

QSR-3920 Series Router Installation Manual

QSR-3920-08

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Safety Statement

Important! Please read the product safety and compatibility information before energizing and enabling the product.

Environmental Statement

This product complies with the design requirements in terms of environmental protection and shall be stored, used and disposed in accordance with the related national laws and regulations.

PREFACE

Manual Introduction

This manual introduces the appearance, hardware, and installation preparation and method of the QSR-3920 series router, as well as its basic use and daily maintenance in terms of energization & operation, troubleshooting and equipment maintenance.

Product Version

This manual is applicable to the product versions as below.

Product name	Product Version
QSR-3920 series router	QSR-3920-08(V1)

Target Users

The major target users of this Manual are:


- ❖ Hardware Installation Engineer
- ❖ Debugging Engineer
- ❖ Site Maintenance Engineer
- ❖ System Maintenance Engineer



Convention

Convention of screen output formats

Format	Description
Screen print	Screen output
Keywords of Screen print	Key information of screen output (red part)

Convention of icons and signs


Format	Description
 Note:	Supplement to or emphasis on the aforesaid.

 Caution:	Matters that need attention while installing or operating the equipment, which are important for proper installation and operation.
 Warning:	Operations prohibited or required to follow the specified steps; otherwise, personal injuries or equipment damages are possible.

Convention of command formats

Format	Description
Bold	Keywords of command line
<i>Italic</i>	Parameters of command line
Brace “{ }”	Options in the brace are compulsory.
Bracket “[]”	Options in the bracket are optional.
Angle bracket “<>”	Information in the angle bracket is not displayed.
Square bracket “【 】”	Contents in the square bracket need attention.
Upright slash “ ”	A sign to separate the options, with the same meaning as “or”.
Slash “/”	A sign to separate the options, indicating a multi-choice operation.

For the purpose of this manual, the icons have the definitions as below:

Icons	Description
	This icon and its related description generally refer to the switch.

Product Details

The manual matching with the product is as follows:

Manual	Description

QSR-3920 Series Router Configuration Manual	Detailed introduction to the methods and steps of configuring the equipment software functions, with the typical cases made available for reference.
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Technical Support

- ❖ Technical support hotline: +7 (495) 797-33-11 * 555
- ❖ Email (feedback): support@qtech.ru

Revision History

The Revision History is the summary of all manual updates. The latest version includes all previous updates.

Version	Revision date	Description
V1.0	2017-10-10	First issue
V1.1	2018-1-24	Add the contents of QSR-M-3920-3ESP3, QSR-M-3920-3ESP10

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1 ROUTER INTRODUCTION

1.1 QSR-3920-08 Appearance and Hardware

QSR-3920 series router only has one product model: QSR-3920-08.

Note

- ❖ QSR-3920-08 router has three kinds of slots: 3ESP, LX9, and MX9. The three slots are respectively inserted with RM3E-3ESP card, QSR-LX9-M-24GETS sub card, and MX9 interface card.
- ❖ 3ESP: Server Processing Unit business processing card, responsible for packet forwarding and control processing. Refer to "Appendix A2 Specifications of 3ESP interface card " for specific specifications
- ❖ MX9 interface card: including QSR-MX9-M-4GET, QSR-MX9-M-4GEF and other interface cards. Refer to "Appendix A7 Specifications of MX9 interface card " for specific specifications.
- ❖ LX9 interface card: include QSR-LX9-M-24GETS interface card.

The dimension of QSR-3920-08 is 442mm × 365mm × 88.6mm (W x D x H). The front appearance diagram of QSR-3920-08 is shown in Figure 1-1, and the rear appearance diagram is shown Figure 1-2.

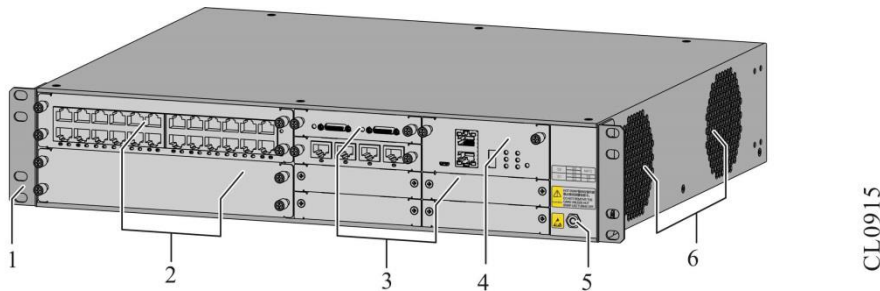
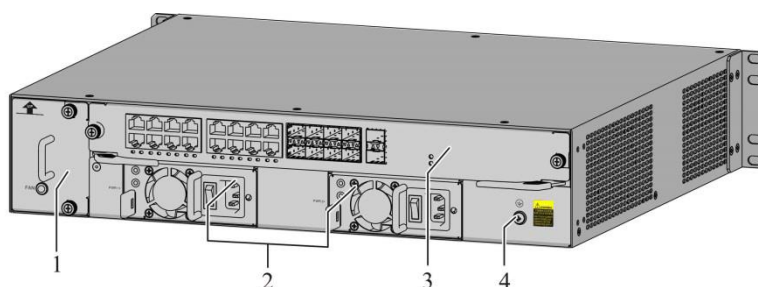


Figure 1-1 QSR-3920-08 front appearance

1.Cabinet bracket	2. LX9 interface card slot
3.MX9 interface card slot	4.MIFC card slot
5.Static wrist socket	6.Chassis air vent



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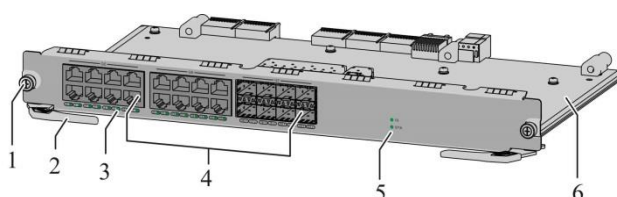
Figure 1-2 QSR-3920-08 rear appearance

1. Fan slot	2. Power slot
3. 3ESP card slot	4. Grounding stud

1.2 Introduction to 3ESP Card

3ESP card is the core of QSR-3920 router, which is responsible for packet forwarding and control processing. QSR-3920-08 must be configured with only one 3ESP card. QSR-3920-08 supports three types of 3ESP cards, QSR-M-3920-3ESP3, QSR-M-3920-3ESP5, and QSR-M-3920-3ESP10.

The appearance of QSR-M-3920-3ESP5 card is as follows:



CL0917

Figure 1-3 QSR-M-3920-3ESP5 appearance


1. Screw	2. Puller
3. Port status indicator	4. Function port
5. Card status indicator	6. Card component area

Note

- ❖ The 3ESP card of QSR-3920 router supports hot-swap.

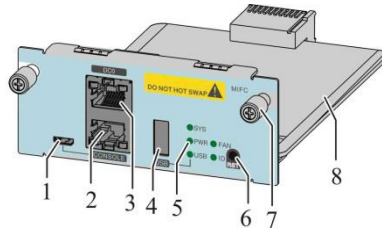
1.3 Introduction to MIFC Card

MIFC card is the management interface card of QSR-3920 router. The serial port, U disk interface, DC0 port and system status indicator of the device are all on the card.

 **Warning**

- ❖ The MIFC card of QSR-3920-08 router prohibits hot-swap operation.
- ❖ The MIFC card of QSR-3920-08 router can only be inserted to slot 9.

The appearance of the MIFC card is as follows:



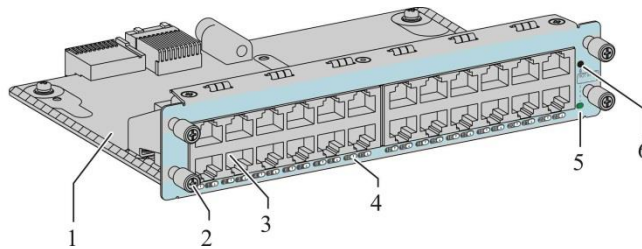
CL0918

Figure 1-4 MIFC appearance

1. Micro USB port	2. CONSOLE port
3. DC0 port	4. USB port
5. Card status indicator	6. Reset function button
7. Screw	8. Circuit board component area

1.4 Introduction to M-3920 Interface Sub Card

The M-3920 sub card slot of QSR-3920 router supports inserting QSR-LX9-M-24GETS interface sub card. The 24GETS interface card supports 24 10/100/1000M Ethernet ports, and its main function is to complete data forwarding.



CL0945

Figure 1-5 The appearance of M-3920 series card

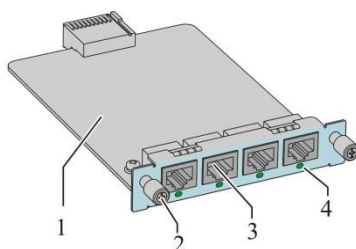
1. Circuit board component area	2. Screw
3. Service port	4. Port indicator
5. Hot-swap indicator	6. Hot-swap button

 **Note**

- ❖ The QSR-LX9-M-24GETS card of QSR-3920 router supports hot-swap.

1.5 Introduction to MX9 Series Card

The QSR-3920 router supports six MX9 card slots. Each card slot supports inserting 1GE, 4GET, 1E1, 4CE1 and other forms of sub cards, which are mainly used as expansion functions.



CL0946

Figure 1-6 The appearance of MX9 series card

1. Circuit board component area	2.Screw
3. Service port	4.Port indicator

1.6 Introduction to Power Module

QSR-3920-08 only supports the AC power module. QSR-3920-08 supports 1+1 redundant backup of two AC powers.

The power module of QSR-3920 router has the following specification:

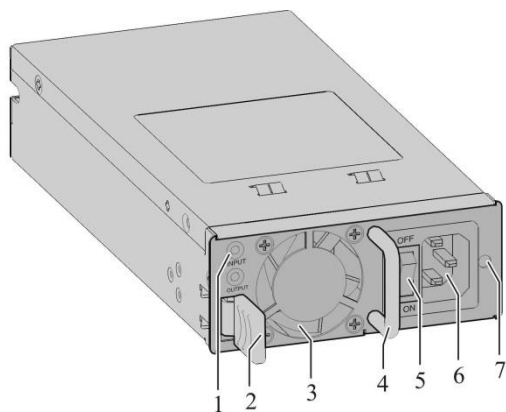
Specification	Description	Applicable Product Model
QSR-M-3920-PWR-AC	AC power module	QSR-3920-08

 **Note**

- ❖ The QSR-3920-08 router provides two power module slots to realize 1 + 1 redundant backup of the power module, and the power module can also realize load balancing.
- ❖ The power module of QSR-3920 router supports hot-swap.

1.6.1 AC Power Module

The appearance of AC power module:



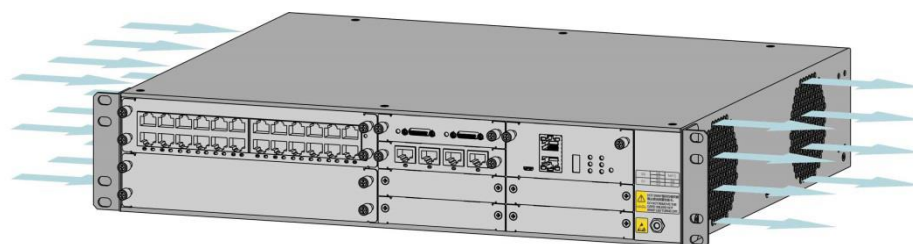
CL0919

Figure 1-7 Power module

1. Indicator	2.Power module lock shrapnel
3.Fan outlet	4.Handle
5.Power switch	6.AC power socket
7.Installation hole of cable anti-stripping strap	

1.7 Air Passage of QSR-3920 Series Router

The air flow direction of QSR-3920 series router chassis is left in and right out, and the diagram is as follows:



CL0920

Figure 1-8 Air flow direction of QSR-3920 series router chassis

Caution

- ❖ Keep the air passage of QSR-3920 router unblocked during the operation.

1.7.1 QSR-M-3920-FAN Fan Module

QSR-M-3920-FAN fan module is a required module of QSR-3920-08, which supports hot-swap. Each QSR-3920-08 has one fan slot, which should be installed with one fan module QSR-M-3920-FAN to ensure the normal operation of the system. The schematic of the fan module is as follows.

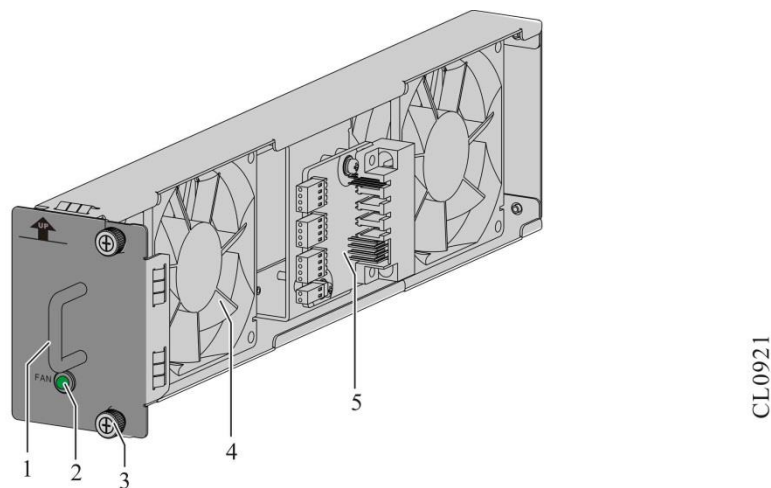


Figure 1-9 QSR-M-3920-FAN module

1. Handle	2. Fan indicator
3. Installation screw of fan card	4. Fan blade
5. Circuit board component area	

2 INSTALLATION PREPARATIONS

Note

- ❖ When the router is delivered, there is the packing list. Please confirm whether the accessories are complete and good according to the items in the packing list. If there is damaged or loss, please contact QTECH technical staff to replace.
-

2.1 Check Router Running Environment

QSR-3920 series routers must be used indoors. To ensure the normal running of the router, take the corresponding measures to meet the environment requirement of the router running:

- ❖ Air conditioning and ventilation system can ensure the normal running temperature and humidity conditions of the router. For details, refer to [Appendix C1 Environment Requirement](#).
- ❖ The good grounding is the basis of the router running and the important guarantee conditions of preventing lightning and resisting interference. Ensure that grounding meets the grounding specifications. For details, refer to [Appendix D1 Router Grounding Specifications](#).
- ❖ Ensure that the cleanness of the equipment room meets the requirement. Do not place the router in the environment with lots of dust, such as in the being renovated passage.

2.2 Safety Precautions

2.2.1 General Safety

Caution

- ❖ Keep the router clean and dust-free; do not place the router in the damp place.
-

2.2.2 Electrical Safety

Caution

- ❖ Please check whether there are potential dangers. For example, the power is not grounded, power supply grounding is not reliable, and the ground is wet.
 - ❖ Before moving the router, be sure to remove all external cables (including power cable).
-

-
- ❖ When maintaining with power, it is recommended that there are two or more persons in the field.
 - ❖ When closing the power, check and ensure that the power is turned off.
-

2.2.3 Static Safety

To avoid the static from damaging the electronic parts of the router, we need to take the anti-static measures.

Caution

- ❖ When installing the components of the router, especially installing the components with the circuit board (such as board), we should wear anti-static wrists.
 - ❖ When holding the circuit board, please hold the edge of the circuit board and do not touch the components or printed circuit.
 - ❖ For the security, please check the resistance of the anti-static wrists. The resistance between the body and the ground should be 1-10 megohms.
-

The using steps of the anti-static wrists are as follows:

- Step 1: Put the hand into the anti-static wrist.
- Step 2: Tighten the fastener and ensure that the piece metal on the anti-static wrist is well contacted with the skin.
- Step 3: Insert the anti-static wrist into the anti-static wrist jack on the router chassis or clip the alligator clip of the anti-static wrist to the grounding terminal of the chassis.
- Step 4: Ensure that the anti-static wrist is well-grounded. The using method of the anti-static wrist is shown in the following figure.

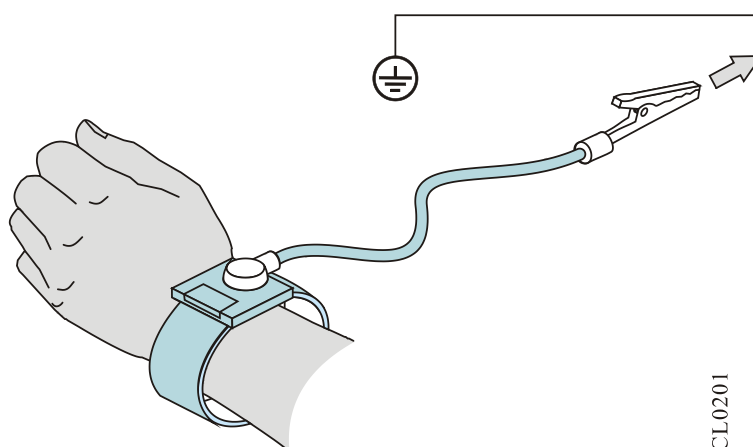


Figure 2-1 Using method of anti-static wrist

2.2.4 Laser Safety

Warning

- ❖ For the QSR-3920 series router with the optical interface, avoid directly viewing the laser beam from the optical module inside. Viewing the laser beam from the optical module inside directly may damage your eyes.

