ZXSDR R8978

TDD 8 Path Remote Radio Unit

User Manual

Version: V5.10

ZTE CORPORATION
No. 55, Hi-tech Road South, ShenZhen, P.R.China
Postcode: 518057
Tel: +86-755-26771900
Fax: +86-755-26770801
URL: http://support.zte.com.cn
E-mail: 800@zte.com.cn

LEGAL INFORMATION

Revision History

Revision Version	Revision Date	Revision Reason
R1.2	2016–08–17	Added S2600L
R1.1	2014-10-30	Added S2600M
R1.0	2014-08-06	First edition

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Contents

About This Manual

Purpose

This manual describes the software and hardware structures, interfaces and cables, functions, features, technical specifications, installation modes, networking, and maintenance methods of the ZXSDR R8978.

Intended Audience

This manual is intended for:

- Base station installation engineers
- Base station commissioning engineers
- Base station maintenance engineers

What Is in This Manual

This manual contains the following chapters.

Chapter 1, FCC Related Statements	Describes the statements related to FCC rule.
Chapter 2, Product Overview	Describes the external view, interfaces, functions, features, and typical network applications of the ZXSDR R8978.
Chapter 3, Product Composition	Describes the system structure, hardware composition, and software composition of the ZXSDR R8978.
Chapter 4, Operation and Maintenance	Provides the technical support contact information, power-on and power-off flow, and component replacement methods.
Chapter 5, Accessory Devices	Describes the accessory devices, including junction box, and AC power lightening protection box, and the replacement methods.
Chapter 6, Technical Specifications	Provides the technical specifications of the ZXSDR R8978.
Chapter 7, Environment Requirements	Describes the environment requirements of the ZXSDR R8978.

Conventions

This manual uses the following conventions.

	Danger: indicates an imminently hazardous situation. Failure to comply can result in death or serious injury, equipment damage, or site breakdown.
	Warning: indicates a potentially hazardous situation. Failure to comply can result in serious injury, equipment damage, or interruption of major services.

	Caution: indicates a potentially hazardous situation. Failure to comply can result in moderate injury, equipment damage, or interruption of minor services.
	Note: provides additional information about a topic.

Chapter 1
FCC Related Statements

Warning!

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 10.2 m between the radiator & your body.

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Chapter 2
Product Overview

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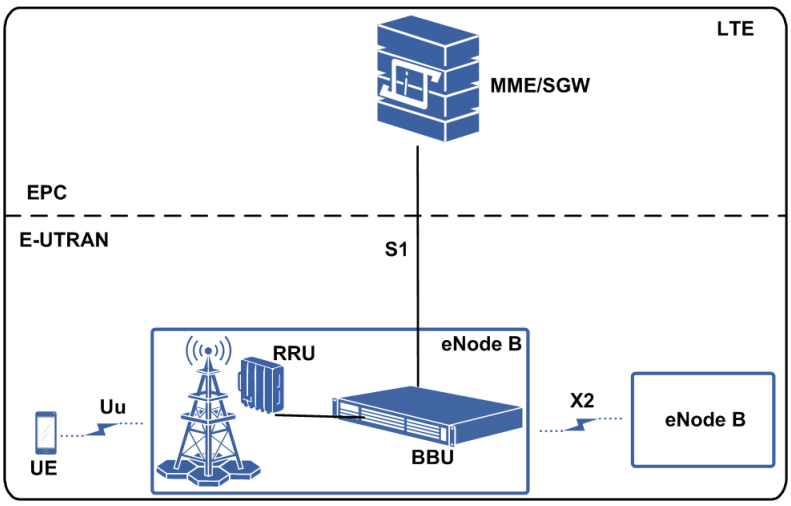
2.1 Product Positioning

The ZXSDR R8978 is an eight-path TD-LTERRU with high power. It operates with a BBU to cover new outdoor sites.

The ZXSDR R8978 works with a BBU to compose a complete eNodeB and implement the functions such as radio transmission in the coverage area and radio channel control.

Figure 2-1 illustrates the position of the ZXSDR R8978 in a LTE network.

Figure 2-1 Position of the RRU in a Network



2.2 Product Features

Unified Platform

The ZXSDR R8978 is developed based on the unified SDR platform, which supports smooth evolution to new technologies in the future, and protects the operators' investment in maximum.

Energy conservation and environmental protection

- Designed with high-efficiency power amplifier technologies: Crest Factor Reduction (CFR), Digital Pre-Distortion (DPD) and Doherty to reduce equipment's power consumption.
- Uses passive heat dissipation without electrical noise, which can save 35% power consumption compared with the traditional air conditioner to effectively reduce the operators' power consumption cost.
- Supports the energy-saving technologies such as slot-based power saving and voltage regulation power saving.

Multi-Carrier, MIMO, BF, and High Performance

- Supports multiple frequency bands such as 2.3 GHz/2.6 GHz to satisfy the requirements of various operators.
- Supports flexible configuration of up to TD-LTE 4x20 MHz multi-carriers to fully and flexibly utilize the operators' spectrum.

High Output Power

Up to 160 W (8x20 W) output power is provided to satisfy the power requirements for high capacity and large coverage.

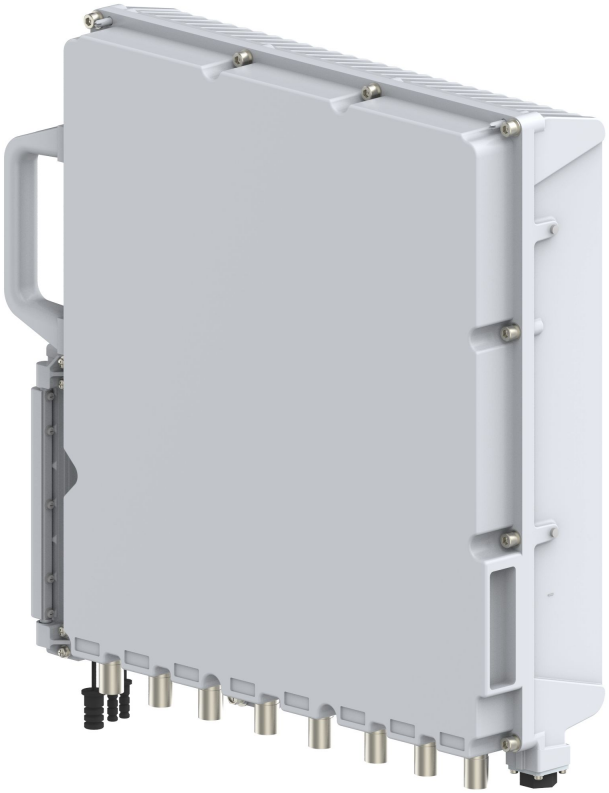
10 Gbps Optical Interface

Two 10 Gbps CPRI optical interfaces are provided to satisfy the TD-LTE CPRI flow requirement. CPRI optical interface multi-mode transmission is supported (the 6 Gbps optical interface rate is also supported).

2.3 External View

Figure 2-2 shows the external view of the ZXSDR R8978.

Figure 2-2 External View



2.4 Product Specifications

The ZXSDR R8978 is an eight-channel RRU that an be used for networking TD-LTE macro cells.

In this manual, all the descriptions for the ZXSDR R8978 are applicable to the following specifications unless specially stated:

- ZXSDR R8978 S2300
- ZXSDR R8978 S2600M
- ZXSDR R8978 S2600L

2.4.1 ZXSDR R8978 S2300

For the key features of the ZXSDR R8978 S2300, refer to Table 2-1.

Table 2-1 Key Features of the ZXSDR R8978 S2300

Item	Description
Radio access mode	TD-LTE
Frequency band	2300 MHz~2400 MHz
Antenna	Supports 4×4 MIMO dual TRX channels.
Maximum number of carriers	TD-LTE: 4×20 MHz

Item	Description
Signal bandwidth	80 MHz
Maximum power output in each channel	20 W
Power input	DC: -48 V DC AC: 100 V AC/110 V AC/220 V AC

2.4.2 ZXSDR R8978 S2600M

For the key features of the ZXSDR R8978 S2600M, refer to Table 2-2.

Table 2-2 Key Features of the ZXSDR R8978 S2600M

Item	Description
Radio access mode	TD-LTE
Frequency band	2496 MHz~2690 MHz
Antenna	Smart Antenna RET 8–path transceiving channels
Maximum number of carriers	TD-LTE: 4x20 MHz 2x20 MHz
Signal bandwidth	100 MHz
Maximum power output in each channel	20 W
Power input	-48 VDC

2.4.3 ZXSDR R8978 S2600L

For the key features of the ZXSDR R8978 S2600L, refer to Table 2-3.

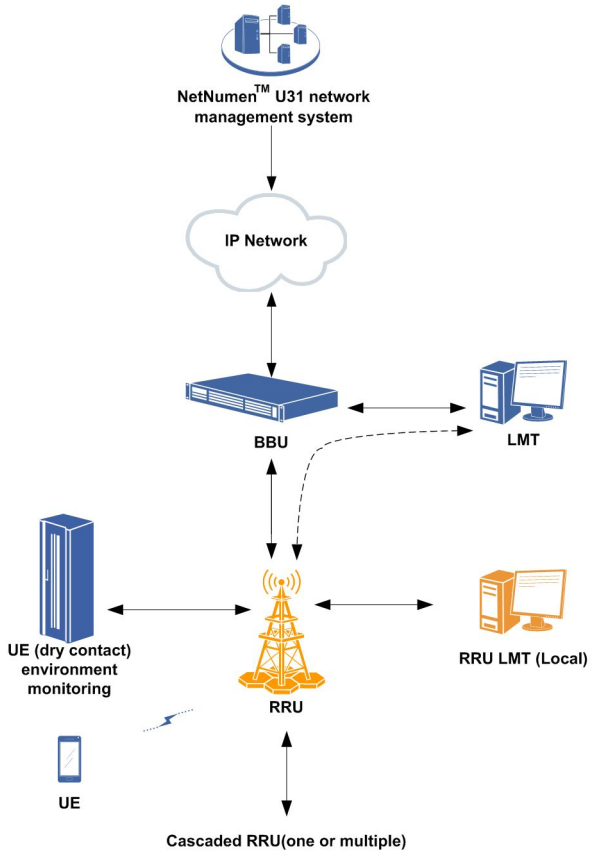
Table 2-3 Key Features of the ZXSDR R8978 S2600L

Item	Description
Radio access mode	TD-LTE
Frequency band	2575 MHz~2635 MHz
Antenna	Smart Antenna RET 8–path transceiving channels
Maximum number of carriers	TD-LTE: 3x20 MHz
Signal bandwidth	60 MHz
Maximum power output in each channel	20 W
Power input	-48 VDC

2.5 External Interfaces

Figure 2-3 illustrates the external interfaces of the ZXSDR R8978.

