MAIPU

MP1900X Series Router

Installation Manual

V1.0

迈普通信技术股份有限公司
www.maipu.com

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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 MP1900X 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
MP1900X series router	MP1900X-12-AC(V1)
	MP1900X-22-AC(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)

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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
Italic	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

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The manual matching with the product is as follows:

Manual	Description
MP1900X 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.

Technical Support

- Technical support hotline: 400-65710935 & 400-886-8669
- Email (feedback): support@maipu.com

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	2018-5-25	First issue

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1 Router Introduction

MP1900X series router is a desktop access router independently developed by Maipu, which includes two product models: MP1900X-12-AC and MP1900X-22-AC.

This chapter mainly describes the specifications of MP1900X series router.

1.1 MP1900X-12-AC Appearance and Hardware Structure

The dimension of MP1900X-12-AC is 340mm × 260mm × 44.2mm (W x D x H). The front appearance diagram of MP1900X-12-AC is shown in Figure 1-1, and the rear appearance diagram is shown Figure 1-2.

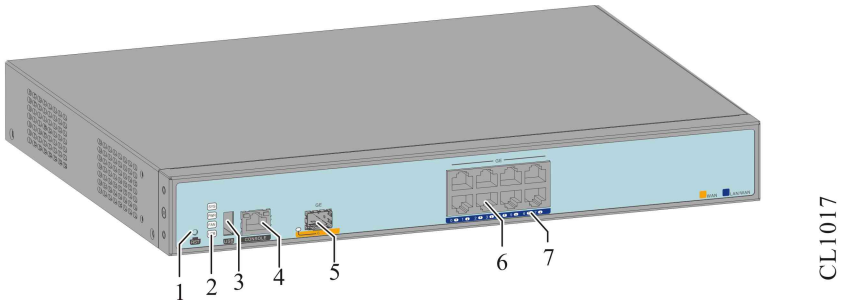

Figure 1-1 The front appearance diagram of MP1900X-12-AC

1. Reset button	2. Function status indicator
3.USB interface	4.RJ45 CONSOLE port
5.1000Base-X SFP Ethernet optical interface	6.1000Base-T Ethernet electrical interface
7. Port status indicator	

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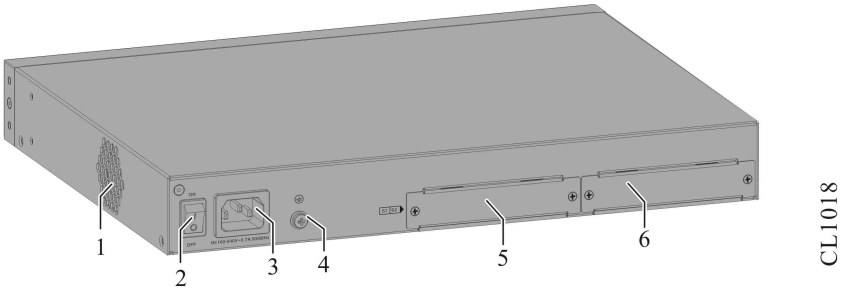

Figure 1-2 The rear appearance diagram of MP1900X-12-AC

1. Fan outlet	2. Power switch
3. Power socket	4. Grounding screw
5.S1 slot of RM2B interface sub card	6.S2 slot of RM2B interface sub card

1.2 MP1900X-22-AC Appearance and Hardware Structure

The dimension of MP1900X-22-AC is 340mm × 260mm × 44.2mm (W x D x H). The front appearance diagram of MP1900X-22-AC is shown in Figure 1-3, and the rear appearance diagram is shown Figure 1-4.

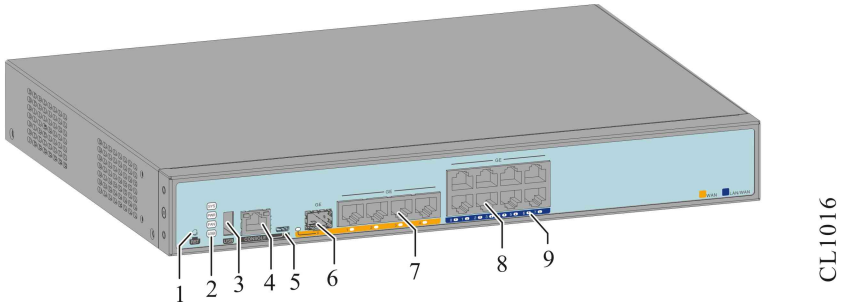

Figure 1-3 The front appearance diagram of MP1900X-22-AC

1. Reset button	2. Function status indicator
3.USB interface	4.RJ45 CONSOLE port
5.USB CONSOLE port	6.1000Base-X SFP Ethernet optical interface
7.1000Base-T Ethernet electrical interface	8.1000Base-T Ethernet electrical interface
9. Port status indicator	

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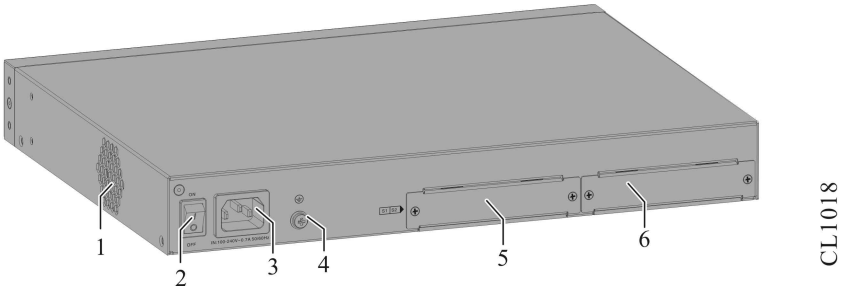

Figure 1-4 The rear appearance diagram of MP1900X-22-AC

1. Fan outlet	2. Power switch
3. Power socket	4. Grounding screw
5.S1 slot of RM2B interface sub card	6.S2 slot of RM2B interface sub card

1.3 Panel Specifications of MP1900X Series Router

The interface description is as shown in the following table:

