MAIPU

MP1800X Series Router

Installation Manual

V1.0

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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 MP1800X 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
MP1800X series router	MP1800X-40 MP1800X-40W MP1800X-40E MP1800X-50

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

Format	Description
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
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

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
MP1800X 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	2017-6-15	First issue

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Appendix Tables

1 Product Introduction

1.1 Product Appearance and Hardware Structure

MP1800X series router includes MP1800X-40, MP1800X-40W, MP1800X-40E, MP1800X-50, SJW12-4G.

1.1.1 MP1800X-40

MP1800X-40 router supports one console port, one USB interface, five 10M/100M/1000M Ethernet ports, as well as TD-LTE, FDD-LTE, TD-SCDMA, WCDMA, EVDO, CDMA 1x, GSM network. The dual SIM card slots can be switched via the DIP switch. The device adopts the 12V/24W power adapter to provide power.

MP1800X-40 dimension is 145 x 100 x 38mm (W x D x H).

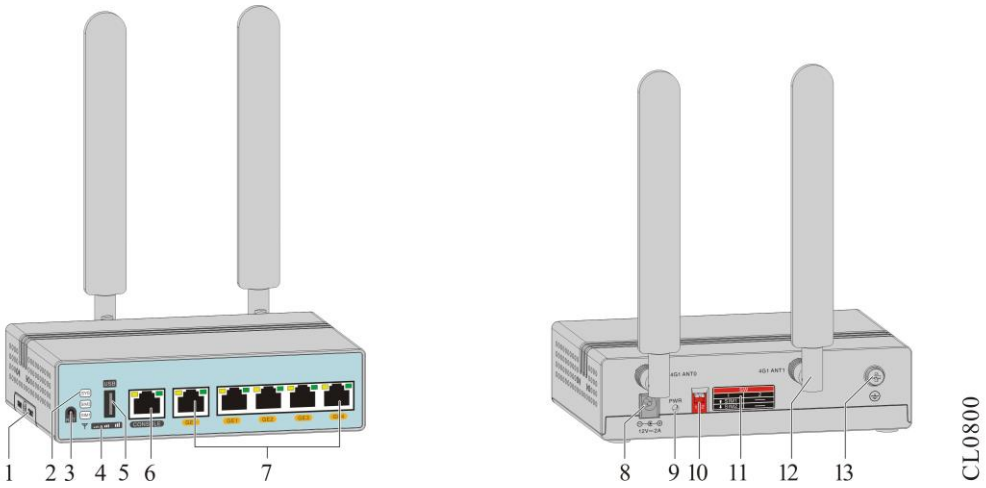


Figure 1-1 MP1800X-40 appearance

1. SIM card slot	2. Function status indicator
3. Reset button	4. Signal indicator
5. USB interface	6. RJ45 CONSOLE port
7. 10/100/1000Base-T Ethernet electrical interface	8. Power interface

9. System power status indicator	10. SIM card DIP switch
11. SMI card switching description	12. 4G antenna
13. Grounding screw	

1.1.2 MP1800X-40W

MP1800X-40W router supports one console port, one USB interface, five 10M/100M/1000M Ethernet ports, supports TD-LTE, FDD-LTE, TD-SCDMA, WCDMA, EVDO, CDMA 1x, and GSM network, and supports WIFI(IEEE 802.11b/g/n). The dual SIM card slots can be switched via the DIP switch. The device adopts the 12V/24W power adapter to provide power.

MP1800X-40W dimension is 145 x 100 x 38mm (W x D x H).

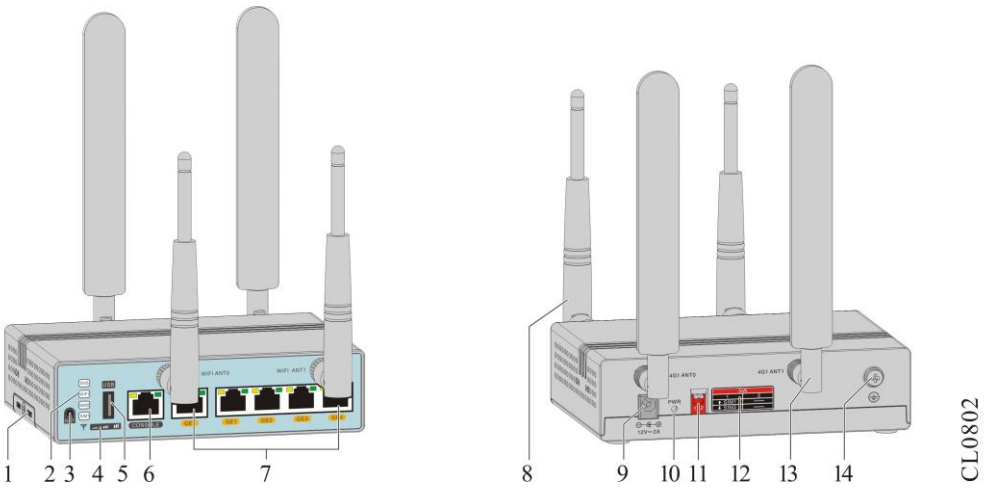


Figure 1-2 MP1800X-40W appearance

1. SIM card slot	2. Function status indicator
3. Reset button	4. Signal indicator
5. USB interface	6. RJ45 CONSOLE port
7. 10/100/1000Base-T Ethernet electrical interface	8. WIFI antenna
9. Power interface	10. System power status indicator
11. SIM card DIP switch	12. SMI card switching description
13. 4G antenna	14. Grounding screw

1.1.3 MP1800X-40E

MP1800X-40E router supports one console port, one USB interface, five 10M/100M/1000M Ethernet ports, supports TD-LTE, FDD-LTE, TD-SCDMA, WCDMA, EVDO, CDMA 1x, and GSM network, and supports dual 4G and dual-card dual-standby . The device adopts the 12V/24W power adapter to provide power.

MP1800X-40E dimension is 145 x 100 x 38mm (W x D x H).

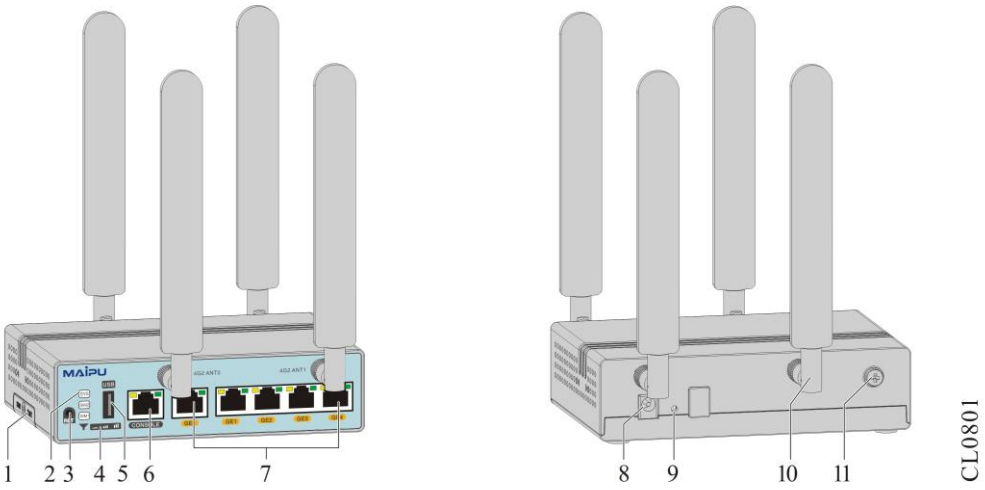


Figure 1-3 MP1800X-40E appearance

1. SIM card slot	2. Function status indicator
3. Reset button	4. Signal indicator
5. USB interface	6. RJ45 CONSOLE port
7. 10/100/1000Base-T Ethernet electrical interface	8. Power interface
9. System power status indicator	10. 4G antenna
11. Grounding screw	

1.1.4 MP1800X-50

MP1800X-50 router supports one console port, one USB interface, five 10M/100M/1000M Ethernet ports.

MP1800X-50 dimension is 260 x 190 x 44.2mm (W x D x H).

