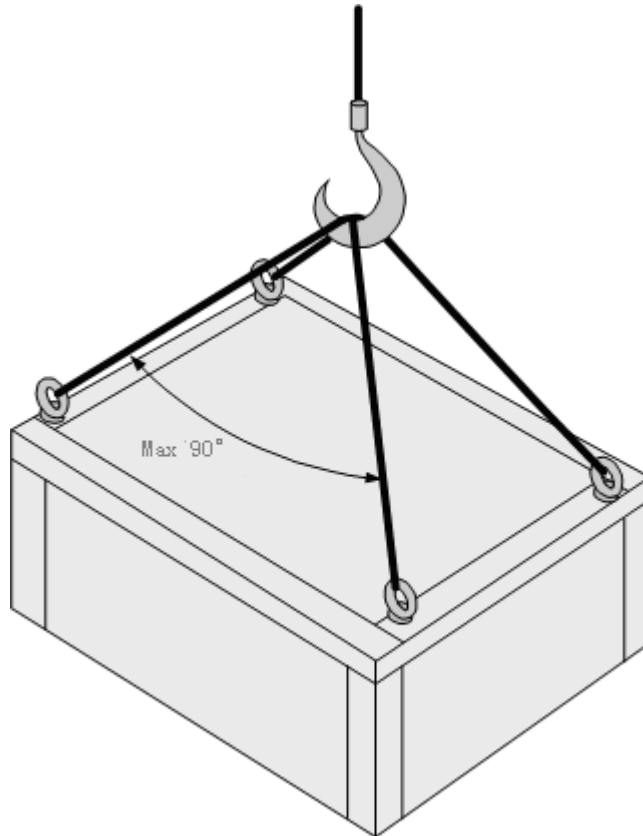
 **WARNING**

Do not walk below the cantilever or hoisted objects when heavy objects are being hoisted.

- Only trained and qualified personnel can perform hoisting operations.
- Before hoisting heavy objects, check that the hoisting tools are complete and in good condition.

- Before hoisting heavy objects, ensure that the hoisting tools are fixed to a secure object or wall with good weight capacity.
- Issue orders with short and explicit words to avoid misoperations.
- Ensure that the angle formed by two cables is not larger than 90 degrees. See [Figure 1-1](#).

Figure 1-1 Hoisting heavy objects



Using Ladders

Checking a Ladder

- Before using a ladder, check whether the ladder is damaged. Only the ladder in good condition can be used.
- Before using a ladder, you should know the maximum weight capacity of the ladder. Avoid overweighing the ladder.

Placing a Ladder

The recommended gradient of ladders is 75 degrees. You can measure the gradient of the ladder with an angle square or your arms. When using a ladder, ensure that the wider feet of the ladder are downward, or take protection measures for the ladder feet to prevent the ladder from sliding. Ensure that the ladder is placed securely.

Climbing Up a Ladder

When climbing up a ladder, note the following:

- Ensure that the center of gravity of your body does not deviate from the edges of the two long sides.
- To minimize the risk of falling, hold your balance on the ladder before any operation.
- Do not climb higher than the fourth rung of the ladder (counted from up to down).
- If you want to climb up a roof, ensure that the ladder top is at least one meter higher than the roof.

1.1.5 Mechanical Safety

Drilling Holes



WARNING

Do not drill the cabinet at will. Drilling holes without complying with the requirements affects the electromagnetic shielding performance of the cabinet and damages the cables inside the cabinet. In addition, if the scraps caused by drilling enter the cabinet, the printed circuit boards (PCBs) may be short circuited.

-
- Before you drill a hole in the cabinet, wear insulated gloves and remove the internal cables from the cabinet.
 - Wear an eye protector when drilling holes. This is to prevent your eyes from being injured by the splashing metal scraps.
 - Ensure that the scraps caused by drilling do not enter the cabinet.
 - Drilling holes without complying with the requirements affects the electromagnetic shielding performance of the cabinet.
 - After drilling, clean the metal scraps immediately.

Sharp Objects



WARNING

Before you hold or carry a device, wear protective gloves to avoid getting injured by sharp edges of the device.

Lifting Heavy Objects



WARNING

When heavy objects are being lifted, do not stand or walk under the cantilever or the lifted object.