2.3 Installation Tools, Instruments, and Equipment

Needed tools:

- ❖ Phillips screwdriver
- ❖ Slotted screwdriver
- ❖ Anti-static wrist
- ❖ Paper knife

Cables:

- ❖ PGND cable and power cable
- ❖ Console cable
- ❖ Optional cable

Equipment and instruments:

- ❖ Configurable terminal (a common PC or a laptop)
- ❖ Multimeter

2.4 Open-Package and Inspection

QSR-3920 series router adopts the carton packaging. The package comprises the carton, plastic bags, protection EPE and other packaging materials. The open-package steps are as follows:

- Step 1: View the carton label, and confirm the router model in the carton.
- Step 2: Use a paper knife to gash the tape along the lid commissure; be careful when using the knife and do not insert too deep to avoid damaging equipment inside.
- Step 3: Open the carton, remove the protection EPE, and then you can get out of the router.

3 ROUTER INSTALLATION

3.1 Install Router

Based on different installation positions, the router can be installed in the following two modes:

- ❖ Install the router to the workbench.
- ❖ Install the router to the cabinet.

3.1.1 Install Router to Workbench

Place the router on the clean workbench. Pay attention to the following operation during the installation:

- ❖ Ensure the stability and well-grounding of the workbench.
- ❖ There is 10cm heat dissipation space around the router.
- ❖ Do not place heavy things on the router.

3.1.2 Install Router to Cabinet

This section describes how to install the QSR-3920 series router to the 19-inch standard cabinet.

Installation Preparations

- ❖ QSR-3920 series router is 2U high, so ensure that enough installation space is reserved for the router.
- ❖ Check the grounding and stability of the cabinet and ensure that there is no obstacle inside and around the cabinet affecting the router installation.

Note

- ❖ 1U is 44.45mm. Here, U is short for Rack Unit.
-

Install Slide to Cabinet

The slide supports the router weight. If a slide is already on the cabinet, skip this section.

Caution

- ❖ Before installing the slide, please confirm whether the bearing capacity of the slide meets the weight requirements of QSR-3920 chassis and internal card. Please refer to "Appendix A specifications of complete device and common modules" for the weight of each component.
 - ❖ Besides the slide, a tray also can be used to support the router. The installation process of the slide is the same as that of the tray. Therefore, the tray installation process is omitted in this installation manual.
-

Note

- ❖ Ensure that the distance between the slide to the bottom cabinet is 2U and three holes on the square hole bar is 1U, as shown in Figure 3-1.
-

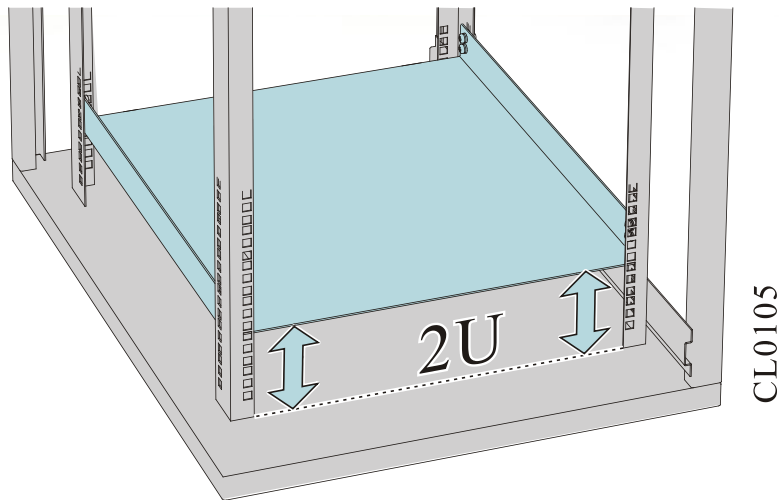


Figure 3-1 The minimum slide height

The following describes how to install a slide to the 19-inch standard cabinet.

The installation steps of the slide are as follows:

- Step 1: Ensure the installation position of the slide on the cabinet and mark the installation hole position using a marker.

The space height above the slide must be larger than the to-be-installed router chassis height and enough margin is reserved (1U margin is recommended).

Caution

- ❖ To ensure the stability of the cabinet, try to place a heavy and high router below the cabinet.
-

- Step 2: Install the slide on the two sides, respectively. The slides installed on the both sides must be at the same height. Then, tighten the fixing screws.
-

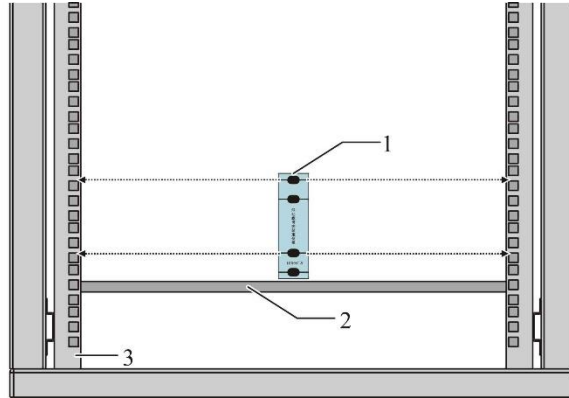
Note

- ❖ The appearance and installation methods of different cabinets and slides may vary. This section is just for your reference. Goods in kind prevail.
-

Install Floating Nut to Cabinet

Before installing the chassis to the cabinet, first install the floating nut on the upright square hole bar on the both sides in the front of the cabinet.

Step 1: Mark the installation position of the floating nut on the upright square hole bar using a marker by comparing with the installation hole position on the router hanging ears.

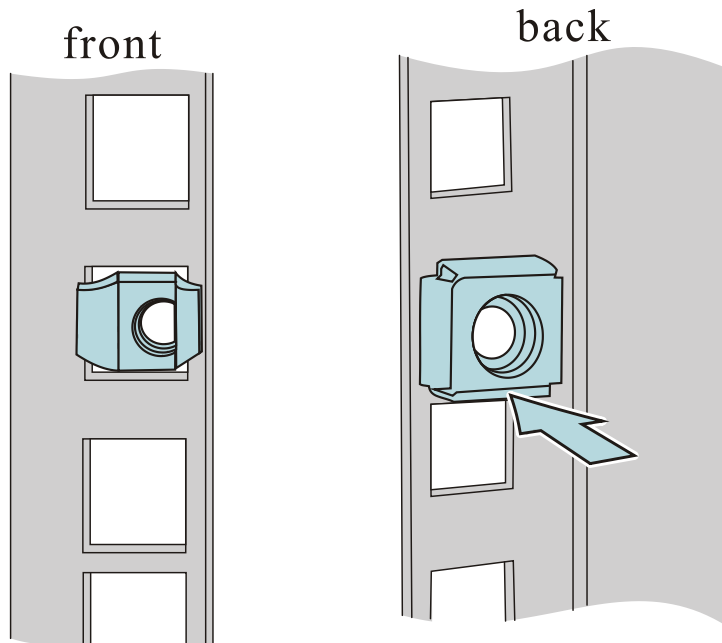


CL0944

Figure 3-2 Install floating nuts

1.Installation locating plate of floating nut	2. Load bearing tray nut
3.Cabinet square hole column	

Step 2: Install the floating nuts on the marked positions. A floating nut must be installed on each installation hole on the hanging ear.



CL0045

Figure 3-3 Install the floating nut

Install Router to Cabinet

! Caution

- ❖ Before installing the router to the cabinet, ensure that the corresponding positions on the cabinet are installed with slide (tray) and the slide (tray) can support the weight of router and its accessories.

The following describes the installation process of installing the router to the cabinet.

- Step 1: Uplift the router from both sides and place it on the slide (tray) of the cabinet. Inset the router to the cabinet smoothly until the hanging ear of the router is closely cling to the square hole bar in the front of the cabinet. The slide (tray) bears the weight. The router is installed to the standard cabinet, as shown in the following figure.

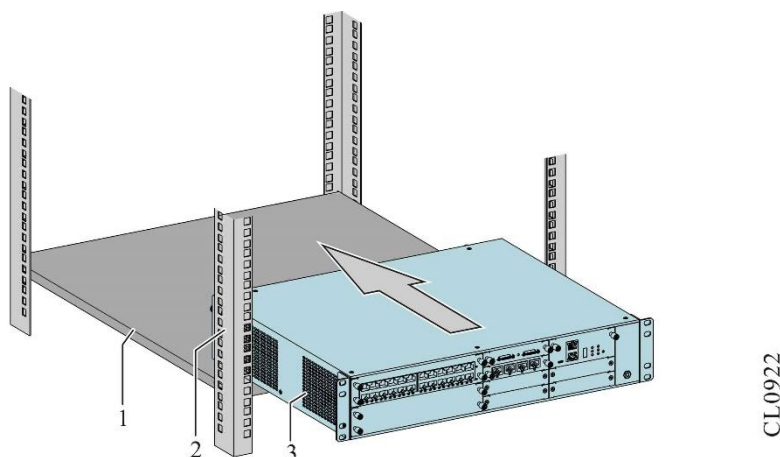


Figure 3-4 Install the router to the standard cabinet

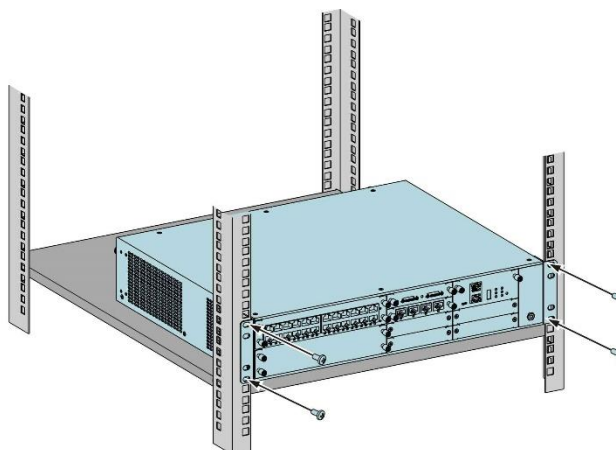
1. Load bearing tray	2. Cabinet square hole column
3. Device host	

📌 Note

- ❖ If the screw hole on the hanging ear cannot align to the floating nut installed on the cabinet correctly, check whether the bearing surface of the slide (tray) is on the integer U boundary and whether the floating nut is installed on the correct hole position.
- ❖ In some special installation environments, if it is necessary to install the device in reverse direction (the rear panel of the device is facing the front door of the cabinet), remove the hanging ears on both sides of the front

panel of the device with a screwdriver, and install on both sides of the rear panel of the device before installing device on the cabinet.

- Step 2: Use the M6 panel screws to fix the floating nuts on the chassis mounting ears and cabinet post square hole bar, so as to prevent the router from sliding front and back.



CL0923

Figure 3-5 Install the router to the cabinet

Warning

- ❖ The hanging ear does not bear the weight. Do not bear the router only using a hanging ear without installing the slide (tray).
-

Check the Installation

After the router is installed to the cabinet, check the installation based on the following items and ensure all the items are normal.

- ❖ Check and ensure that the router is installed correctly.
- ❖ Check and ensure that the router hanging ear and cabinet are secure and well.
- ❖ Check and ensure that enough space is reserved around the router for heat dissipation.

3.2 Ground the Router

Warning

-
- ❖ For the router and human security, the router must be grounded well. The resistance between the router chassis and the ground should be less than 1 ohm.
-

Generally, there is the grounding bar on the cabinet and we can connect the ground cable of the router to the grounding bar.

Note

-
- ❖ Please use the ground cable carried by the router.
-

The steps of installing the ground cable are as follows:

- Step 1: Remove the ground screw on the chassis of the router.
- Step 2: Bind the wiring terminal of the ground cable carried by the router to the ground screw of the chassis.
- Step 3: Install the ground screw with the ground cable to the grounding hole and tighten it.
- Step 4: Use the same method to install the other side of the ground cable to the grounding terminal of the cabinet.

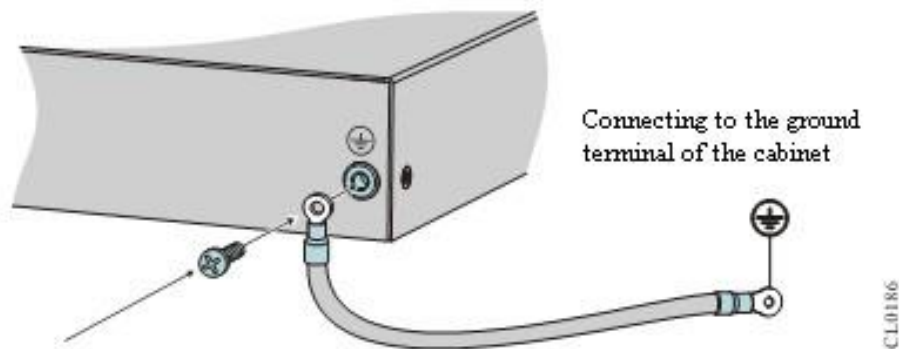


Figure 3-6 Connect the ground cable

Caution

- ❖ If there is no appropriate grounding point on the cabinet, we also can connect the grounding cable of the router to other grounding bar of the installation place.
-

-
- ❖ Fire hose and lightning rod grounding of the building are not the proper grounding location; the grounding cable of the router should be connected to the engineering grounding of the equipment room.
-

3.3 Install Interface Sub Card Components (Optional)

If the installed router contains QSR-MX9-M-4G-LTE interface sub card, the USIM card and 4G antenna need to be installed. This chapter takes the installation of QSR-MX9-M-4G-LTE as an example to describe the installation method of USIM card and 4G antenna.

3.3.1 Install USIM Card

The diagram of the USIM card is as follows:

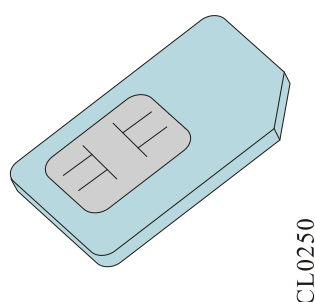


Figure 3-7 USIM card

The specific position of USIM slot of QSR-MX9-M-4G-LTE interface sub card on board card is as follows:

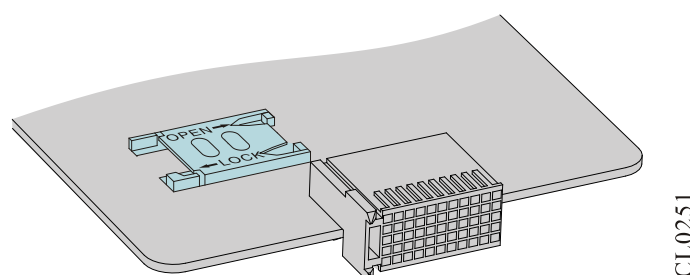
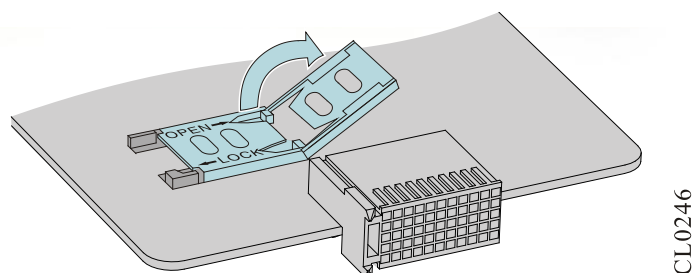


Figure 3-8 USIM card slot

When installing the USIM card, operate according to the following steps:

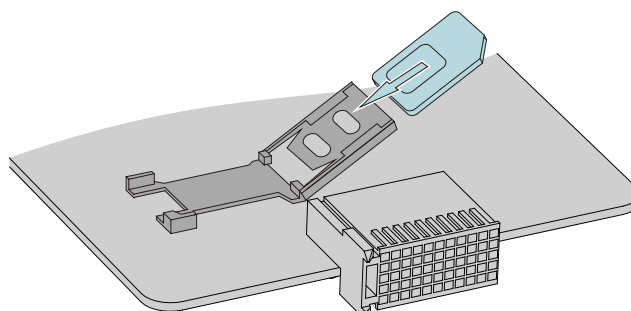
- Step 1: Unplug the QSR-MX9-M-4G-LTE interface daughter card from the router. Refer to "6.1 Replace interface daughter card" for the method of pulling out interface daughter card.
- Step 2: Determine the position of the USIM slot on the board card according to the figure above.
- Step 3: Push the buckle horizontally in the direction of the OPEN arrow to move the buckle about 2mm. At this time, the buckle will be loose and slightly spring up, and the buckle can be turned over manually.



CL0246

Figure 3-9 Turn over the buckle

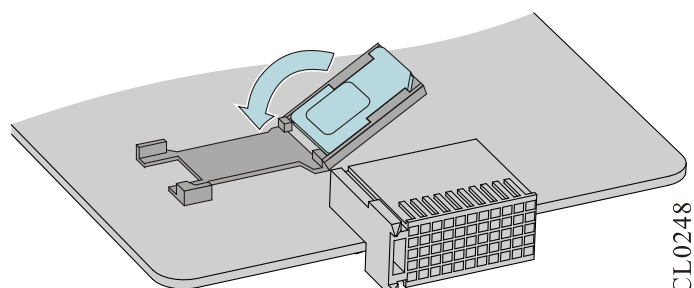
Step 4: Insert the USIM card to the buckle.