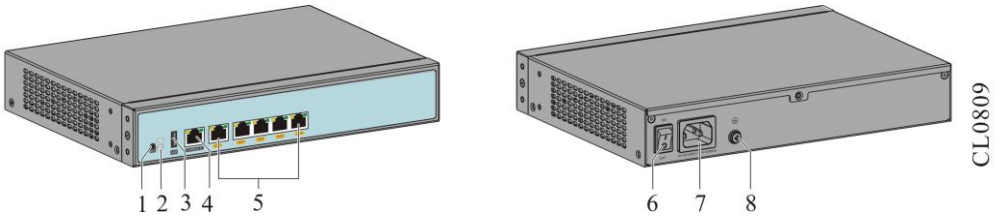


Figure 1-4 MP1800X-50 appearance

1. Reset button	2. Function status indicator
3. USB interface	4. RJ45 CONSOLE port
5. 10/100/1000Base-T Ethernet electrical interface	6. Power switch
7. Power socket	8. Grounding screw

1.2 Power Introduction

MP1800X-40, MP1800X-40W, MP1800X-40E, SJW12-4G adopt the external power adapter AD24-1S0N to provide the power. The output voltage of the power adapter is 12V and the output power is 24W. MP1800X-50 adopts the inbuilt fixed power, and is connected with the external electric power supply.

The appearance of the AD24-1S0N power adapter is as follows:

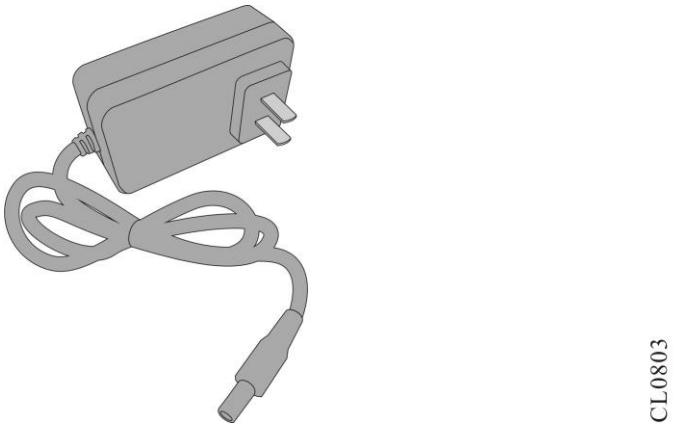


Figure 1-5 Power adapter appearance

2 Installation Preparation

Note:

- The equipment is accompanied with Packing List. Please verify whether the accessories are complete and in good conditions accordingly. In case of any damage or omission, please contact Maipu's technical support without delay to request a replacement.

2.1 Operating Environment Inspection

2.1.1 Machine Room Inspection

For the purpose of a smooth operation, the proper measures shall be in place to maintain the operating conditions of the equipment.

- The AC system shall ensure the temperature and humidity suitable for normal operation. Refer to "Appendix D1 Machine Room Requirements" for details.
- A well grounded equipment can work stably, protect against lightning stroke and interference and satisfy the grounding specifications. Refer to "Appendix E1 Equipment Grounding Specifications" for details.
- Check whether the installation space and handling channel are sufficient.
- Check whether the machine room satisfies the cleanliness requirements. It is forbidden to place the equipment in an environment under decoration works and with high density of dust.

2.1.2 Power System Inspection

A good power system constitutes the basis for energizing and steadily operating the switch. To meet the power supply requirement of MP1800X series router, use AD24-1S0N power adapter to provide power for MP1800X-40, MP1800X-40W, MP1800X-40E, and SJW12-4G. MP1800X-50 can directly adopt the electric power supply.

Therefore, you are requested to inspect the power system of the installation site only, which shall work steadily and satisfy the input mode, rated input voltage and other requirements. Refer to "Appendix D2 Power Conditions and Requirements" for details.

Caution:

- Please refer to "Appendix A Specifications of the Router and Common Modules" for details on the power consumption of the router.

2.2 Safety Precautions

2.2.1 General Safety

Caution:

- The floor of the installation site shall be dry and smooth, with the anti-skid measures in place.
- The equipment shall be clean, dust free and placed in a dry environment.

2.2.2 Electrical Safety

Caution:

- Please carefully check any potential risks within the working area, including power ground, grounding reliability and wet ground.
- Before installation, it is required to know the location of the emergency power switch in the equipment room. In case of an accident, the emergency power switch shall be turned off first.
- Two or more personnel are preferred to conduct the live maintenance.
- When closing the power, check and ensure that the power is turned off.

2.2.3 Static Safety

The anti-static precautions shall be in place to prevent the electronic elements of the router from being damaged by the static electricity.

Caution:

- For safety sake, please check the resistance of the ESD wrist. The resistance between human body and ground shall be 1-10 megohm.

The steps to use the ESD wrist are as follows:

Step 1: Put your hand into the ESD wrist.

Step 2: Pull tightly the lock catch and ensure that the sheet metal of the ESD wrist well contact with your skin.

Step 3: Insert the anti-static wrist into the anti-static wrist jack on the router chassis or clamp the alligator clip of the anti-static wrist to the grounding pole of the router.

Step 4: Ensure that the ESD wrist is well grounded.

Refer to Figure 2-1 for the specific usage of the ESD wrist.

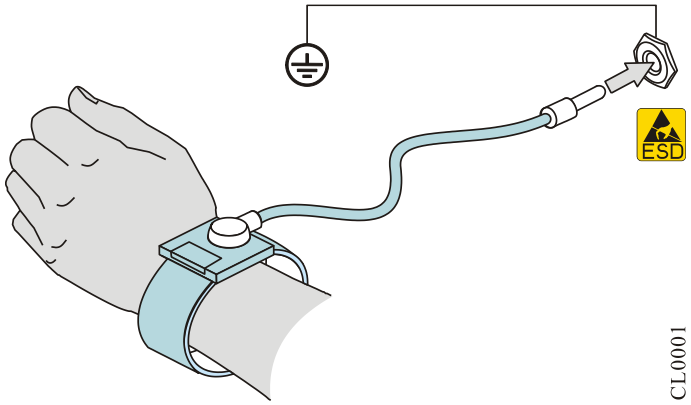


Figure 2-1 Usage of the ESD wrist

2.3 Installation Tools, Instruments, and Equipment

Tools:

- Phillips 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 Unpacking Inspection

The unpacking steps of MP1800X series router are as follows:

Step 1: View the carton label, and confirm the device model in the carton.

Step 2: Check whether the goods in the carton are complete.

Step 3: View the equipment nameplate and bar code label, and check the product model.

3 Router Installation

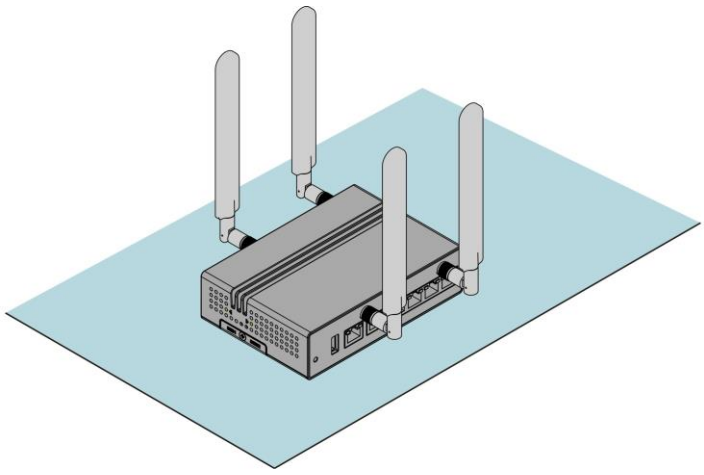
3.1 Example 1 of Installing Router

In example 1, describe installing MP1800X-40, MP1800X-40W, MP1800X-40E, SJW12-4G router on the horizontal plane, table surface environment or vertical surface, upright column and other vertical environment. Select the correct installation mode according to the actual installation environment.