Figure 2-3 External Interfaces



For a description of the external interfaces, refer to Table 2-4.

Table 2-4 External Interface Description

External Device	Description	External Interface
BBU	BBU performs the functions such as GPS synchronization, main control, and baseband processing.	Logical interface: Ir interface Physical interface: optical fiber interface
UE	UE accomplishes the Uu interface functions of transmitting voice and data services.	Logical interface: Uu interface Physical interface: none
User device	External environment monitoring device	Logical interface: not standardized Physical interface: dry contact

External Device	Description	External Interface
RRULMT	Operates and maintains the RRU at the local end	Logical interface: not standardized Physical interface: Ethernet interface
Cascade RRU	Upstream RRU	Logical interface: Ir interface Physical interface: optical fiber interface

- External interfaces exclude the power and antenna interface of the RRU.

Note:

The LMT at the BBU side can operate and maintain multiple RRUs under the BBU. ZTE NetNumen™ EMS provides unified operation and maintenance on multiple sites.

2.6 Installation Modes

The ZXSDR R8978 supports three installation modes:

- A single RRU mounted on a pole
- Two RRUs mounted on a pole
- Mounted on a wall
- Mounted on slot steel
- Mounted on angle steel

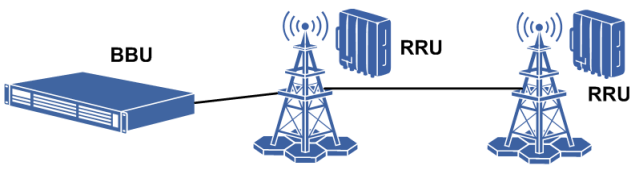
2.7 Typical Networking Applications

The ZXSDR R8978 supports the following networking solutions:

- Chain networking

  Chain networking applies to strip-shaped areas with sparse population, where optical fibers can be laid conveniently. Figure 2-4 shows a chain networking solution.

  Figure 2-4 Chain Networking

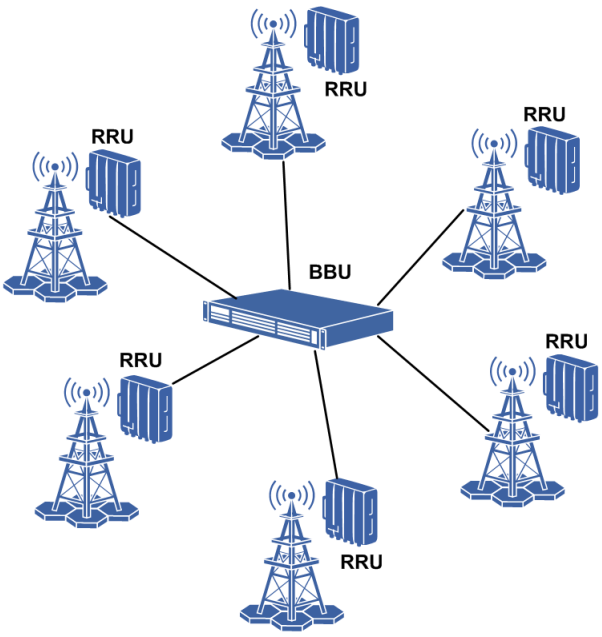
  

- Star networking

  In a star networking solution, a BBU is connected to each RRU and the RRU is the terminal equipment. This networking type is simple and easy for maintenance

and engineering. Because the signal passes through fewer intermediate links along the transmission path, the link reliability is much higher. Figure 2-5 shows a star networking solution.

Figure 2-5 Star Networking



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Chapter 3
Product Composition

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3.1 System Structure

Figure 3-1 shows the system structure of the ZXSDR R8978.

Figure 3-1 System Structure

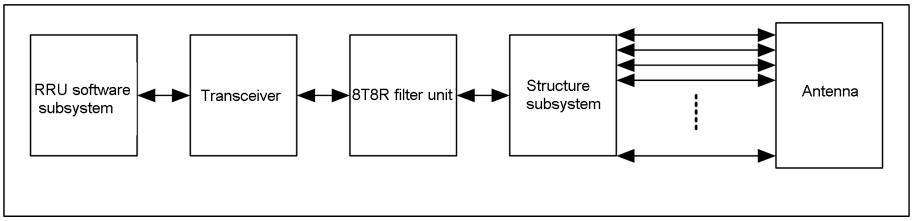


Table 3-1 describes the subsystems of the ZXSDR R8978.

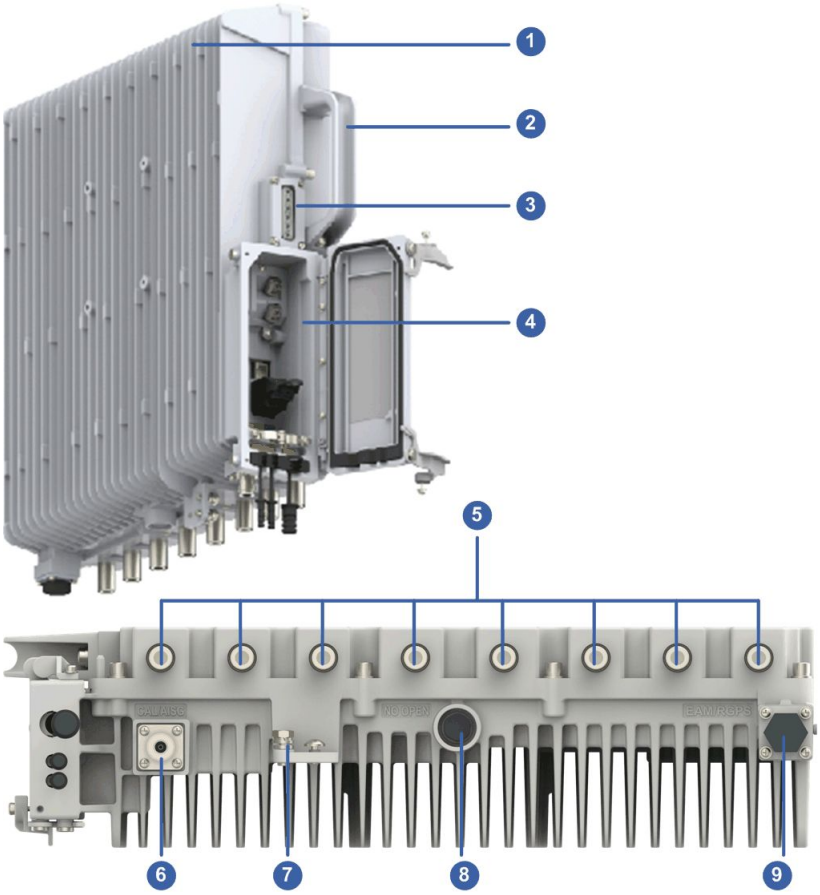
Table 3-1 Subsystem Description

Name	Type	Function
RRU software subsystem	Software subsystem	Provides the system operating system and OM functions
Transceiver	Hardware subsystem	• Power interface • Optical interface • Control functions • Clock functions • DIF • TRX
8T8R filter unit	Hardware subsystem	Eight-channel filter
Structure subsystem	Structure subsystem	Provides equipment protection, heat dissipation, and installation, and module structure, heat dissipation, and installation.

3.2 Composition

Figure 3-2 shows the composition of the ZXSDR R8978.

Figure 3-2 Product Composition



1. Radiating pin
2. Handle
3. LED indicators
4. Operation and maintenance cavity
5. Antenna interface
6. CAL/AISG interface
7. Grounding bolt
8. Breathable valve
9. EAM/RGPS interface

- The operation and maintenance cavity contains one DC power interface, two optical interfaces (OPT1 and OPT2), one RRU LMT/test interface (LAM/TST).
- The equipment has six LED indicators.
- A handle is installed on the upper shell to facilitate installation and transportation.
- At the bottom of the equipment, there are eight antenna interfaces (ANT1–ANT8), one hermetic seal (breathable valve), one antenna calibration interface (CAL/AISG), and one dry contract user device interface (EAM/RGPS).

Note:

The LMT/TST interface is used for ZTE maintenance personnel to perform commissioning and maintenance.

3.3 LED Indicators

An indicator indicates the operating status of a device. Figure 3-3 shows the positions of the indicators.

