

# HS2310-16GH2GT1XS Switch

## Hardware Installation and Reference Guide

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# Preface

## Intended Audience

This document is intended for:

- Network engineers
- Technical support and servicing engineers
- Network administrators

## Technical Support

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- Skype: [service\\_rj@ruijienetworks.com](https://www.skype.com/people/service_rj@ruijienetworks.com)

## Conventions

### 1. Signs

The symbols used in this document are described as follows:

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 **Caution**

An alert that calls attention to essential information that if not understood or followed can result in function failure or performance degradation.

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 **Note**

An alert that contains additional or supplementary information that if not understood or followed will not lead to serious consequences.

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### 2. Note

This manual provides the device installation steps, hardware troubleshooting, module technical specifications, and specifications and usage guidelines for cables and connectors. It is intended for the users who have some experience in installing and maintaining network hardware. At the same time, it is assumed that the users are already familiar with the related terms and concepts.

# Contents

1	Product Overview.....	1
1.1	Technical Specifications .....	2
1.2	Product Appearance .....	3
1.3	Port Definition .....	4
1.4	Power Supply .....	5
1.5	Heat Dissipation .....	6
1.6	LED .....	6
1.7	Buttons.....	7
1.8	Topology .....	8
2	Preparation Before Installation .....	10
2.1	Safety Suggestions.....	10
2.1.1	Installation .....	10
2.1.2	Movement.....	10
2.1.3	Electricity.....	10
2.1.4	Static Discharge Damage Prevention .....	11
2.1.5	Laser .....	11
2.1.6	Storage .....	12
2.2	Installation Site Requirements.....	12
2.2.1	Ventilation.....	12
2.2.2	Temperature and Humidity .....	12
2.2.3	Cleanness .....	13
2.2.4	Anti-Interference.....	13
2.2.5	Grounding .....	14
2.2.6	Lightning Resistance .....	15
2.2.7	EMI.....	15
2.3	Optical Fiber Connection.....	16
2.4	Requirements of Installation Tools.....	16
3	Product Installation .....	17
3.1	Installation Flowchart.....	17
3.2	Confirmations before Installation .....	17
3.3	Installing the HS2310-16GH2GT1XS.....	18
3.3.1	Mounting the Switch to a Standard 19-inch Rack .....	18
3.3.2	Mounting the Switch on the Wall.....	19
3.3.3	Mounting the Switch on a Workbench .....	21
3.4	Grounding the Switch.....	22
3.5	Connecting the External Port Cables.....	22
3.6	Bundling the Cables.....	23
3.7	Checking after Installation .....	23
4	System Debugging.....	24
4.1	Establishing the Environment .....	24
4.2	Startup Check .....	25

4.2.1	Checking before the Device is Powered on .....	25
4.2.2	Checking after Program Startup (Recommended) .....	25
5	Web Configuration.....	26
6	Maintenance and Troubleshooting .....	27
6.1	General Troubleshooting Procedure .....	27
6.2	Troubleshooting Common Faults .....	27
	Appendix A Connectors and Connection Media .....	29
	Appendix B Mini-GBIC and SFP+ Module.....	31
	Appendix C Lightning Protection .....	35
	Appendix D Cabling Recommendations in Installation .....	38
	Appendix E Site Selection .....	41

# 1 Product Overview

The HS2310-16GH2GT1XS switch is designed for old apartments to provide the fiber to the home (FTTB) solution, without affecting telephone and fax functions. The switch provides a gigabit high-speed network over existing telephone lines in an old apartment.

Table 1-1 HS2310-16GH2GT1XS

Model	POTS/ISDN Port	Console Port	10/100/1000Base-T Ports	SFP+ Ports	SYNC_IN Port	SYNC_OUT Port	G.hn Ports	Power Supply
HS2310-16GH2GT1XS	1	1	2	1	1	1	16	External Adapter

-  The 1000Base-T ports are downward compatible with 100Base-T and 10Base-T.
-  The SFP+ port supports 10G Base-R and 1000Base-X.
-  The type of POTS/ISDN port is a 50-pin RJ21 female connector. It supports support 16 telephone signal inputs.
-  The SYNC\_IN and SYNC\_OUT ports are used in a cascaded scenario.

## 1.1 Technical Specifications

Model	HS2310-16GH2GT1XS
Dimensions	340 mm x 200 mm x 44 mm (13.39 in. x 7.87 in. x 1.73 in.)
Weight	About 2.5 kg
CPU	Build-in single-core CPU, 800MHz
BOOTROM	/
FLASH Memory	256MB
SDRAM	DRIII 512MB
Fiber Module and Cables	<p> Refer to Appendix B. Copper cables are not supported.</p> <p> The supported module model may be updated at any time, please consult Ruijie networks for details.</p>
SFP+ Port	Support 10G Base-R and 100Base-X.
Power Supply (Adapter)	<ul style="list-style-type: none"> <li>■ Input: Rate voltage range: 100–240 V~ Maximum voltage range: 90–264 V~ Frequency: 50/60 Hz Rated current: 2 A</li> <li>■ Output: Rate voltage: 12V DC Rated current: 6.25A</li> </ul>
RTC	Not support
PoE	Not support
Power Consumption	<65 W
Operating Temperature	-10°C to 50°C (14°F to 122°F)
Storage Temperature	-40°C to 70°C (-40°F to 158°F)
Operating Humidity	10% to 90% RH (Non-condensing)
Storage Humidity	5% to 95% RH (Non-condensing)
Operating Altitude	0–2000m
Fan	Support speed control and fault alarm.
EMC Standards	VCCI-CISPR 32
Certification	VCCI & JATE

 The HS2310-16GH2GT1XS switch should be installed in an equipment room or in a dedicated place, and is accessible only by maintenance personnel, professional personnel or technicians.

## 1.2 Product Appearance

On the front panel, the HS2310-16GH2GT1XS switch provides 1 POTS/ISDN port, 1 console port, 2 10/100/1000Base-T ports (RJ45), 1 SFP+ port, 2 clock synchronization ports (SYNC\_IN and SYNC\_OUT), and 16 G.hn ports (RJ11). On the back panel, it provides an 12V AC power socket.