CL0247

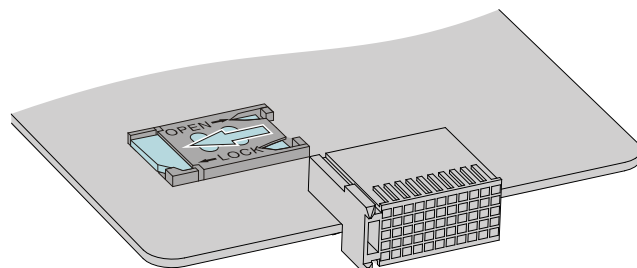
Figure 3-10 Insert the USIM card to the buckle

Step 5: Flip down and level the buckle of the inserted USIM card. After the buckle is leveled, push it horizontally in the direction of lock arrow to make the buckle move about 2mm.



CL0248

Figure 3-11 Press down the buckle



CL0249

Figure 3-12 Push the buckle according to the direction of the LOCK arrow

Step 6: Install QSR-MX9-M-4G-LTE interface daughter card to the router. Refer to "6.1 Replace interface daughter card" for the installation method of interface daughter card.

! Caution

- ❖ When installing the USIM card, pay attention to the insertion direction of the USIM card. The side with missing angle of the USIM card faces out of the board.
- ❖ When installing the USIM card, pay attention to the front and back sides of the USIM card. The metal side of the USIM card is downward.

3.3.2 Install 4G Antenna

The diagram of the 4G antenna:

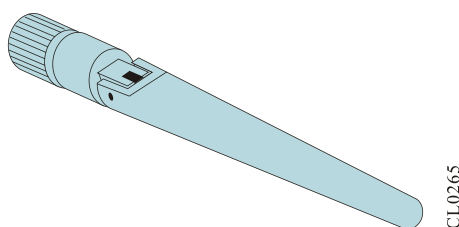


Figure 3-13 4G antenna

When installing the 4G antenna, operate according to the following steps:

- Step 1: Remove the red plastic anti-dust cap on the antenna interface of the QSR-MX9-M-4G-LTE interface daughter card.
- Step 2: Insert 4G antenna into the antenna interface of QSR-MX9-M-4G-LTE interface sub card.

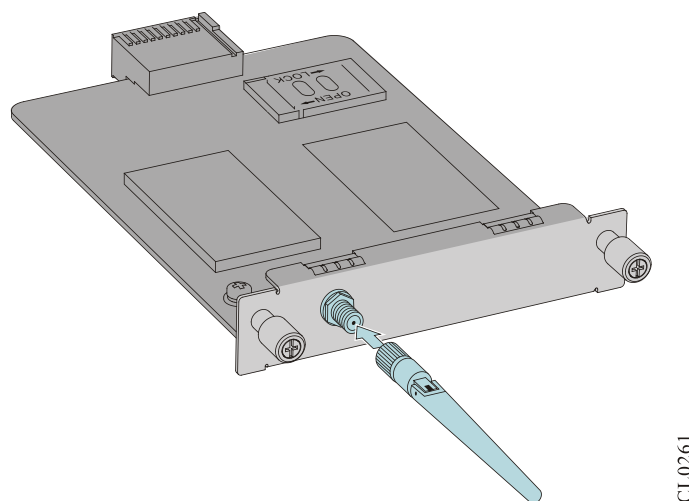
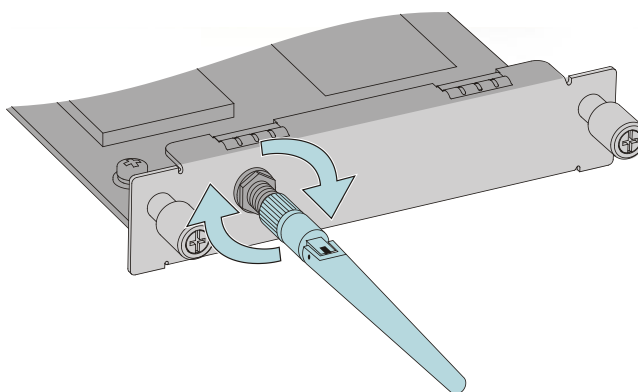


Figure 3-14 Insert 4G antenna

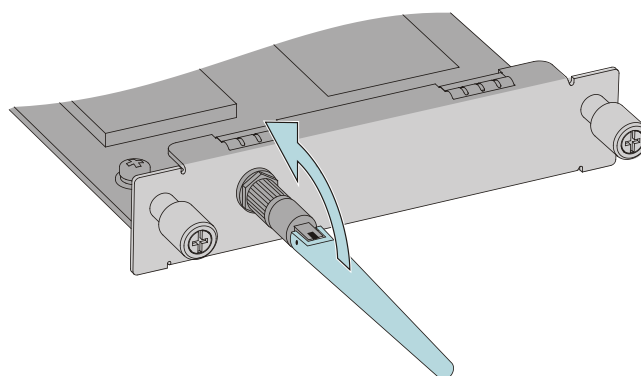
- Step 3: Rotate the 4G antenna to the right and tighten it.



CL0262

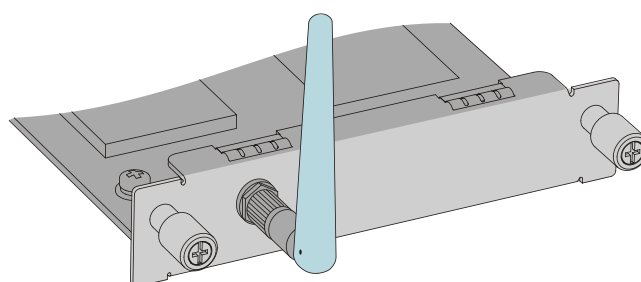
Figure 3-15 Tighten the 4G antenna

Step 4: Pull up the fixed 4G antenna to complete the installation.



CL0263

Figure 3-16 Pull up the 4G antenna



CL0264

Figure 3-17 Complete the installation of 4G antenna

Note

- ❖ The default configuration of 4G antenna can be used, or the ceiling antenna can be used, with a 15m long feeder.
- ❖ Some 4G interface sub cards use dual antennas, which are similar in installation, and will not be described here. For the dual-antenna 4G interface sub card, the left is the main antenna, and the right is the auxiliary antenna. The main antenna must be installed, and the auxiliary antenna

may not be installed. Refer to Figure 3-18 for the diagram of dual-antenna 4G interface sub card.

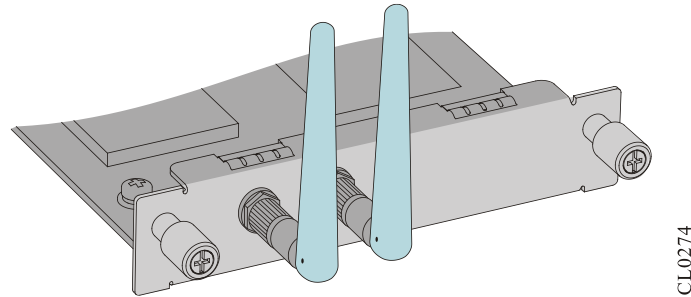


Figure 3-18 Dual-antenna 4G interface sub card

3.4 (Optional) Install SPD

3.4.1 Install AC Power SPD

The AC power SPD (surge protection device) suppresses the transient overvoltage caused by lightning inductance shock or other reasons on the power transmission line. When a SPD is used, the AC power first enters the SPD and then enters the router.

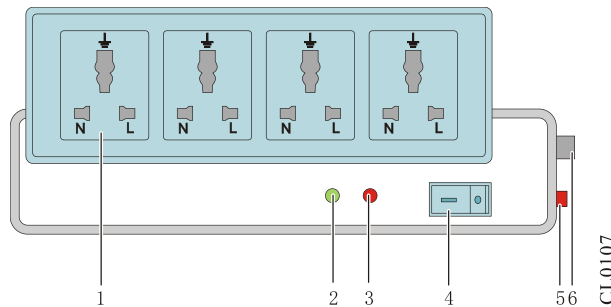


Figure 3-19 The power SPD

1.Socket	Connects the router power.
2.Normal work indicator (green)	on: indicates that the circuit is running normally. Off: indicates that the protection circuit is damaged.
3.Grounding and polarity detection indicator (red)	on: indicates the wiring error (the PE is not connected or the live wire and naught wire are reversely connected). At this time, check the power supply circuit.
4.Power switch	Turn on or turn off the power.

5. Automatic protector	overload	If the overload occurs, the power is cut off. When the overload comes to recovery, the power resets automatically.
6. Standard socket		Connects to the power in the equipment room via the power cable.

Caution

- ❖ The power SPD is not provided with the router. The user can purchase it as required.
 - ❖ When using the power SPD, ensure the PE terminal is grounded.
 - ❖ Insert the AC power plug of the router into the socket of the power SPD (surge protection connector bar). When only the green indicator indicating the running power SPD is always on without red indicator alarms, the SPD function works.
 - ❖ If the red alarms occur to the power SPD, check and ensure whether the live wire, naught wire, and PE are connected correctly. If the PE is connected correctly, perform further detection. Switching the multimeter to the AC power, test whether the voltage between the naught wire and the PE is less than 5 V and whether the voltage between the live wire and the PE is about 220V. If no, it indicates that the live wire and the naught wire are reversely connected.
-

3.4.2 (Optional) Install Port Lightning Protector

When using the router, if an outdoor network cable will be connected to the router, first cascade the port lightning protector before connecting the signal line to the router interface to reduce the probability of router damage caused by lightning stroke.

The port lightning protector is installed as follows:

- Step 1: Cut short the PE of the port lightning protector based on the distance of the router ground terminal or the lightning protection ground copper bar in the equipment room. Tighten the PE of the port lightning protector securely to the router ground terminal or the lightning protection ground copper bar in the equipment room.
- Step 2: Use a multimeter to test whether the lightning protector PE is well connected to the router ground terminal or the lightning protection ground copper bar in the equipment room.

- Step 3: According to the description on the port lightning protector specification, use the network port conversion cable to connect the port lightning protector (Pay attention to the connection direction and note that the external cable is connected to the IN end and the conversion cable on the router is connected to the OUT end). At the same time, observe whether the indicators on the boards are normal.
- Step 4: Bind the cables tidily using cable ties.

Note

- ❖ The port lightning protector is not provided with the router. The user can purchase it as required.
 - ❖ The port lightning protector aims for the Ethernet port of the 10/100/1000M electrical interface using the RJ-45 connector.
 - ❖ The port lightning protector specifications contain the technical parameters and the installation and maintenance instruction of the surge protector. Refer to the specifications carefully in the actual installation.
-

Caution

- ❖ Avoid the installation direction of the port lightning protector is connected reversely. The external cable is connected to the IN end and the router network port is connected to the OUT end.
 - ❖ Avoid the port lightning protector is improperly grounded. When installing the PE of the surge protector, keep the PE as short as possible to ensure the well contact with the router ground terminal. After the connection is finished, use a multimeter to check the connection.
 - ❖ Avoid that the port lightning protector is incompletely installed. When there is more than one outbound network port of interconnected cable between the router and other router, install the lightning protector for all cable outbound network ports.
-

3.5 Install Power Supply

3.5.1 Installation Preparations

- ❖ Take out the power module from the packing box and keep the accessories in the box.
- ❖ Confirm that the power module switch is in "off" state before installation.

3.5.2 Install Power Module

- Step 1: Insert the power module into the power slot of the host chassis.
- Step 2: Push in the power module until the buckle is fastened with the host chassis.
- The diagram of inserting the power module:

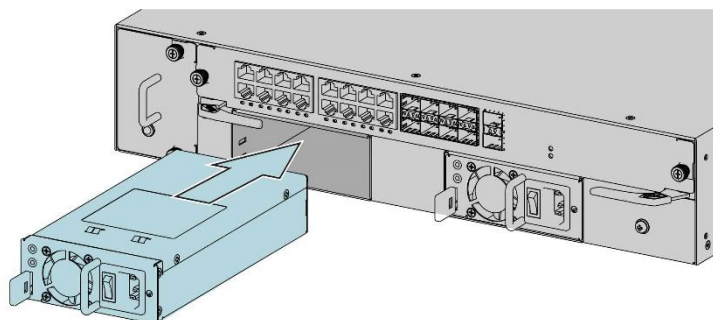


Figure 3-20 Insert the power module

3.6 Connect Power Cable

3.6.1 Installation Preparations

- ❖ Considering the lightning protection requirement of the router, it is recommended that the AC power reaches the better lightning protection effect via the external lightning equipment when bringing in the router.
- ❖ Before connecting the power cable, check and ensure that the power switch is OFF.

3.6.2 Connect AC Power Cable

- Step 1: Install the anti-stripping of the AC power cable to the installation hole of the power module panel.

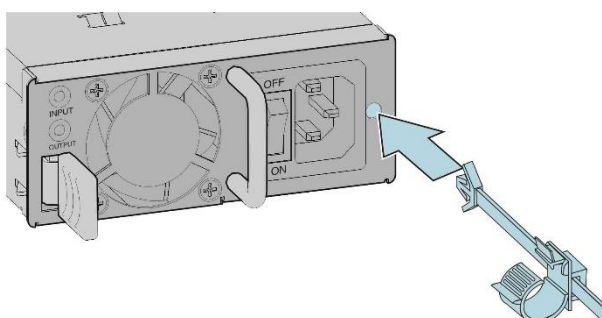
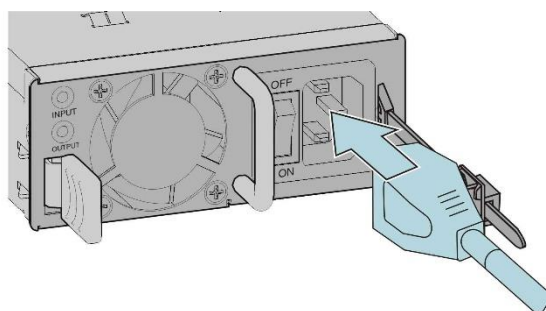


Figure 3-21 Install the anti-stripping

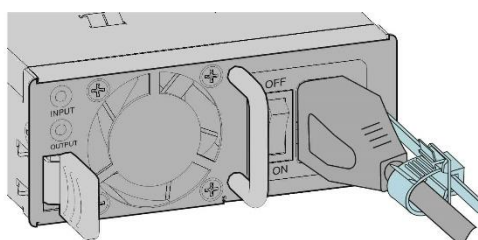
- Step 2: Insert the output plug of the power cable into the input jack of the power module.



CL0979

Figure 3-22 Install the power cable

- Step 3: Fix the tail of the power cable output plug with the anti-stripping to prevent the output plug of the power cable from falling off.



CL0943

Figure 3-23 Install the power cable

- Step 4: Insert the input plug of the power cable into the power strip.

3.7 Check after Installation

Warning

- ❖ Before checking whether the installation is correct, please confirm that the power is turned off, avoiding that the connection error damages the body or router components.
-

- ❖ Check and ensure that the PE is connected correctly.
- ❖ Check and ensure that the power cable is connected correctly.
- ❖ Check and ensure that the interface daughter card is installed and well-contacted.

4 POWER ON AND RUN ROUTER

4.1 Log into Router

When logging into the router for the first time, you can only log into the router via Console port. This is the most basic mode of logging into the router and also the basis of configuring other login modes.

4.1.1 Connect Console Cable

QSR-3920 router provides two configuration serial ports on the panel of the MIFC card: EIA/TIA-232 and Micro USB 2.0. With these two interfaces, the user can use a PC (or laptop) with RS-232 serial port (or USB interface) to configure the router.

To configure the router via the PC (or laptop), connect according to the following steps:

- Step 1: Prepare one PC (or laptop). Confirm that the PC (or laptop) has the RS-232 serial interface.
- Step 2: After confirming that any one of the router or PC (or laptop) is powered off, connect the RS-232 serial interface of the PC (or laptop) with the Console port of the router via the configuration cable.
- Step 3: The configuration cable (configured with the router) is one eight-core unshielded cable. One side is the crimped RJ-45 plug, inserted to the Console port of the router; the other side is one DB-9 (hole), inserted to the nine-core (pin) serial interface socket of the PC (or laptop). The configuration cable is shown in Figure 4-1, and the connection diagram is shown in Figure 4-2.

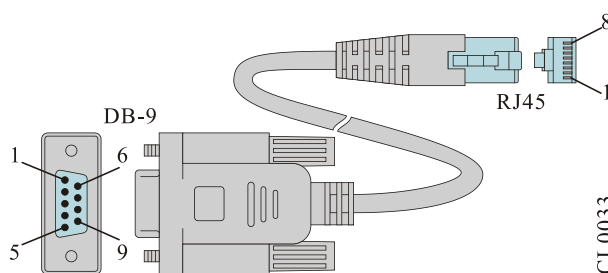


Figure 4-1 Console cable

For details about the inner signal connection of the Console cables, refer to [Appendix E1 Console Cable](#).

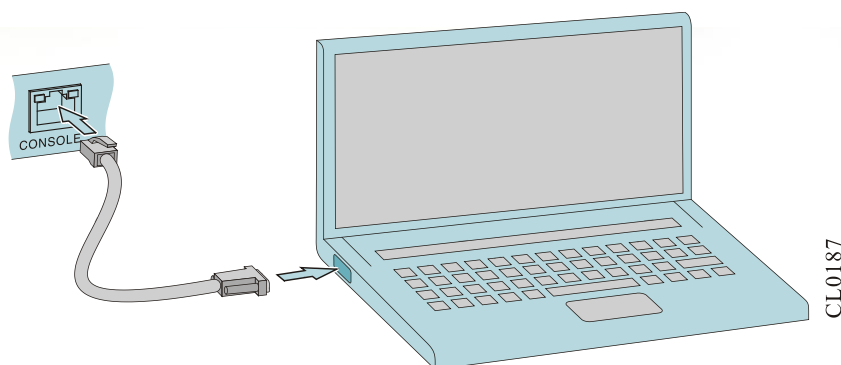



Figure 4-2 Connect the router and PC via the Console port

! Caution

- ❖ When the PC (or laptop) is connected with the router via the configuration cable, first connect the DB-9 side of the configuration cable to the serial interface of the PC and then connect the RJ-45 connector of the configuration cable to the Console port of the router.
- ❖ When removing the configuration cable that connects the PC (or laptop) with the router, first remove the RJ-45 connector of the configuration cable, and then remove the DB-9 side of the configuration cable.