3.1.1 Installing the Router Horizontally

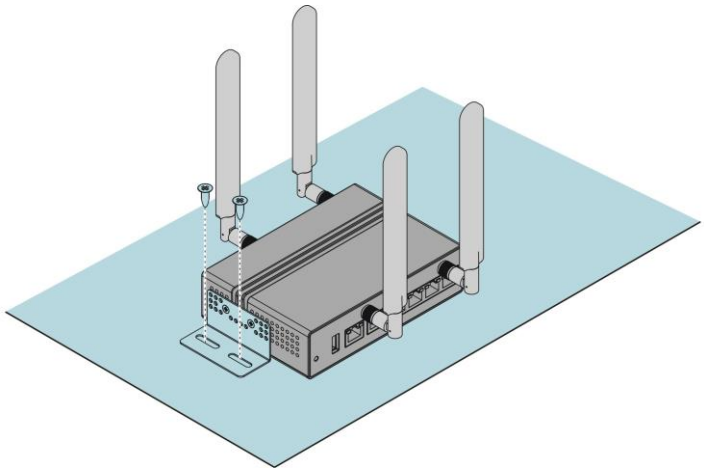
Place the router on the clean workbench. During the installation, pay attention to the following:

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



CL0804

Figure 3-1 The diagram of the table top placement

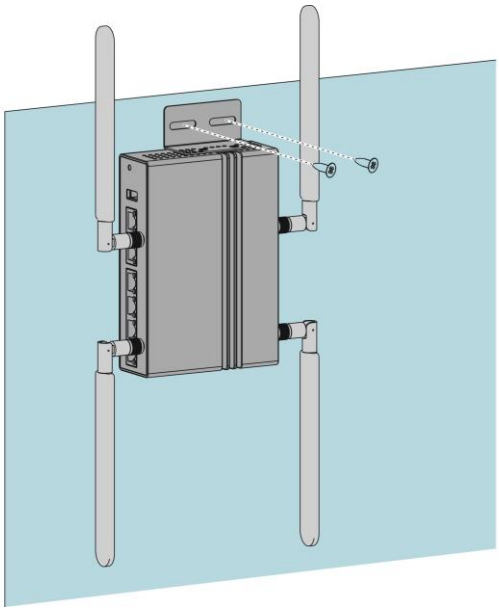


CL0805

Figure 3-2 The diagram of the desktop fixing

3.1.2 Install the Router Vertically

The equipment can be fixed on the vertical surface of the wall, cabinet, and other installation environment by screws. Purchase expansion screws or OTC screws according to the installation environment.



CL0806

Figure 3-3 The diagram of the vertical installation

3.2 Example 2 of Installing the Router

In example 2, describe the installation mode of MP1800X-50 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.

3.2.1 Install Router to Workbench

Place the router on the clean workbench. During the installation, pay attention to the following:

- 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.

3.2.2 Installing the Router to the Cabinet

This section will describe the method to install the MP1800X-50 router in a 19" standard cabinet.

Installation Preparation

- The height of the MP1800X-50 router is 1U, so ensure that the enough installation space is reserved for the router.
- Check the grounding conditions and stability of the cabinet. Ensure the cabinet is free from any inside/surrounding item having an adverse impact on the switch installation.

Note:

- 1U is 44.45mm. U refers to Rack Unit (RU).

Installing the Tray to the Cabinet

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

Note:

- Ensure that the distance between the tray and the bottom cabinet is 2U and three holes on the square hole bar is 1U, as sown in Figure 3-4.

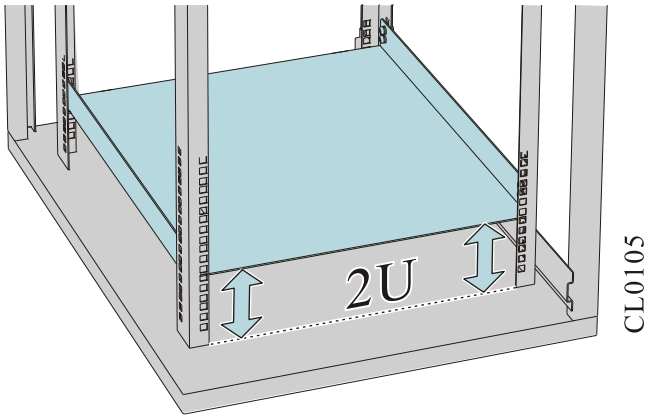


Figure 3-4 The minimum height of the tray

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

The installation steps of the tray are as follows:

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

The space height above the tray 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: Use the screw to fix the tray.

Note:

- The appearance and installation methods of different cabinets and trays may vary. This section is just for your reference. The actual situation prevails.

Installing the Floating Nuts to the Cabinet

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

Step 1: Align the mounting ears with the floating nuts on the square hole strip of the cabinet

column, with the expected position marked with a marking pen.

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

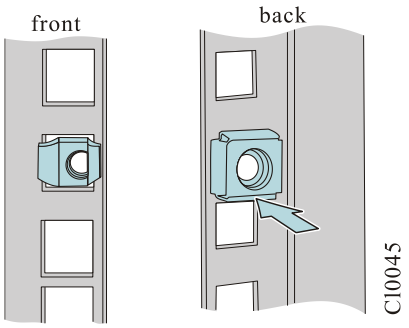


Figure 3-5 Install the floating nuts

Installing the Router to the Cabinet

Caution:

- Before installing the equipment, ensure that the tray has been properly installed to the cabinet, which are capable of supporting the equipment and its accessories.

The steps of installing the router to the cabinet are:

Step 1: Uplift the router form both sides and place it on the tray of the cabinet. Push the router into 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 tray bears the weight. Install the router to the 19-inch standard cabinet, as shown in the following figure.

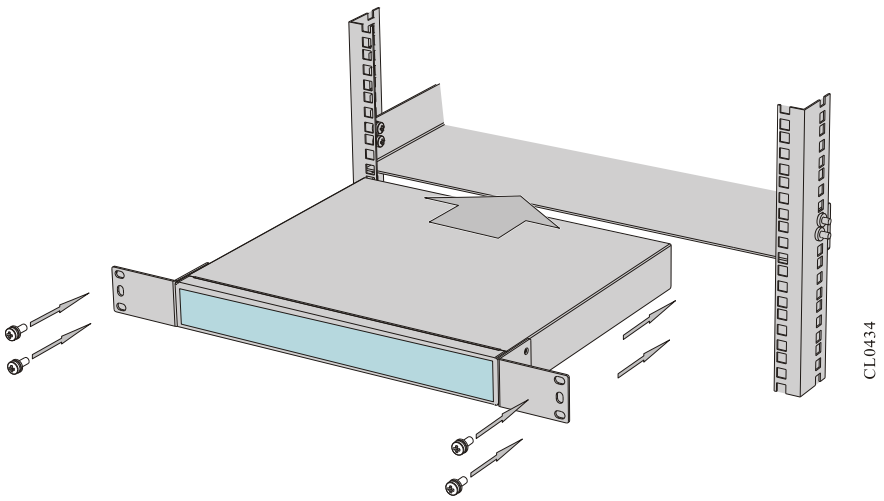


Figure 3-6 Install the router to the 19-inch standard cabinet

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 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.

Warning:

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

Installation Inspection

After installing the router to the cabinet, please check whether the listed items are in good conditions as per the following steps.

- Check whether the router is properly installed in place.
- Check whether the mounting ears of the router are tightly fixed with the cabinet.
- Check whether the surrounding space of the router is sufficient for heat dissipation.

4 Energization and Operation

4.1 Equipment Login

The Console port is the only approach to log into the equipment for the first time, which is the basic log-in mode and the only way to configure other log-in modes.

4.1.1 Connecting the Configuration Cable

The MP1800X router has a serial port (EIA/TIA-232), through which, the PC (or laptop) with RS-232 serial port may be used to configure the router.

For the purpose of such configuration, the steps below shall be followed:

Step 1: Prepare a PC (or laptop) and check whether this PC (or laptop) has a RS-232 serial port (or USB interface).

Step 2: Connect the PC (or laptop)'s RS-232 serial port with the router's RJ45 serial port by using the configuration cable, provided that either of the aforesaid two devices is power off.