Figure 3-3 LED Indicators

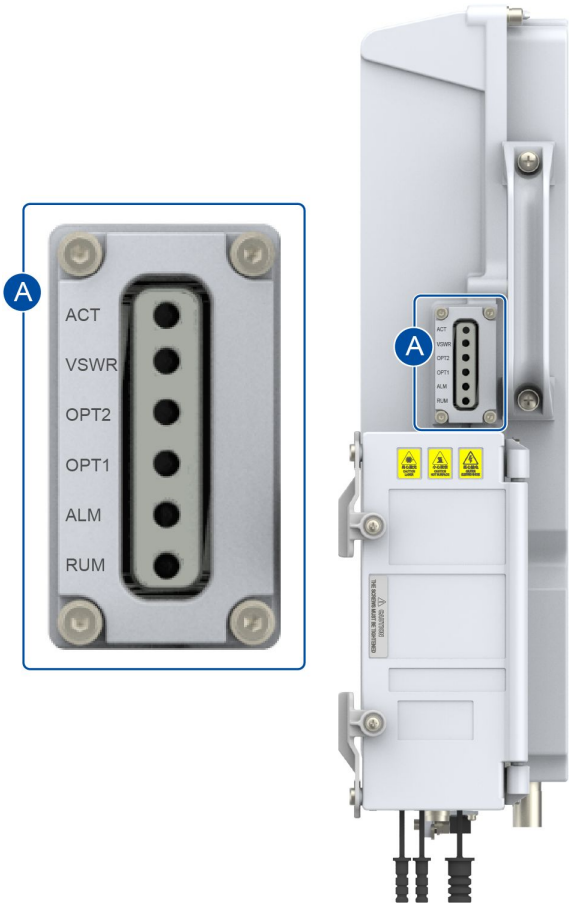


Table 3-2 describes the LED indicators.

Table 3-2 Indicator Descriptions

Name	Indication	Color	Description
RUN	Operation indicator	Green	OFF: The system is not powered.
			ON: The system is powered. The software system is not running.
			Flashing slowly (ON for 1 s and OFF for 1 s): The system is powered. The software system is being started.
			Flashing normally (ON for 0.3 s and OFF for 0.3 s): The system is powered. The software system has been started. The communication between the RRU and BBU is normal.
			Flashing fast (ON for 70 ms and OFF for 70 ms): The system is powered. The software system has been started. The link between the ZXSDR R8978 and BBU is not established.
ALM	Alarm indicator	Red	OFF: There is no alarm.
			ON: There is an alarm.
OPT1	Indicator of optical interface 1	Green	OFF: The optical interface does not receive optical signals.
			ON: The optical interface has received optical signals and the link is not synchronized.
			Flashing (ON for 0.3 s and OFF for 0.3 s): The optical interface has received optical signals and the link is synchronized.
OPT2	Indicator of optical interface 2	Green	OFF: The optical interface does not receive optical signals.
			ON: The optical interface has received optical signals and the link is not synchronized.
			Flashing (ON for 0.3 s and OFF for 0.3 s): The optical interface has received optical signals and the link is synchronized.
VSWR	Indicator of the VSWR at the antenna interface	Red	OFF: VSWRs at all antenna interfaces of the transmitting links are normal.
			ON: There is a VSWR alarm at the antenna interface of the transmitting link.
ACT	Radio link status indicator	Green	Solid ON: Indicates that the radio links are successfully established, and cells are established.
			OFF: Indicates that no radio links are established or establishment failed, and no cell exists.

- The ALM indicator does not indicate alarms of the optical interfaces (OPT1 and OPT2) and VSWR alarms at the antenna interfaces.

3.4 Physical Interfaces and Cables

3.4.1 Protective Grounding Cable

Function

The protective grounding point is located at the bottom of the handle.

The protective grounding cable provides protective ground for the system. There are a total of two bolts that provide a grounding connection to the ZXSDR R8978. The grounding bolt can be connected with a dual hole OT terminal that complies with the GR1089 specification. The OT terminal can be connected to the 16 mm^2 multi-cores yellow-green copper wire.

External View

The protective grounding cable is a 16 mm^2 yellow/green cable. Figure 3-4 shows the external view.

Figure 3-4 Protective Grounding Cable

Connection

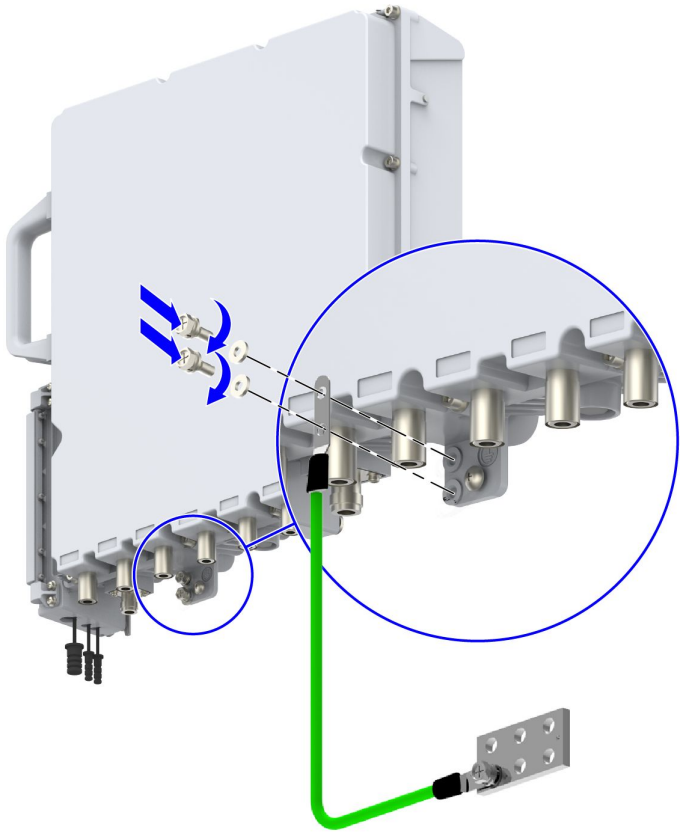
End A is connected to the grounding interface of the ZXSDR R8978. End B is connected to the external grounding bar.

Note:

The connection area of the grounding bolt and OT terminal shall not be less than the area of the OT terminal, and the connection resistance must be less than 50 mΩ.

Figure 3-5 illustrates the cable connection.

Figure 3-5 Connection of the Protective Grounding Cable



Note:

The two bolts on the left are used for installing the protective grounding cable. The bolt on the right is only used for fixing and does not connect to any cable.

3.4.2 DC Power Input Cable

Function

The DC power input interface is located in the operation and maintenance cavity of the ZXSDR R8978.

The DC power input cable leads the external DC power into the operation and maintenance cavity of the ZXSDR R8978. It connects to the DC power through a dual-core DC bracket and a dual-core DC connector, to provide -48 V DC power input for the RRU.

Caution!

The 10 mm² DC power cable cannot be directly connected to the ZXSDR R8978, and needs to be converted to a 4 mm² DC power cable through a junction box before connecting to the ZXSDR R8978.

The ZXSDR R8978 does not have an AC power interface. The AC power should be converted into DC power through the outdoor AC power lightening protection box and then connected to the ZXSDR R8978.

External View

The DC power cable is a blue-black cable. Figure 3-6 shows the external view.

Figure 3-6 DC Power Input Cable

1. Copper wire
2. Shielding layer
3. -48 V core
4. -48 V GND core

Signal Description

Signal Name	Signal Meaning	Wire Color
-48 V	-48 V power	Blue
-48 V GND	-48 V ground	Black

Connection

If...	Then...
Use the DC power supply without a junction box	The junction box is not required if the indoor power lightening protection box is near to the ZXSDR R8978 and voltage drop can be ignored.
	The indoor DC power distribution unit (with a power switch) connects to the lighting protection box of the indoor DC power supply.
	Connect the ZXSDR R8978 to the indoor DC power lighting protection box (there are a total of three outputs in the indoor DC power lighting protection box, each of which has an air switch and can be connected to an RRU).
Use the DC power supply with a junction box	If voltage drop occurs due to the distance between the ZXSDR R8978 and the indoor DC power lighting protection box, a power cable with a larger diameter size is needed to reduce the voltage drop caused by long

If...	Then...
	distance transmission. A junction box is needed to convert the cables to a different size.
	The indoor DC power distribution unit (with a power switch) connects to the lighting protection box of the indoor DC power supply.
	Connect the junction box to the indoor DC power lighting protection box (there are a total of three outputs in the indoor DC power lighting protection box, each of which has an air switch and can be connected to an RRU).
	After the DC power cable is converted by the junction box, it can be connected to the ZXSDR R8978.
Use the AC power supply without a junction box	The junction box is not required because the AC power supply is low with a large voltage and voltage drop can be ignored.
	Connect the indoor AC power distribution cabinet to the outdoor AC power lightening protection box (there are a total of three outputs in the indoor AC power distribution cabinet, each of which has a power switch and can be connected to an RRU).
	Connect the outdoor AC power lightening protection box to the ZXSDR R8978.

Figure 3-7 illustrates the cable connection.

Figure 3-7 Connection of DC Power Input Cable

Note:

- The two cores of the DC power cable End A should be wrapped with a tube terminal. After the tube terminal is crimped and inserted to the dual core DC connector, the DC power cable can be inserted to the dual core DC socket through the DC connector.
- The End B of the DC power cable is bare and connects to the external power supply.
- The two ends of the power cable must be made at the site.

3.4.3 LMT/TST Interface Cable

Function

The LMT/TST interface is located in the operation and maintenance cavity. It uses an RJ45 socket.