Table 1-1 Interfaces on the front panel of MP1900X series router

Interface Name	Description
Reset function button	Press it for 3s, and the system restarts and restores the factory setting
USB	One USB interface, USB2.0 standard
CONSOLE	Console port, one RJ45 interface, asyn series port, default baud rate: 9600bps
Micro USB	Console port, one Micro USB interface
GE0~GE4 port	WAN port MP1900X-12-AC: 1 GEF MP1900X-22-AC: 1 GEF +4 GET
GE0/0~ GE0/7 port	LAN port/ WAN port Eight RJ45 interface, 10M/100M/1000M Ethernet port, support auto crossing of data receiving and sending MP1900X-12-AC: eight ports MP1900X-22-AC: eight ports

The meanings of the panel indicators are as follows:

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Table 1-2 The meanings of the panel indicators

Name	Indicator Color	Status Description
SYS	Green	Flash: indicates that the router works properly. Off/On: indicates the router works abnormally.
PWR	Green	on: indicates that the system power status is normal. off: indicates the system power alarm
FAN	Green	on: indicates that the system fan status is normal. off: indicates that the system fan status is alarm
USB	Green	on: indicates that the USB device works properly. off: indicates that no USB device is installed or the USB device is removed. flash: indicates that the USB device is transmitting data.
CONSOLE	RXD: green TXD: yellow	Off: indicates that no data is transmitted over the port. Flash: indicates that data is transmitted over the port.
GE	Green	on: indicates that the port is up. off: indicates that the port is down. Flash: indicates that data is transmitted over the port.

1.4 Air Passage of MP1900X Series Router

The air flow direction of MP1900X series router chassis is left in and right out, and the diagram is as follows:

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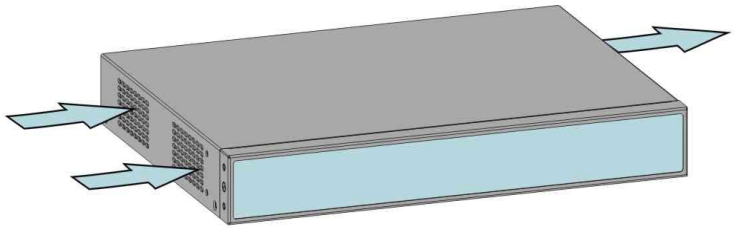

CL1023

Figure 1-5 Air passage of MP1900X series router

Caution

- Keep the air passage of the route unblocked during the operation.
- Avoid placing the device with left outlet adjacently above and below the router.

1.5 Power Module of MP1900X Series Router

The back panel of MP1900X series router provides one power input. MP1900X-12-AC and MP1900X-22-AC are fixed with one power. The power model and function description are as follows:

Table 1-3 Power modules supported by MP1900X

Model	Name	Remarks
AD30-1S005D	30W ACDC power	Output 12V system power

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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 Maipu technical staff to replace.

2.1 Check Router Running Environment

MP1900 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 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 Routing 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.

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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

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wrist is shown in the following figure.

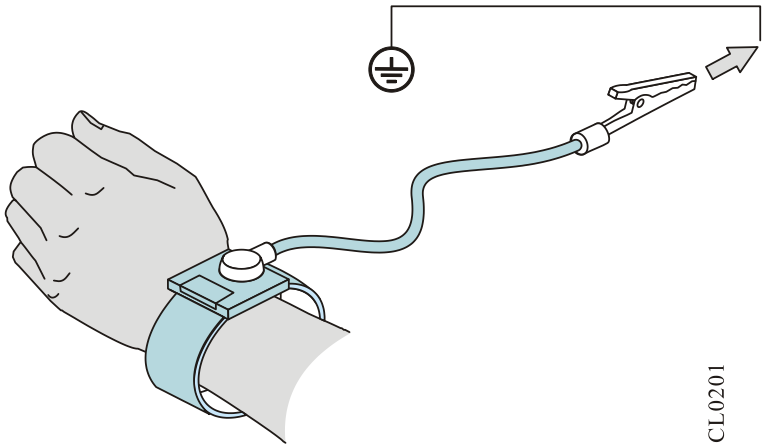

Figure 2-1 Using method of anti-static wrist

2.2.4 Laser Safety

Warning

- For the MP1900X 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 srewdriver
- Slotted screwdriver
- Anti-static wrist
- Paper knife

Cables:

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

Equipment and instruments:

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- Configurable termianl (a common PC or a laptop)
- Multimeter

2.4 Open-Package and Inspection

MP1900X 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.

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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 MP1900X series router to the 19-inch standard cabinet.

Installation Preparations

- MP1900X series router is 1U 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

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section.

Caution

- 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 slid to the bottom cabinet is 2U and three holes on the square hole bar is 1U, as shown in Figure 3-1.

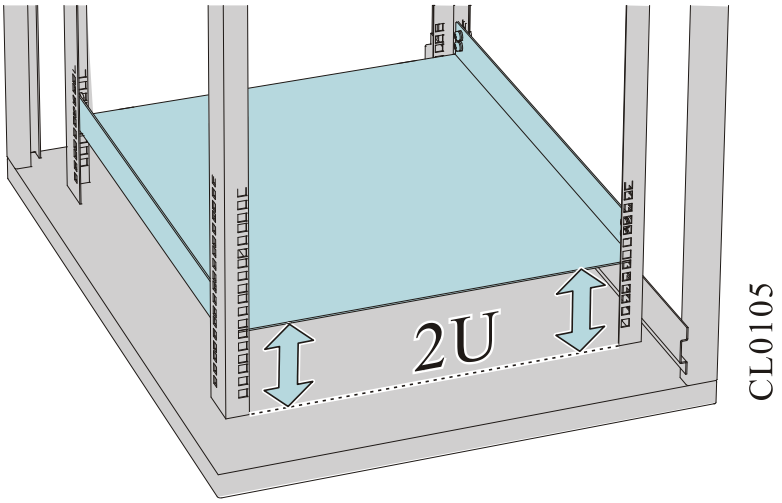

Figure 3-1 The minimum slide height

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

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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.