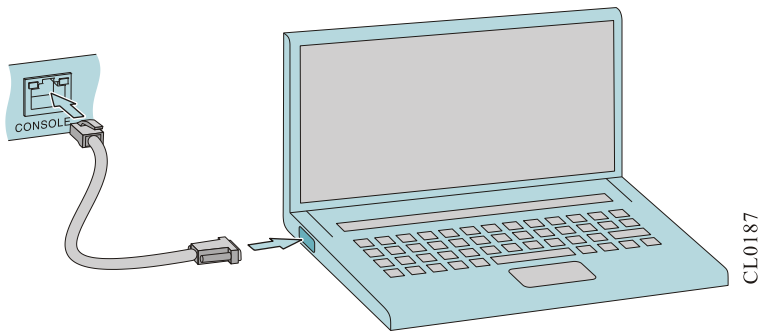


Figure 4-1 Connecting the router and the PC through the RS-232 serial port

Note:

- The configuration cable (included) for RS-232 serial port is an 8-core unshielded cable, with a crimping RJ-45 plug as an end to connect with the router's Console port. The other end is a 9-core (pin) serial port socket, with a DB-9 (hole), which is

used to connect with the PC (or laptop), as shown in Figure 4-1.

Caution:

- Matters that need attention while installing or operating the equipment, which are important for proper installation and operation.
- When connecting the PC (or laptop) with the router by using the configuration cable, it is required to firstly connect the DB-9 end with the PC and then the RJ-45 end with the router's Console port.
- When disconnecting the configuration cable between the PC (or laptop) and the router, it is required to firstly disconnect the RJ-45 end and then the DB-9 end.

4.1.2 Setting the Hyperterminal Parameters of PC

The serial port/interface parameter configuration of the PC (or laptop) is introduced on the basis of a PC (or laptop) running Windows XP hyperterminal.

Step 1: Start the PC (or laptop). Select "Start/All Programs (or Programs)/Attachment/Communication/Hyperterminal" menu. Click "" icon to establish a new connection. The "Connection Description" interface pops up, 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**.

Figure 4-2 “**Location information**” interface

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

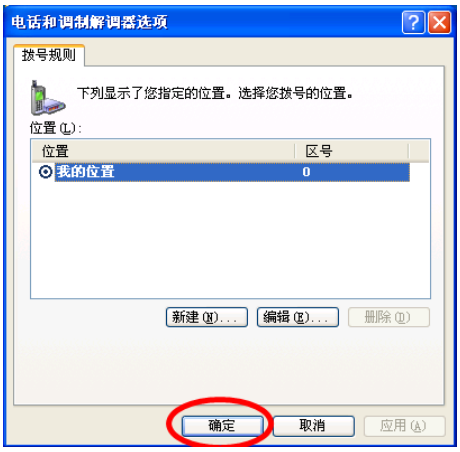


Figure 4-3 The **Telephone and Modem** interface

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

Figure 4-4 “Connection description” interface

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

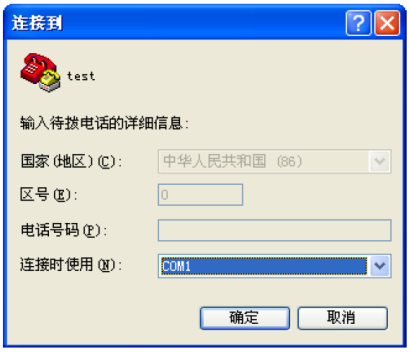


Figure 4-5 “Connect to” interface

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**.

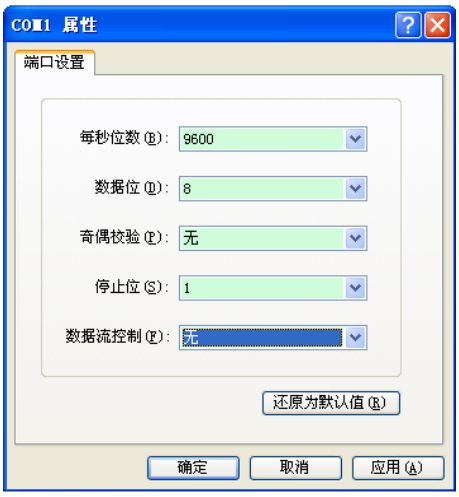


Figure 4-6 The **COM1 Properties** interface

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

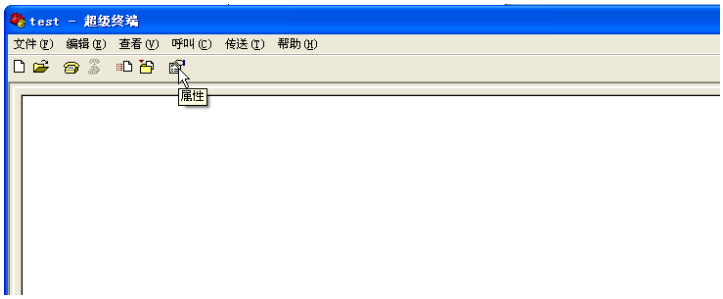


Figure 4-7 The **test-HyperTerminal** interface

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

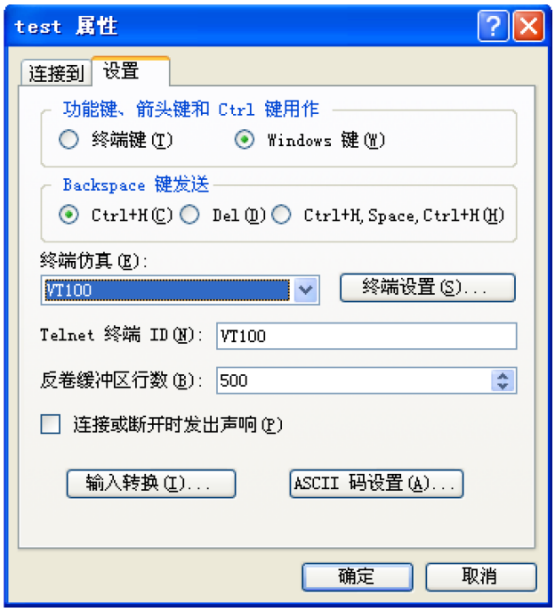


Figure 4-8 “**Test properties**” interface

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.

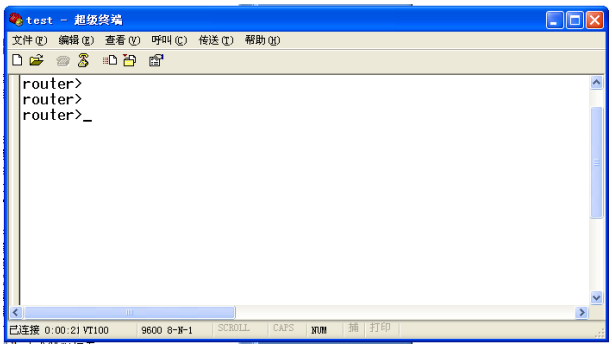


Figure 4-9 The **test-Hyperterminal** interface after setting

4.1.3 Energization

Pre-energization Inspection

The pre-energization inspection for the router includes:

- The interface cable, power cord and ground lead are properly connected.
- The power supply voltage satisfies the equipment power requirements. Refer to “Appendix D2 Power Conditions and Requirements” for details.
- The configuration cable is properly connected. The PC for configuration is started. The terminal parameters have been well set.

Caution:

- Before energizing the router, it is required to check the power supply switch in the machine room where the switch is located, in order to cut off the power supply immediately in case of an accident.

Energization

The steps to energize the router are:

- Turn on the power supply switch of the router.

After the router is powered on and started, the configuration terminal displays some loading information of the router:

```
 Bootloader 1.38 for PR020_18_40-50 (May 12 2017 - 09:54:52)

DDR config clock: 800M
NAND:  512 MiB
PCI:
arm_clk=1000MHz, axi_clk=500MHz, apb_clk=250MHz, arm_periph_clk=500MHz
Net:   bcmiproc_eth-0
Press ctrl+c to enter bootloader mode:  0
Use boot parameter 0:
device=flash0, file=rp37-7.3.0.58(R).pck
Copy flash/rp37-7.3.0.58(R).pck to 0x91007ed0 with size 22350568(0x1550ae8)
.....................   [DONE]
   Verifying Checksum ... OK
Uncompressing Linux... done, booting the kernel.
Starting init...Starting do before load ...
mount flash file system
done
Starting modules.....done
```

Note:

- The above displayed information on the start interface is just for reference. The actual display prevails.