Figure 1-1 HS2310-16GH2GT1XS Appearance

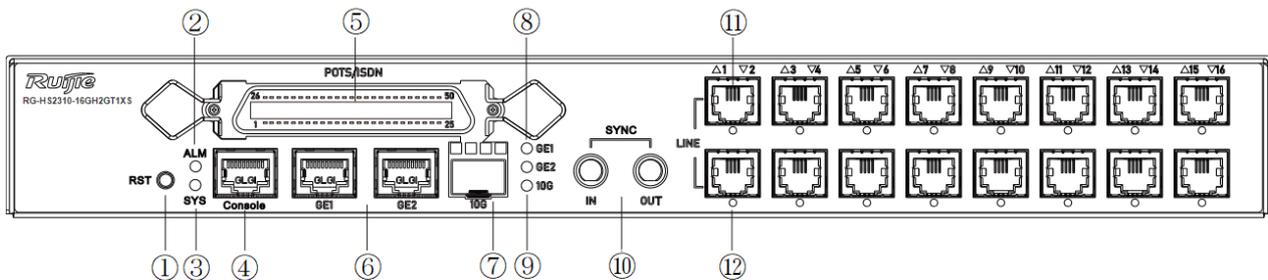


Figure 1-2 HS2310-16GH2GT1XS Appearance



### Front Panel

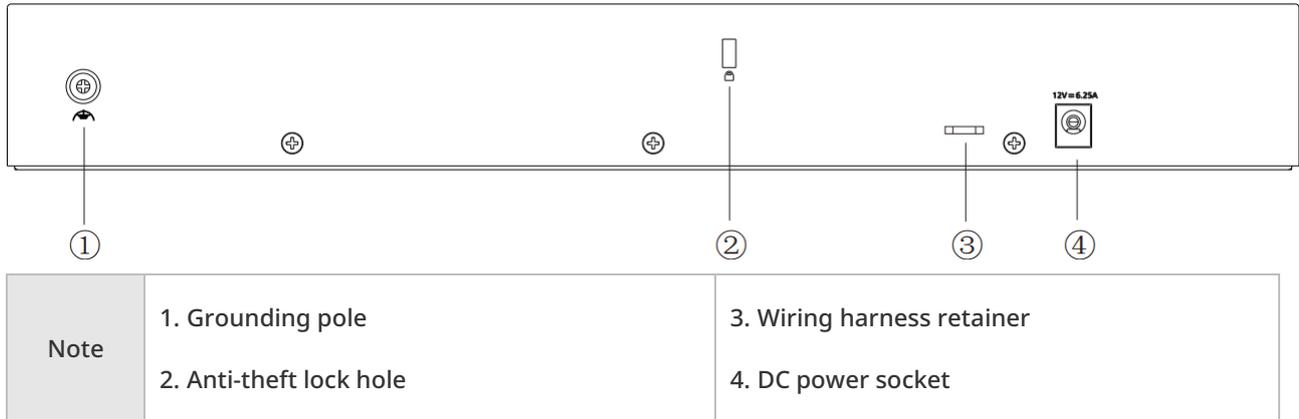
Figure 1-3 Front Panel of HS2310-16GH2GT1XS



Note	1. Reset Button	7. SFP/SFP+ Port
	2. Alarm status LED	8. SFP/SFP+ Status LED
	3. System status LED	9. 10/100/1000Base-T Ethernet Port Status LED
	4. Console port	10. SYNC_IN and SYNC_OUT Ports
	5. 10/100/1000Base-T Ethernet port	11. G.hn Ports
	6. POTS/ISDN Port	12. G.hn Port Status LED

### Back Panel

Figure 1-4 Back Panel of HS2310-16GH2GT1XS



## 1.3 Port Definition

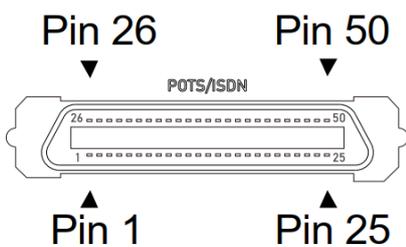
### ■ POTS/ISDN Port

The POTS/ISDN port is a 50-pin connector (RJ21). It supports 16 POTS/ISDN signal inputs, which means the signal can be transmitted through the device internally to provide internet access to the HA3515-DG in the room without effecting the POTS or ISDN function.

Corresponding relationship between 16 G.hn ports and the Pin number of RJ21:

Telephone Ports	RJ 21 Pin No.		Telephone Ports	RJ 21 Pin No.	
1	48	49	9	36	37
2	22	23	10	10	11
3	45	46	11	33	34
4	19	20	12	7	8
5	42	43	13	30	31
6	16	17	14	4	5
7	39	40	15	27	28
8	13	14	16	1	2

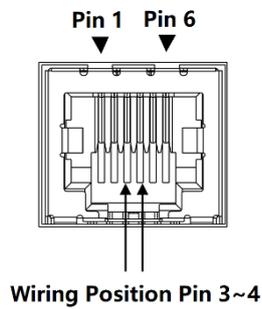
Figure 1-5 RJ21 Connector



### ■ G.hn Ports

The G.hn port is a 6P4C connector (RJ11). Only the Pin 3 and Pin 4 are used for transmitting signals. The connection between the G.hn port of the switch and the G.hn port of HA3515-DG can be crossover or straight-through.

Figure 1-6 RJ11 Connector



## 1.4 Power Supply

### ■ AC Input

Rated voltage range: 100–240 VAC, 50/60 Hz

Maximum voltage range: ~90–264 V, 47 Hz to 63 Hz

Frequency: 50/60 Hz

Rated current: 2 A

Power cord: 7A

### ■ DC Input

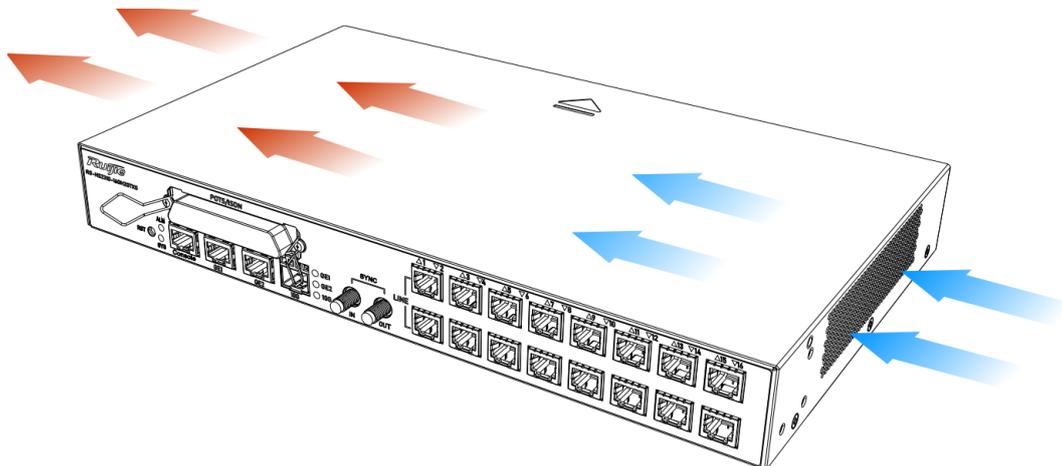
Rated voltage: 12 V DC

Rated current: 6.25 A

## 1.5 Heat Dissipation

HS2310-16GH2GT1XS switch adopts a right-to-left airflow to ensure normal operation. Maintain a minimum clearance of 10 cm around the device to allow air circulation. It is recommended to clean the device once every 3 months to avoid dust from blocking vents.