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

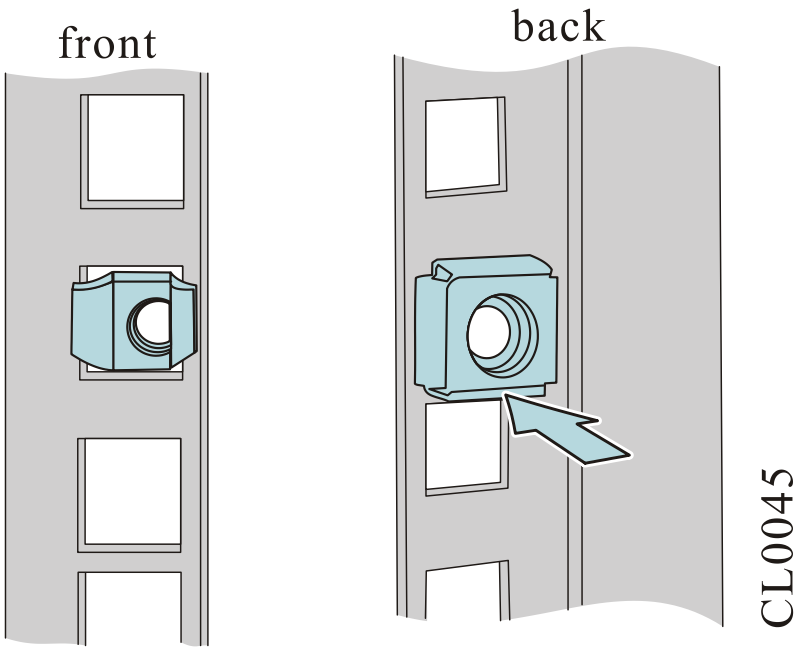

Figure 3-2 Install the floating nut

Install Router to Cabinet

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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 19-inch standard cabinet, as shown in the following figure.

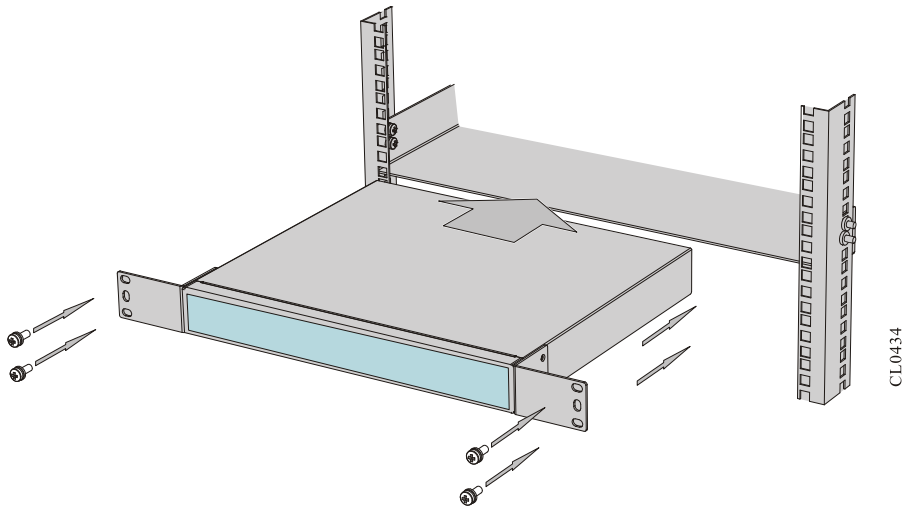

Figure 3-3 Install the router to the 19-inch standard cabinet

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.

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.

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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 than1 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.

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Step 4: Use the same method to install the other side of the ground cable to the grounding terminal of the cabinet.

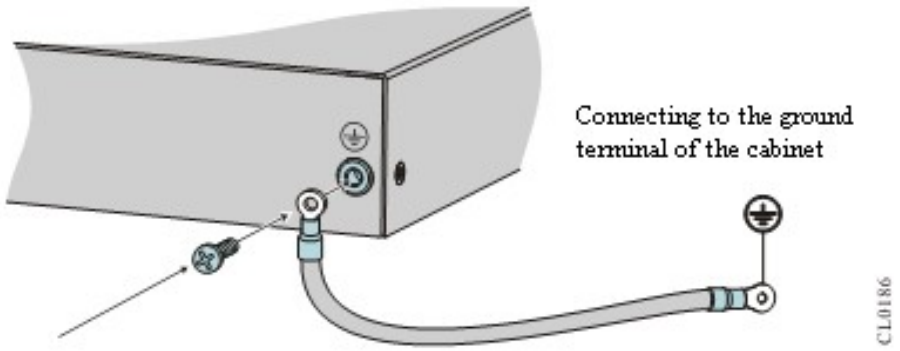

Figure 3-4 Connect the ground cable

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 (Optional) Install SPD

3.3.1 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.

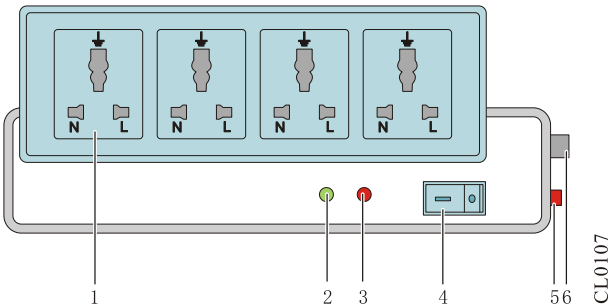

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Figure 3-5 The power SPD

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 overload protector	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.

3.3.2 (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:

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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.

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3.4 Connect Power Cable

3.4.1 Installation Preparations

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

3.4.2 Connect AC Power Cable

Step 1: Insert the AC power cable into the socket of the router power.

Step 2: Insert the AC power cable to the socket providing power for the router.

The AC power cable is connected, as shown in the following figure.