4.1.2 Set PC HyperTerminal Parameters

The following takes running Windows XP HyperTerminal on the PC (or laptop) as an example to describe the setting of the serial interface parameters of the PC (or laptop).

- Step 1: Enable the PC (or laptop), select **Start > All Programs > Accessories > Communication > HyperTerminal**, and click  to set up the new connection as shown in Figure 4-5. If it is the first time to set the Hyperterminal, the system displays the interface of **Location Information**, as shown in Figure 4-3. Fill in according to the red indication in the figure and click **OK**.

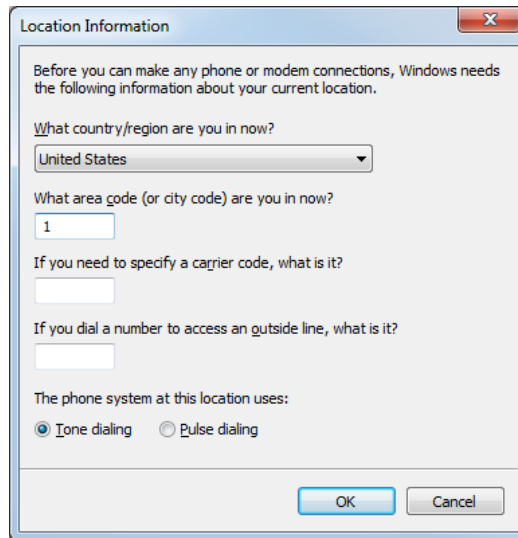


Figure 4-3 “Location information” interface

Step 2: Display the following **Telephone and Modem** interface and click **OK**.

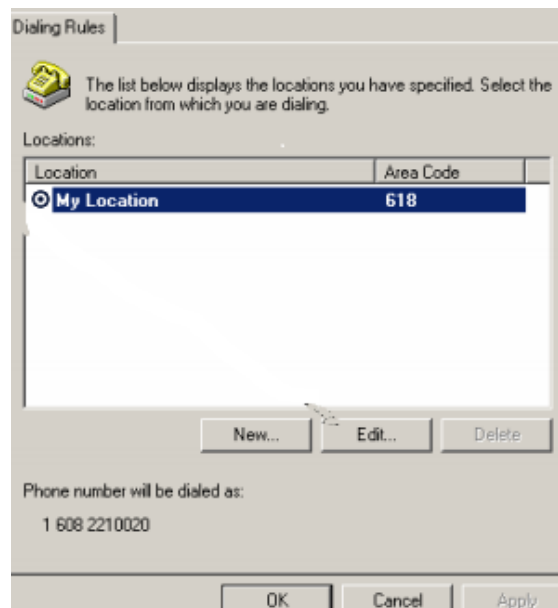


Figure 4-4 The **Telephone and Modem** interface

Step 3: Display the following **Connection Description** interface, and fill in the name in **Name (N)**, such as test, and click **OK**.

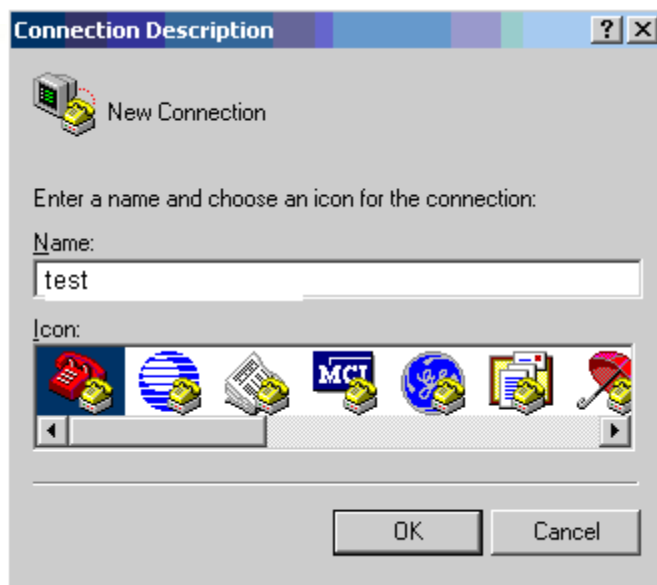


Figure 4-5 “Connection Description” interface

Step 4: Display the following **Connect to** interface, select the serial interface used by the connection in the **Connect using**, and click **OK**.

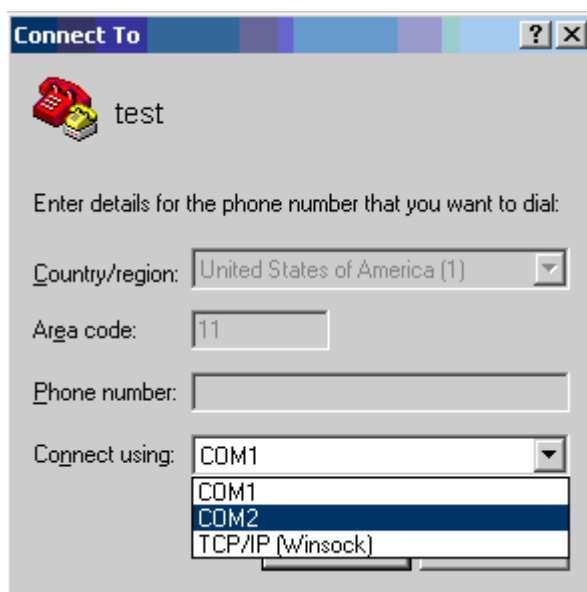


Figure 4-6 “Connect to” interface

Step 5: Display the following **COM1 Properties** interface, set the baud rate as 9600, data bit as 8, parity check as none, stop bit as 1, and data flow control as none, and then click **OK**.

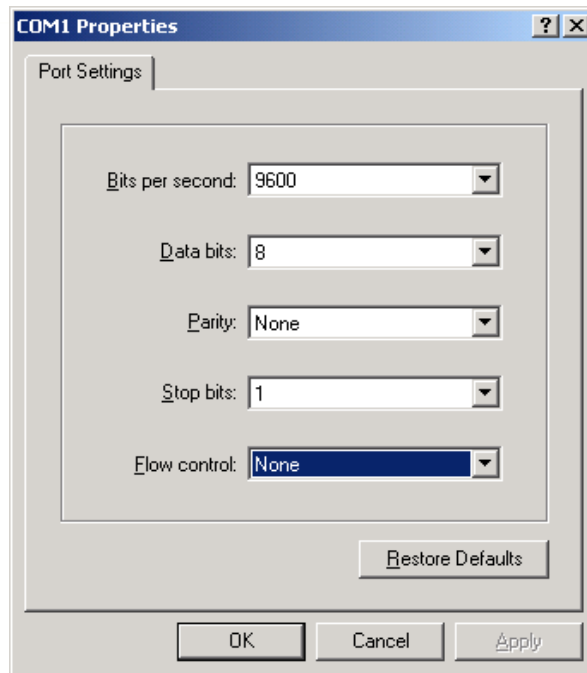


Figure 4-7 “com* Properties” interface

Step 6: Display the following **test-HyperTerminal** interface, and click **Properties**.

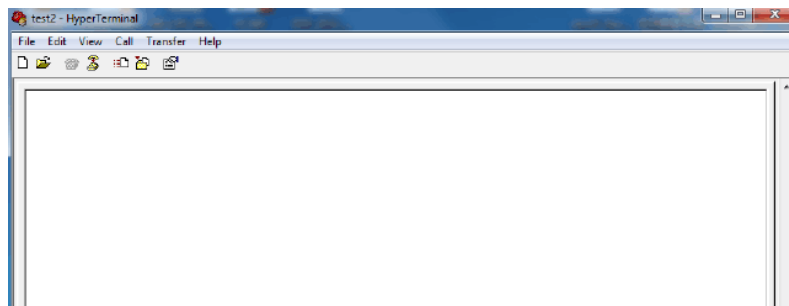


Figure 4-8 “test-HyperTerminal” interface

Step 7: Display the following “**test properties**” interface, click **Setting**, select VT100 in **Terminal emulation**, and click **OK**.

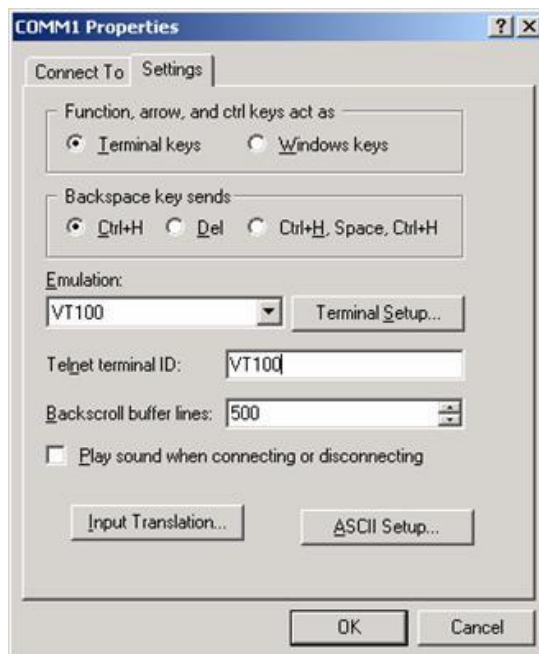


Figure 4-9 “Test properties” interface

Step 8: Display the following **test-HyperTerminal** interface, press **Enter** at the blank place, and the serial port displays the print information. The setting of the HyperTerminal is complete.

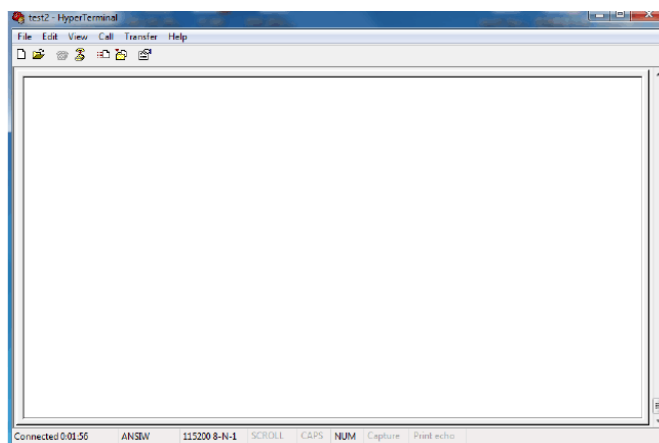


Figure 4-10 test-Hyperterminal interface after setting

4.1.3 Power on and Start

Check before Power on

Check the router before powering on:

- ❖ The interface cables, power cables, and PEs are connected correctly.
- ❖ Power supply voltage meets the power requirement of the device. For details, refer to [Appendix C2 Requirements for Power Supply](#).

- ❖ The configuration cable is connected correctly; the PC for configuration is enabled; the setting of the terminal parameters is complete.

Caution

- ❖ Before the router is powered on, confirm the position of the power router of the equipment room where the router is located, so as to cut off the power in time when there is an accident.
-

Power on Router

Power on the router in the following order:

- ❖ Enable the power supply switch of the router.
- ❖ Enable the power switch of the router.

After the router is powered on and started, the configuration terminal will display some basic manufacturing information of the router, such as:

```
*****
                        Operating System Software
QSR-3920-08 (V1) system image file (flash0: /flash/rp39-7.3.2.75(R).pck),
version 7.3.2.75(R) (integrity), Compiled on Sep 29 2017, 08:45:29
Copyright (C) 2014 QTECH LLC. All Rights Reserved.

System ID           : 08c6b32a453e
Hardware Model      : QSR-3920-08 (V1) with 2048 MBytes SDRAM, 8192 MBytes
flash
Hardware Version    : 001(Hotswap Supported)
MPU CPLD Version    : 101
Bootloader Version  : 1.0.13
Software Version    : 7.3.2.75(R) (integrity)
Software Image File : flash0: /flash/rp39-7.3.2.75(R).pck
Compiled           : Sep 29 2017, 08:45:29
*****
```

Note

- ❖ The display information of the above boot interface is for reference only. Please refer to the actual display.
-

4.1.4 Check after Power on

Power on the router. After loading all cards, check as follows to ensure that the later configuration work can be done normally:

- ❖ After the router is powered on, the ventilation system works, and check whether there is the sound of the fan rotation and whether there is air discharged from the ventilation holes of the router.
- ❖ View whether the indicators on the router are normal.

Table 4-1 The indicator status when the router works normally

Indicator Name	Indicator Color	Description
SYS	Green	Quickly flash: indicates that the board is in bootloader loading or IOS loading state (flash frequency 5Hz) on: the status before IOS loading and after bootloader starts successfully Slowly flash: IOS loaded successfully (frequency 0.5Hz) off: not powered on
PWR	Green	On: Indicate that the system power status is normal
FAN	Green	On: Indicates that the system fan status is normal

4.2 Access Network

4.2.1 Access Network via Ethernet Twisted Pair

The 10/100/1000Base-T electrical interface of the router adopts the RJ-45 connector. The port supports MDI/MDIX auto-sensing and adopts class-5 or above twisted-pair to connect the network.

Connection steps:

- Step 1: Insert one side of the Ethernet twisted pair to the Ethernet electrical interface of the router (RJ-45 port).
- Step 2: Insert the other side of the Ethernet twisted pair to the RJ-45 port of the device connected to the network.

Note

- ❖ The router does not carry Ethernet twisted pair. Please prepare the desired cables by self in advance.
-

4.2.2 Access Network via Fiber

For the SFP optical interface of the router, you can use the fiber to connect the network. Before connecting fiber, first install the optical module to the router and then insert the fiber connector to the optical module. The appearance of the general LC fiber connector is as shown in the following figure.

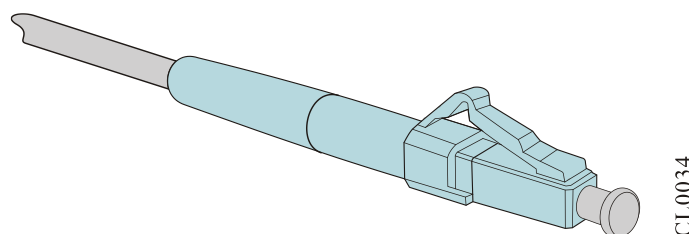


Figure 4-11 Appearance of the LC fiber connector

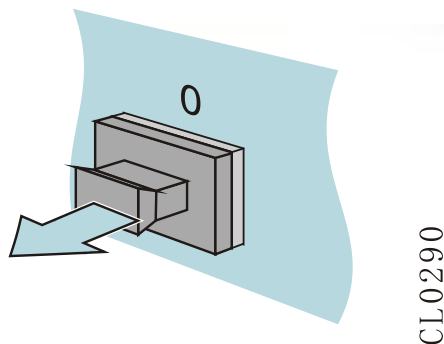
Install Optical Module

The QSR-3920 series router supports the SFP optical module and the SFP optical module is installed as follows:

Caution

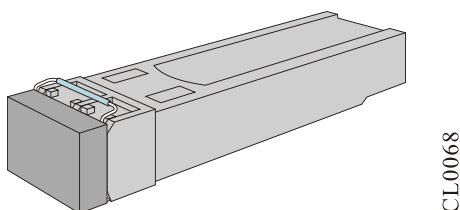
- ❖ When installing the SFP module, do not use the hands to touch the gold-finger of the SFP module directly.
 - ❖ The TX wire should be connected to the RX wire of the peer router; the RX wire should be connected to the TX wire of the peer router.
-

- Step 1: Wear the anti-static wrist and confirm that the anti-static wrist is well contacted with the skin and well-grounded.
- Step 2: Pull out the dust plug on the optical interface of the router, as shown in Figure 4-12.
- Step 3: Get the SFP module out from the packing box. The appearance of the SFP module is as shown in Figure 4-13. Use the hands to hold the two sides of the SFP module and push it into the interface slot of the router horizontally until the SFP module is close-contact with the slot (you can feel that the shrapnel at the top and bottom of the SFP module stuck the interface slot), as shown in Figure 4-14.



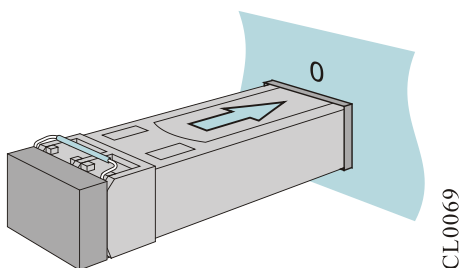
CL0290

Figure 4-12 Pull out the dust plug



CL0068

Figure 4-13 SFP module



CL0069

Figure 4-14 Install the SFP module

! Caution

- ❖ When installing the fiber, do not pull out the protection rubber stopper on the SFP module.
- ❖ For unused optical interfaces, please do not unplug the dust plug on the optical interface of the router.
- ❖ It is recommended not to insert the SFP module with the fiber into the interface slot directly. Please install after unplugging the fiber.
- ❖ When installing the SFP module, do not use the hands to touch the gold-finger of the SFP module directly.
- ❖ The TX wire should be connected to the RX wire of the peer router; the RX wire should be connected to the TX wire of the peer router.