Figure 1-7 Heat Dissipation



## 1.6 LED

LED	Panel Identification	State	Meaning
Status LED	Status	Off	The switch is powered off or abnormal.
		Blinking green	The switch is being initialized. Continuous blinking indicates errors.
		Solid green	The switch is operational.
	ALM	Off	The fan and clock synchronization are operational, and the temperature is normal.
Solid Yellow		A fault occurs. Fault Reasons: 1. The fan is faulty. 2. The output of clock synchronization is abnormal. 3. The temperature is abnormal.	
	LINE1-16	Off	The port is powered off or not linked.

G.hn Port Status LEDs		Solid green/yellow	The port has been linked, but no data is transmitted. Green: The transmission rate is higher than the threshold value. Yellow: The transmission rate is lower than the threshold value.
		Blinking green/yellow	The port has been linked and data is transmitted. Green: The transmission rate is higher than the threshold value. Yellow: The transmission rate is lower than the threshold value.
GE1/GE2 Port Status LEDs	GE1 GE2	Off	The port is not connected.
		Solid green	The port is connected but no data is transmitted.
		Blinking green	The port is connected and data is transmitted.
SFP/SFP+ Port Status LEDs	10G	Off	The port is not connected.
		Solid green	The port is connected but no data is transmitted.
		Blinking green	The port is connected and data is transmitted.

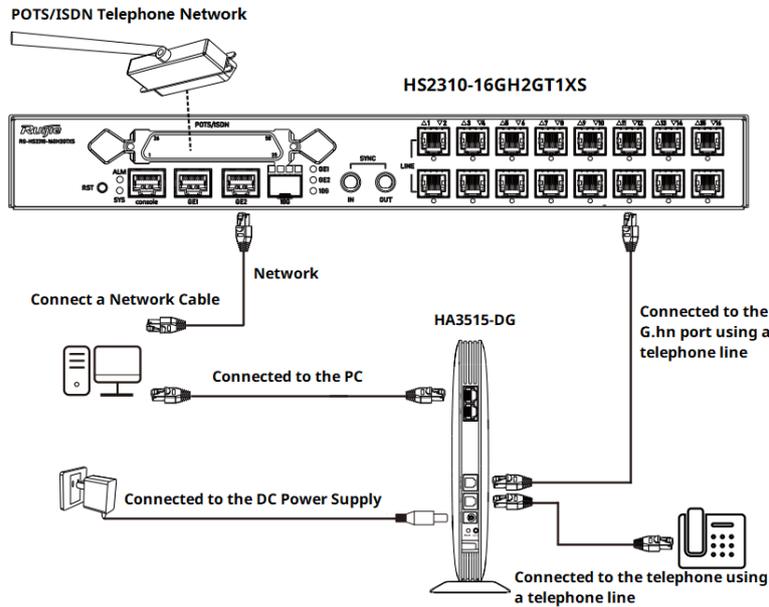
## 1.7 Buttons

Button	Panel Identification	Status	Meaning
Reset Button	RST	Press and hold the button for 5 seconds	Restart the device
		Press and hold the button for 10 seconds	Reset the G.hn ports and restore the device to factory settings.

# 1.8 Topology

## ■ A Single Switch

Figure 1-8 Topology of a Single Switch



The POTS/ISDN port is connected to the telephone bus.

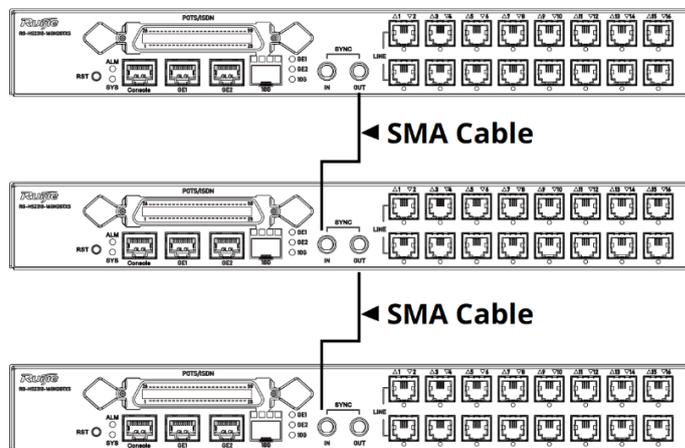
Connect one of the three ports (GE1/GE2/10G) to the network.

LINE1-16 is connected to the G.hn ports of the HA3515-DG in rooms using telephone lines.

## ■ Three Switches

Up to three switches can be cascaded. When over 16 HA3515-DG are going to be deployed and the telephone lines are parallel or close to each other, the switches should be cascaded using coaxial cables (sold separately) from the SYNC\_OUT port of a switch to the SYNC\_IN port of another switch.

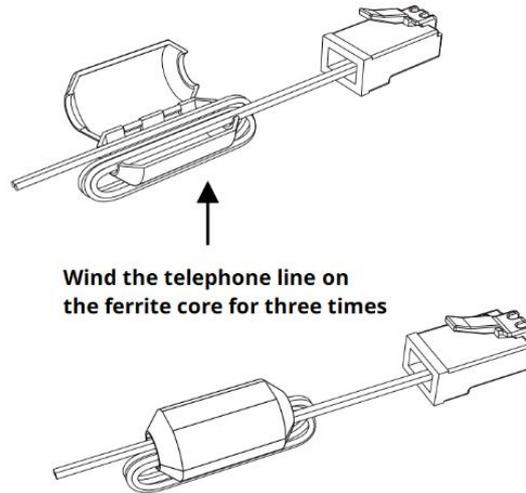
Figure 1-9 Topology of the Cascaded Connection between Three Switches



When multiple switches are cascaded, it is recommended to wind telephone lines on ferrite cores for EMI suppression so as to improve the overall performance of the switches.