4.1.4 Post-energization Inspection

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

- View whether the indicators on the router are normal.

Table 4-1 MP1800X-40E indicator description

Indicator Type	Indicator Name	Indicator Color	Status
System status indicator	SYS	Green	Flash quickly (5Hz flash frequency): The hardware starts to work after energization Flash slowly (0.5Hz flash frequency):The system works normally On/off: The system works abnormally
Power status indicator	PWR	Green	On: The power works normally Off: The power works abnormally
4G indicator 1	SIM1	Monochrome green light	On: 4G channel 1 has data receiving and sending Off: 4G channel 1 has no data receiving and sending or works abnormally
4G indicator 2	SIM2	Monochrome green light	On: The SIM card of 4G channel 2 is in place Off: The SIM card of 4G channel 2 is not in place or the module is abnormal
4G signal indicator	Signal strength	Monochrome green light	All on: The signal is the strongest Part on: The signal is general All off: No signal
Console interface status indicator	TXD	Yellow	Flash: The serial port has data sending Off: The serial port has no data sending
	RXD	Green	Flash: The serial port has data receiving Off: The serial port has no data receiving
GET interface status indicator	1000M	Yellow	On: The Ethernet port is connected successfully and the negotiated rate is 1000M. Off: The Ethernet port is not

Indicator Type	Indicator Name	Indicator Color	Status
			connected or is connected, but the negotiated rate is 10/100M.
	ACT	Green	Off: The interface is not linked On: The interface is linked, but there is no data receiving and sending Flash: The interface is linked, and there is data receiving and sending.

Table 4-2 MP1800X-40W indicator description

Indicator Type	Indicator Name	Indicator Color	Status
System status indicator	SYS	green	Flash quickly (5Hz flash frequency): The hardware starts to work after energization Flash slowly (0.5Hz flash frequency):The system works normally On/off: The system works abnormally
Power status indicator	PWR	green	On: The power works normally Off: The power works abnormally
WIFI indicator	WIFI	Monochrome green light	On: WIFI works normally Off: WIFI works abnormally
4G indicator1	SIM1	Monochrome green light	On: The SIM card of 4G channel 1 is in place Off: The SIM card of 4G channel 1 is not in place or the module is abnormal
4G indicator2	SIM2	Monochrome green light	On: The SIM card of 4G channel 2 is in place Off: The SIM card of 4G channel 2 is not in place or the

Indicator Type	Indicator Name	Indicator Color	Status
			module is abnormal
4G signal indicator	Signal strength	Monochrome green light	All on: The signal is the strongest Part on: The signal is general All off: No signal
Console interface status indicator	TXD	Yellow	Flash: The serial port has data sending Off: The serial port has no data sending
	RXD	Green	Flash: The serial port has data receiving Off: The serial port has no data receiving
GET interface status indicator	1000M	Yellow	On: The Ethernet port is connected successfully and the negotiated rate is 1000M. Off: The Ethernet port is not connected or is connected, but the negotiated rate is 10/100M.
	ACT	Green	Off: The interface is not linked On: The interface is linked, but there is no data receiving and sending Flash: The interface is linked, and there is data receiving and sending.

Table 4-3 MP1800X-40/SJW12-4G indicator description

Indicator Type	Indicator Name	Indicator Color	Status
System status indicator	SYS	green	Flash quickly (5Hz flash frequency): The hardware starts to work after energization Flash slowly (0.5Hz flash frequency):The system works

Indicator Type	Indicator Name	Indicator Color	Status
			normally On/off: The system works abnormally
Power status indicator	PWR	green	On: The power works normally Off: The power works abnormally
4G indicator1	SIM1	Monochrome green light	On: The SIM card of 4G channel 1 is in place Off: The SIM card of 4G channel 1 is not in place or the module is abnormal
4G indicator2	SIM2	Monochrome green light	On: The SIM card of 4G channel 2 is in place Off: The SIM card of 4G channel 2 is not in place or the module is abnormal
4G signal indicator	Signal strength	Monochrome green light	All on: The signal is the strongest Part on: The signal is general All off: No signal
Console interface status indicator	TXD	Yellow	Flash: The serial port has data sending Off: The serial port has no data sending
	RXD	Green	Flash: The serial port has data receiving Off: The serial port has no data receiving
GET interface status indicator	1000M	Yellow	On: The Ethernet port is connected successfully and the negotiated rate is 1000M. Off: The Ethernet port is not connected or is connected, but the negotiated rate is 10/100M.

Indicator Type	Indicator Name	Indicator Color	Status
	ACT	Green	Off: The interface is not linked On: The interface is linked, but there is no data receiving and sending Flash: The interface is linked, and there is data receiving and sending.

Table 4-4 MP1800X-50 indicator description

Indicator Type	Indicator Name	Indicator Color	Status
System status indicator	SYS	green	Flash quickly (5Hz flash frequency): The hardware starts to work after energization Flash slowly (0.5Hz flash frequency):The system works normally On/off: The system works abnormally
Power status indicator	PWR	green	On: The power works normally Off: The power works abnormally
Console interface status indicator	TXD	Yellow	Flash: The serial port has data sending Off: The serial port has no data sending
	RXD	Green	Flash: The serial port has data receiving Off: The serial port has no data receiving
GET interface status indicator	1000M	Yellow	On: The Ethernet port is connected successfully and the negotiated rate is 1000M. Off: The Ethernet port is not connected or is connected, but the negotiated rate is

Indicator Type	Indicator Name	Indicator Color	Status
			10/100M.
	ACT	Green	Off: The interface is not linked On: The interface is linked, but there is no data receiving and sending Flash: The interface is linked, and there is data receiving and sending.

4.2 Network Access

4.2.1 Network Access via Ethernet Twisted Pair

The electrical port of 10/100/1000Base-T uses the RJ-45 connector, with MDI/MIDX self-adaption supported. The network is accessed by the twisted pair of Category 5 or above.

The connection steps are:

Step 1: Insert an end of the Ethernet twisted pair to the Ethernet electrical port (RJ-45 port) of the router.

Step 2: Insert the other end to the RJ-45 port of the network device.

Note:

- No Ethernet twisted pair is included. Please prepare the required cables.

4.3 Hardware Management

This section describes the various hardware management functions of MP1800X series router, through which, the user may easily check the software and hardware versions and the working conditions of all hardware modules.

Note:

- The section takes MP1800X-40E as an example to describe the viewing method.
- The printed information involved in this section is just for reference. Actual information will prevail.

4.3.1 Viewing the Software and Hardware Versions of the Router

The software and hardware versions may be viewed by the show version command, including: system number, overall hardware data, hardware version, Bootloader version, software version and other information. For example:.

```
router#show version
            MyPower (R) Operating System Software
MP1800X-40E(V1) system image file (flash0: /flash/rp37-7.3.0.58(R).pck), version 7.3.0.58(R)(integrity),
Compiled on May 12 2017, 10:24:21
Copyright (C) 2014 Maipu Communication Technology Co., Ltd. All Rights Reserved.

MP1800X-40E(V1) Version Information
        System ID           : 00017a205314
        Hardware Model      : MP1800X-40E(V1) with 512 MBytes SDRAM, 128 MBytes flash
        Hardware Version    : 002(Hotswap Unsupported)
        Bootloader Version  : 1.38
        Software Version    : 7.3.0.58(R)(integrity)
        Software Image File : flash0: /flash/rp37-7.3.0.58(R).pck
        Compiled            : May 12 2017, 10:24:21

System Uptime is 0 hour 11 minutes 39 seconds
```

Table 4-5 The description for the key fields of the information displayed by the **show version** command

Field	Description
System ID	The equipment number of the router, which is provided by the supplier, such as 00017a205314
Hardware Model	The hardware information, such as MP1800X-40E(V1)
Hardware Version	PCB version, such as 002(Hotswap Unsupported)
Bootloader Version	Bootloader version, such as 1.38
Software Version	The software version, such as 7.3.0.58(R)(integrity)
Software Image File	Boot path and boot file name