Connect Fiber on Optical Module

- Step 1: Wear the anti-static wrist and confirm that the anti-static wrist is well contacted with the skin and well-grounded.
- Step 2: Remove the dust cap of the fiber connector and clean the optical connector core by using the dust-free paper with the anhydrous alcohol.

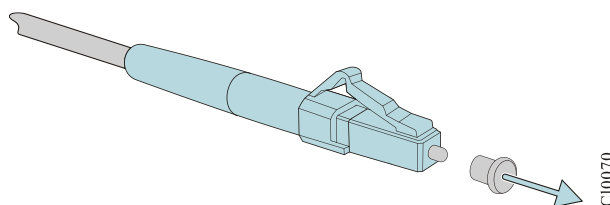


Figure 4-15 Remove the optical dust cap

- Step 3: Remove the dust cap of the SFP module.

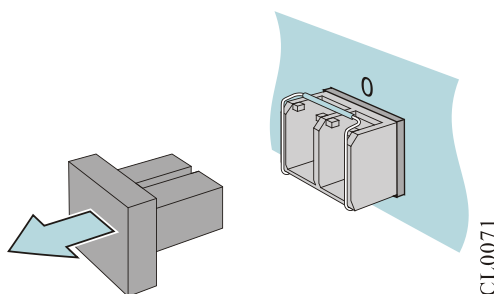


Figure 4-16 Remove the dust cap of the SFP module

- Step 4: Insert the prepared fibers to the ports of the optical module in order.

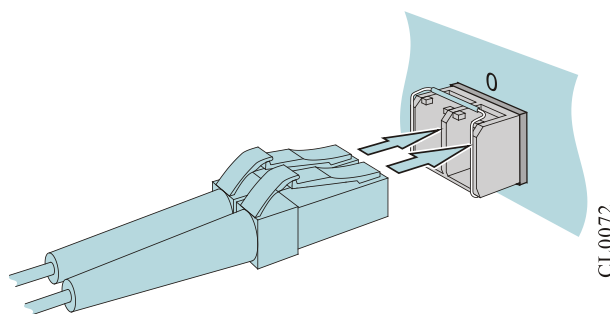


Figure 4-17 Connect the optical fiber

- Step 5: Connect the other side of the fiber to the peer router.

! Caution

- ❖ If the optical interface is not inserted with the SFP module, cover the dust cap of the optical interface. The dust cap of the optical interface is
-

delivered with the router. The dust cap of the optical interface is installed, as shown in Figure 4-18.

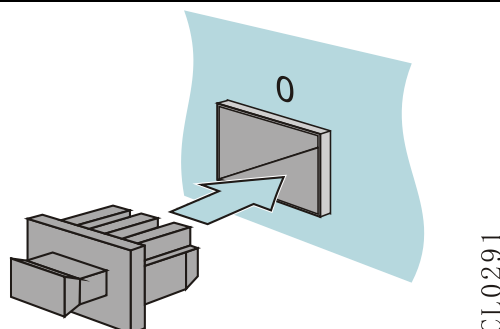


Figure 4-18 Install the dust cap of the optical interface

4.3 Hardware Management

This section describes various hardware management functions of the QSR-3920 series router. With the function interfaces, the user can conveniently view the software and hardware version information of the QSR-3920 series router, as well as the work status information of the hardware modules.

Note

- ❖ The printed information involved in this section is just for reference. Actual information will prevail.

4.3.1 View Software and Hardware Version Information of Router

You can use the **show version** command to view the software and hardware version information of QSR-3920 series router, including system serial number, hardware general information, hardware version, CPLD version, Monitor version, software version and other information.

Command: **router#show version**

Display as follows:

```

Operating System Software
QSR-3920-08 (V1) system image file (flash0: /flash/rp39-7.3.2.75(R).pck),
version 7.3.2.75(R) (integrity), Compiled on Sep 29 2017, 08:45:29
Copyright (C) 2014 QTECH LLC. All Rights Reserved.
```

```

QSR-3920-08 (V1) Version Information
System ID           : 08c6b37393e1
Hardware Model      : QSR-3920-08 (V1) with 2048 MBytes SDRAM, 8192
MBytes flash
Hardware Version    : 001 (Hotswap Supported)
MPU CPLD Version    : 103
```

```

Bootloader Version   : 1.0.13
Software Version     : 7.3.2.75(R) (integrity)
Software Image File  : flash0: /flash/rp39-7.3.2.75(R).pck
Compiled             : Sep 29 2017, 08:45:29

```

System Uptime is 0 hour 1 minute 2 seconds

Table 4-2 Key field description of the information displayed via **show version**

Field	Description
System ID	System ID, provided by the device supplier, such as 08c6b37393e1
Hardware Model	The router name and the configured memory and FLASH capacity information
Hardware Version	Hardware version number (support the hot swap)
MPU CPLD Version	Hardware CPLD version information
Software Version	Software version number
Software Image File	Software mirror file name

4.3.2 View Power Module Status Information

You can use the **show system power** command to view the relevant information of the power supply used on the device, including the online information of the power, status information, the swapping times statistics of the power module, and the error times statistics during the swapping process.

Command: **router#show system power**

Display as follows:

```
System Power Information(Power 1 - ONLINE)
```

```

-----
Type:      QSR-M-3920-PWR-AC (V1) [0xf115]
Status:    Normal
Serial No.: B554174272900106
Description:
-----

```

```
STATISTICS:      1 IN, 0 OUT, 0 IERR, 0 OERR
```

```
System Power Information(Power 2 - ONLINE)
```

```
-----
Type:      QSR-M-3920-PWR-AC(V1) [0xf115]
Status:    Normal
Serial No.: B554174272900107
Description:
-----
```

```
STATISTICS:      1 IN, 0 OUT, 0 IERR, 0 OERR
```

Table 4-3 Key field description of the information displayed via **show system power**

Field	Description
Power Name	Power name, such as QSR-M-3920-PWR-AC
Status	Power status, such as Normal
Description	The power description information, provided by the device supplier, example: <NULL> indicates that the description is empty.
Serial No	The serial number of the power, provided by the device supplier, for example: B554174272900106: the serial number of Power 0 B554174272900107: the serial number of Power 1
IN	The physical inserting times of the power supply, for example: 2: Power 0 is inserted twice 1: Power 1 is inserted once
IERR	The error times of physically inserting the power supply, for example: 0: The error times of inserting Power0, Power1 is 0
OUT	The times of physically pulling out the power, for example:

	<p>1: Power 0 is pulled out once 0: Power 1 is pulled out 0 times</p>
OERR	<p>The error times of physically pulling out the power, for example: 0: The error times of inserting Power0, Power1 is 0</p>

4.3.3 View System Environment Temperature Information

You can use the **show environment** command to view the temperature of the main chips on the device card and the air inlet temperature information.

Command: `router#show environment`

Display as follows:

```
Mpu CPU temperature is 42°C
Mpu switch temperature is 33°C
Mpu inlet air temperature is 21°C
```

4.3.4 View Fan Status Information

You can use the **show system fan** command to view the information of the fan used on the QSR-3920 series router, including the fan location information, fan speed, fan work status, swapping times of the fan module, and the error times during swapping.

Command: `router#show system fan`

Display as follows:

```
System FAN Information(Fan 1 - ONLINE)
-----
Status:      Normal
Serial No.:
Description:
Speed Rate:  64%
-----
STATISTICS:      1 IN, 0 OUT, 0 IERR, 0 OERR

System FAN Information(Fan 2 - ONLINE)
-----
Status:      Normal
Serial No.:
Description:
```

Speed Rate: 64%

 STATISTICS: 1 IN, 0 OUT, 0 IERR, 0 OERR

Table 4-4 Key field description of the information displayed via **show system fan**

Field	Description
System FAN Information(Fan 1 - ONLINE)	System fan information (fan 1, the status is online)
Status	Fan status information
Fan-Speed	Fan speed percentage

4.3.5 View Swappable Optical Module Information

You can use the **show optical all** command to view the work parameters of all optical modules used on QSR-3920 series router.

Command: **router#show optical all**

Display as follows:

```
Name          VendorName          LaserWaveLen (nm)  Temperature (C)    Voltage (V)
TxPower (dBm) RxPower (dBm)
-----
 gigabitethernet16  TRIAXON INC.        850                ----              ---
-
 gigabitethernet17  TRIAXON INC.        850                ----              ---
-
-----
```

Table 4-5 Key field description of the information displayed via **show optical all**

Field	Description
Name	The name of the port where the optical module is located
VendorName	The name of the manufacturer of the optical module
LaserWaveLen(nm)	The center wavelength of the sent laser

Temperature(C)	The temperature of the optical module (only for the optical module supporting the DDMI function)
Voltage(V)	The work voltage of the optical module (only for the optical module supporting the DDMI function)
TxPower(dBm)	The sending power of the optical module (only for the optical module supporting the DDMI function)
RxPower(dBm)	The receiving power of the optical module (only for the optical module supporting the DDMI function)

5 TROUBLESHOOTING

5.1 Troubleshooting of Configuration System

After the router is powered on and if the system is normal, the start information is displayed on the configuration terminal. If the configuration system fails, there may be no display or messy code on the configuration terminal.

5.1.1 Troubleshooting about no Display on Terminal

If there is no display information on the configuration terminal after being powered on, check according to the following steps:

- Step 1: Check whether the power system of the router works normally
- Step 2: Check whether the indicator on the front panel of the router works normally.
- Step 3: Check whether the configuration cable is connected to Console port on the front panel of the router.

If no problem is found in the above checks, there may be the following reasons:

1. The serial port connected to the configuration cable is wrong (the actual selected serial port is not consistent with the set serial port of the terminal).
2. The setting of the configuration terminal parameters is wrong (the parameter requirement: set the baud rate as 9600, data bit as 8, parity check as none, stop bit as 1, traffic control as none, and select the terminal emulation as VT100). For details, refer to [4.1.2 Set PC HyperTerminal Parameters](#).
3. There is something wrong with the configuration cable and you can try to change the configuration cable.

5.1.2 Troubleshooting about Messy Code on Terminal

If messy code is displayed on the configuration terminal, maybe the setting of the configuration terminal parameters is wrong (set the baud rate as 9600, data bit as 8, parity check as none, stop bit as 1, traffic control as none, and select the terminal emulation as VT100), and please check correspondingly. For details, refer to [4.1.2 Set PC HyperTerminal Parameters](#).

5.2 Troubleshooting about Fan

There is a fan status indicator on the panel of the QSR-3920 series router, which indicates the work status of the fan. The meaning of the indicator is shown in the following table.

Table 5-1 Meanings of fan indicator on the panel of the fan module of QSR-3920

Indicator Name	Indicator Color	Status
FAN	Green	on: indicates that the fan works normally.

		Off: indicates that the fan works abnormally.
--	--	---

When the fan indicator on the panel of the QSR-3920 series router is off, it indicates that the system fan fails. View whether the fans rotate to confirm the faulty fan. Troubleshoot the faults according to the following steps.

- Step 1: Check whether the power works normally.
- Step 2: Check whether the air outlet and inlet of the chassis are blocked. If yes, clean the air outlet and inlet to ensure the air passage is smooth.
- Step 3: Check that the fan module is installed in place. You can unplug the fan module and reinsert it to see if the fan module panel indicator returns to normal.
- Step 4: If possible, try replacing the fan module to see if the replaced fan module works properly. If yes, the original fan module is damaged.

If the fault remains after all the preceding steps, contact the agent or the local technical support engineer.

5.3 Troubleshooting about Power

When the PWR indicator on the front panel of the router is off, it indicates that the power module of the device is faulty. Troubleshoot the faults according to the following steps:

- Step 1: Check and ensure that the power supply system connected by the router and the voltage are normal.
- Step 2: Check the connection of the power cable on the power slot of the router. Re-swap the power cable and confirm whether the power cable is loose.
- Step 3: Replace the power cable connected to the router, and then check whether the power status LED recovers to normal. If yes, you can confirm that the original power cable has been damaged; if no, please contact the agent or local technical service engineer for handling.

5.4 Get Technical Support

If the fault remains via the above contents of the chapter, please contact the agent or local technical engineers in time. Before you contact the customer service, please prepare the following information, which is convenient for the customer service staff to help you solve the problem.

1. The arrival time of the router
2. The serial number of the chassis (labeled on the chassis)
3. Software version number (it can be viewed via **show version** in the command line view)
4. Maintenance agreement or warranty card

5. Simple description of the fault problem
6. Simple introduction of the taken troubleshooting steps

You can contact the customer service via the customer service hotline and you can also search for help via the website or email.

Customer service: +7 (495) 797-33-11 * 555

Website: <http://www.qtech.ru>

E-mail: support@qtech.ru

6 ROUTER MAINTENANCE

6.1 Change Module

Note

- ❖ The QSR-3920 series router supports five types of board cards, 3ESP card, MIFC card, fan card, LX9 card and MX9 card.
 - ❖ The MIFC card does not support hot swap.
-

6.1.1 Change Power Module

Preparations before changing

- Step 1: Wear the anti-static wrist, and make sure the anti-static wrist is reliably grounded.
- Step 2: Turn off the power switch of the AC power module to be removed (the switch is set to the "off" state).
- Step 3: Unplug the power cable from the AC power module.

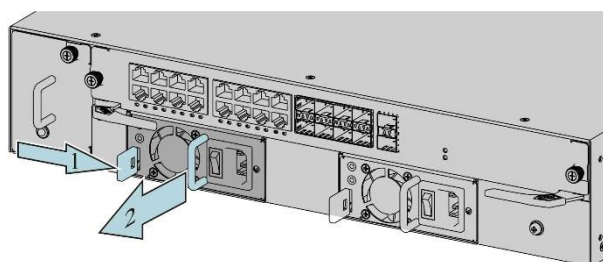
Caution

- ❖ When moving the power module, please hold the bottom of the module parts by hand, and do not carry the module handle.
 - ❖ The power module supports hot swap and can be replaced during operation. Please ensure safety.
 - ❖ Do not touch any terminal marked with live line or possibly live line to avoid the risk of electric shock.
-

Change Power Module

The process of replacing the AC power module of QSR-3920 chassis is as follows:

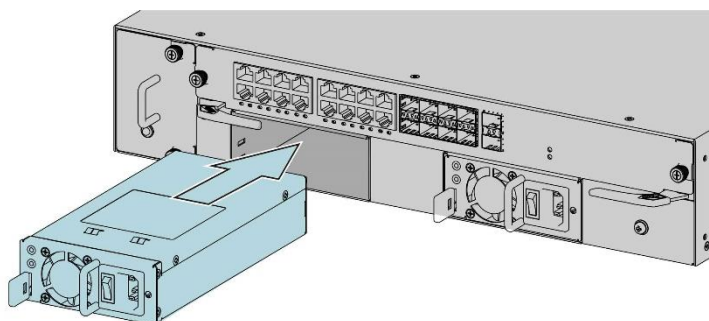
- Step 1: Wear anti-static wrist, first press the limit switch as shown in the left figure below, and then pull out the power module as shown in the right figure below.



CL0924

Figure 6-1 Press the limit switch and pull out the power module

- Step 2: Put the removed power module on the anti-static mat or in the packaging box.
- Step 3: Slowly and horizontally push the other power module along the guide slot until the limit buckle does not fall off from the chassis. As shown in the figure below:

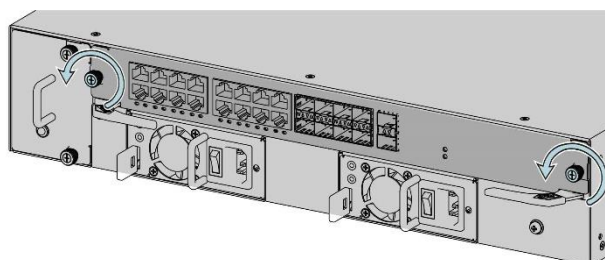


CL0925

Figure 6-2 Insert the power module

6.1.2 3ESP Card

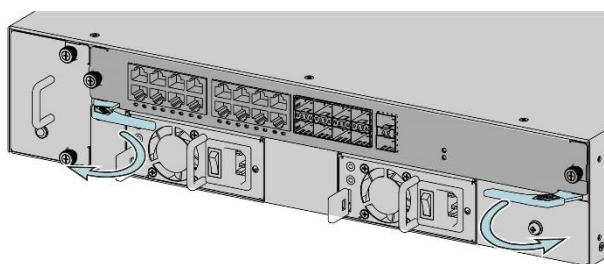
- Step 1: Wear an antistatic wrist, and use a cross screwdriver to unscrew the screws on both sides of the 3ESP card to be replaced.