1.1.6 Bundling Signal Cables



CAUTION

- Do not bundle signal cables with high current cables or high voltage cables.
 - Maintain a minimum space of 150 mm between adjacent ties.
-

1.2 Equipment Safety

- [1.2.1 Electricity Safety](#)
- [1.2.2 Electrostatic Discharge](#)
- [1.2.3 Installing and Removing a Board](#)
- [1.2.4 Laying Cables](#)

1.2.1 Electricity Safety

Thunderstorm



CAUTION

During thunderstorms, the electromagnetic field generated in the thunderstorm area may damage the electronic parts. To prevent damage to the device during lightning, ground the device properly.

High Electrical Leakage



CAUTION

If the "high electrical leakage" tag is present on the power terminal of the device, you must ground the device before powering it on.

Fuse



WARNING

If a fuse is to be replaced, the new fuse must be of the same type and specifications.

Table 1-1 lists the fuses that affect the safety of the device (or system). Use fuses according to this list.

Table 1-1 Fuse description

Position	Manufacturer	Type	Rating
Fuse (F7000) on pRRU3901 19040112	LITTELFUSE INC	0451010.MRL	125VAC/DC,10 A
	CONQUER ELECTRONICS CO LTD	SEF010	125VAC/DC,10 A
	BEL FUSE INC	SSQ10	125VAC/86 VDC, 10 A
Fuse (F7001) on pRRU3901 19040110	LITTELFUSE INC	0452004.MRL	125VAC/DC, 4 A
	CONQUER ELECTRONICS CO LTD	SET004	125VAC, 32 VDC, 4 A
	BEL FUSE INC	SST4	125VAC, 4 A

1.2.2 Electrostatic Discharge



CAUTION

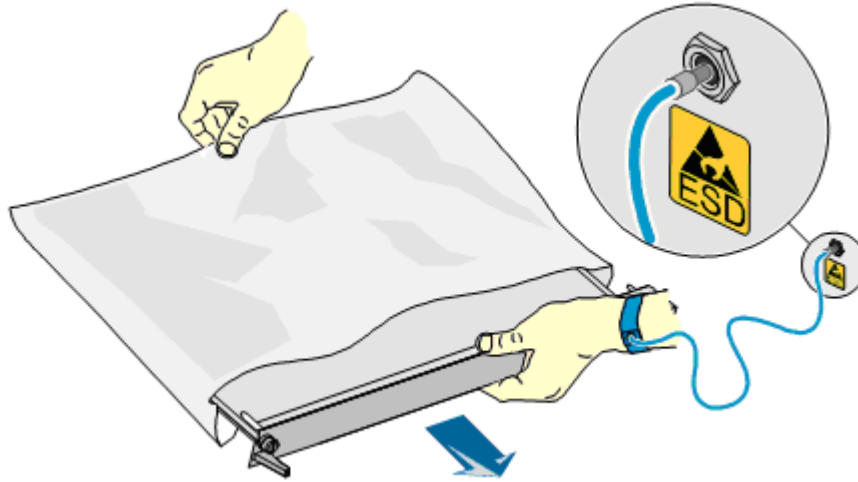
The static electricity generated by human bodies may damage the electrostatic-sensitive components on boards, for example, the large-scale integrated (LSI) circuits.

Human body movement, friction between human bodies and clothes, friction between shoes and floors, or handling of plastic articles causes static electromagnetic fields on human bodies. These static electromagnetic fields cannot be eliminated until the static is discharged.

To prevent electrostatic-sensitive components from being damaged by the static on human bodies, you must wear a well-grounded ESD wrist strap when touching the device or handling boards or application-specific integrated circuits (ASICs).

Figure 1-2 shows how to wear an ESD wrist strap.

Figure 1-2 Wearing an ESD wrist strap



1.2.3 Installing and Removing a Board

 **CAUTION**

When installing a board, use proper force to prevent the pins on the backplane from being leaned.

When installing or removing a board, note the following:

- Insert the board along the guide rails.
- Prevent the surface of a board from contacting the surface of another board. This is to prevent the boards from being short-circuited or scratched.
- To prevent electrostatic-sensitive devices from being damaged by the ESD, do not touch the circuits, components, connectors, or connection slots on boards.