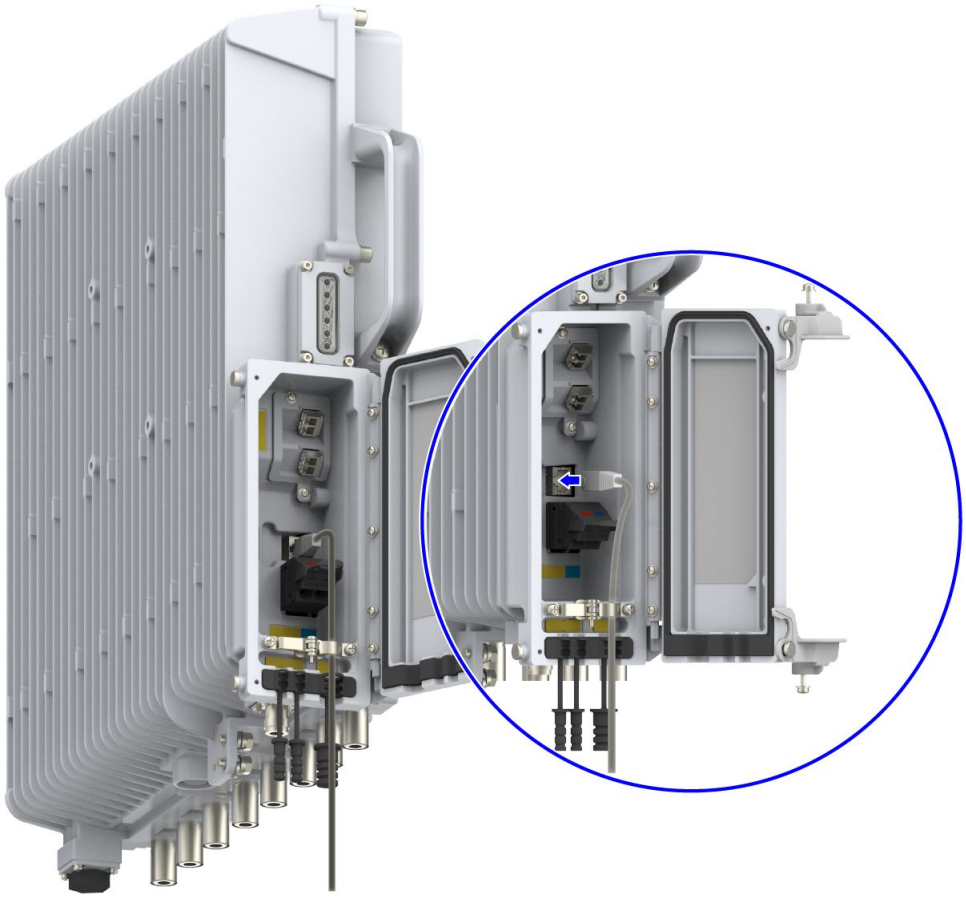
The LMT interface is used for the interaction between the LMT and ZXSDR R8978 through an Ethernet port using TCP/IP. TELNET command lines are supported.

Connection

End A is connected to the LMT interface in the operation and maintenance cavity. End B is connected to the LMT or PC.

Figure 3-8 illustrates the cable connection.

Figure 3-8 Connection of the LMT/TST Interface Cable



Note:

The LMT/TST interface is used for ZTE maintenance personnel to perform commissioning and maintenance.

3.4.4 Optical Fiber

Function

The ZXSDR R8978 has two optical interfaces, OPT1 and OPT2. They are located in the operation and maintenance cavity. LC-type optical fiber connectors are supported.

In the ZXSDR R8978 system, the optical interfaces have the following functions:

- OPT1 and OPT2 can connect the RRU to an upstream BBU, to carry the IQ data and communication signaling between the RRU and BBU.
- If the RRU serves as the upstream RRU. one optical interface can be used to cascade a downstream RRU.
- If the RRU serves as the downstream RRU, one optical interface can be used to cascade an upstream RRU.

External View

The optical fiber uses LC-type connectors. Figure 3-9 shows the external view.

Figure 3-9 Optical Fiber

Connection

End A is connected to the optical ports (OPT1 and OPT2) of the ZXSDR R8978. End B is connected to the BBU/dowstream RRU/upstream RRU.

Figure 3-10 illustrates the cable connection.

Figure 3-10 Connection of the Optical Fiber

3.4.5 Antenna Feeder Interface Cable

Function

The antenna feeder interface is located on the external filter at the equipment bottom. It uses N-type female connectors.

The antenna feeder interface cable connects the antenna interface of the ZXSDR R8978 to the antenna. It is used for the signal receiving and transmission at the antenna.

External View

The antenna feeder interface cable is a 50 Ω cable with a diameter of 1/2 in (1 in=25.4 mm). Both ends are N-type male connectors. Figure 3-11 shows the external view.

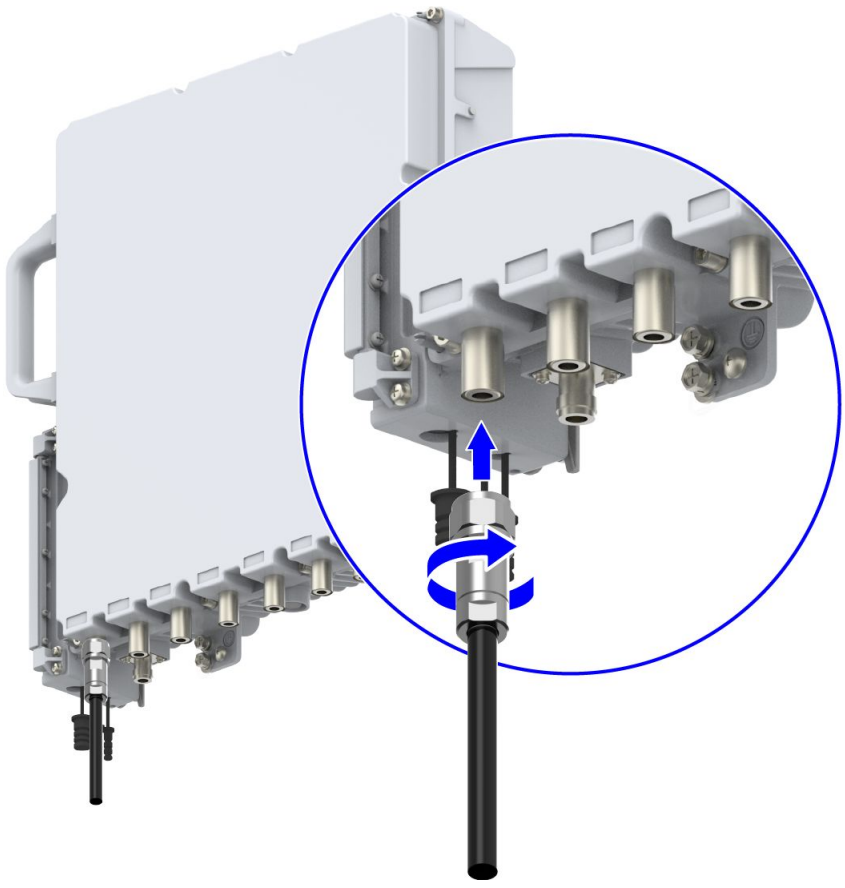
Figure 3-11 Antenna Feeder Interface Cable

Connection

End A is connected to the ANT interface of the ZXSDR R8978. End B is connected to the corresponding interface of the main antenna feeder.

The antenna feeder interface cable is a 1/2 inch jumper. Figure 3-12 illustrates the cable connection.

Figure 3-12 Connection of the Antenna Feeder Interface Cable



3.4.6 CAL/AISG Interface Cable

Function

The CAL interface is located at the external filter at the bottom of the ZXSDR R8978. It uses a type-N female connector.

The CAL interface cable used by the ZXSDR R8978 uses a jumper with a diameter of 1/2 inch. Both ends are N-type male connectors. The CAL interface supports antenna channel calibration and AISG for RET antennas.

The CAL interface integrates AISG and antenna calibration. If an RET antenna is used, the CAL interface of the ZXSDR R8978 is connected to the integrated interface of the antenna.

External View

The CAL interface cable is an RF cable with a diameter of 1/2 in (1 in=25.4 mm). Both ends are N-type male connectors. Figure 3-13 shows the external view.

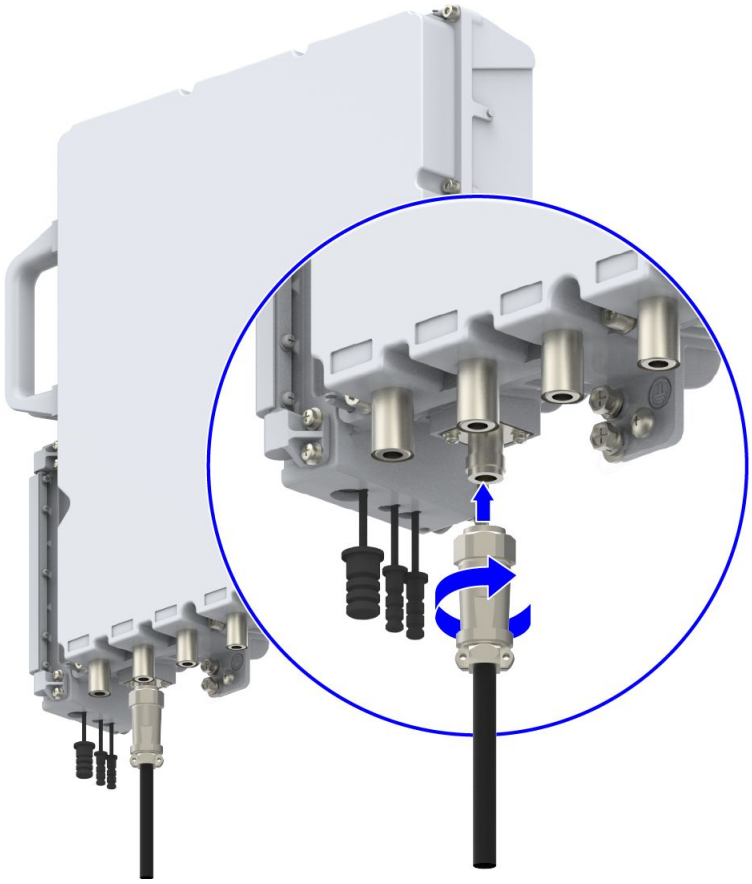
Figure 3-13 CAL Interface Cable

Connection

End A is connected to the CAL interface of the ZXSDR R8978. End B is connected to the CAL interface of the antenna.

Figure 3-14 illustrates the cable connection.

Figure 3-14 Connection of the CAL Interface Cable



3.4.7 EAM/RGPS Interface Cable

Function

The dry contact (EAM) interface is located at the external filter at the bottom of the ZXSDR R8978. It uses an eight-core round connector. It supports the RGPS functions and one dry contract input to transparently transmit the external device status.