CL0926

Figure 6-3 Pull out the 3ESP card 1

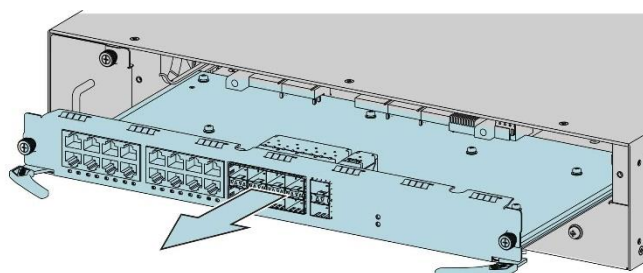
- Step 2: Hold the puller on the 3ESP card with both hands and turn the puller outward to separate the 3ESP card from the chassis backplane. The figure below shows the diagram of pulling out the 3ESP card:



CL0927

Figure 6-4 Pull out the 3ESP card 2

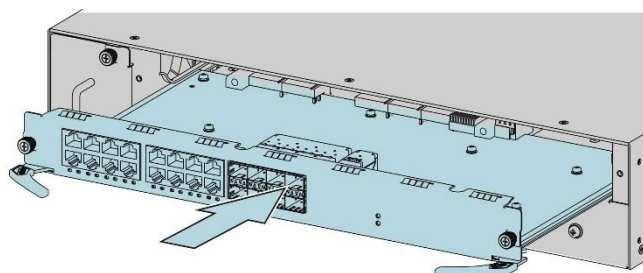
Step 3: Slide smoothly along the slot guide, pull out the 3ESP card, and place the unloaded 3ESP card on the anti-static mat or in the packaging box.



CL0928

Figure 6-5 Pull out the 3ESP card 3

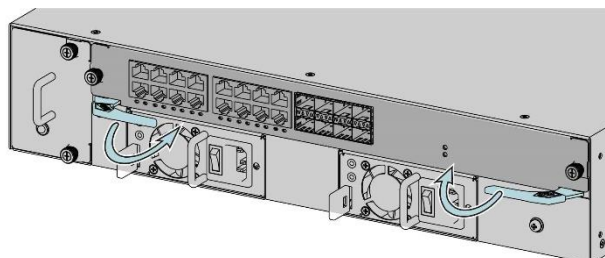
Step 4: Rotate the puller on both sides of the 3ESP card to be installed outwards, then hold the board with both hands and insert it smoothly along the slot guide rail.



CL0929

Figure 6-6 Insert 3ESP 1

Step 5: Close the puller inward, so that the back end of the 3ESP card is in close contact with the backplane. The following figure is the diagram of installing the 3ESP card:



CL0930

Figure 6-7 Install the 3ESP card 2

Step 6: Manually screw in the screws on both sides of the 3ESP card, and then tighten the screws with a screwdriver to fix the 3ESP card.

6.1.3 Change MX9/LX9 Interface Card

The MX9/LX9 interface card supports hot-swap. There are two ways to replace the interface card:

Mode 1: turn off the router, then pull out and install the interface card.

Mode 2: when the router is powered on, install the interface card, which can be directly inserted into the router frame. However, when replacing the interface card, it should be noted that when unplugging the interface card, you need to input the command of **hotswap lpu x out** (x represents slot number, such as 1, 2, 3, 4, 5, 6, 7, 8) or press the hot swap button on the interface card for 3 seconds, then release it to trigger the software unloading of the interface card, and then unplug the card after the indicator stops flashing and goes out.

Caution

- ❖ Only QSR-LX9-M-24GETS board card on QSR-3920 router has the hot-swap button.
-

The following describes the method of replacing the interface card when the router is powered on (the method of replacing the interface card when the router is powered off is similar to the replacement of the 3ESP card, which will not be described in detail here).

Step 1: Wear the anti-static wrist, press the HOT SWAP button on the interface card panel with the tip object for 3 seconds, then release it, and wait for the indicator to stop flashing and go out before the next operation;

Or input the **hotswap lpu x out** (x stands for slot number, such as 1, 2, 3, 4, 5, 6) command, input "Y" according to the prompt, and wait for the indicator to stop flashing and go out before the next operation;

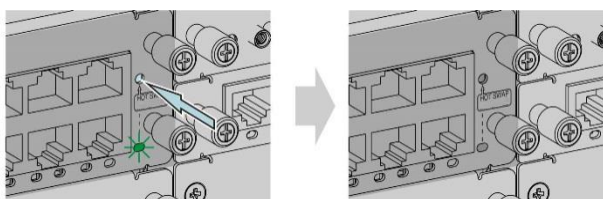


Figure 6-8 HOT SWAP button

Step 2: Use a cross screwdriver to loosen the screws on the interface card to be replaced. Grasp the screws with both hands and pull them outwards to make the interface card separate from the frame panel.

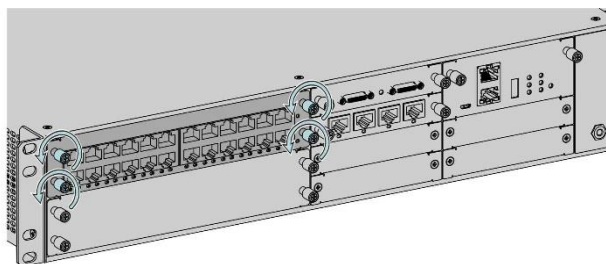


Figure 6-9 Uninstall the interface card

- Step 3: Slide smoothly along the slot guide and pull out the interface card.
- Step 4: Place the unloaded interface card on the anti-static mat or in the packaging box.
- Step 5: Insert the new interface card smoothly along the slot guide rail. When the distance between the interface card panel and the frame panel is about 1cm, and there is obvious obstruction, gently push the interface card panel by hand to make the interface card panel and the frame panel fit.

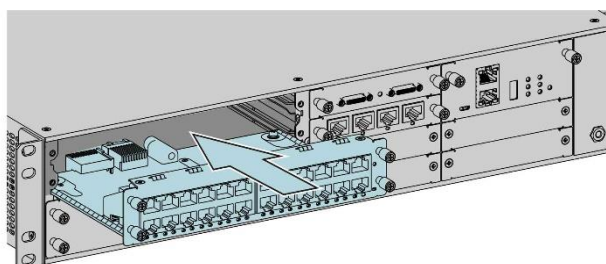


Figure 6-10 Insert the interface card

- Step 6: Tighten the screws on the interface card with a cross screwdriver to fix the interface card.

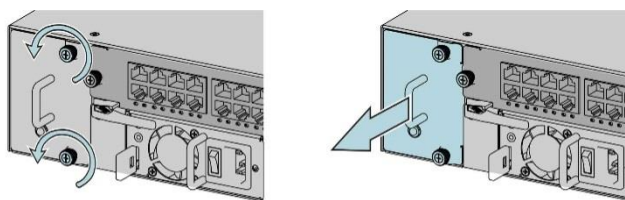
6.1.4 Change Fan Module

Caution

- ❖ Do not touch any exposed wires, terminals and dangerous voltage marks in the product, so as to avoid injury to human body.
- ❖ The fan module supports hot-swap. If the fan module is replaced under the working state of the router, the replaced fan module shall not be pulled out of the chassis until the fan stops running. At the same time, considering the possibility that the fan is still running, it is forbidden to put the hands into the fan module to avoid injury.
- ❖ Before replacement, please prepare a new fan module in advance, and install a new fan module immediately after unplugging the fan module in the working state of the router to ensure the normal use of the router.

The fan module of QSR-3920 series router only contains one integral fan module. The replacement steps are as follows:

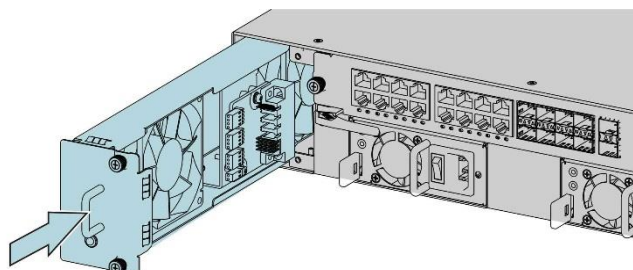
- Step 1: Wear an anti-static wrist, and use a cross screwdriver to loosen the upper and lower screws of the fan module.
- Step 2: Drag the fan with the left hand, hold the handle with the right hand, pull out the fan module smoothly along the slot guide rail, and put the uninstalled fan module on the anti-static mat or in the packaging box. The diagram of uninstalling the fan module is as follows:



CL0934

Figure 6-11 Uninstall the fan module

- Step 3: Insert the fan module to be installed smoothly into the fan module slot along the slot guide, so that the fan module is in close contact with the chassis backplane.
- Step 4: Tighten the upper and lower screws of the fan module panel.



CL0935

Figure 6-12 Insert the fan module to the chassis

6.2 Change Swappable Optical Module

QSR-3920 series router supports the SFP module. The following describes how to change the SFP module.

Warning

- ❖ When installing or uninstalling the SFP module, do not use the hands to touch the gold-finger part of the SFP module directly.
- ❖ Do not directly stare at the fiber connection holes of the optical module when the fiber is pulled down, but the optical module is not pulled out.

- Step 1: Wear the anti-static wrist and pull out the fiber connected to the SFP module.
- Step 2: Pull the handle of the SFP module down to the horizontal position, and then pull out the SFP module, as shown in the following figure.

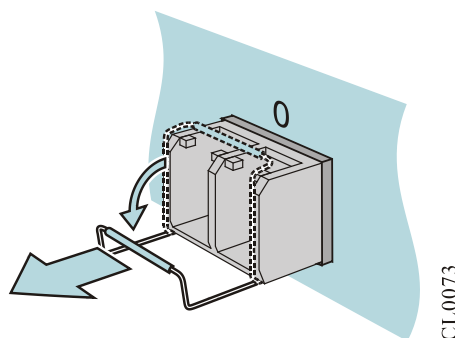


Figure 6-13 Uninstall the SFP module

- Step 3: Fit the removed SFP module with the dust cap and put it in the anti-static bag or packaging box, as shown in the following figure.

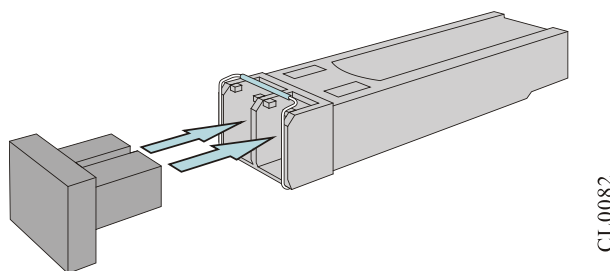


Figure 6-14 Install the dust cap of the SFP module

- Step 4: Up-turn the handle of the installed SFP module to the vertical position to lock the buckle at the top of the module. Use the hands to hold the two sides of the SFP module and push it into the SFP slot horizontally until the SFP module closely-contacts the slot (you can feel that the shrapnel at the bottom and top of the SFP module locks the SFP slot), as shown in the following figure.

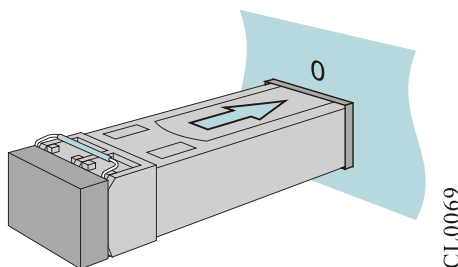


Figure 6-15 Install the SFP module

- Step 5: Remove the dust cap of the SFP module, as shown in the following figure.

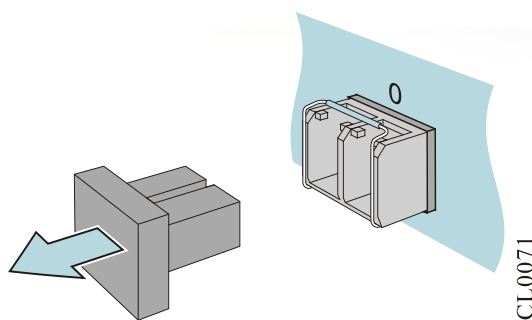


Figure 6-16 Uninstall the dust cap of the SFP module

Step 5: Insert the fibers into the SFP ports in order, as shown in the following figure.

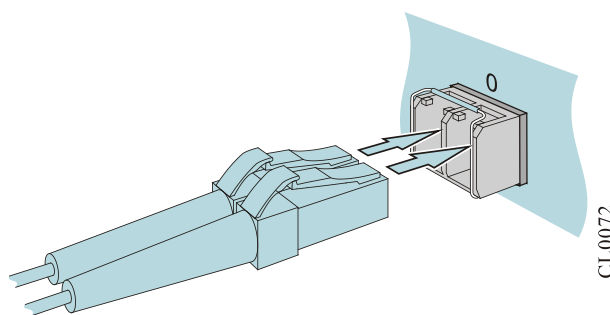


Figure 6-17 The SFP connection fiber

 **Note**

- ❖ It is suggested not to insert the SFP module with the fiber into the slot directly. Please first pull out the fiber and then install.
-

6.3 De-dust the Router

This section describes how to de-dust the QSR-3920 series router.

 **Note**

- ❖ The de-dusting mainly refers to the air inlet, outlet, swappable board card, and pigtail of the router.
-

 **Warning**

- ❖ All de-dusting must be operated based on the anti-static requirements. For example, the staff must wear the anti-static overalls, anti-static wrist, and anti-wrist gloves if they'll work on the workbench.
-

-
- ❖ The de-dusting tool and cleaning agent are selected based on a certain standard. Otherwise, the board of the router will be severely damaged.
-

6.3.1 De-dust the Fan Module

A fan is an important part of the router, which provides motive power of heat dissipation and ventilation for the router. During the router operation, the fan vanes in the fan module will absorb the dust in the around air. When the amount of the dust reaches a certain degree, the dust will affect the stable running of the fan module and will also be the pollution source of other service boards on the router. This further brings the potential danger for the stable running of the router.

To ensure the long-term stable running of the router, the maintenance personnel should de-dust the fan of the router regularly, once one year recommended. The related steps are as follows:

Note

- ❖ Before operation, please prepare the standby fan module in advance, and install the standby fan module in time after removing the fan module in the working state of the device to ensure the normal operation of the device.
-

- Step 1: Dust removal of the standby fan module: after the maintenance personnel correctly wear anti-static wrist or gloves, clean the fan blades, control circuit board and other parts of the standby fan module with clean cotton gauze, anti-static brush, vacuum cleaner and other cleaning tools, and the fan module after dust removal shall be free of dust attachment.
- Step 2: Replace the fan module to be dedusted. Refer to "6.1 Change board card" for specific operation steps. The replacement process of the whole fan module needs to be timely. Otherwise, the temperature of the chassis will be too high, which will seriously threaten the safe and stable operation of the device.
- Step 3: The replaced and dedusted fan module will be used as the standby fan module.

6.3.2 De-dust the Board Card

Caution

- ❖ To reduce the maintenance risks, de-dust the board card of the router in the period with small traffic volumes.
-

During the router operation, due to the charged board card and cross ventilation in the router dissipation, the board card will inevitably absorb and accumulate the charged particle or dust in the air. When the air cleanliness is weaker and the relative humidity is lower, this absorption process is stronger. When the dust accumulates to a certain degree, the heat dissipation rate and electrical insulation performance will be badly affected, which further brings potential dangers for the stable running of the router.

To ensure the long-term stable running of the router, the maintenance personnel should de-dust all the service boards comprehensively and regularly, once for two years recommended.

The de-dusting process is as follows:

- Step 1: Prepare a standby board card for the board card to be de-dusted when the maintenance personnel de-dusts the board card.
- Step 2: Replace the board card to be de-dusted. For details, refer to [6.1 Change Board Card](#).
- Step 3: Dedust the replaced board card.

Caution

- ❖ There are many methods to de-dust the board card. However, the overall principle is that the physical and electrical specifications of the board card cannot be damaged.
 - ❖ When using a vacuum cleaner, use a clean and dry anti-static soft brush to gently remove the dust on the surface of the board card and meanwhile use the suction nozzle of the vacuum cleaner to aim at the anti-static brush, which achieves the brushing and absorbing the dust at the same time. But this method cannot de-dust thoroughly and cannot effectively remove the noxious gas attached on the surface of the board card.
 - ❖ When using the cleaning agent, use anhydrous, non-corrosive, non-conductive, and high-volatile cleaning agent dedicated for the circuit board to de-dust the board card, IPA (isopropyl alcohol) for example. The advantage of using cleaning agent is thorough and can effectively remove the harmful particles attached on the surface of the board card. This method is characterized with difficult operation and high cost.
-

6.3.3 De-dust Optical Interface and Pigtail Connector

To ensure the long-term stable running of the router, de-dusting the optical interface and pigtail connector of the router is necessary.

The de-dusting process is as follows:

- Step 1: Remove the optical fiber connected to the optical interface when cleaning the optical interface.
- Step 2: Use the dedicated cleaning tools and materials when cleaning the optical interface and pigtail connector. These materials can be purchased from the optical fiber or optical cable manufacturer.