The use of a ferrite core is shown as follows:

Figure 1-10 Winding Telephone Lines on the Ferrite Cores



## 2 Preparation Before Installation

### 2.1 Safety Suggestions

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 To avoid personal injury and equipment damage, please carefully read the safety suggestions before you install the HS2310-16GH2GT1XS switch.

 The following safety suggestions do not cover all possible dangers.

---

#### 2.1.1 Installation

- Keep the chassis clean and free from any dust.
- Do not place the equipment in a walking area.
- Do not wear loose clothes or accessories that may be hooked or caught by the device during installation and maintenance.
- Turn off all power supplies and remove the power sockets and cables before installing or uninstalling the device.

#### 2.1.2 Movement

- Do not frequently move the device.
- When moving the device, note the balance and avoid hurting legs and feet or straining the back.
- Before moving the device, turn off all power supplies and dismantle all power modules.

#### 2.1.3 Electricity

- Observe local regulations and specifications when performing electric operations. Relevant operators must be qualified.
- Before installing the device, carefully check any potential danger in the surroundings, such as ungrounded power supply, and damp/wet ground or floor.
- Before installing the device, find out the location of the emergency power supply switch in the room. First cut off the power supply in the case of an accident.
- Try to avoid maintaining the switch that is powered-on alone.
- Be sure to make a careful check before you shut down the power supply.
- Do not place the equipment in a damp location. Do not let any liquid enter the chassis.

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 Any nonstandard and inaccurate electric operation may cause an accident such as fire or electrical shock, thus causing severe even fatal damages to human bodies and equipment.

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- 
-  Direct or indirect touch through a wet object on high-voltage and mains supply may bring a fatal danger.
  -  If a power supply system is equipped with a leakage protector (also referred to as "leakage current switch" or "leakage current breaker"), the rated leakage action current of each leakage protector is greater than twice of the theoretical maximum leakage current of all the power supplies in the system. For example, if a system is equipped with 16 identical power supplies, the leakage current of each power supply is equal to or less than 3.5 mA, and the leakage current of the system totals 56 mA. A leakage protector with 30 mA rated action current supports less than 5 power supplies (that is, Action current of the leakage protector/2/Maximum leakage current of each power supply =  $30/2/3.5=4.28$ ). In other words, the leakage protector with 30 mA rated action current supports no more than 4 power supplies. In this case, the 16 power supplies in the system require at least 4 leakage protectors with 30 mA rated action current and each leakage protector supports 4 power supplies. If power supplies in a system differ in models, the rated leakage action current of each leakage protector divided by two is greater than the sum of maximum leakage current of all the power supplies. The rated leakage non-action current of a leakage protector shall be 50% of the leakage action current. Take a leakage protector with 30 mA rated leakage action current as an example. The rated leakage non-action current shall be 15 mA. When the leakage current is below 15 mA, the protector shall not act. Otherwise, misoperation may easily occur due to high sensitivity and thus the leakage protector trips, devices are powered off, and services are interrupted.
  -  To guarantee personal safety, the rated leakage action current of each leakage protector in the system must be equal to or less than 30 mA (human body safety current is 30 mA). When twice of the total leakage current of the system is greater than 30 mA, the system must be equipped with two or more leakage protectors.
  -  For the leakage current value of each power supply model, see the power supply model parameter table in Chapter 1.
- 

## 2.1.4 Static Discharge Damage Prevention

To prevent damage from static electricity, pay attention to the following:

- Proper grounding of grounding screws on the back panel of the device. Use a three-wire single-phase socket with protective earth wire (PE) as the AC power socket.
- Indoor dust prevention.
- Proper humidity conditions.
- Wear anti-static wrist strap before installation.

## 2.1.5 Laser

The HS2310-16GH2GT1XS switch supports varying models of optical modules sold on the market which are Class I laser products. Improper use of optical modules may cause damage. Therefore, pay attention to the following when you use them:

- When a fiber transceiver works, ensure that the port has been connected with an optical fiber or is covered with a dust cap, to keep out dust and avoid burning your eyes.
- When the optical module is working, do not pull out the fiber cable and stare into the transceiver interface or you may hurt your eyes.

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 Do not stare into any optical port under any circumstances, as this may cause permanent damage to your eyes.

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## 2.1.6 Storage

To ensure the normal operation of the switch, please check the requirements of storage temperature and humidity shown in the technical specifications in Chapter 1.

## 2.2 Installation Site Requirements

To ensure the normal working and a prolonged durable life of the equipment, the installation site must be indoor and meet the following requirements.

### 2.2.1 Ventilation

Maintain a minimum clearance of 10 cm around the device to ensure the normal ventilation. After various cables have been connected, they should be arranged into bundles or placed on the cabling rack to avoid blocking the air inlets. It is recommended to clean the switch at regular intervals (like once every 3 months). Especially, avoid dust from blocking the screen mesh on the back of the cabinet.

### 2.2.2 Temperature and Humidity

To ensure the normal operation and prolong the service life of HS2310-16GH2GT1XS switch, you should keep proper temperature and humidity in the equipment room.

If the equipment room has temperature and humidity that do not meet the requirements for a long time, the equipment may be damaged.

- In an environment with high relative humidity, the insulating material may have bad insulation or even leak electricity. Sometimes the materials may suffer from mechanical performance change and metallic parts may get rusted.
- In an environment with low relative humidity, however, the insulating strip may dry and shrink. Static electricity may occur easily and endanger the circuit on the equipment.
- In an environment with high temperature, the equipment is subject to even greater harm, as its performance may degrade significantly and various hardware faults may occur.

Therefore, the ambient temperature and humidity of the HS2310-16GH2GT1XS switch must meet the requirements listed in Table 2-1:

Table 2-1 Temperature and Humidity Requirements of the HS2310-16GH2GT1XS Switch

Model	Temperature	Relative Humidity
HS2310-16GH2GT1XS	-10°C to 55°C (14°F to 131°F)	10% to 90%

- i** The requirements for the sampling site of the temperature and humidity in the operating environment of the device are as follows:

There is no protective plate at the front or back of the equipment rack.

The vertical height is 1.5 m above the floor.

The distance from the front panel of the equipment is 0.4 m.

### 2.2.3 Cleanness

Dust poses a severe threat to the running of the equipment. The indoor dust falling on the equipment may be adhered by the static electricity, causing bad contact of the metallic joint. Such electrostatic adherence may occur more easily when the relative humidity is low, not only affecting the useful life of the equipment, but also causing communication faults. Table 2-2 shows the requirements for the dust content and granularity in the equipment room.