The RGPS receiver is located at the GPS receiving antenna. Installed near the antenna, the satellite card transmits the output digital signal to the clock main control card through a differential line. Because digital signal transmission is not affected by RF signal attenuation, the remote distance is long and good reliability and maintainability is ensured.

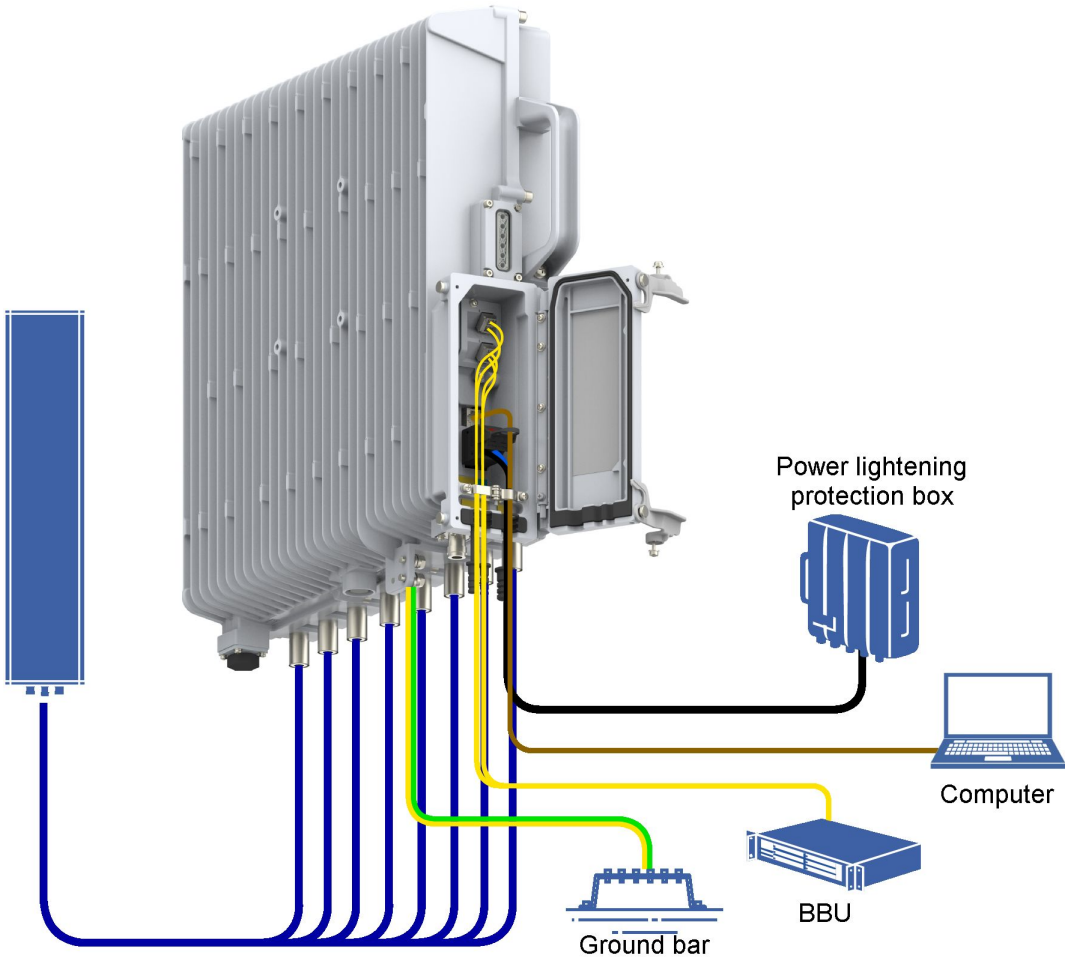
Connection

End A is connected to the EAM interface of the ZXSDR R8978. End B is connected to the dry contact output/RGPS interface of the external device.

3.5 External Cable Connection

Figure 3-15 illustrates the external cable connection.

Figure 3-15 External Cable Connection



3.6 Software Composition

The ZXSDR R8978 software system is composed of:

- RF management

  Includes RF main control and RF channel management.

- OAM adaptation software

  Provides an adaptation interface for entire operation and maintenance.

  Provides the following OAM functions: configuration management, version management, performance statistics, test management, security management, diagnostic test, system control, and communication processing.

- OSS

  Uses an SDR platform architecture.

  Provides the functions such as scheduling management, memory management, and timer management.

- BSP

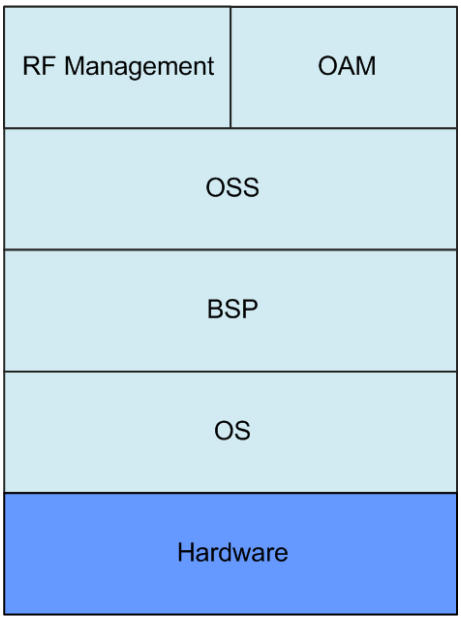
Uses a unified architecture design and provides a unified interface for the upper layer.

- OS

  Uses the Linux system independently developed by ZTE.

Figure 3-16 shows the software composition of the ZXSDR R8978.

Figure 3-16 Software Composition



Chapter 4
Operation and Maintenance

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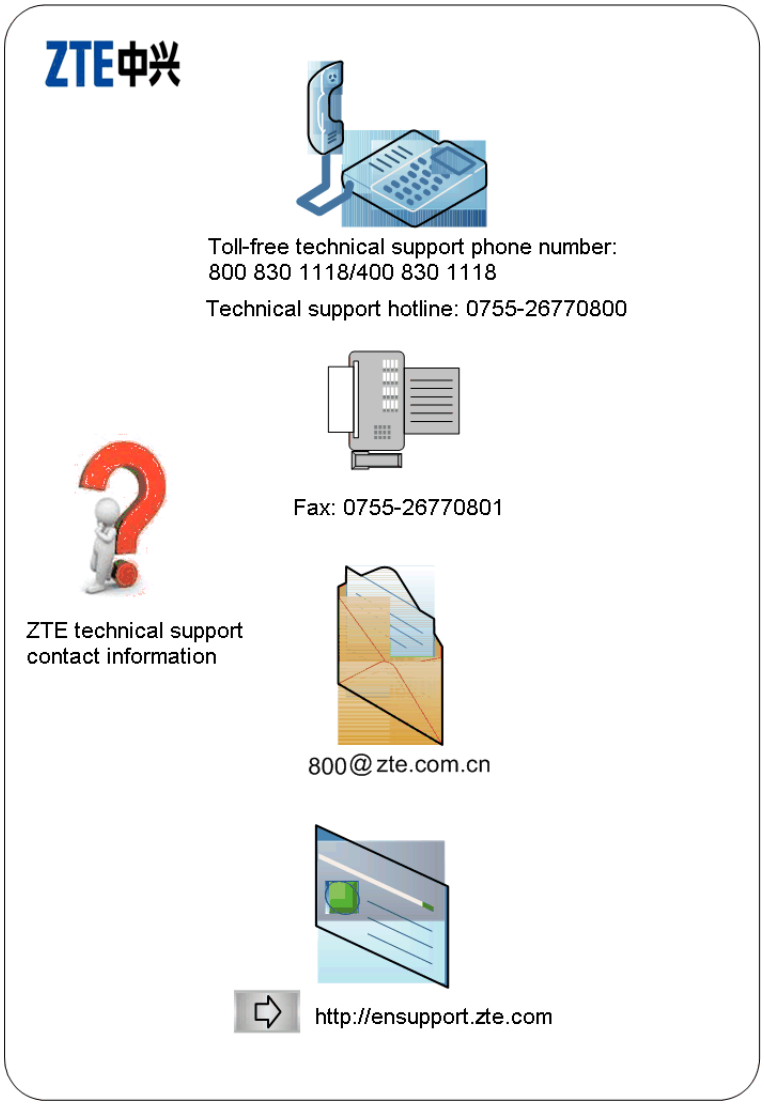
4.1 Technical Support

ZTE technical support contract information is pasted in a conspicuous position in the equipment room, see Figure 4-1.

Figure 4-1 ZTE Technical Support Contact Information



4.2 Fault Location

For the fault location methods in routine maintenance, refer to Table 4-1.

Table 4-1 Fault Location Methods

Maintenance Method	Description
Checking Alarms and Operation Logs	This is the most common method for troubleshooting. By checking the alarm management tab of the operation and maintenance system, you can check the alarms and operation logs. ● Check and analysis of the current, historical alarms and common notifications through the alarm management tab, to find the abnormal status, locating and handling faults.

Maintenance Method	Description
	• By checking the operation logs in user management, you can trace system parameter modification, locate relevant terminals and operators, and discover the faults caused by manual operations.
Performance Analysis	By checking the performance management tab, you can create different performance test tasks, generate the relevant performance reports to determine the system performance indexes. By analyzing this information, you can find the load distribution in the network and adjust the relevant network parameters, to improve the integrated network performance in time.
Instrument and Meter Analysis	Auxiliary instruments, such as test UE, signaling analyzers, and bit error analyzers, can be used for fault analysis, fault location and troubleshooting.
Replacement	You can replace a faulty part with a spare part or a peer part that operates properly in the system to locate a fault. For fault location by using the replacement method, you need to perform relevant operations in accordance with the replacement procedures described in this manual.
Self-test	The system performs a self-test when it is powered on again. During the self-test, the indicators flash in accordance with relevant rules. You can locate faults by checking the indicators.
Integrated Method	In actual operation, all the methods can be used for troubleshooting. You can handle different faults based on the fault location methods and past experience.