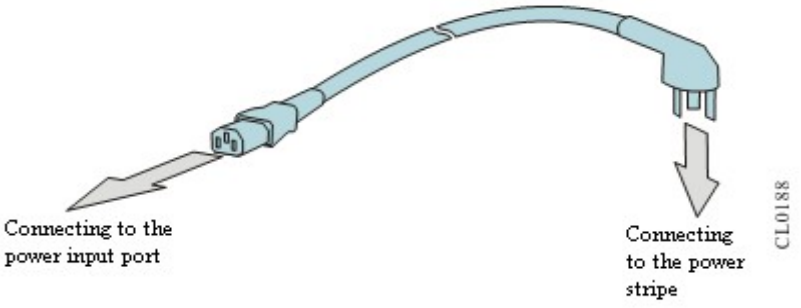

Figure 3-6 Connect to the AC power cable

3.5 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.

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

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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

MP1900X router provides configuration serial port on the front panel. MP1900X-22-AC supports EIA/TIA-232 and Micro USB 2.0 series ports, and MP1900X-12-AC supports EIA/TIA-232 series ports. 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.

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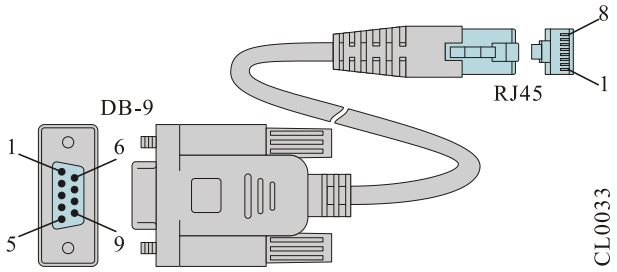

Figure 4-1 Console cable

For details about the inner signal connection of the Console cables, refer to Appendix E1 Console Cable.

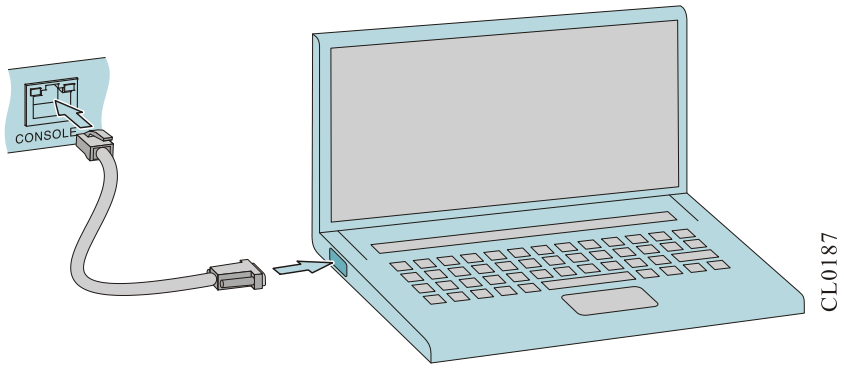

Figure 4-2 Connect the router and PC via the Console port

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 fiugre and click **OK**.

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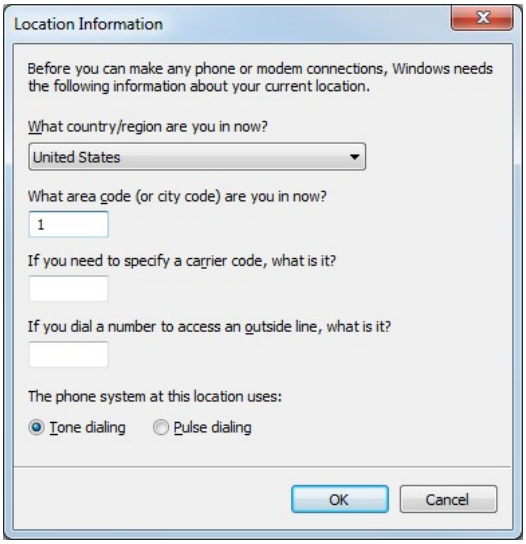

Figure 4-3 "**Location information**" interface

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

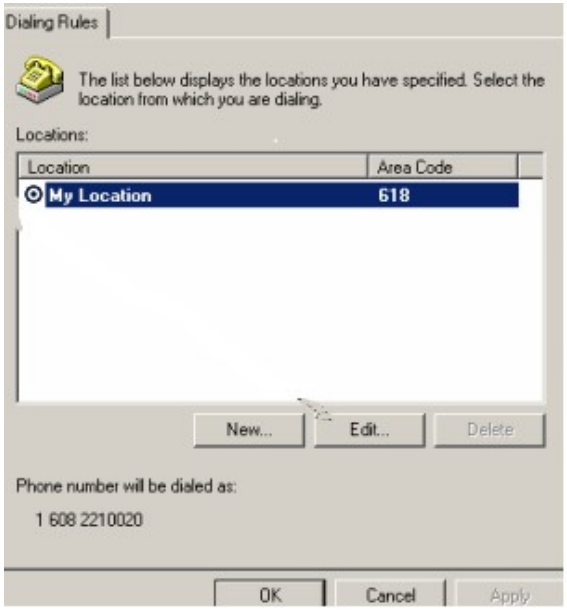

Figure 4-4 The **Telephone and Modem** interface

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

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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**.