Table 2-2 Requirements for the Dust Content and Granularity in the Equipment Room

Dust	Unit	Density
Diameter $\geq$ 0.5 $\mu\text{m}$	Particles/ $\text{m}^3$	$\leq 3.5 \times 10^6$
Diameter $\geq$ 5 $\mu\text{m}$	Particles/ $\text{m}^3$	$\leq 3 \times 10^4$

Apart from dust, the salt, acid and sulfide in the air in the equipment room must also meet strict requirements, as such poisonous substances may accelerate the corrosion of the metal and the aging of some parts. The equipment room should be protected from the intrusion of harmful gases such as sulfur dioxide, sulfured hydrogen, nitrogen dioxide, and chlorine), whose requirements are listed in Table 2-3.

Table 2-3 Requirements for Harmful Gases in the Equipment Room

Gas	Average ( $\text{mg}/\text{m}^3$ )	Maximum ( $\text{mg}/\text{m}^3$ )
SO <sub>2</sub>	0.3	1.0
H <sub>2</sub> S	0.1	0.5
NO <sub>2</sub>	0.5	1.0
Cl <sub>2</sub>	0.1	0.3

- i** Both average and maximum value are measured for a week. The switch cannot be placed in the environment with the maximum density for over 30 minutes every day.

### 2.2.4 Anti-Interference

The operational switch may be subjected to interference from external factors, which affects the equipment through capacitive coupling, inductive coupling, electromagnetic radiation, common impedance coupling (including ground systems) and conduction of wires (power, signal and output lines, etc.). Therefore, pay attention to the following.

The switch adopts the AC power distributor system with TN system. It uses a three-wire single-phase socket with protective earth wire (PE) as the AC power socket, which can effectively suppress the interference from power grid.

- The switch should be located at places free from the large power radio launch pad, radar launch pad, and high-frequency large-current devices.

- If necessary, electromagnetic shielding should be adopted. For example, use interface cables to shield cables.
- Interface cables should be laid inside the equipment room and outdoor cabling of such cables is prohibited to prevent the ports of the device from being damaged by overvoltage and overcurrent caused by lightning.

## 2.2.5 Grounding

A good grounding system is the basis for the stable and reliable operation of the HS2310-16GH2GT1XS switch. It is the chief condition to prevent lightning stroke and resist interference. Please carefully check the grounding conditions on the installation site according to the grounding requirements, and perform grounding operations properly as required.

 Effective grounding of the switch is an important guarantee for lightning protection and interference resistance. Therefore, connect the grounding line of the switch properly.

### Safety Grounding

The equipment using AC power supply must be grounded by using the yellow/green safety grounding cable. Otherwise, when the insulating resistance decreases the power supply and the enclosure in the equipment, electric shock may occur.

 The building must provide protective grounding connection to ensure that the device is connected to the protection location.

 The installation and maintenance personnel must check whether the A.C. socket is well connected to the protection location of the building, if not, they should use a protective grounding wire to connect the grounding end of the A.C. socket to the building's protection location.

 The power supply socket must be installed in a place that is near to the device and where users can operate the device easily.

 Before the installation of the device, make sure that ground connection is connected at first and disconnected finally.

 The sectional area of the protective grounding wire should be at least 0.75 mm<sup>2</sup> (18 AWG).

 Use the 3-core power supply line. The sectional area of each pin should be at least 0.75 mm<sup>2</sup> or 18 AWG.

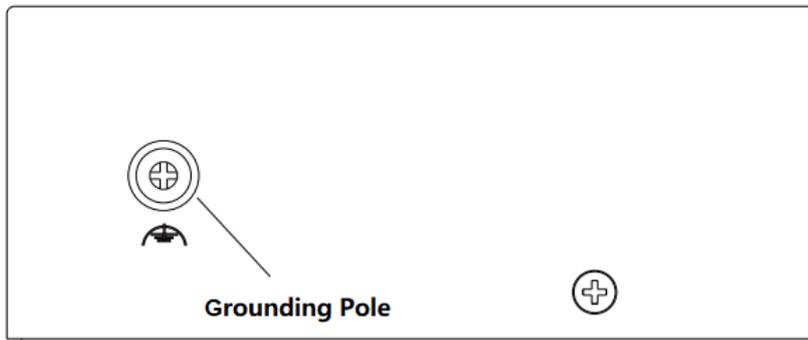
### Lightning Grounding

The lightning protection system of a facility is an independent system that consists of the lightning rod, downlead conductor and the connector to the grounding system, which usually shares the power reference ground and yellow/green safety cable ground. The lightning discharge ground is for the facility only, irrelevant to the equipment.

### EMC Grounding

The grounding required for EMC design includes shielding ground, filter ground, noise and interference suppression, and level reference. All the above constitute the comprehensive grounding requirements. The resistance of earth wires should be less than 1 Ω. The HS2310-16GH2GT1XS switch back plane is reserved with one grounding pole, as shown in Figure 2-1.

Figure 2-1 Grounding Pole



## 2.2.6 Lightning Resistance

When the AC power cable is imported outdoors and directly connected to the power port of the HS2310-16GH2GT1XS switch, lightning-proof grounding connectors should be adopted to prevent the switch from being hit by lightning shocks. Connect the AC cable to the lightning-proof grounding connectors. Then, connect the switch to the lightning-proof grounding connectors. This can help to prevent the current of high-voltage lightning from passing the switch directly through the mains supply cable to a certain extent.

**!** The lightning-proof grounding connectors are not provided and should be purchased by users as required. For the usage of lightning-proof grounding connectors, refer to their related manuals.

## 2.2.7 EMI

Electro-Magnetic Interference (EMI), from either outside or inside the equipment or application system, affects the system in the conductive ways such as capacitive coupling, inductive coupling, and electromagnetic radiation.

There are two types of electromagnetic interference: radiated interference and conducted interference, depending on the type of the transmission path.

When the energy, often RF energy, from a component arrives at a sensitive component via the space, the energy is known as radiated interference. The interference source can be either a part of the interfered system or a completely electrically isolated unit. Conducted interference results from the electromagnetic wire or signal cable connection between the source and the sensitive component, along which cable the interference conducts from one unit to another. Conducted interference often affects the power supply of the equipment, but can be controlled by a filter. Radiated interference may affect any signal path in the equipment and is difficult to shield.

- Measures must be taken to prevent interference in power supply system.
- The grounding device of the switch must not be used as the grounding device of the electrical equipment or anti-lightning grounding device. In addition, the grounding device of the switch must be deployed far away from the grounding device of the electrical equipment and anti-lightning grounding device.
- Keep the equipment away from high-power radio transmitter, radar transmitting station, and high-frequency large-current device.
- Measures must be taken to shield static electricity.