Field	Description
	flash0: /flash/rp37-7.3.0.58(R).pck
Compiled	Version compile time, such as May 12 2017, 10:24:21

4.3.2 Viewing the System Environment Temperature

The temperature information of the main chips on MP1800X series router may be viewed by the **show environment** command. For example:

```
router#show environment
        Mpu CPU temperature is 54°C
        Mpu inlet air temperature is 44°C
```

4.3.3 Viewing the 4G Module Information

The information of the main modules on MP1800X series router may be viewed by the **show fastcellular {n} phyinfo hardware** command. For example: (the print information is just for reference)

```
router#show fastcellular 1 phyinfo hardware
Hardware Information
====================
Modem Status = On Line
Modem device name = U8300C
Modem manufacturer = LONGSUNG
Modem Firmware Version = QA30002.1.9_MV11
Hardware Version = PART104_VERSION3.1
SIM Status = EXIST
International Mobile Subscriber Identity (IMSI1) = 460031242852908
International Mobile Subscriber Identity (IMSI2) = 460110504648640
Integrate Circuit Card Identity (ICCID) = 89860315040287598418
International Mobile Equipment Identity (IMEI) = 869751023786526
User Phone Number = None
Modem Functionality Status = online(full functionality)
router#
```

5 Troubleshooting

This section describes how to clear the installation errors of the MP1800X series router.

5.1 Configuration System Troubleshooting

After energizing the router, the start information may be displayed on the configuration terminal if the system works properly. In case of a configuration system failure, the configuration terminal may display no information or the messy code.

5.1.1 No-display Failure Troubleshooting

In case of no display after energization, please follow the steps below to check:

Step 1: Check whether the power system of the router works normally

Step 2: Check whether the indicator of the router works normally.

Step 3: Check whether the configuration cable is connected to Console port.

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 Messy Code Troubleshooting

In case of any messy code displayed, the wrong configuration terminal parameters are highly possible (set the Baud rate to be 9600, data bit 8, odd-even check null, stop bit 1, data flow control null and terminal emulation VT100). Inspect the parameters

accordingly. Refer to "4.1.2 Configure the hyperterminal parameters of PC ".

5.2 Power Failure Troubleshooting

If the "PWR" indicator on the panel of the router is off, the corresponding power in the device fails. The troubleshooting steps are:

Step 1: Check the power supply system connected by the router, and confirm that the power supply system and the voltage are normal.

Step 2: Check the connection of the power cable on the router, re-swap the power cable, and confirm whether the power cable is loosened.

Step 3: Change the power cable or adapter connected to the router, and then, view whether the power indicator returns to normal. If yes, it can be confirmed that the previous power cable is damaged. If no, contact the agent or the local technical engineer.

5.3 Gain Technical Supporting

In case the failure still exists after implementing the above steps, you are requested to contact the agent or local technical engineer for replacement without delay. Before contacting the Customer Service, you are required to prepare the following data to assist the customer service personnel in solving the problem as soon as possible.

1. The delivery time of the router
2. The serial number of the chassis (indicated on the chassis label)
3. Software version number (the version information may be viewed by the **show version** command in the command line view).
4. Maintenance Agreement or Warranty Card
5. Brief description of the failure
6. Brief description of the troubleshooting measures taken

You can call the Customer Service Hotline or seek for help through the website or E-mail.

Customer Service Hotline: 028-65710935; 400-886-8669

Website: http://www.maipu.com

E-mail: support@maipu.com

6 Router Maintenance

This chapter describes the changing and maintaining of the device module.

6.1 De-dust the Router

This section describes how to de-dust the MP1800X series 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.

6.1.1 De-dust the Board

During the router operation, due to the charged board and cross ventilation in the router dissipation, the board 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.

Caution:

- When using a vacuum cleaner, use a clean and dry anti-static soft brush to gently remove the dust, 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 board.

- 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, 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. This method is characterized with difficult operation and high cost.

Appendix

A Specifications of the Router and Common Modules

A1 Dimension/Weight/Power Consumption

Appendix table A-1Dimension

Model	Dimension		
	Width (W)	Depth (D)	Height (H)
MP1800X-40	145	100	38
MP1800X-40W	145	100	38
MP1800X-40E	145	100	38
SJW12-4G	145	100	38
MP1800X-50	260	190	44.2

Note:

- The dimension data is the dimension value of the chassis itself, excluding the dimensions of the hanging ears, wire rack and other field installation parts and accessories after assembly.

Appendix Table A-2 Board power consumption

Model	Power Consumption (W)
MP1800X-40	13
MP1800X-40W	13
MP1800X-40E	13
SJW12-4G	13
MP1800X-50	12

A2 Power Adapter Specifications

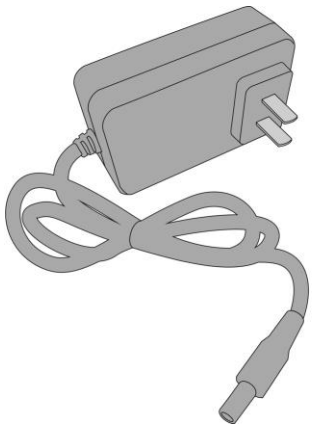
MP1800X-40, MP1800X-40W, MP1800X-40E, and SJW12-4G routers adopt the DC power supply, which is converted to the DC power via the external power adapter.

The power adapter has the following specification:

Specification	Description
AD24-1S0N	Power adapter, 24W

A2.1 AD24-1S0N Power Adapter

The diagram of the AD24-1S0N power adapter is shown in the following figure:



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Appendix Figure A-1 AD24-1S0N power adapter

The specification of the AD24-1S0N power adapter is shown in the following table:

Appendix Table A-4 AD24-1S0N power adapter specification

Item	Data
Rated input voltage range	100V-240V AC 50/60Hz
Max. input voltage range	90V-264V AC 47-63Hz
Output voltage	12V
Max. output current	2A
Max. output power	24W

B Specifications of Common Interfaces

Describe the properties of the device interface.

B1 Console Port Properties

Appendix Table B-1 Console port properties

Property	Description
Interface standards	Asynchronous EIA/TIA-232
Connector type	RJ45
Rate	2400bps/4800/9600/19200/38400/57600/115200bps The default value: 9600bps
Supported services	Connect the local terminal (such as PC) and run the terminal emulation program on the terminal.

B2 Properties of 10Base-T/100Base-TX/1000Base-T RJ45 Electrical Interface

Appendix Table B-2 The properties of the 10Base-T/100Base-TX/1000Base-T RJ45 electrical interface

Property	Description
Interface standards	IEEE 802.3, IEEE802.3u, IEEE802.3ab
Connector type	RJ45
Operating mode	10Mbps/100Mbps/1000Mbps

Property	Description
	Half-duplex/full-duplex/auto negotiation
Max. transmission distance	100m
Connection cable	Twisted pair of Category 5 or above

B3 Properties of USB Interface

Appendix Table B-3 USB interface properties

Property	Description
Interface standard	USB2.0
Interface type	USB A
Work mode	1.5M, 12Mbps, 480Mbps Host, support direct hot-swap and controlled (command mode) hot-swap mode (the hot-swap operation cannot be performed during the data transmission)
Cable	no

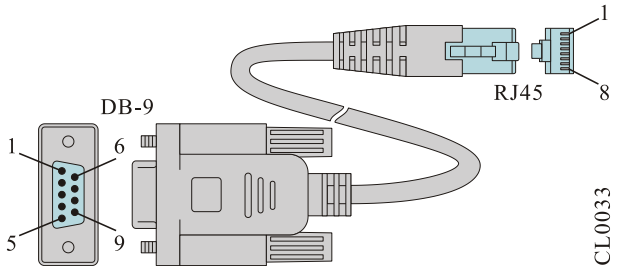
C Cable

Note:

- It is recommended to use Maipu modules on the router.
- The following information is just for reference. For details, consult Maipu marketing personnel or technical support personnel.