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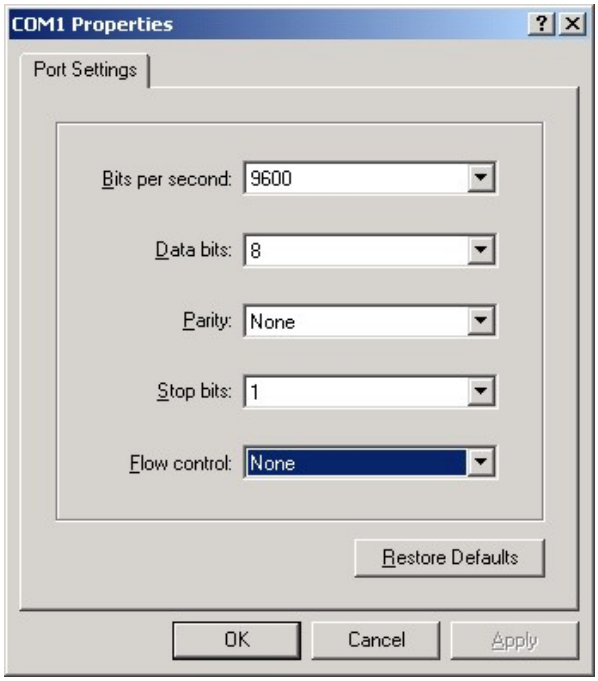

Figure 4-7 "**com* Properties**" interface

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

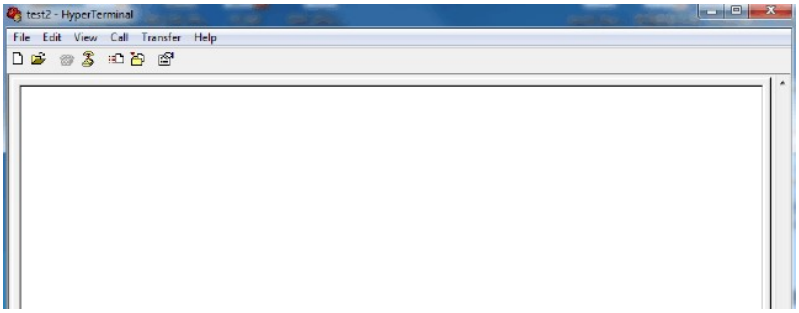

Figure 4-8 "**test-HyperTerminal**" interface

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

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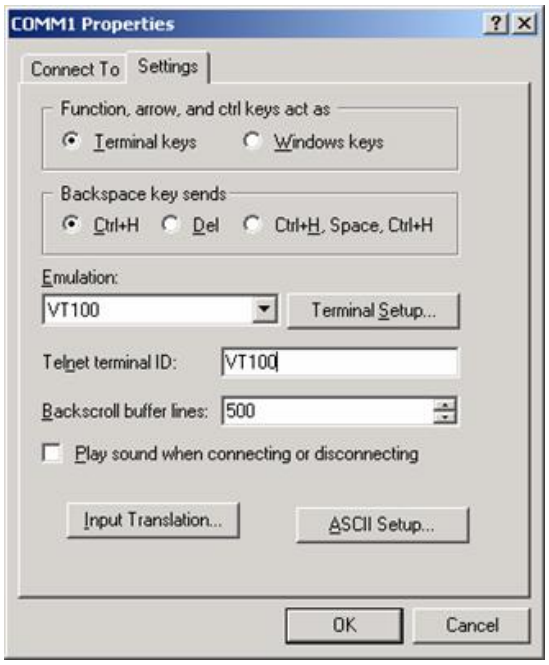

Figure 4-9 "**Test properties**" interface

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.

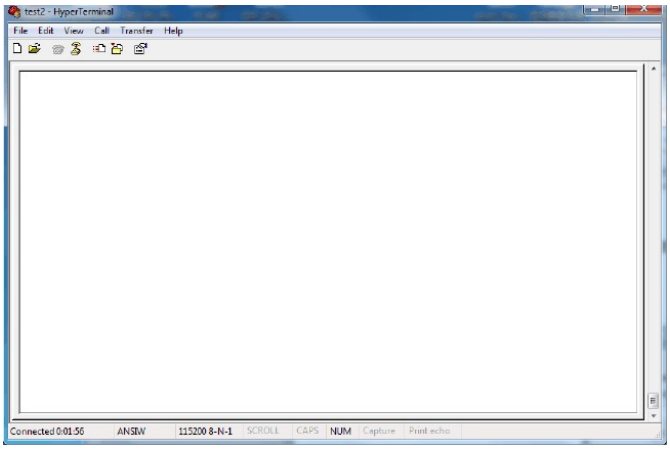

Figure 4-10 **test-Hyperterminal** interface after setting

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

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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.

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

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Indicator Name	Indicator Color	Description
USB	Green	On: The USB device works normally Off: No USB device is inserted or the USB device is removed Flash: The USB device is transmitting data

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.

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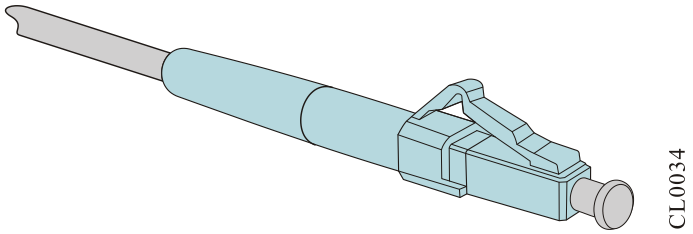

Figure 4-11 Appearance of the LC fiber connector

Install Optical Module

The MP2900 router only 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.

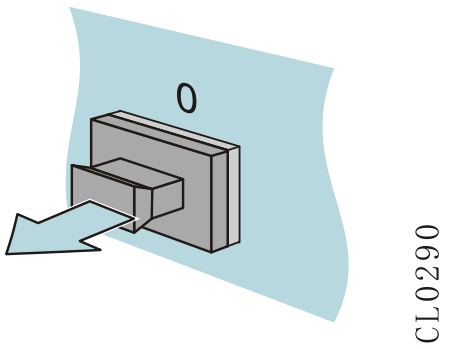

Figure 4-12 Pull out the dust plug

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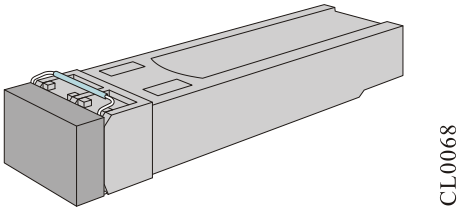

Figure 4-13 SFP module

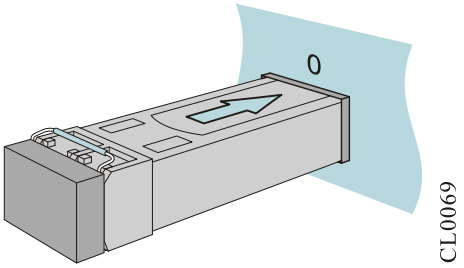

Figure 4-14 Install the SFP module

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.