4.3 Equipment Maintenance

For a description of the ZXSDR R8978 equipment maintenance, refer to Table 4-2.

Table 4-2 Equipment Maintenance

Item	Description	Fre-quency
Check equipment surface	Check whether the equipment is damaged or cracked	Quarterly
Check the equipment clean condition	Check whether there is deposited dust on the equipment surface. If yes, you need to clean the dust.	Quarterly
Check labels	Check whether the equipment and cable labels are clean and clear.	Quarterly
Check indicators	In accordance with the description for the indicators, check the indicator status. If any fault occurs, handle it as soon as possible.	Monthly

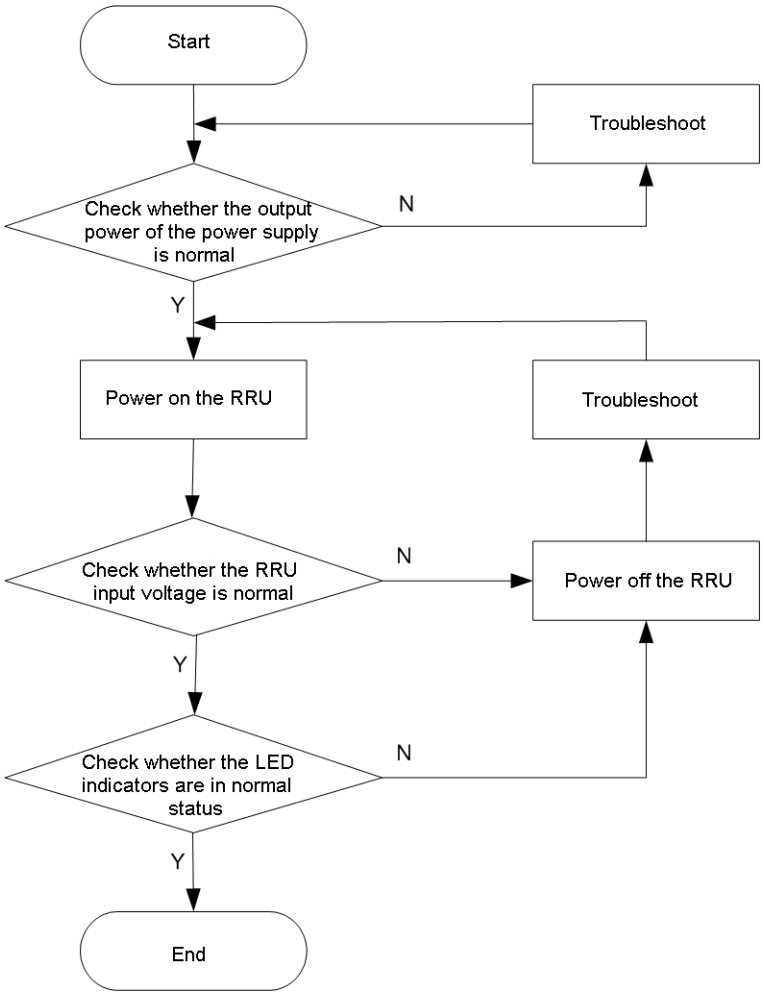
4.4 Power On

Caution!

Before power on, you need to check the equipment and cable installation in detail, to ensure that all the installation results comply with the engineering installation specifications.

Figure 4-2 shows the power-on flow.

Figure 4-2 Power-on Flow



For a description of the ZXSDR R8978 power-on flow, refer to Table 4-3.

Table 4-3 Power-on Steps

Item	Power-on Steps
DC power supply	1. Turn on the switch of the power distribution unit, and check whether the equipment output voltage is in the normal range. 2. Turn on the switch of the indoor DC power lighting protection box of the ZXSDR R8978. Power the ZXSDR R8978 on, and test whether the RRU input voltage is in the normal range. 3. Check whether the BBU indicator or the RRU indicator is normal.
AC power supply	1. Turn on the switch of the AC power distribution unit of the ZXSDR R8978, and check whether the equipment output voltage is in the normal range. 2. Check whether the BBU indicator or the RRU indicator is normal.

Note:

To avoid current surge, you need to power on the RRUs in the cell sequence every 30 s. At the same time, you can check whether the cables of a cell are connected properly through the BBU indicator.

4.5 Power Off

Power-off of the ZXSDR R8978 includes:

- Emergency power-off: occurs when the equipment room is on fire, flooding or in smog.
- Common power-off: occurs in some application scenarios, for example, equipment move or expected local power outage.

For a description of the ZXSDR R8978 power-off flow, refer to Table 4-4.

Table 4-4 Power-off Steps

Item	Emergency Power-off	Common Power-off
DC power supply	Turn off the air switch of the indoor DC power distribution unit.	1. Turn off the air switch of the DC power lighting protection box of the ZXSDR R8978. 2. Turn off the air switch of the indoor DC power distribution unit.
AC power supply	Turn off the air switch of the indoor AC power distribution unit.	

4.6 Parts Replacement

4.6.1 Replacing the ZXSDR R8978

Locate the ZXSDR R8978 faults through observation and analysis, and determine whether to replace the ZXSDR R8978. Replacing the ZXSDR R8978 will interrupt all the services carried by the ZXSDR R8978.

Prerequisite

- Verify the hardware type of the faulty ZXSDR R8978. Prepare a proper ZXSDR R8978. The specifications of the proper ZXSDR R8978 must be consistent with the faulty one.
- Prepare the following tools.

Tool	Function
Wrench	Installs or uninstalls the RF cables
M5 cross screw driver	Installs or uninstalls the ZXSDR R8978 maintenance cavity, or fastens the screws and protection grounding cables.
Waterproof tape	Provides waterproof protection for the RF cable connectors
Sticker	Marks the connection of the cables to be replaced (after the replacement, all the cables must be reconnected to the place where they were)
Moisture proof antistatic bag and carton	Stores the faulty ZXSDR R8978

Steps

1. Power off the ZXSDR R8978.
2. Open the cover of the ZXSDR R8978 maintenance cavity by using the M5 screw driver.
3. Paste a label at each end of every optical fiber.
4. Remove the fix screws from the cable crimper by using the M5 screwdriver.
5. Pull up the insulating part of the dual core DC connector against the direction of the arrow marked on the shell. Pull out the connector and uninstall the power cables.
6. Press the blue crimper of the fiber, and pull the fiber out of the connector.
7. Use the M5 cross screwdriver to remove the grounding bolt and remove the protective grounding cable.
8. Remove all the waterproof tapes from the jumpers of the antenna port. Uninstall the jumper from the ZXSDR R8978 antenna port by using the wrench with insulation protective treatment.
9. Uninstall the AISG/EAM cable.

10. Tighten the jacking screw clockwise and jack the ZXSDR R8978 chassis. Then, loosen the plate-pressing bolt anti-clockwise.
11. Pull up the ZXSDR R8978 from the pole or wall-mounting bracket, and remove the ZXSDR R8978.
12. Put the faulty equipment into the moisture proof antistatic bag. Label the equipment model, sector ID and fault information on the bag. Put the faulty equipment into the carton and label the same information as the antisatic bag.
13. Reinstall all equipment parts and tighten every screw.
14. Connect all cables with waterproof and insulation protective treatment.
15. Power on the ZXSDR R8978.
16. The ZXSDR R8978 perform the self-test process after it is powered on. During the self-test, you need to observe the indicator status and perform operations accordingly.

If...	Then...
The indicator is normal, which means that services are restored.	The self-test and replacement are successful.
The indicator is abnormal, which means that services are not restored.	Troubleshoot the fault and handle the relevant alarms, or contact ZTE technical support.

– End of Steps –

4.6.2 Replacing the Optical Module

The optical module provides the optics and electrical conversion. Replacing the optical module will interrupt all the services carried on the optical module.

Caution!

- The optical module supports hot plugging. Before hot plugging, you must wear the antistatic wrist strap.
- Do not look directly at the optical module inside when replacing the optical fiber, avoiding damage to your eyes.

Prerequisite

- Prepare a proper optical module.
- Take a record of the connection position at both ends of the faulty optical modules and fibers. Mark the positions between the optical module and fibers.

Tool	Function
Antistatic wrist strap	Provides antistatic protection

Tool	Function
M5 cross screw driver	Installs or uninstalls the ZXSDR R8978 maintenance cavity
Sticker	Marks the connection of the cables to be replaced (after the replacement, all the cables must be reconnected to the place where they were)
Moisture-proof antistatic bag and carton	Stores the faulty optical module

Steps

1. Open the cover of the maintenance cavity by using the M5 screw driver.
2. Paste a label at each end of every optical fiber.
3. Press the blue clamp of the fiber, and pull the fiber connector out of the optical module to be replaced.
4. Pull the optical module out of the slot.
5. Install the proper optical module into the slot.
6. Remove the dustproof cap, and connect the fiber connector to the new optical module.
7. Check whether the optical module is operating properly in accordance with the indicator status.
8. Tighten the fiber clamp and close the maintenance cavity.

– End of Steps –

4.6.3 Replacing the RF Cable

The RF cable transmits or receives RF signals. Locate the faults through observation and analysis, and ensure that whether to replace the RF cable. Replacing the RF cable will interrupt all the services carried by the ZXSDR R8978.

Prerequisite

- Prepare a proper RF cable to be replaced.

  Each site has a set of RF cables corresponding to the site type.

  → For BTS expansion or modification, you can select a set of RF cables corresponding to the site type.

  → For replacement of a single RF cable, you can select a proper RF cable from the RF cable set.

  Check whether the core connector of the RF cable is proper.