C1 Console Cable

Connected to the nine-core serial interface socket of the PC, the console cable of the MP1800X 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 C-1 The diagram of the console cable

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

Appendix Table C-1 Connection relationship of the console cable

RJ45	Signal	Direction	DB-9
1	RTS	→	8
2	DTR	→	6
3	TXD	→	2
4	GND	——	5
5	GND	——	5
6	RXD	←	3
7	DSR	←	4

RJ45	Signal	Direction	DB-9
8	CTS	←	7
	——	——	1
	——	——	9

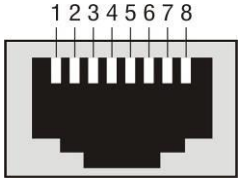
C2 Ethernet Electrical Interface Cable

The Ethernet interface cable for the MP1800X series router is recommended to be the 8-core straight-through unshielded twisted pair of category 5 or above.

Appendix Table C-2 The connection relation of the RJ45 cable (category-5 twisted pair)

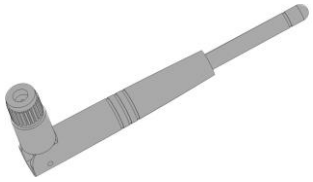
RJ45	Signal	Direction	RJ45	Description	Length
1	TRD0+	←→	1	Twisted pair1	Support 100m
2	TRD0-	←→	2		
3	TRD1+	←→	3	Twisted pair2	
6	TRD1-	←→	6		
4	TRD2+	←→	4	Twisted pair3	
5	TRD2-	←→	5		
7	TRD3+	←→	7	Twisted pair4	
8	TRD3-	←→	8		

The wire sequence of Ethernet RJ45 port is as shown in the Appendix Figure C1-1.



Appendix Figure C-2 RJ45 base

C3 WIFI Antenna



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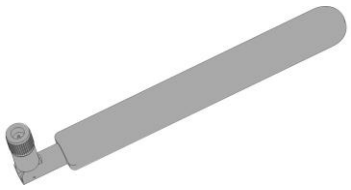
Appendix Figure C-3 WIFI antenna

C4 4G Antenna



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Appendix Figure C-4 4G antenna

D Requirements for Equipment Operating Environment

D1 Requirements for equipment room environment

D1.1 Architectural requirements for equipment room

It is recommended to use the ESD floor for the equipment room, to avoid dusting. Generally, the raised ESD floor is required to be laid. The floor blocks shall be tightly and solidly laid, with horizontal error of each square meter of no more than 2mm. When raised floor is unavailable, the static-conducting flooring (volume resistivity shall be $1.0\times10^{7}\Omega$*m~$1.0\times10^{10}\Omega$*m) shall be laid. The static-conducting flooring or raised floor must be conducted ESD grounding which can be done by connecting the limiting resistor and connection line and grounding device, with the resistance of the limiting resistor of 1MΩ.

D1.2 Requirements for environmental adaptability

Appendix Table D-1 Requirements for environmental adaptability

Description	Temperature
Storage temperature	-20°C～70°C
Storage humidity	0%～95%/RH, non-condensing

Description	Temperature
Work temperature 1	-20°C～60°C
Work temperature 2	0°C～45°C
Work humidity	5%～85%/RH, non-condensing

Caution:

- Work temperature 1 indicates the permitted work temperature of MP1800X-40, MP1800X-40W, MP1800X-40E, SJW12-4G.
- Work temperature 2 indicates the permitted work temperature of MP1800X-50.
- Excessive temperature will largely reduce the reliability of the router, prolonged high temperature will also affect their lives, and excessive temperature will accelerate the aging of the insulating material.
- Long-term excessive humidity in the equipment room easily results in poor insulation of the insulating material and even creepage, and sometimes is liable to lead to material mechanical performance change and metal part corrosion, etc.
- Long-term too low humidity in the equipment room will cause the insulating spacer to shrink, leading to looseness of the fastening screw; also, the dry climatic environment easily leads to static to harm the circuit on the router.
- The measured values of the operating environment temperature and humidity in the equipment room of the router refer to those measured when there are no protection boards in front and at the back of the cabinet, and at the position 1.5m above floor and 0.4m from the front of the router.
- When the router is moved from a low-temperature environment to a high-temperature environment, if there is condensate on it, please take certain measures (such as drying or airing) before powering on it, to prevent short circuit and burnout of its internal part.
- Operating altitude: 55℃@2,000m. When the altitude is between 2,000m and 4,000m, the temperature decreases by 1℃ when the altitude increases by every 220m, namely, the derating is 1℃/220m.
- Storage altitude: <5,000m.

D1.3 Cleanliness requirements

Dust is harmful to the safe operation of the router. When indoor dust falls on the router, it may cause electrostatic adsorption to lead to poor contact of the metal connector or metal contact. In particular, it is easier to cause electrostatic adsorption when the indoor relative humidity is low, which does not only affect the equipment life, but also easily lead to communication failure. Requirements for content and particle size of dust in equipment room are as shown in the following table.

Appendix Table D-2 Requirements for content of dust in equipment room

Maximum diameter (μm)	0.5	1	3	5
Maximum concentration (particle/m^3)	1.4×10^7	7×10^5	2.4×10^5	1.3×10^5

Caution:

- The cleanliness requirements are met when there is no visible dust on a desktop in 3 days.

Besides dust, the equipment room for the router also has strict requirements for the salt, acid and sulfide in the air as those will accelerate metal corrosion and aging of some parts.

Harmful gases like SO2, H2S, NO2, NH3 and Cl2 shall be prevented from entering the equipment room, with the specific limit values as shown in the following table.

Appendix Table D-3 Content index of the harmful gases in equipment room

Gas	Maximum (mg/m^3)
SO_2	0.2
H_2S	0.006
NO_2	0.2
NH_3	0.05
Cl_2	0.01

D1.4 Anti-interference requirements

There may be certain interference sources during the working of the router. The router is influenced by capacitive coupling, inductance coupling, electromagnetic wave radiation, common impedance (including grounding system) coupling and conducting wires (including power cable, signal cable and output cable, etc.), etc., either from outside of the application system or from inside of the router. Therefore, please note that:

Caution:

- Effective measures against electricity network interference shall be taken for the power supply system.
- The working ground for the router shall be better not to be shared by the electrical equipment's grounding device or lightning-proof grounding device, and shall be kept away from them as far as possible.
- The router shall be kept away from high-power radio transmitting station, radar station and high-frequency high-current equipment. Users can conduct anti-interference through electromagnetic shielding method, if necessary.

D1.5 Grounding requirements

A good grounding system is the basis for the stable and reliable operation of the router, and the important guarantee for the router to be lightning resistant, interference resistant and antistatic. Users shall provide a good grounding system for the router, with the resistance between the router chassis and ground required to be less than 1Ω.

D2 Requirements for power supply condition

D2.1 Requirements for fundamental AC power supply

Caution:

- The low-voltage power supply system shall use the three-phase five-wire or single-phase three-wire, with the low-voltage AC nominal voltage of 110V/220V and frequency of 50Hz/60Hz.
- Uninterruptible power supply (UPS) shall be used as the AC back-up power. The AC back-up power shall be kept the same phase with the mains supply, with the switching time of both required to be less than 10ms, otherwise, the equipment may

restart or reset.

- With regard to the AC distribution capacity in the equipment room, the equipment working current and fault current shall be taken into full account. Independent equipment shall be guaranteed to have independent AC distribution protection device. And the protection switch configured shall be bigger than that of the lower-level electric equipment.

The allowable fluctuation range of the power supply input of the equipment using AC is as shown in the following table.

Appendix Table D-4 Requirement for fundamental AC power supply

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

Caution:

- The AC conducting wires shall be flame-retardant and routed as specified in the *Code for Fire Protection Design of Tall Buildings* (GB50045-95). In the event of low-voltage distribution, it shall be implemented in accordance with the *Code for Design of Low Voltage Power Distribution Installations and Wiring Systems* (GB50045-95).
- The devices adopting the AC power supply include MP1800X-50 and the power adapter AD24-1S0N.

D2.2 DC Power Requirement

The allowable fluctuation range of the power supply input of the equipment using DC is as shown in the following table.

Appendix Table D-5 DC power requirement

Item	Index
Input voltage range	11.4V～12.6V

Caution:

- The AC conducting wires shall be flame-retardant and routed as specified in the *Code for Fire Protection Design of Tall Buildings* (GB50045-95). In the event of low-voltage distribution, it shall be implemented in accordance with the *Code for Design of Low Voltage Power Distribution Installations and Wiring Systems* (GB50045-95).
- The devices adopting the DC power supply include MP1800X-40, MP1800X-40W, MP1800X-40E, and SJW12-4G.