Note

- ❖ Use the dust cap to cover the unused optical interfaces on the board and pigtail.
 - ❖ For the optical interface in using, use a dust cap to cover the optical interface and the pigtail connector connected by the optical interface when the pigtail requires to be removed. In this way, on the one hand, the invisible laser sent by the laser maser can be prevented radiating human eyes. On the other hand, the dustproof function is available to avoid the loss of the optical interface contaminated with dust or pigtail connector being increased.
-

Caution

- ❖ Before de-dusting the optical interface, remove the corresponding board card at first and ensure that the normal deployment of the system service will not be affected.
 - ❖ For the high-power laser interface, use the cleaning tool and material for cleaning.
 - ❖ For the small-power optical interface, use the clean and dry anti-static soft rush to remove the dust on the surface of the optical interface if the dedicated cleaning tool and material cannot be obtained.
-

Warning

- ❖ The laser on sent by the laser maser on the optical interface is invisible infrared light. When the laser directly radiates the human eyes, it may cause permanent injury for the human eyes.
 - ❖ It is forbidden to use any unapproved cleaning tools or materials to clean the optical interface or the pigtail connector.
-

7 APPENDIX

A Entire Router and Common Module Specifications

A1 Power Consumption/Dimension/Weight

Appendix Table A-1 Power consumption/dimension

Model	Power Consumption	Dimension
QSR-3920-08	Single power 250W (when the whole device is fully loaded with boards, it is recommended to configure N + 1 power redundancy backup)	442mm x 365mm x 88.6mm (W×D×H)

Appendix Table A-2 The weight of the frame/board card

Model	Weight (kg)
QSR-3920-08	8.58 kg (including fan card, excluding power supply and inserted cards)
QSR-M-3920-3ESP3	1.52kg
QSR-M-3920-3ESP5	1.8kg
QSR-M-3920-3ESP10	1.81kg
QSR-LX9-M-24GETS	0.72kg
QSR-M-3920-FAN	0.74kg
QSR-M-3920-PWR-AC	1.08kg
QSR-MX9-M-2SA(V2)	0.14kg
QSR-MX9-M-1SA(V2)	0.12kg
QSR-MX9-M-1CE1(V2)	0.12kg
QSR-MX9-M-1E1(V2)	0.12kg

QSR-MX9-M-4CE1(V2)	0.14kg
QSR-MX9-M-4E1(V3)	0.14kg
QSR-MX9-M-4GET(V1)	0.13kg
QSR-MX9-M-1GE(V1)	0.13kg
QSR-MX9-M-1P-OC3(V2)	0.12kg
QSR-MX9-M-4GEF(V1)	0.13kg
QSR-MX9-M-4G-LTES(V1)	0.18kg
QSR-MX9-M-4G-LTE(V1)	0.18kg
QSR-MX9-M-4G-LTE-A(V1)	0.18kg

Appendix Table A-3 The power consumption of the board card

Model	Power Consumption (W)
QSR-M-3920-3ESP3	31W
QSR-M-3920-3ESP5	57W
QSR-M-3920-3ESP10	57W
QSR-LX9-M-24GETS	17W
QSR-M-3920-FAN	5W
QSR-MX9-M-2SA(V2)	6W
QSR-MX9-M-1SA(V2)	3W
QSR-MX9-M-1CE1(V2)	4W
QSR-MX9-M-1E1(V2)	4W
QSR-MX9-M-4CE1(V2)	4W
QSR-MX9-M-4E1(V3)	4W
QSR-MX9-M-4GET(V1)	4W

QSR-MX9-M-1GE(V1)	3W
QSR-MX9-M-1P-OC3(V2)	4W
QSR-MX9-M-4GEF(V1)	5W
QSR-MX9-M-4G-LTES(V1)	2W
QSR-MX9-M-4G-LTE(V1)	2W
QSR-MX9-M-4G-LTE-A(V1)	2W

A2 Specifications of 3ESP Card

3ESP card is the most important and necessary board card in QSR-3920, which is used for packet forwarding and control processing (QSR-3920-08 has and can only be configured with one).

A2.1 QSR-M-3920-3ESP3

The diagram of the QSR-M-3920-3ESP3 panel:



Appendix Figure A-1 QSR-M-3920-3ESP3 panel

Note

- ❖ QSR-M-3920-3ESP3 supports 2COMBO+1GEF, only used for QSR-3920-08 (V1).

The meanings of the QSR-M-3920-3ESP3 indicators are as follows:

Appendix Table A-4 The meanings of the QSR-M-3920-3ESP3 indicators

Name	Indicator Color	Status Description
ID	Green	Flashing: device selected Off: device not selected
STA	Green	Slowly flashing: indicates that the board is in normal operation state, 0.5Hz.

		Flashing quickly: indicates that the board is in IOS loading state, 5Hz.
LINK/ACT 0~2	Green	Off: interface not connected On: the interface connected, but there is no data received and sent Flashing: the interface connected, and there is data received and sent

A2.2 QSR-M-3920-3ESP5

The diagram of the QSR-M-3920-3ESP5 panel:



Appendix Figure A-2 QSR-M-3920-3ESP5 panel

Note

- ❖ QSR-M-3920-3ESP5 supports 16GET+8GEF, only used for QSR-3920-08 (V1).

The meanings of the QSR-M-3920-3ESP5 indicators are as follows:

Appendix Table A-5 The meanings of the QSR-M-3920-3ESP5 indicators

Name	Indicator Color	Status Description
ID	Green	Flashing: device selected Off: device not selected
STA	Green	Slowly flashing: indicates that the board is in normal operation state, 0.5Hz. Flashing quickly: indicates that the board is in IOS loading state, 5Hz.
LINK/ACT 0~23	Green	Off: interface not connected On: the interface connected, but there is no data received and sent

		Flashing: the interface connected, and there is data received and sent
--	--	--

A2.3 QSR-M-3920-3ESP10

The diagram of the QSR-M-3920-3ESP10 panel:



Appendix Figure A-3 QSR-M-3920-3ESP10 panel

Note

- ❖ QSR-M-3920-3ESP10 supports 16GET+8GEF+2XGEF, only used for QSR-3920-08 (V1).

The meanings of the QSR-M-3920-3ESP10 indicators are as follows:

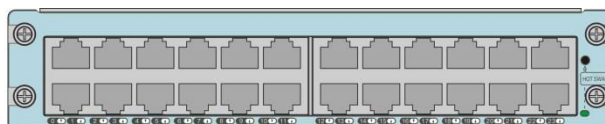
Appendix TableA-6 The meanings of the QSR-M-3920-3ESP10 indicators

Name	Indicator Color	Status Description
ID	Green	Flashing: device selected Off: device not selected
STA	Green	Slowly flashing: indicates that the board is in normal operation state, 0.5Hz. Flashing quickly: indicates that the board is in IOS loading state, 5Hz.
LINK/ACT 0~23	Green	Off: interface not connected On: the interface connected, but there is no data received and sent Flashing: the interface connected, and there is data received and sent

A3 Specifications of QSR-M-3920-3ESP Interface Card

A3.1 QSR-LX9-M-24GETS

QSR-LX9-M-24GETS interface card supports 24 10/100/1000M Ethernet ports, and the panel figure is as follows:



CL0936

Appendix Figure A-4 QSR-LX9-M-24GETS panel

The interfaces of QSR-LX9-M-24GETS interface daughter card are described as follows:

Appendix Table A-7 The interfaces of QSR-LX9-M-24GETS interface daughter card

Interface Name	Description
HOT SWAP button	Hot-swap button
0~23	10/100/1000M Ethernet port

The meanings of the indicators on QSR-LX9-M-24GETS interface daughter card are described as follows:

Appendix Table A-8 The meanings of the indicators on QSR-LX9-M-24GETS interface daughter card

Name	Indicator Color	Status Description
HOT SWAP indicator	Green	Off: board not loaded On: Board loaded successfully Flashing: board loading/unloading
LINK/ACT 0~23	Green	Off: Link interface not connected On: Link interface connected Flashing: Link interface has data sent and received

Note

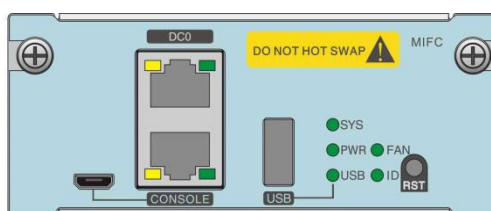
- ❖ There are two types of port indicators: ▲ and ▼, ▼ indicates the status of the lower 0, 2, 4... and other even port, ▲ indicates the status of the upper 1,3,5 ... and other odd ports.

A4 Specifications of MIFC Card

A4.1 QSR-3920-MIFC

QSR-3920-MIFC is a management interface card for QSR-3920-08. The interfaces, such as CONSOLE, DC0, and USB of 3ESP card are led out from the front panel to facilitate the management and debugging of the system in the single master mode.

The diagram of the QSR-3920-MIFC panel:



CL0940

Appendix Figure A-5 QSR-3920-MIFC panel

QSR-3920-MIFC interfaces are described as follows:

Appendix Table A-9 QSR-3920-MIFC interfaces

Interface Name	Description
DC0	Network management interface, one RJ45 interface, 10M/100M/1000M Ethernet interface, supporting auto crossing of data sending and receiving, only used as network management
CONSOLE	Configuration port: One RJ45 interface, asyn serial port, default baud rate: 9600bps; One micro USB console interface; Multiplexing mode, auto switching, RJ45 interface preferred.
Micro USB	Configuration port, one Micro USB interface
USB	One U-disk slot
RST	Reset key (press for 3s, and the device restarts)

The meanings of the indicators on the QSR-3920-MIFC panel are as follows:

Appendix Table A-10 The meanings of the indicators on the QSR-3920-MIFC panel

Name	Indicator Color	Status Description
SYS	Green	On: indicates that the board is powered on, but the software is not running Off: indicates that the board is not powered on, or the board is powered on, but the operation is abnormal Slowly flashing: indicates that the board is in normal operation state (0.5Hz) Quickly flashing: indicates that the board is in loading state (5Hz)
PWR	Green	On: at least one power module of the whole device is in place and working normally Off: the power module of the whole device has an alarm
USB	Green	Off: no U disk inserted On: with U disk inserted Flashing: there is data reading and writing on the U disk (it is strictly prohibited to pull out the U disk at this time. Otherwise, the data file in the card will be damaged)
FAN	Green	On: fan module works normally Off: fan module works abnormally
ID	Green	Flashing: device selected Off: device not selected
CONSOLE indicator	Yellow	Off: The interface has not data sent Flashing: The interface has data sent
	Green	Off: The interface has not data received Flashing: The interface has data received
DC0 port indicator	Yellow	On: The interface rate is 1000M

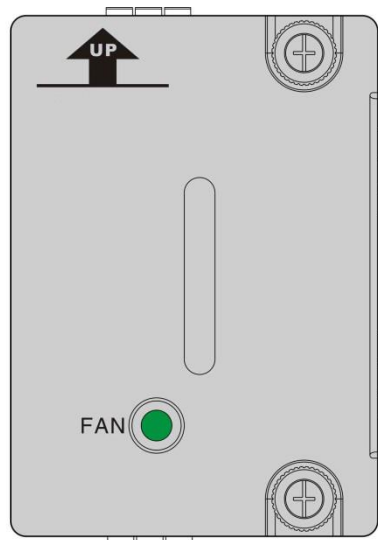
	Green	Off: The interface link is not connected On: The interface link is connected Flashing: The interface has data received and sent
--	-------	---

A5 Specifications of Fan Card

A5.1 QSR-M-3920-FAN

Fan module is an important part to ensure the normal operation of the device system, which provides air flow for system cooling. It is composed of fan frame, fan, fan controller, etc.

The diagram of the QSR-M-3920-FAN panel:



CL0941

Appendix Figure A-6 QSR-M-3920-FAN panel

Note

- ❖ QSR-M-3920-FAN is used for QSR-3920, one is required.

The meanings of the QSR-M-3920-FAN indicators are as follows:

Appendix Table A-11 The meanings of the QSR-M-3920-FAN indicators

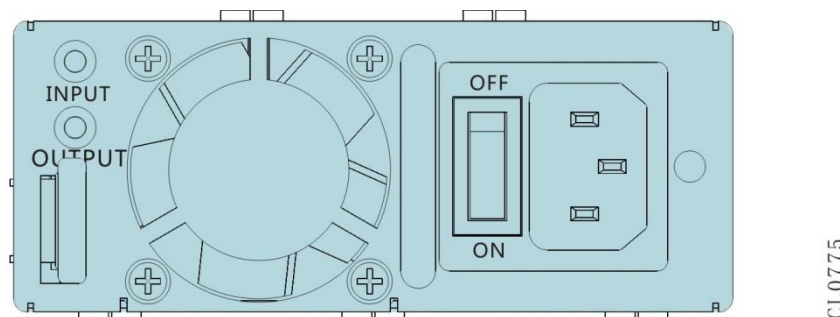
Name	Indicator Color	Status Description
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FAN	Green	Off: The fan works abnormally/does not work On: The fan works normally
-----	-------	---

A6 QSR-M-3920-PWR-AC Power Module

QSR-3920 series routers support two modular power slots and two power modules 1 + 1 redundancy backup. For reliability, it is recommended that customers configure two power supplies of the same model.

The diagram of QSR-M-3920-PWR-AC power module panel is as follows:



Appendix Figure A-7 QSR-M-3920-PWR-AC power module panel

The meanings of the indicators on the QSR-M-3920-PWR-AC power module are as follows:

Appendix Table A-12 The indicators of the QSR-M-3920-PWR-AC power module

Name	Indicator Color	Status Description
INPUT	Green	The input power is normal
	Red	Abnormal input power supply (undervoltage, overvoltage)
	Off	No power input or poor contact of power cable
OUTPUT	Green	The output is normal
	Red	Output is abnormal (power fan abnormal, output overvoltage, output current limitation, output short circuit, power over-temperature protection)

	Off	No voltage input, poor contact of power cable, power supply damage
--	-----	--

The specifications of the QSR-M-3920-PWR-AC power module are as follows:

Appendix Table A-13 The specifications of the QSR-M-3920-PWR-AC power module

Item	Data
Rated input voltage range	100V AC ~240V AC 50Hz/60Hz
Output voltage	12V
Rated output power	250W

B Specifications of General Interfaces

B1 10GBase-SR/LR/ER-SFP+ Optical Interface Attributes

Appendix Table B-1 10GBase-SR/LR/ER-SFP+

Attribute	Description
Interface Standard	IEEE 802.3ae
Interface type	SFP+
Work modes	10GBASE-ER 10GBASE-LR 10GBASE-SR 10GBASE-EW 10GBASE-LW 10GBASE-SW 10.3125Gbps(LAN mode)
Connector	SFP+
Support SFP+ module type	Support 10GBASE-SR Support 10GBASE-LR Support 10GBASE-ER

Connection cables	Single-mode fiber or multi-mode fiber (LC)
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B2 10Base-T/100Base-TX/1000Base-T-RJ45 Electrical Interface Attributes

Appendix Table B-2 10Base-T/100Base-TX/1000Base-T-RJ45

Attribute	Description
Interface standard	IEEE 802.3, IEEE802.3u, IEEE802.3ab
Connector type	RJ45
Work mode	10Mbps/100Mbps/1000Mbps Half-duplex/full-duplex/auto-negotiation
Maximum transmission distance	100m
Connection cable	Straight-through network cable: C1212-1002 Cross network cable: C1212-1003

B3 1000Base-X-SFP Optical Interface Attributes

Appendix Table B-3 1000Base-X-SFP

Attribute	Description
Interface standard	IEEE 802.3ab
Interface type	SFP
Work mode	1000Mbps full-duplex
Connector	SFP
Supported SFP module type	Gigabit SFP optical module Gigabit SFP BiDi module
Connection cable	Single mode fiber or multimode fiber

B4 USB Interface Attributes

Appendix Table B-4 USB interface attributes

Attribute	Description
Interface standard	USB2.0
Interface type	USB Type-A
Work mode	1.5Mbps, 12Mbps, 480Mbps Host (it can be pulled out after un-installing the USB device via the command)
Cables	no

B5 CONSOLE Port Attributes

Appendix Table B-5 CONSOLE Port attributes

Attribute	Description
Interface standards	Asynchronous EIA/TIA-232
Connector type	RJ45
Baud Rate	2400bps/4800/9600/19200/38400/115200bps Default value: 9600bps
Supported services	Connect the local terminal (such as PC) and run the terminal emulation program on the terminal.

B6 Micro USB Interface Attributes

Appendix Table B-6 Micro USB interface attributes

Attribute	Description
Interface standard	USB2.0
Interface type	Micro usb
Work mode	12Mbps
Cables	Standard USB AM-to-MICRO USB cable:

	C0105-1436
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C Router Running Environment Requirement

C1 Environment Requirement

C1.1 Temperature Requirement

To ensure that the router can work normally, it is recommended to maintain certain temperature in the equipment room. The work temperature requirement is shown in the following table.

Appendix Table C-1 Work temperature requirements

Description	Temperature
Storage environment temperature	-45°C–85°C
Work condition	0°C–45°C

Caution

- ❖ If the temperature is too high, the reliability of the router reduces greatly. The long-time high temperature affects the router life and speeds up the aging of insulation materials.
 - ❖ When the router enters the high-temperature environment from the low-temperature environment and if there is condensed water on the router, be sure to take some measures (such as drying and airing) before the router is powered on, so as to prevent the internal components of the router from short-circuit and being burned.
-

C1.2 Humidity Requirement

To ensure that the router can work normally, it is recommended to maintain certain humidity in the equipment room. The work humidity requirement is shown in the following table.

Appendix Table C-2 Work humidity requirements

Description	Humidity
Work condition	5%–85%, no-condensing
Storage Condition	0%–95%, no-condensing

Caution

- ❖ Measuring points of the working temperature and humidity of QSR-3920 router in the equipment room mean the values measured from the floor above 1.5 m and 0.4 m from the front of the rack when there are no protection boards.
- ❖ If the humidity in the equipment room is too high for long time, it causes the poor insulation and even electricity leak of insulation materials easily. Sometimes, the mechanical performances of materials change and the metal parts are corroded easily, too.
- ❖ If the relative humidity in the equipment room is too low, insulation pads shrink, which causes the fastened screws loose. Meanwhile, in dry environment, static electricity appears easily, which harms the circuits on the router.

C1.3 Cleanliness Requirements

Dust is harmful for the router operation. Dust causes electrostatic absorption, which makes the poor contact of metal connectors. Electrostatic absorption appears especially when the temperature and humidity are lower, which affects the router life and easily causes communication fault. The requirement for the dust content and particle diameter in the equipment room is as shown in the following table.