1.2.4 Laying Cables

When the temperature is very low, violent strike or vibration may damage the cable sheathing. To ensure safety, comply with the following requirements:

- Cables can be laid or installed only when the temperature is higher than 0°C.
- Before laying cables which have been stored in a temperature lower than 0°C, move the cables to an environment of the ambient temperature and store them at the ambient temperature for at least 24 hours.
- Handle cables with caution, especially at a low temperature. Do not drop the cables directly from the vehicle.

1.3 Electromagnetic Field Exposure

Introduction

The Base Transceiver Station (BTS) emits Radio Frequency (RF) radiation. Follow the local safety regulations when installing and operating the BTS to avoid radiation hazard.

Location of Base Station Antennas

Base station antennas, the source of the radiation, are usually mounted:

- On freestanding towers, with a height up to 30 m
- On a tower on the top of buildings
- To the side of buildings, on rare occasions

Generally, the antenna cannot be located in a position lower than 10 m. The energy usually forms a horizontal main beam and is slightly tilted downwards. The remaining energy forms into weaker beams on both sides of the main beam. The main beam, however, does not reach the ground if the antenna is around 50–200 m away from the ground.

The highest level of emission would be expected in close vicinity of the antenna and in line of sight to the antenna.

Exclusion Zones

The requirements for exclusion zones are as follows:

- The antenna should be properly located to prevent the public from accessing the area where the RF radiation exceeds the previously mentioned limits.
- If areas with excessive RF radiation are accessible to the operation and maintenance (O&M) personnel, ensure that they know the source of radiation and can power off or shut down the transmitters before entering high radiation areas. In addition, such areas must be confined within a distance of 10 m from the antennas.
- Each exclusion zone should be defined by a physical barrier and by a recognizable sign warning the public or O&M personnel.

Guidelines on Choosing Antenna Sites

The guidelines on choosing the antenna sites are as follows:

- For roof-mounted antennas, raise the antennas above the height of the personnel who may have to work on the rooftop.
- For roof-mounted antennas, keep the transmitter antennas away from the areas accessible to the public, such as roof access points, telephone service points, and HVAC devices.
- For roof-mounted directional antennas, place the antennas near the periphery, and do not make the antennas face the building.
- Consider the trade-off between large aperture antennas (lower maximum RF) and small aperture antennas (lower visual impact).
- Keep higher-power antennas away from accessible areas.
- Keep the antennas in a site that is far away from urban areas, though this may contradict the coverage area requirements.

- Exercise extra caution when designing co-location sites, that is, antennas owned by different companies are located in the same site or are co-sited. This applies particularly to sites that include high-power broadcast (FM/TV) antennas. Local zone often favors co-location, but co-location may cause safety problems.
- Take special precautions for antenna sites near hospital and schools.

Location of BTS

The BTS is shielded from RF radiation hazards. The device has been tested to comply with the radioactive spurious emission requirements of international standards or local regulations. Therefore, the BTS under normal operating conditions does not cause danger to the public and O&M engineers. However, the limits for RF radiation might be exceeded due to faulty antenna cables or for other causes.

- BTS sites shall not be accessible to the public. Only authorized and trained personnel can access BTS sites or equipment rooms.
- A sign of excessive RF radiation must be present on the doors of the sites or equipment rooms to warn the personnel inside the site or equipment room of excessive RF radiation.
- BTS sites must be regularly monitored and inspected after installation.

Prediction of the Exposure to Electromagnetic Fields

This section provides a theoretical approach to calculate possible exposure to electromagnetic radiation around a BTS antenna. Precise statements are possible either with measurements or complex calculations considering the complexity of the environment, such as soil conditions, nearby buildings and other obstacles. The complexity may cause reflection, deflection, and scattering of electromagnetic fields.

The maximum output power (given in EIRP) of a BTS is usually limited by license conditions of the network operator.

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = (P(W) \times G_{\text{numeric}}) / (4 \times r^2(\text{m}) \times \pi)$$

Where,

P = Maximum output power at antenna port of the BTS in W

G_{numeric} = Numeric gain (see below)

r = Distance between the antenna and the point of exposure in meters

For the calculation of the G_{numeric} ,

$$G_{\text{numeric}} = 10^{\text{GdB}/10}$$

$$\text{GdB} = G_{\text{antenna}}(\text{dB}) - B_{\text{cable}}(\text{dB}) - B_{\text{vertical-attenuation}}(\text{dB}) - B_{\text{horizontal-attenuation}}(\text{dB})$$

B = attenuation in dB