D2.3 Suggestions on fundamental AC power supply

Suggestions on fundamental AC power supply include:

- If the equipment 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 equipment, 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.

E Equipment Grounding Specifications and Protection

E1 Equipment grounding specifications

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

E1.1 General grounding specifications

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

Appendix Table E-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 cable tray, hung iron stand, rack or casing, metal ventilating duct and metal door and window, etc. in the equipment room.
3	Protection ground shall be done for the metal parts of the equipment that normally are not energized.
4	Ground cables shall be guaranteed to have good contact with the protection ground bar in the equipment room.
5	Other equipment shall not be used as a component of electrical connection of ground cables.

E1.2 Grounding specifications for the building of equipment rooms

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).

E1.3 Equipment grounding specifications

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

Appendix Table E-2 Equipment grounding specifications

S/N	Description
1	Protection ground shall be done for various kinds of communication equipment and corollary equipment (mobile base station, transmission equipment, and power supply, etc.) in the equipment room, and the protection grounds of various kinds of equipment in the station shall be tandem to the same ground busbar, and the protection grounds of different pieces of equipment in same equipment room shall be tandem to the protection ground bar in the same equipment room.
2	The equipment 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.
3	The ground terminals with ground symbols at the bottom of the front, back and side doors of a cabinet must be separately connected to the ground terminals of the cabinet structure via link cables with cross-sectional area of not less than 1.6mm^2.
4	Various metal parts of the equipment cabinet must be guaranteed to have good conductivity, and the connections of various metal parts of the cabinet are prohibited from spraying insulation paint.
5	The rack bodies of cabinets on the same row shall be closely connected with each other through the fastening bolts and spacers at the top. The 30mm*50mm rectangular surface around the fastening bolt connection hole shall not be sprayed paint, and must be conducted rustproof and anticorrosion treatment, and spacers and nuts shall have zinc electroplating with iridescent yellow chromate conversion coating on the surfaces, to guarantee good electrical contact.
6	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.

E1.4 Grounding specifications for communication power

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

Appendix Table E-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

S/N	Description
	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.

E1.5 Specifications for ground cable laying

The ground cable laying specification is as shown in the following table.

Appendix Table E-4 Specifications for ground cable laying

S/N	Description
1	The ground lead shall not be in parallel with or intertwine with the signal cable.
2	The ground cable is prohibited to be led in overhead from outdoors, but must be all buried or cabled indoors.
3	The PGND cable shall have no connector, and is prohibited from adding a switch or fuse.
4	The yellow/green plastic insulated copper conducting wire shall be selected as the PGND cable.
5	The neutral line of AC power cable is prohibited from connecting to the protection grounds of transmission equipment and various kinds of communication equipment in the equipment room.
6	The PGND cable shall not be longer than 45m, and shall be kept as short as possible. When it is longer than 45m, the user shall be required to set up the ground bar again nearby.

E2 Equipment protection

This section mainly introduces the matters to be noticed for equipment lightning protection during the installation.

E2.1 General requirements for lightning protection cable layout

Equipment cables can be divided into indoor cables and outdoor cables according to positions of the connecting terminals. The two kinds of cable have different requirements for cable layout in the lighting protection design.

Caution:

- The communication connection cables shall be cabled indoors as far as possible, to effectively reduce the rate of equipment damage caused by induction lightning strike. Ethernet cables are indoor signal connection cable, and normally shall not be cabled overhead outdoors or along the cornice.

General requirements for indoor cable layout

- During cable installation, the cabling shall be conducted by category, and bundling of cables of different categories shall be avoided.
- It is suggested that cables are bundled with one cable tie every other 100mm, to strengthen the management and fixation.
- Ground cables shall be as short and thick as possible. Connection of ground cable and ground bar shall be tightened with screw and conducted anticorrosion treatment.

General requirements for outdoor cable layout

- Outdoor cables shall be buried and laid underground (led indoors from underground) if the actual conditions cannot fully meet the indoor cabling requirements.
- If not all outdoor cables can be buried and laid underground, the aerial cables shall be put in metal tubes in the place 15m in front of the room, with both ends of metal tubes grounded; after cables enter the room, the corresponding interface of equipment shall be added the signal lightning arrester.
- If shielded cables are used, the shield layer shall be made sure to have good contact with the equipment metal housing at the equipment interface position; after cables enter the room, the corresponding interface of equipment shall be added the signal lightning arrester.

- When outdoor cables without any protection are connected to the equipment, the corresponding port must be added the signal lightning arrester.
- During cabling of optical fibers, the cabling shall be smooth and optical fibers shall be bundled neatly. Before outdoor optical cables enter the room, the internal reinforced cores shall be grounded, and optical fibers shall not be stretched or bundled too tightly.

E2.2 Cabling and installation methods

Installation method of power cable

One end of the power cable shall be connected to the equipment and the other end to a power strip or lightning protection strip, with the excess part folded to S shape and fixed inside the enclosure, and the power cable shall be kept a distance of above 20cm from other cables.

Cable installation method

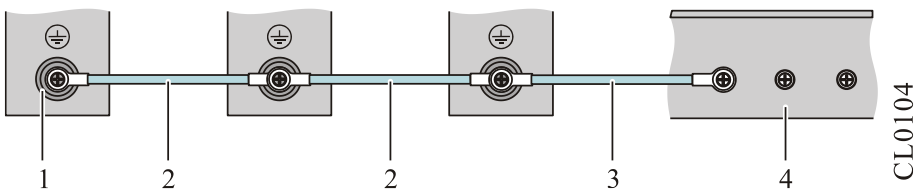
Signal cables shall be installed and bundled by category according to indoor and outdoor cables, and led to user terminals or cascaded equipment from different chassis cable outlets.

E2.3 Equipotential bonding requirements and method

Caution:

- Interconnected devices within the same operating range shall be conducted equipotential bonding. For example, interconnected devices, cable metal jacket, power supply PE line, and metal mechanical part, etc. shall be guaranteed the equipotential bonding.

The equipotential bonding of interconnected devices can be conducted with reference to the following figure. Measure whether there is good contact between equipotential bonding points and sufficiently low impedance with multimeter after completion of bonding.



Appendix Figure E-1 The diagram of device equipotential bonding

1. Device ground terminal	2. Device equipotential bonding line
3. Ground protection cable	4. Ground bar

F Environmental Substance Statement

Appendix Table F-1 Toxic and harmful substance name and content identification

Part name[1]	Toxic and harmful substance or element					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr(VI))	Polybrominated biphenyl (PBB)	Polybrominated diphenyl ether (PBDE)
Printed wiring board components[2]	×	O	O	O	O	O
Switch mode power supply	×	O	O	O	×	×
Casing/subrack (metal)	O	O	O	O	O	O
Enclosure base plate	O	O	O	O	×	×
Screw	×	O	×	O	O	O
Dust-proof cover (plastic)	×	×	×	×	×	×
Heat radiator	O	O	O	O	O	O
Fan	O	O	O	O	O	O
Cable	×	×	×	×	×	×
Lithium ion battery	O	O	O	O	O	O

O: Means that the content of the toxic and harmful substance in all homogeneous materials of the part is below the limit requirement specified in the standard SJ/T11363-2006.

×: Means that the content of the toxic and harmful substance in a certain homogeneous material of the part exceeds the limit requirement specified in the standard SJ/T11363-2006.

The environmental substances or elements contained in the product will not leak or change suddenly in the environment-friendly use period if the use conditions in the environment-friendly use period are strictly followed.

The environment-friendly use period of the lithium ion battery of the product is 5 years, and that of other parts is 50 years.

See the requirements for operating environment in the product manual for the product use conditions in the environment-friendly use period.

 Note:

- Note 1: The statement lists all parts possibly configured by the product of our company. The parts actually contained by each product are subject to the material object.
- Note 2: The printed wiring board components include the printed wiring board and the IC devices and discrete devices constituted by printed wiring board, such as resistor, capacitor, integrated circuit and connector.