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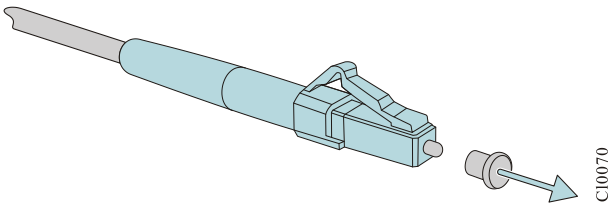

Figure 4-15 Remove the optical dust cap

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

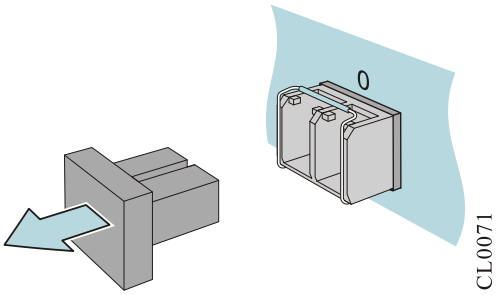

Figure 4-16 Remove the dust cap of the SFP module

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

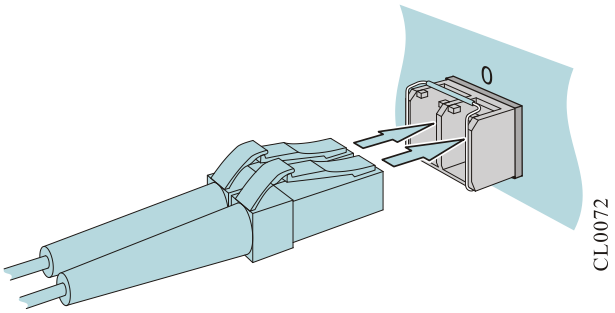

Figure 4-17 Connect the optical fiber

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.

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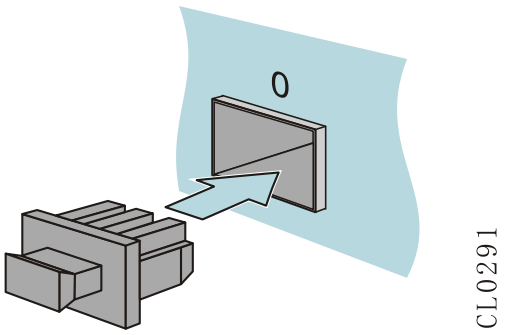

Figure 4-18 Install the dust cap of the optical interface

4.3 Hardware Management

This section describes various hardware management functions of the MP1900X series router. With the function interfaces, the user can conveniently view the software and hardware version information of the MP1900X 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 MP1900X 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:

```
MyPower (R) Operating System Software
MP1900X-22V1 system image file (flash0: /flash/rp43-7.3.0.27(R).pck), version 7.3.0.27(R)(integrity), Compiled
on Mar  6 2018, 17:26:29
Copyright (C) 2014 Maipu Communication Technology Co., Ltd. All Rights Reserved.

MP1900X-22V1 Version Information
        System ID               : 00017a93651b
        Hardware Model          : MP1900X-22(V1) with 1024 MBytes SDRAM, 128 MBytes flash
        Hardware Version        : 002(Hotswap Supported)
        MPU CPLD Version        : 102
        Bootloader Version      : 1.0.0.30
        Software Version        : 7.3.0.27(R)(integrity)
        Software Image File : flash0: /flash/rp43-7.3.0.27(R).pck
        Compiled                : Mar  6 2018, 17:26:29

System Uptime is 0 hour 2 minutes 39 seconds
```


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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 00017a93651b
Hardware Model	The router name and the configured memory and FLASH capacity information
Hardware Version	Hardware version number (does not supporting the hot swapping)
MPU CPLD Version	Hardware CPLD version information
Bootloader Version	Bootloader version number
Software Version	Software version number
Software Image File	Software mirror file name
Compiled	The compiling time of the software mirror file

Note: If the version changes, subject to the actual display.

4.3.2 View Power 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)
 ------------------------------------------------------------------
                        Status:     Normal
                   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
System Power Information(Power 1 -	System power information (power module,

Field	Description
ONLINE)	the status is online)
Status	Power module status
STATISTICS	The swapping times of the power module and the swapping error times statistics, such as 1 IN, 0 IERR, 0 OUT, 0 OERR indicates that the power module is correctly inserted once.

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 59°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 MP1900X 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
               Description:
                Speed Rate:   30%
 ------------------------------------------------------------------
 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
Speed Rate	Fan speed percentage

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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 MP1900X series router.