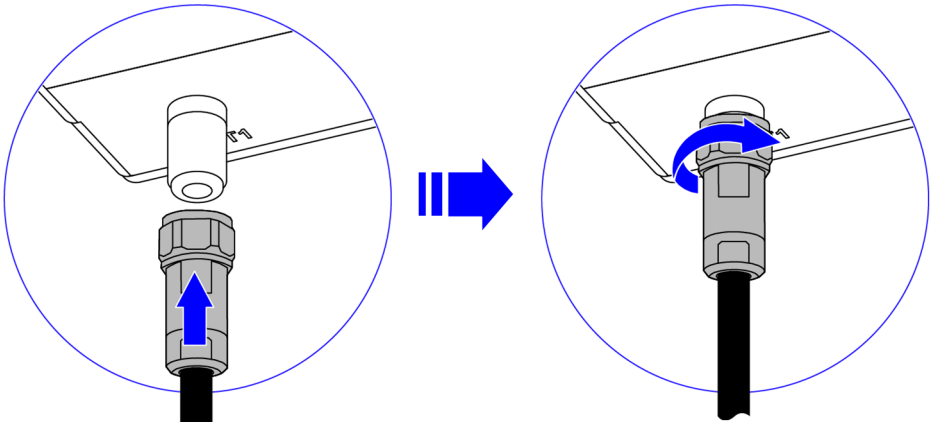
- Prepare the following tools.

Tool	Function
Wrench	Installs or uninstalls the RF cable
Waterproof tape	Provides waterproof protection for the RF cable connector
Sticker	Marks the connection of the cable to be replaced (after the replacement, the cable must be reconnected to the place where it was)
Moisture-proof antistatic bag and carton	Stores the faulty RF cable

Steps

1. Power off the ZXSDR R8978.
2. Remove the waterproof tape of the RF cable.
3. Loosen the connectors of the RF cables by using the wrench.
4. Put the faulty cable into the moisture proof antistatic bag. Label the cable model, sector ID and fault information on the bag. Put the faulty cable into the carton and label the same information as the antisatic bag.
5. Connect the proper RF cable in accordance with the previous connection, see Figure 4-3.

Figure 4-3 Connecting the RF cable

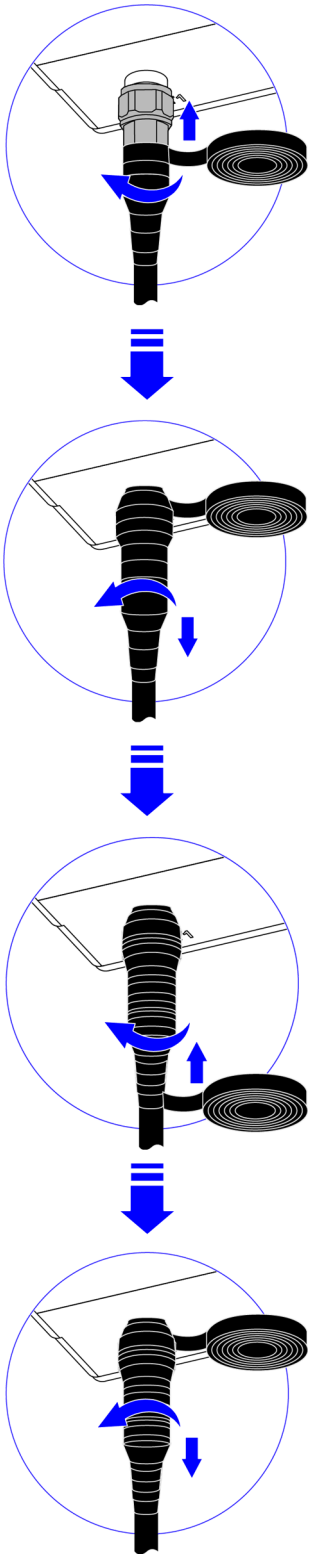


Caution!

During the uninstallation process, take off the connector carefully. Try not to damage the connector.

6. Wrap the RF cable connectors with waterproof tape, see Figure 4-4.

Figure 4-4 Waterproof Treatment



7. Power on the ZXSDR R8978.
8. The ZXSDR R8978 performs the self-test process after it is powered on. During the self-test, you need to observe the indicator status and perform operations accordingly.

If...	Then...
The indicator is normal, which means that services are restored.	The self-test and replacement are successful.
The indicator is abnormal, which means that services are not restored.	Troubleshoot the fault and handle the relevant alarms, or contact ZTE technical support.

– End of Steps –

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Chapter 5
Accessory Devices

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5.1 Junction Box

Function

When the DC power supply is far from the ZXSDR R8978, to avoid voltage drop, a 2×10 mm^2 DC power cable needs to be used. To connect to the 2×4 mm^2 DC power cable used by the ZXSDR R8978, the 2×10 mm^2 DC power cable should be converted through the junction box.

External View

Figure 5-1 shows the external view of the junction box.

Figure 5-1 Junction Box

Specifications

Table 5-1 shows the specifications of the junction box.

Table 5-1 Junction Box Specifications

Name	Specification
Height × Width × Depth	233 mm × 119 mm × 55 mm (excluding the handle and waterproof cap)

Installation Mode

For single RRU pole-mounted installation or wall-mounted installation, the junction box can be installed at a side (recommended) or the front of the RRU through an adaptor. For two RUUl pole-mounted installation, the junction box needs to be installed on the pole.

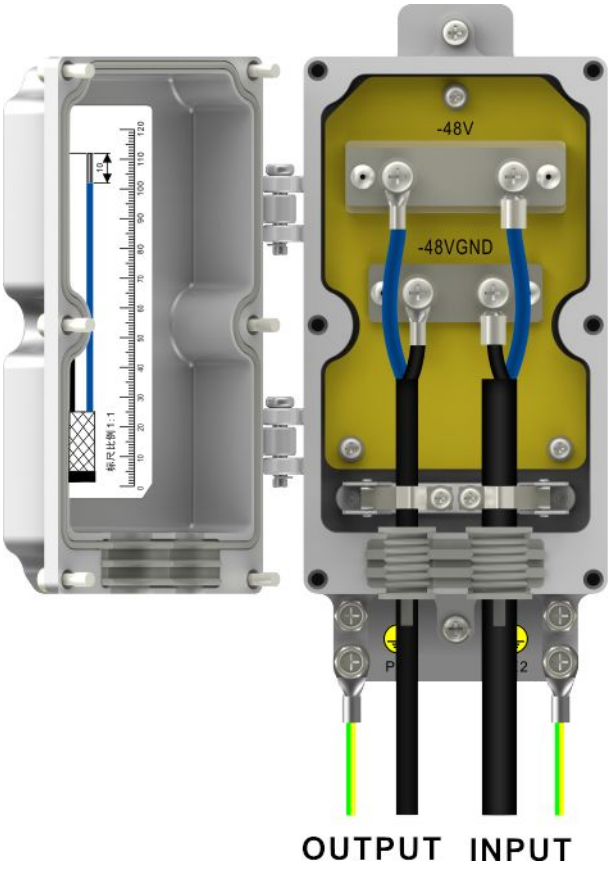
Figure 5-2 shows how to install the junction box at a side for example.

Figure 5-2 Junction Box Installation

Interfaces and Cable Connection

Figure 5-3 shows the interfaces and cable connection of the junction box.

Figure 5-3 Interfaces and Cable Connection



Interface Name	Cable Description
INPUT	2×10 mm² DC power cable
OUTPUT	2×4 mm² DC power cable

5.2 AC Power Lightening Protection Box

Function

The outdoor AC power lightening protection box is *PPC33 A009*. It protects the AC current from lightening and coverts AC into the DC that is applicable for the ZXSDR R8978.

External View

Figure 5-4 shows the external view of the AC power lightening protection box.

Figure 5-4 External View

Specifications

Table 5-2 shows the specifications of the AC power lightening protection box.

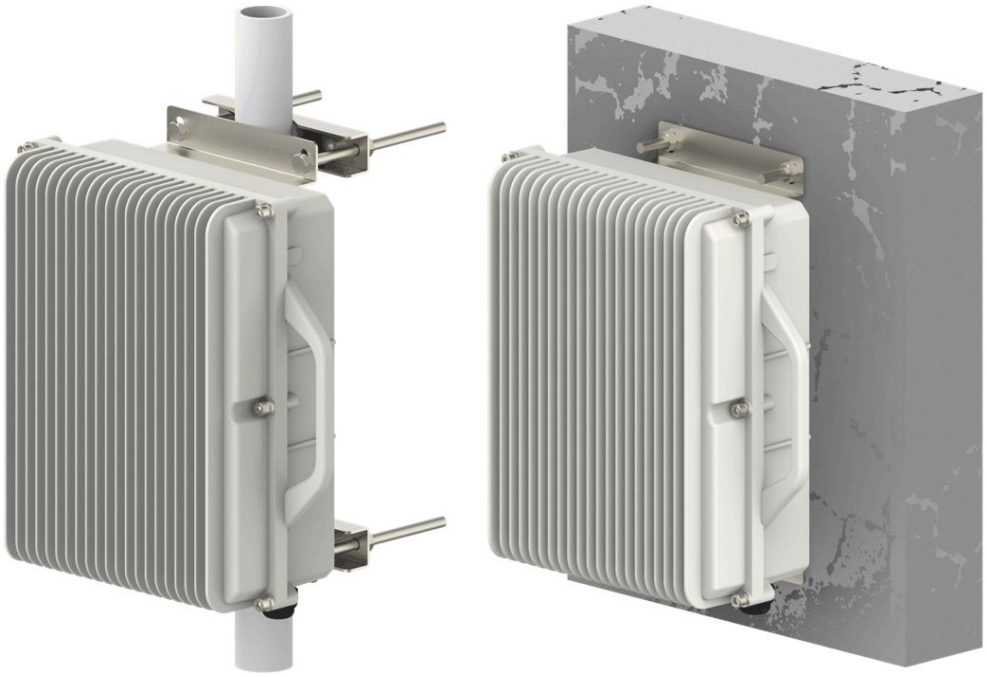
Table 5-2 Specifications of the AC Power Lightening Protection Box

Item	Specification
Height × Width × Depth	300 mm × 250 mm × 118 mm (excluding the handle and waterproof cap
Installation mode	Pole-mounted installation, all-mounted installation
Lightening protection index	20 kA

Installation Modes

The AC power lightening protection box can be mounted on a pole or wall, see Figure 5-5.