## 2.3 Optical Fiber Connection

Before connecting optical fibers, ensure that the types of optical connector and optical fiber can be matched with the type of optical interface used, and check the sending and receiving direction of the optical fiber. The sending end of the device should be connected to the receiving end of the other device, and the receiving end of the device should be connected to the sending end of the other device.

## 2.4 Requirements of Installation Tools

Table 2-4 List of Installation Tools

Common Tools	Phillips screwdriver, flathead screwdriver, related electric cables and optical cables, bolts, diagonal pliers, straps
Special Tools	Anti-static tools
Meters	Multimeter

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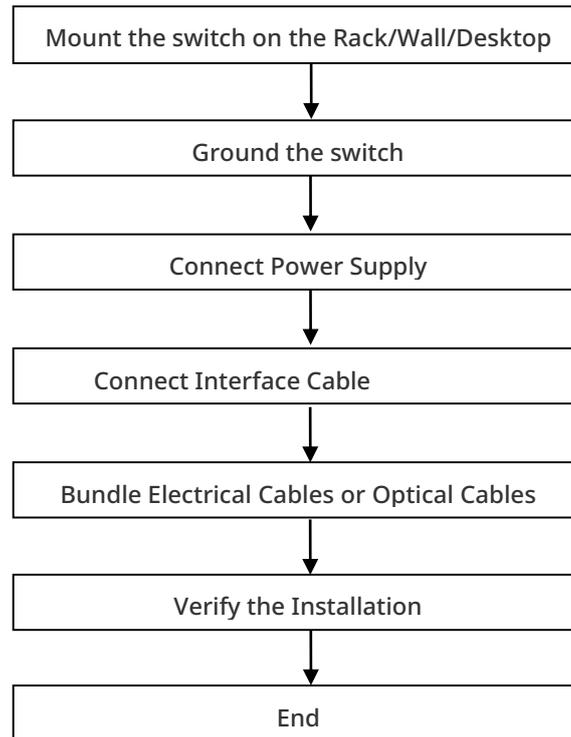
 The tool kit is customer-supplied.

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## 3 Product Installation

**i** Please ensure that you have carefully read Chapter 2. Make sure that the requirements set forth in Chapter 2 have been met.

### 3.1 Installation Flowchart



### 3.2 Confirmations before Installation

Before installation, please confirm the following points:

- Whether ventilation requirements are met for the switch;
- Whether the requirements of temperature and humidity are met for the switch;
- Whether power cables are already laid out and whether the requirements of electrical current are met;
- Whether related network adaption lines are already laid out.

## 3.3 Installing the HS2310-16GH2GT1XS

### Precautions

During installation, note the following points:

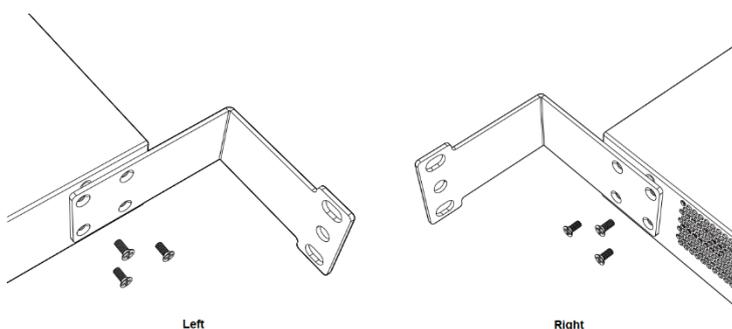
- Connect the power cables of different colors to the corresponding grounding posts.
- Ensure that the interface of the power supply cable is well connected to the power interface of the device. The power cable is attached to the wiring harness retainer on the rear panel using a cable tie after it is connected to the device.
- Do not place any articles on the HS2310-16GH2GT1XS switch.
- Maintain a minimum clearance of 10 cm around the device. Do not stack the devices.
- The switch should be located at places free from the large power radio launch pad, radar launch pad, and high-frequency large-current devices. If necessary, electromagnetic shielding should be adopted. For example, use interface cables to shield cables.
- 100-meter network cables should be laid inside the equipment room and outdoor cabling of such cables is prohibited. If outdoor cabling is necessary, take relevant measures for lightning protection.

### 3.3.1 Mounting the Switch to a Standard 19-inch Rack

The HS2310-16GH2GT1XS switch follows the EIA standard dimensions and can be installed in a 19-inch distribution cabinet.

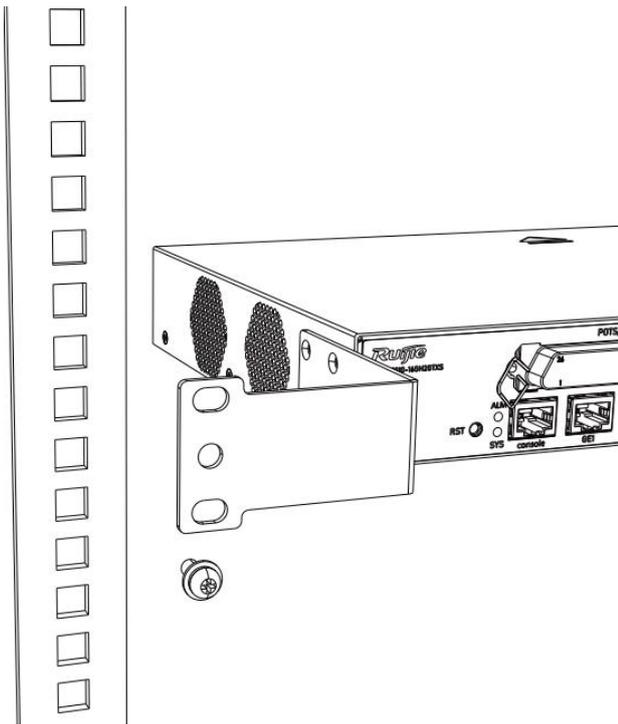
Step 1: Attach the mounting brackets to the switch with the supplied screws, as shown in Figure 3-1.