Command: **router#show optical all**

Display as follows:

```
Name                VendorName          LaserWaveLen(nm)  Temperature(C)   Voltage(V)   TxPower(dBm)
RxPower(dBm)

-------------------------------------------------------------------------------------------------------------------

gigabitethernet0    EOPTOLINK 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)

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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

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PC HyperTerminal Parameters.

5.2 Troubleshooting about Fan

There is a fan status indicator on the panel of the MP1900X 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 MP1900X

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 MP1900X series router is off, it indicates that the system fan is faulty. 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.

If the problem remains after all the preceding operations, 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 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 power cable connection. 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

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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: 400-886-8669

Website: http://www.maipu.com

E-mail: techsupport@maipu.com

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6 Router Maintenance

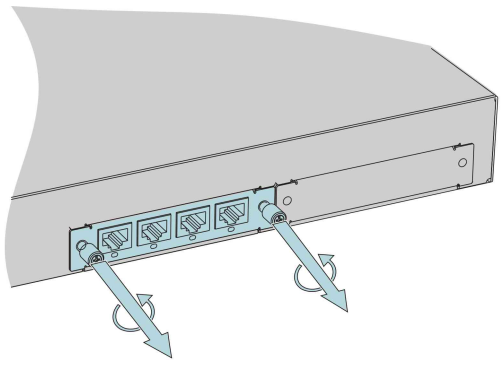
6.1 Change Interface Daughter Card

Note

- The interface daughter card of MP1900X series router is the RM2B card.
- The interface daughter card of MP1900X series router does not support hot-swap.

Step 1: Power off the router.

Step 2: Use a Phillips screwdriver to loosen the captive screws of the interface daughter card. Use two hands to hold the captive screws of the interface daughter card and pull out it to enable the interface daughter card to separate from the inbuilt connector of the router.



CL1019

Figure 6-1 Loosen the captive screw

Step 3: Pull out the interface card along the slot guide smoothly.

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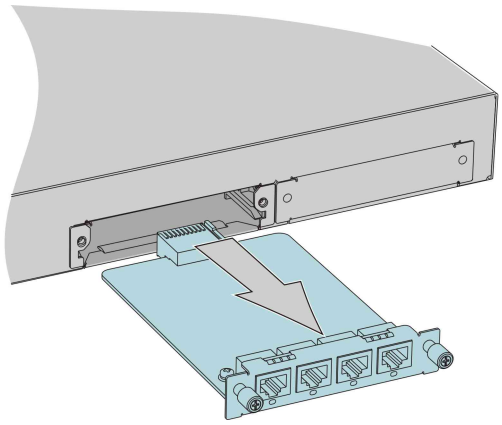

Figure 6-2 Uninstall the interface daughter card

Step 4: Put the uninstalled interface daughter card on the anti-static mat or the initial packaging box.

Step 5: Push a new interface daughter card along the slot guide slowly and horizontally until the panel of the interface daughter card has a distance of about 1cm to the panel of the service card. At this time, you will feel obvious blocking, use your hand to push the panel of the interface daughter card gently to enable the panel of the interface daughter card and the back panel of the router to joint.

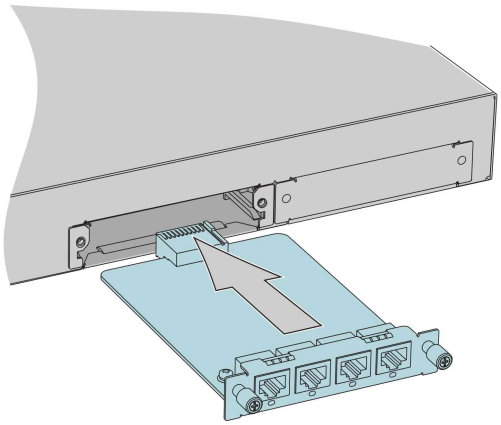

Figure 6-3 Install the interface daughter card

Step 6: Use the Phillips screwdriver to tighten the captive screw on the interface daughter card and fix the interface daughter card.

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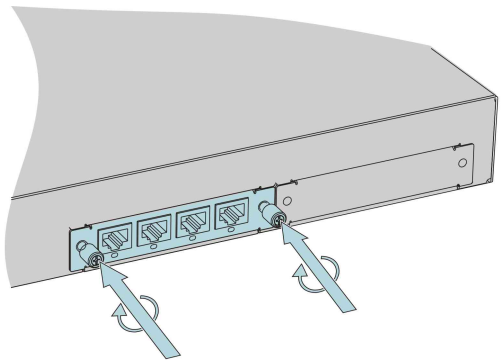

Figure 6-4 Fix the captive screw

6.2 Change Swappable Optical Module

MP1900X series router only 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.

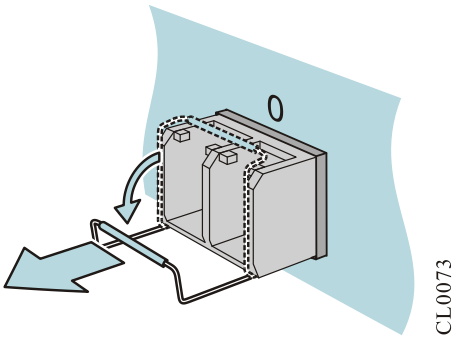

Figure 6-5 Uninstall the SFP module

Step 3: Fit the removed SFP module with the dust cap and put it in the anti-static bag or

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packaging box, as shown in the following figure.

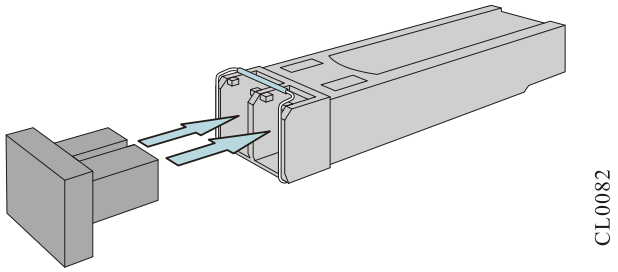

Figure 6-6 Install the dust cap of the SFP module

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.

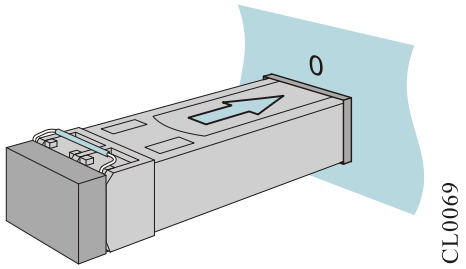

Figure 6-7 Install the SFP module

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

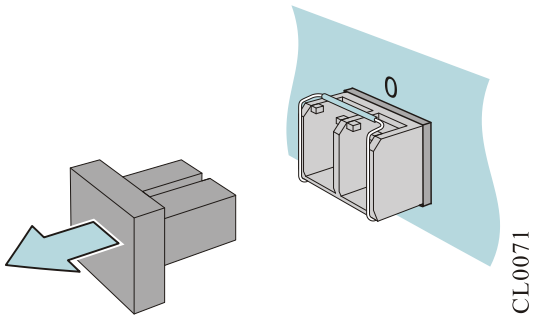

Figure 6-8 Uninstall the dust cap of the SFP module

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

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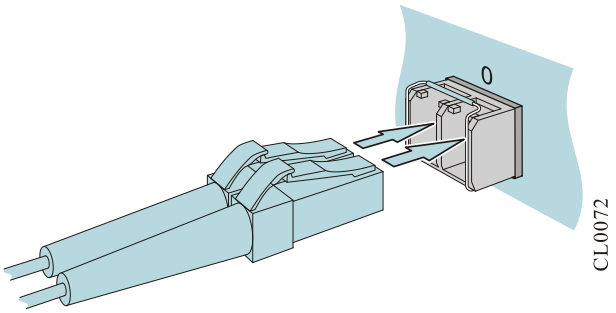

Figure 6-9 The SFP connection fiber

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 MP1900X series router.

Note

- The de-dusting mainly refers to the air inlet, outlet, swappable interface daughter card, and pigtail of the router. The main board can only be maintained by opening the cover, and therefore, it is not included in the de-dusting.

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

A fan is an important part of the router, which provides motive power of heat dissipation

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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. When de-dusting the fan of the router, the maintenance personnel should correctly wear the anti-static wrist or gloves and use the cleaning tools, such as clean cotton yarn, anti-static brush, and vacuum cleaner to de-dust the vanes of the backup fan and the air inlet and outlet of the router.

6.3.2 De-dust the Interface Daughter Card

Caution

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

During the router operation, due to the charged interface daughter card and cross ventilation in the router dissipation, the interface daughter 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 interface daughter card for the interface daughter card to be de-dusted when the maintenance personnel de-dusts the interface daughter card.

Step 2: Replace the interface daughter card to be de-dusted. For details, refer to 6.1 Change Interface Daughter Card.