Appendix Table C-3 Dust requirement for equipment room

Max. diameter (μm)	0.5	1	3	5
Maximum density (tablets/ m^3)	1.4×10^7	7×10^5	2.4×10^5	1.3×10^5

Caution

- ❖ If there is no visible dust on the desk within three days, it meets the cleanliness requirement.

Apart from dust, the router equipment room has the strict requirements for salts, acids, and sulfides contained in the air, because these harmful gases speed up the eroding of metals and the aging of some components.

We should prevent the harmful gases, such as SO₂, H₂S, NO₂, NH₃ and Cl₂, from entering the equipment room. The specific limited values are as shown in the following table.

Appendix Table C-4 Limitations for the harmful gases in the equipment room

Gas	Max. (mg/m ³)
SO ₂	0.2
H ₂ S	0.006
NH ₃	0.05
Cl ₂	0.01

C1.4 Anti-Interference Requirement

The various interference sources no matter from the exterior of the router or from the interior router affect the router through capacitance coupling, inductance coupling, electromagnetic radiation, public impedance (including grounding system) coupling, and lead (such as power cables, signal lines and output lines). Therefore, pay attention to the following items:

Caution

- ❖ Take valid anti-grid disturbance measures for the power system.
 - ❖ The working place of the router had better not be used with the grounding settings of power devices or lightning protection grounding settings and the distance between them had better be as long as possible.
 - ❖ Be away from the strong power radio transmitters, radar transmitter, and high frequency high-current equipment; take electromagnetic shielding methods when necessary.
-

C1.5 Grounding Requirement

The well grounding system is the basis for the router to run stably and reliably, and the important guarantee for lightning protection, anti-interference, and anti-static of the router. The user should provide the well grounding system for the router. The resistance between the router chassis and the ground should be smaller than 1 ohm.

C2 Requirements for Power Supply

C2.1 AC Power Supply Requirement

Caution

- ❖ The low-voltage power supply system should adopt the three-phase five-wire or single-phase three-wire system. The voltage of the low-voltage power supply system is 110V/220V and the frequency is 50Hz/60Hz.
- ❖ It is required to adopt the un-interruptible power, such as UPS (Uninterrupted Power Supply), as the AC backup power supply. The AC backup power and AC power should keep the same phase and the switching time with the AC should be smaller than 10 ms. Otherwise, the router may restart or reset.
- ❖ The AC capacity of the equipment room should consider the work current and faulty current of the router. Ensure that the independent router has the independent AC power distribution protection device. The configuration protection switch should be larger than the protection switch of the post powered device.

The power input range of the router using the AC power is as shown in the following table.

Appendix Table C-5 AC power supply requirement

Item	Index
Input voltage range	100–240V
Input frequency range	50–60Hz

Caution

- ❖ AC wire should adopt the flame-retardant wire. The wire layout should be done according to *Code for fire protection design of tall buildings GB50045-95*. The low-voltage distribution is done according to *Specifications for the design of low-voltage electric power distribution systems GB50045-95*.

C2.2 Suggestions on fundamental AC power supply

Suggestions on fundamental AC power supply include:

- ❖ If the router is directly powered by mains supply, and its power supply voltage exceeds - 10%~5% of the rated voltage, or the voltage range allowed for the router, a voltage regulation device shall be used to meet the requirements.
- ❖ In case the communication load requires uninterruptible or transient-free AC, the UPS or inverter power supply system shall be used.
- ❖ In the case of abnormality of the mains supply, the telecommunication bureau (station) shall equip self-provided electric generator set as self-contained power supply, to guarantee important communication load and important power load. The capacity thereof shall be checked to be not less than 1.5-2 times the total capacity of the AC incessant consumers.

D Router Grounding Specifications and Protection

D1 Router Grounding Specifications

Grounding specifications include general grounding specification, grounding specification for the building of equipment rooms, router grounding specification, communication power grounding specification, signal cable grounding specification, and ground cable laying specification.

D1.1 General Grounding Specifications

The general grounding specification is as shown in the following table.

Appendix Table D-1 General grounding specifications

S/N	Description
1	The grounding design shall be done according to the voltage-sharing and equipotential principle, i.e., the equipotential bonding mode in which the working ground and protection ground (including shielded grounding and distribution frame lightning protection and grounding) share a group of ground body.
2	Protection ground shall be done for the metal parts of the router that normally is not energized.
3	Ground cables shall be guaranteed to have good contact with the protection ground bar in the equipment room.
4	Other equipment shall not be used as a component of electrical connection of ground cables.

D1.2 Grounding Specifications for the Building

Specific requirements of the grounding specification for the building of equipment rooms:

The ground resistance of comprehensive communication buildings shall not be greater than 1Ω , and that of general telecommunication bureaus (stations) shall be less than 5Ω (or relaxed to 10Ω in areas with high soil resistivity).

D1.3 Router Grounding Specifications

The router grounding specification is as shown in the following table.

Appendix Table D-2 Router grounding specification

S/N	Description
1	The router protection ground (PGND) shall be short-circuited nearby to the protection grounding cooper bar provided by the user, with the short-

	circuiting cable of the yellow/green plastic insulated copper conducting wire above 35mm ² .
2	If the router is installed in the cabinet, the metal parts of the router cabinet must be guaranteed to have good conductivity, and the connections of various metal parts of the cabinet are prohibited from spraying insulation paint.
3	When cabinets of the same type are combined, the grounding busbars (if any) of adjacent cabinets shall be interconnected via busbar short-circuiting cable with cross-sectional area of 6mm ² and length of not more than 300mm. Both ends of such cable shall be separately connected to the grounding busbar terminals of adjacent cabinets, tightened and fixed.

D1.4 Grounding Specifications for Communication Power

The grounding specification of the communication power is as shown in the following table.

Appendix Table D-3 Grounding specifications for communication power

S/N	Description
1	The AC power supply system of telecommunications rooms shall adopt the TN-S power supply mode.
2	The entrance for the AC power cable to enter the room shall be equipped with an AC surge protector (Class C) with nominal discharge current of not less than 20KA.
3	The communication power protection ground shall share a group of ground body with the communication equipment protection ground, and when the communication power and communication equipment are in the same room, they shall share the protection ground bar in the same room.
4	The AC power port shall be added the lightning protection circuit.
5	The positive terminal of -48V DC power shall be grounded at the output of the DC power.
6	The working ground and protection ground of DC power shall share a same group of ground body with the protection ground of communication equipment, and when the communication power and communication equipment are in the same room, they shall share the protection ground bar in the same room.

7	The DC power shall be added the protection circuit against surge.
---	---

D1.5 Laying Specifications of Signal Cable

The laying specifications of the signal cable are shown in the following table:

Appendix Table D-4 The laying specifications of the signal cable

No.	Description
1	If the router has a digital relay line directly or indirectly connected to the base station of the wireless communication router, the E1 lightning arrester should be installed on the corresponding interface of the router.
2	The metal outer sheath cable should be adopted outdoors. Both sides of the metal outer sheath should be grounded reliably and connected to the protection ground bar in the equipment room. When the cable enters indoors, a signal lightning arrester should be added to the corresponding interface of the router with the PGND cable of the signal lightning arrester as short as possible.
3	The outer conductor of the coaxial cable and both sides of the shielded cable must be electrically well connected to the outside surface of the metal enclosure of the connector router.

D1.6 Laying Specifications of Ground Wires

The laying specifications of the ground wire are as shown in the following table.

Appendix Table D-5 Laying specifications of ground wire

No.	Description
1	Ground lead should not be intertwined or parallel with the signal line.
2	Grounding cable cannot be led aerially, but should be buried in the earth or routed indoor.
3	On the protection ground wire, prohibit installing the connectors; prohibit installing the switch or fuse.
4	The protection ground wire should adopt the yellow and green plastic insulated copper-core lead.

5	The neutral line of the AC power cable in the equipment room cannot be connected with the protection ground of the communication routers in the equipment room.
6	The length of the protection ground wire should not exceed 45 m, but should be as short as possible. When exceeding 45m, it is required that the consumer re-sets the ground bar nearby.

D2 Router Protection

This section mainly describes the precautions for the lightning protection of the router during installation.

D2.1 General Requirement of Lightning Protection Wires

The router cables can be divided to indoor cables and outdoor cables according to the location of connecting the terminal. They have different requirements for the wiring in the lightning protection design.

Caution

- ❖ Communication connection cable should be routed indoors, which can effectively reduce the damage rate of the induction lightning of the router. The Ethernet cable is the interconnection line of the indoor signal and should not be led aerially outdoors.
-

The general requirements for the wiring of the indoor cables:

- ❖ The cable installation is required to be routed by category, avoiding that the cables of different categories are bundled together.
- ❖ It is recommended that the cable is bundled with one cable clip every 100 mm, to organize and fix the cables.
- ❖ The ground wire should be as short and thick as possible. The connection of the ground wire and grounding bar needs to use the screw to tighten or welding and preservative treatment.

The general requirements for the wiring of the outdoor cables:

- ❖ If the actual conditions cannot meet the indoor wiring, the outdoor cables should be laid and buried (introduced to the indoor from the underground).
- ❖ If you cannot lay and bury all outdoor cables, the aerial cables should be dressed with the metal pipes 15m before entering the indoor. The two sides of the metal pipe are grounded and we should install the signal arrester at the corresponding interface of the router after the cable enters the indoor.

- ❖ If using the shielded cable, ensure that the shielded layer well contacts with the metal shell of the router at the router interface. We should install the signal arrester at the corresponding interface of the router after the cable enters the indoor.
- ❖ When the outdoor cable without any protection is connected to the router, we should install the signal arrester at the corresponding interface.
- ❖ When laying the fibers, it is required that the wiring is smooth and the bundling is neat. It is required that the internal core wire is grounded before the outdoor fiber enters the indoor. The fiber cannot be stretched or bundled too tightly.

D2.2 Installation Method of Cable Wiring

Installation Method of Power Cable

One end of the power cable is connected to the router and the other end is connected to the power strip or lightning protection bar. The excessive part is folded to the shape of S and fixed in the chassis. Keep a distance of more than 20cm with other cables.

Installation Method of Cables

The signal cables should be installed and bundled by indoor and outdoor, drawn from the outlet holes of different chassis to the user terminal or cascading router.

Precautions for Using Fiber

Caution

- ❖ When using the fiber to connect the network router, first confirm whether the type of the optical connector and the fiber type conform to the used optical port type.
 - ❖ Before connecting the fiber, first confirm that the optical power of the receiving end does not exceed the upper threshold of the receiving optical power of the optical module. Otherwise, it may burn the optical module.
 - ❖ If the optical interface is not connected to the optical connector, please be sure to wear a dust cap.
 - ❖ If the optical interface is not connected to the optical connector and the dust cap is opened, maybe some invisible rays emitted from the optical interface, so you do not directly look at the optical interface.
 - ❖ The fiber connector should have the safe and reliable packaging and the connector should wear the dust cap. When not using, the fiber connector should wear the dust cap, avoiding scratching the insert core of the fiber connector, and affecting the performance index. If the dust cap is too loose or polluted, change it in time.
 - ❖ Before connection, we should use the dust-free paper to soak the anhydrous alcohol and wipe the insert core of the fiber connector. You can wipe in one direction only and you also need to wipe the surface of the peer fiber connector.
-

- ❖ When connecting, you cannot twist or bend the fiber. After installation, the bent radius of the fiber cannot be smaller than 40 mm (In dynamic bending case, the minimum bend radius is 20 D; in the static bending case, the minimum bend radius is 10 D; D is the fiber sheath diameter).
- ❖ If the fiber needs to pass through the metal board hole when connecting, the metal board hole should have the smooth and fully rounded surface (the rounded radius should be no less than 2 mm). When passing through the metal board hole and turning along the sharp edge of the structural part, we should add the protective sleeve or pad.
- ❖ Be careful when plugging the connector and avoid damaging the connector or fracturing the fiber because of too much force. Avoid pulling, pressing, and extruding the fiber. The permitted maximum tensile force and crush force of the fiber are as shown in the following table.

Appendix Table D-6 Permitted force of the fiber

Force Time	Tensile Force (N)	Crush Force (N/100mm)
Short-term force	150	500
Long-term force	80	100

Installation Method of Fiber

After the fiber is drawn out from the optical interface, the fiber directly connected to the photoelectric converter can be coiled to hang in the inner side of the chassis. The fiber cascaded with other routers should slip over the PVC pipe to draw out, avoiding traction and stretching.

Caution

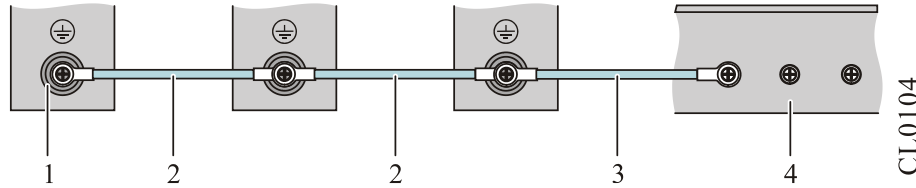
- ❖ Fiber itself does not belong to the conductor, and it does not sense or transduce the over-voltage, but the strengthen core of the fiber optic cable (the armored component installed to prevent the fiber from being affected by the environment event) can easily sense and transduce the lightning overvoltage, so we should treat properly. It is recommended that the user performs the ground protection at the user end of the fiber optic cable.

D2.3 Equipotential Connection Method

Caution

- ❖ The interconnected routers in the same work range need the equipotential connection. For example, the interconnected routers, the metal sheath of the cable, power supply PE line, and the installed metal structure should ensure the equipotential connection.

For the equipotential connection of the interconnected routers, refer to the following figure. After connection, use the multimeter to measure whether each equipotential connection point well contacts and the impedance is low enough.



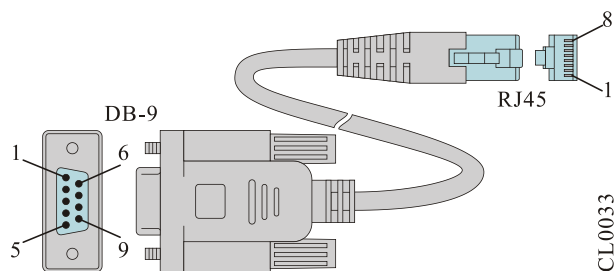
Appendix figure D-1 Diagram of router equipotential connection

1. Router ground terminal	2. Router equipotential connection line
3. Ground protection cable	4. Ground bar

E Cables

E1 Console Cables

Connected to the nine-core serial interface socket of the PC, the console cable of the QSR-3920 series router is an eight-core unshielded cable. The one side of the cable is the crimping RJ-45 crystal plug and the other side is a DB9 (hole). The view of the console cable is shown in the following figure.



Appendix figure E-1 Console cable

The connection relationship of the internal signal of the console cable is shown in the following table.

Appendix Table E-1 Connection relationship of the console cable

RJ-45	Signal	Direction	DB-9
1	RTS	→	8
2	DTR	→	6
3	TXD	→	2
4	GND	---	5
5	NC	---	---
6	RXD	←	3
7	DSR	←	4
8	CTS	←	7
	---	---	1
	---	---	9

E2 GE Ethernet Interface Cable

The GE Ethernet interface cable of the QSR-3920 series router is an eight-core unshielded twisted cable. Port 1 and port 2, port 3 and port 6, port 4 and port 5, and port 7 and port 8 consist of four pairs of bidirectional receiving and transmitting difference cable pairs.

Appendix Table E-2 Connection table of the GE Ethernet RJ45 interface cable

RJ-45	Signal	Direction	RJ-45
1	TD0+	←→	1
2	TD0-	←→	2
3	TD1+	←→	3
6	TD1-	←→	6
4	TD2+	←→	4
5	TD2-	←→	5
7	TD3+	←→	7
8	TD3-	←→	8

F Environmental Substance Statement

Appendix Table F-1 Toxic and hazardous substance name and content

Part Name 1	Toxic and Hazardous Substance or Element					
	Pb	Hg	Cd	Cr(VI)	PBB	PBDE
Printed circuit board component 2	×	0	0	0	0	0
Switch power	×	0	0	0	×	×
Shell/frame (metal)	0	0	0	0	0	0
Chassis mat	0	0	0	0	×	×
Screw	×	0	×	0	0	0
Dust cap (Plastic)	×	×	×	×	×	×

Heat dissipation	O	O	O	O	O	O
Fan	O	O	O	O	O	O
Cable	x	x	x	x	x	x
Lithium battery	O	O	O	O	O	O
Memory	O	O	O	O	O	O

O: It indicates that the content of the toxic and hazardous substance in all homogeneous materials of the component is below the limit requirement in SJ/T11363-2006 standard.

x: It indicates that the content of the toxic and hazardous substance in at least one homogeneous material of the component exceeds the limit requirement in SJ/T11363-2006 standard.

In the environmental protection use period, only strictly complying with the using conditions in the environmental protection use period, the environmental substances or elements contained in the product do not leak or mutate.

The environmental protection use period of the Li battery of the product is 5 years; the environmental protection use period of the other components is 50 years.

For the use conditions of the product in the environmental protection use period, refer to the requirements for the use environment in the product manuals.

Caution

- ❖ In the statement, list all components that may be configured in QTECH products. For the actual components contained in each product, please prevail in kind.
- ❖ PCB components include the printed circuit boards and the formed IC devices and the discrete devices, such as resistors, capacitors, integrated circuits, and connectors.