Figure 3-1 Attaching the Mounting Bracket to the Switch



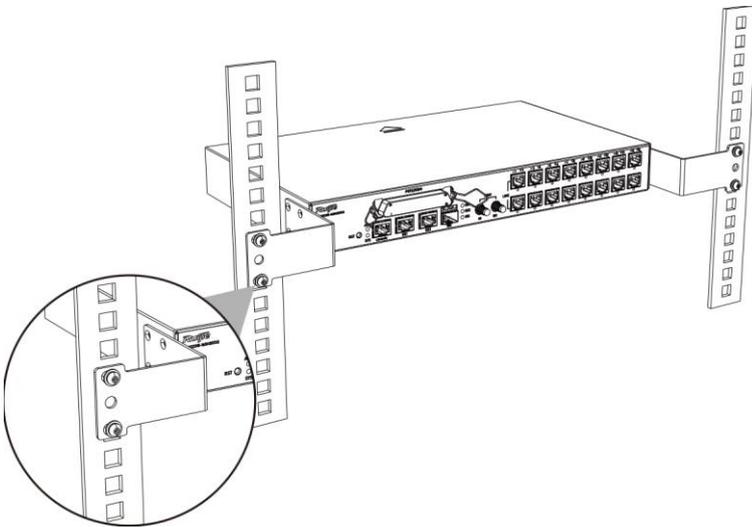
Step 2: Align the mounting holes in the mounting bracket with the mounting holes in the rack, as shown in Figure 3-2.

Figure 3-2 Aligning the Mounting Holes



Step 3: Use the supplied M6 screws and cage nuts to securely attach the mounting brackets to the rack, as shown in Figure 3-3.

Figure 3-3 Attaching the Mounting Brackets to the Rack

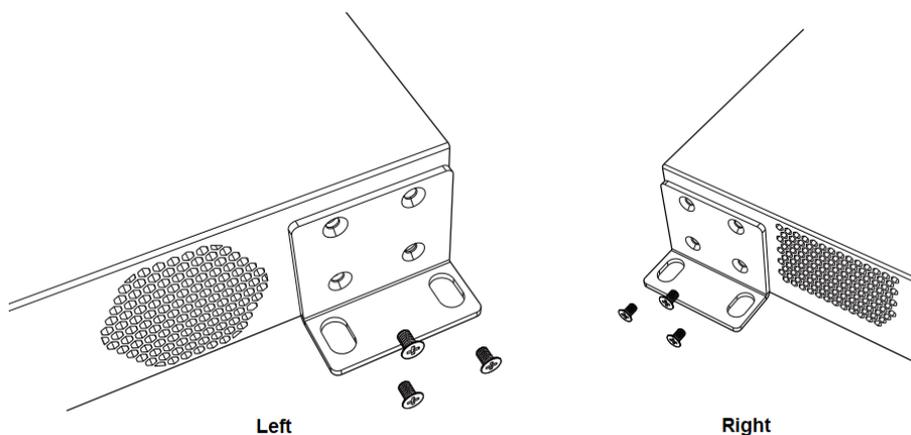


### 3.3.2 Mounting the Switch on the Wall

The HS2310-16GH2GT1XS switch can be mounted on the wall, as shown in the following figures.

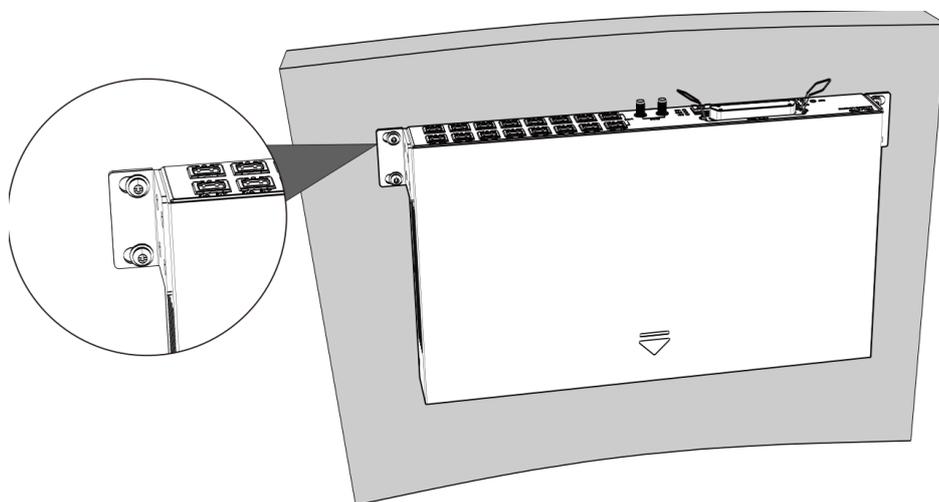
Attach the mounting brackets to the switch with the supplied screws, as shown in Figure 3-4.

Figure 3-4 Attaching the Mounting Brackets to the Switch for Wall-Mounting



Use the expansion screws to secure the mounting brackets on the wall, as shown in Figure 3-5.

Figure 3-5 Attaching the Switch on the Wall



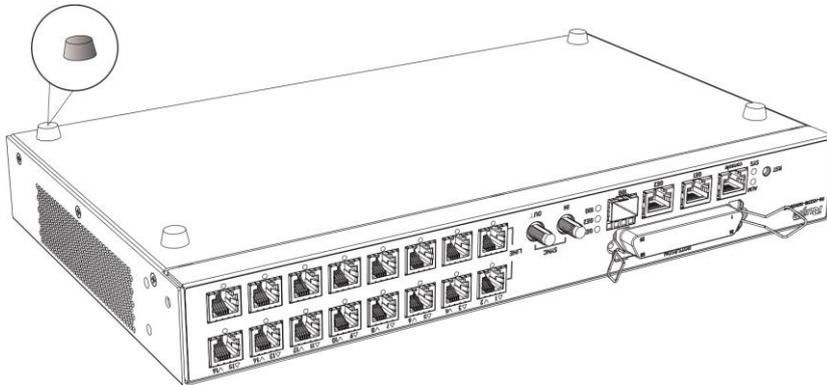
**⚠** SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.

### 3.3.3 Mounting the Switch on a Workbench

In some cases, users don't have a 19-inch standard cabinet and wall hanging installation environment. At this time, people can choose to place the switch on a workbench.

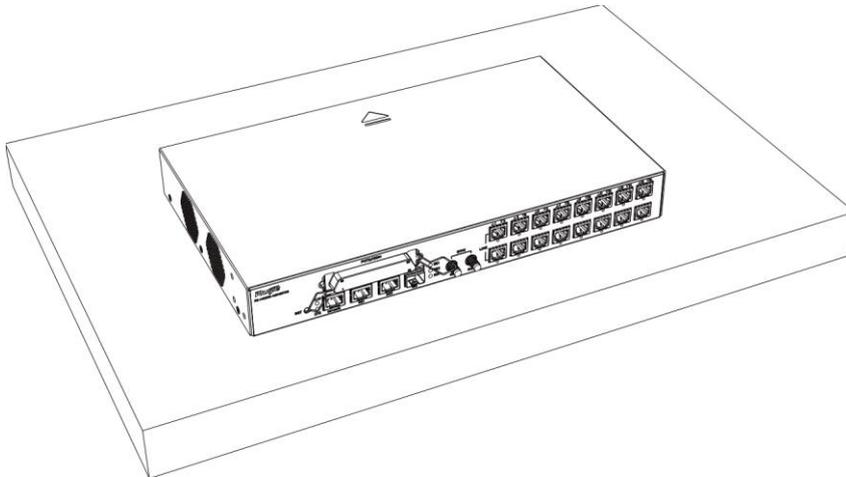
Attach the four rubber feet to the recessed areas on the bottom of the switch, as shown in Figure 3-6.