Step 3: Dedust the replaced interface daughter card.

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Caution

- There are many methods to de-dust the interface daughter card. However, the overall principle is that the physical and electrical specifications of the interface daughter 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 interface daughter 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. De-dusting using a vacuum cleaner is easy to operate and of low cost conserving. But this method cannot de-dust thoroughly and cannot effectively remove the noxious gas attached on the surface of the interface daughter 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 interface daughter 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 interface daughter 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.

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Caution

- Before de-dusting the optical interface, remove the corresponding interface daughter 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.

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Appendix

A Entire Router and Common Module Specifications

A1 Power Consumption/Dimension/Weight

Appendix Table A-1 Power consumption and dimension

Model	Power Consumption	Dimension
MP1900X-12-AC	13W	340mm×260mm×44.2mm (W×D×H)
MP1900X-22-AC	15W	340mm×260mm×44.2mm (W×D×H)

Appendix Table A-2 Router weight

Model	Weight (kg)
MP1900X-12-AC	2.54
MP1900X-22-AC	2.64

B Specifications of General Interfaces

This section describes the attributes of the router interfaces.

B1 10Base-T/100Base-TX/1000Base-T-RJ45 Electrical Interface Attributes

Appendix Table B-1 10Base-T/100Base-TX/1000Base-T-RJ45

Attribute	Description
Interface standard	IEEE 802.3, IEEE802.3u, IEEE802.3ab

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Attribute	Description
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

B2 1000Base-X-SFP Optical Interface Attributes

Appendix Table B-2 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

B3 USB Interface Attributes

Appendix Table B-3 USB interface attributes

Attribute	Description
Interface standard	USB2.0
Interface type	USB Type-A
Work mode	1.5Mbps, 12Mbps, 480Mbps Host

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Attribute	Description
	(it can be pulled out after un-installing the USB device via the command)
Cables	no

B4 CONSOLE Port Attributes

Appendix Table B-4 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.

B5 Micro USB Interface Attributes

Appendix Table B-5 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

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

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following table.

Appendix Table C-1 Work temperature requirements

Description	Temperature
Storage environment temperature	-20°C–70°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%/RH, no-condensing
Storage Condition	0%–95%/RH, no-condensing

Caution

- Measuring points of the working temperature and humidity of MP1900X 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

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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_2S	0.006
NH_3	0.05

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Gas	**Max. (mg/m^3)**
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

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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 abnormity 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.

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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

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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.

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S/N	Description
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 transmission and communication routers in the equipment room.

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No.	Description
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.

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- 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

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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.

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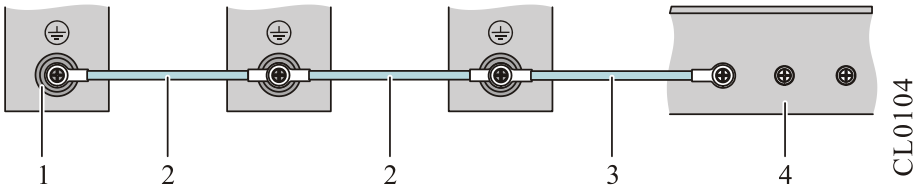
D2.3 Equipotential Connection Method

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

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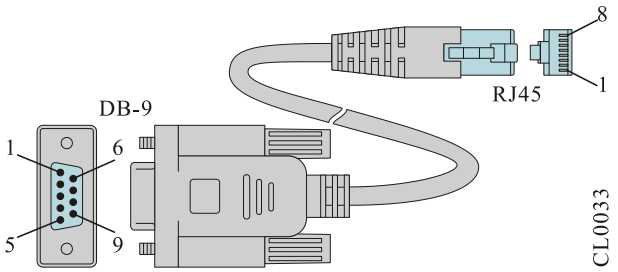
E Cables

E1 Console Cables

Connected to the nine-core serial interface socket of the PC, the console cable of the MP1900X 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

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E2 GE Ethernet Interface Cable

The GE Ethernet interface cable of the MP1900X 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	×	O	O	O	O	O
Switch power	×	O	O	O	×	×
Shell/frame (metal)	O	O	O	O	O	O
Chassis mat	O	O	O	O	×	×
Screw	×	O	×	O	O	O

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Dust cap (Plastic)	×	×	×	×	×	×
Heat dissipation	O	O	O	O	O	O
Fan	O	O	O	O	O	O
Cable	×	×	×	×	×	×
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.

×: 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 Maipu 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.

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