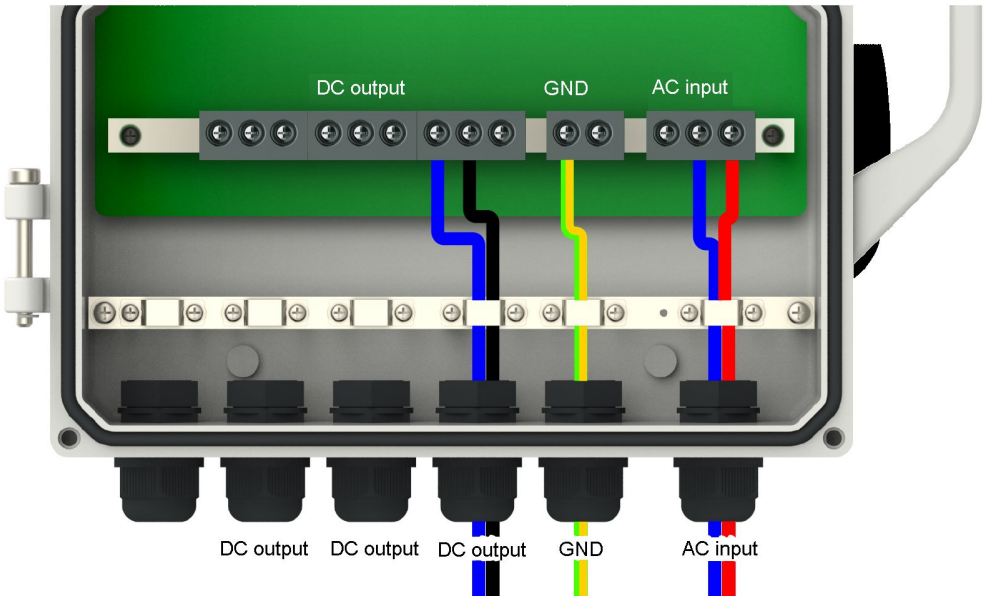
Figure 5-5 Installation Modes



Interfaces and Cable Connection

Open the AC power lightening protection box and connect the internal and external cables, see Figure 5-6.

Figure 5-6 Interfaces and Cable Connection



Name	Description
-220 AC_L	220 V AC live line
-220 AC_N	220 V AV neutral line

Name	Description
-48 V DC	-48 V DC neutral line
-48 V DC RTN	-48 V DC earth line
PE	Protective grounding cable

5.3 Replacing the AC Power Lighting Protection Box

If the AC power lighting protection box has an abnormal output but the input is normal, it has some faults and should be replaced immediately.

Prerequisite

- Verify the hardware type of the faulty AC power lighting protection box. Prepare a proper AC power lighting protection box. The specifications of the proper AC power lighting protection box must be consistent with the faulty one.
- Prepare the following tools.

Tool	Function
Wrench	Installs or uninstalls the outdoor AC power lighting protection box from a pole
M4 Inner-hexagon wrench	Installs or uninstalls the pole-mounted installation assemblies, or fastens the anti-theft screws
M6 cross screwdriver	Installs or uninstalls the mounting plate and cables of the outdoor AC power lighting protection box
Waterproof tape	Provides waterproof protection for the cable connectors
Sticker	Marks the connection of the cables to be replaced (after the replacement, all the cables must be reconnected to the place where they were)
Moisture proof antistatic bag and carton	Stores the faulty AC power lighting protection box

Steps

1. Power off the ZXSDR R8978.
2. Remove the waterproof tape from the cables. Uninstall the cables of the AC power lighting protection box by using the M6 screwdriver
3. Uninstall the anti-theft screws by using the M4 Inner-hexagon wrench, and uninstall the mounting plate by using the M6 cross screw driver. Take the AC power lighting protection box down from the pole.

4. Put the faulty equipment into the moisture proof antistatic bag. Label the equipment model, sector ID and fault information on the bag. Put the faulty equipment into the carton and label with the same information as the antisatic bag.
5. Reinstall the proper AC power lighting protection box, fasten the anti-theft screws, and install the mounting plate and cables. Wrap the cables with the water proof tape.
6. Power on the ZXSDR R8978.

– End of Steps –

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Chapter 6
Technical Specifications

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6.1 Physical Specifications

Table 6-1 shows the physical specifications of the ZXSDR R8978.

Table 6-1 Physical Specifications

Item	Specification
Dimensions (H × W × D)	430 mm × 400 mm × 125 mm
Weight	≤22 kg
Volume	22 L

6.2 Performance Indexes

Table 6-2 shows the performance indexes of the ZXSDR R8978.

Table 6-2 Performance Indexes

Item	Index
Supported antenna types	Dual-polarized smart antenna (a common antenna type)
	Eight–antenna circular array smart antenna
	RET antenna
Receiver sensitivity	TD-LTE: –105 dBm per channel
Frequency deviation	± 0.05 ppm
Installation	Supports installation in the equipment room. The ZXSDR R8978 is generally installed outdoors. For indoor installation, mount it on a pole or wall.

Item		Index
Maximum distance between the outdoor unit and the antenna		12 m
Filter		Replaceable
Optical module	Whether the rate is downward compatible	Yes
	Whether the optical module can be replaced on site	Yes
	Rate	2×6 Gbps / 2×10 Gbps
Optical fiber	Number of cascade levels / Maximum distance of a cascade level	One cascade level / 10 km

6.3 Power Consumption

Table 6-3 shows the power consumption specifications of the ZXSDR R8978.

Table 6-3 Power Consumption Specifications

Item	Power Consumption
DL: UL=2:2	400 W
DL: UL=3:1	580 W

6.4 Reliability Indexes

For a description of the reliability indexes of the ZXSDR R8978, refer to Table 6-4.

Table 6-4 Reliability Indexes

Item	Index
Protection level	IP66
Protection mode	Cast shell
MTBF	> 180000 h
MTTR	< 60 min
Availability	> 99.9994 %
Service interruption time	< 3 min/year
Annual Return Rate	< 2 %

6.5 Grounding Requirement

In practical applications, the grounding resistance must be less than 10 Ω.

6.6 Lightening and Surge Protection

Table 6-5 shows the lightening protection specification of the ZXSDR R8978.

Table 6-5 Lightening Protection Specification

Item	Current
Lightening protection specification	20 kA

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Chapter 7
Environment Requirements

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7.1 Power Supply Requirements

Table 7-1 shows the requirements for the power supply of the ZXSDR R8978.

Table 7-1 Power Requirements

Item	Requirement
DC power supply	-48 V DC (fluctuation range: -57 V DC to –37 V DC) The DC power supply must support the anti-reverse connection and over-current protection functions.
AC power supply	100 V AC/110 V AC/220 V AC (fluctuation range: 90 VAC to 290 V AC) If the AC power supply is used, the AC power needs to be converted into DC power through the AC power lightening protection box and then connected to the ZXSDR R8978.

7.2 Operating Environment

The ZXSDR R8978 can operate properly in the following conditions:

Climatic Environment Condition

Item	Description
Lowed temperature	-40 ℃
Highest temperature	55 ℃
Lowest relative humidity	2 %RH
Highest relative humidity	100 %RH
Temperature change rate	0.5 ℃/min
Lowest atmospheric pressure	70 kPa
Highest atmospheric pressure	106 kPa

Item	Description
Solar radiation	1120 W/m^2
Condensation	Allowed
Precipitation (rain, snow, and hail)	Allowed
Humidity	Wet surface is allowed
Freezing and frost	Allowed

Biological Environment Condition

Item	Description
Plants	Mold and fungus are allowed.
Animals	Rodents and other animals that damage the product are allowed, except termites

Chemical Substance Environment Condition

Item	Description
Salt fog	Allowed

7.3 Storage Environment

To ensure normal operation after installation, the ZXSDR R8978 should be stored in a package in a place with good protection.

Climatic Environment Condition

Item	Description
Lowed temperature	-55 ℃
Highest temperature	70 ℃
Lowest relative humidity	10 %RH
Highest relative humidity	100 %RH
Temperature change rate	1 ℃/min
Lowest atmospheric pressure	70 kPa
Highest atmospheric pressure	106 kPa
Solar radiation	1120 W/m^2
Condensation	Allowed
Precipitation (rain, snow, and hail)	Allowed
Humidity	Wet surface is allowed

Item	Description
Freezing and frost	Allowed

Biologic Environment Condition

Item	Description
Plants	Mold and fungus are allowed.
Animals	Rodents and other animals that damage the product are allowed, except termites

Chemical Substance Environment Condition

Item	Description
Salt fog	Allowed

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Figures

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Tables

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Glossary

AISG
- Antenna Interface Standards Group

ALM
- Alarm

ANT
- Antenna

BBU
- Base Band Unit

BBU
- Base Band Unit

BSP
- Board Support Package

CFR
- Crest Factor Reduction

DIF
- Digital IF

DL
- Down Link

DPD
- Digital Pre-Distortion

EAM
- Electro-Absorption Modulation

eNodeB
- Evolved NodeB

GPS
- Global Positioning System

IP
- Internet Protocol

LMT
- Local Maintenance Terminal

LTE
- Long Term Evolution

MIMO
- Multiple-Input Multiple-Output

MTBF
- Mean Time Between Failures

MTTR
- Mean Time To Recovery

OAM
- Operation, Administration and Maintenance

OS
- Operating System

OSS

RET
- Remote Electrical Tilt

RF
- Radio Frequency

RGPS
- Remote GPS

RRU
- Remote Radio Unit

RRU
- Remote Radio Unit

SDR
- Software Defined Radio

TCP
- Transmission Control Protocol

TD
- Time Division

TELNET
- Telecommunication Network Protocol

TRX
- Transceiver

UE
- User Equipment

UL
- Uplink

VSWR
- Voltage Standing Wave Ratio