Figure 3-6 Attaching the Rubber Feet to the Recessed Areas



Place the switch on the workbench, as shown in Figure 3-7.

Figure 3-7 Mounting the Switch on the Table



 The device must be installed and operated in the place that can restrict its movement.

## 3.4 Grounding the Switch

The switch has a PGND on the back panel. First connect the PGND to the grounding lug of the rack and then connect the grounding lug to the grounding bar of the equipment room. Wall mounting and desktop mounting also need to be well grounded.

### Precautions

- The sectional area of the grounding wire should be determined according to the possible maximum current. Cables of good conductor should be used.
  - Do not use bare wire.
  - The grounding electric resistance should be less than 1  $\Omega$ .
- 
- ⚠ To guarantee the security of the body and the device, the switch must be well-grounded. The grounding resistance for combined grounding should be less than 1  $\Omega$ .
  - ⚠ The maintenance personnel shall check whether or not the AC socket powering the switch is well connected to the building protective earth (PE). If not, the personnel shall connect the grounding lug of the AC socket with the PE by using a grounding connector.
  - ⚠ The AC socket shall be installed near the equipment and shall be easily used.
  - ⚠ When installing the switch, make sure the grounding is connected first and disconnected last.
  - ⚠ The cross-sectional area of PE conductor shall be at least 2.5 mm<sup>2</sup> (12AWG).
- 

## 3.5 Connecting the External Port Cables

### Precautions

- Correctly distinguish single-mode and multi-mode fibers and ports.
- Avoid bends of small radius at the connector.

### Steps

1. Connect one end of the RJ45 connector to the Ethernet interface of the device board, and the other end to the NMS or a control terminal.
2. Insert the single-mode or multi-mode fiber into the appropriate interface according to the identification on the panel of the module.
3. Insert the twisted pair with the RJ45 port into the appropriate interface according to the identification on the panel of the module. Distinguish the crossover cable and straight-through cable.

## 3.6 Bundling the Cables

### Precautions

- The power cables and other cables should be bundled in a pleasing way.
- When you bundle fibers, make sure that the fibers at the connectors have natural bends or bends of large radius.
- Do not bundle fibers and twisted pairs too tightly, as this may press hard the fibers and affect their service time and transmission performance.

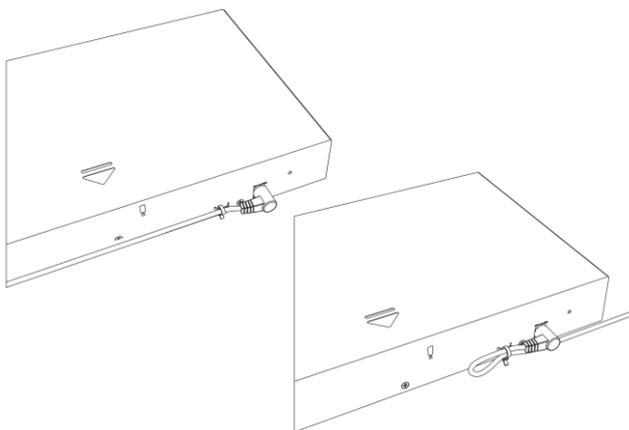
### Steps

- Bind the drooping part of the fibers and twisted pairs of each board, and lead them to both sides of the chassis for convenience.
- On the both sides of the chassis, fasten the fibers and twisted pairs to the cabinet cable management ring or cabling chute.
- For the power cables, you should bundle them closely along the bottom of the chassis, in a straight line wherever possible.

## 3.7 Checking after Installation

**!** Before checking the installation, switch off the power supply so as to avoid any personal injury or damage to the component due to connection errors.

- Check that the ground line is connected.
- Check that the cables and power input cables are correctly connected. Check that the power cable is bundled well.



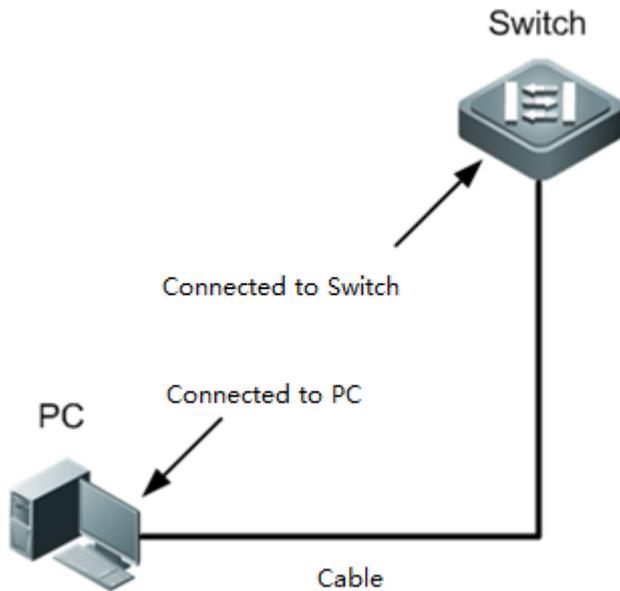
- Check that all interface cables are laid out inside the equipment room. In the case of external cabling, ensure that the lightning-proof connectors or network interface lightning protector are connected.
- Maintain a minimum clearance of 10 cm around the device.

## 4 System Debugging

### 4.1 Establishing the Environment

Connect the PC to the console port of the switch through the cable, as shown in Figure 4-1.

Figure 4-1 Configuration Environment



Start a terminal application on the computer, such as PuTTY, and configure the following parameters.

Configure the serial line	
Speed (baud)	<input type="text" value="9600"/>
data bits	<input type="text" value="8"/>
Stop bits	<input type="text" value="1"/>
Parity	<input type="text" value="None"/> ▼
Flow control	<input type="text" value="None"/> ▼

Press Enter on the command-line interface.



When the Ruijie prompt appears, you are set to configure your switch.

## 4.2 Startup Check

### 4.2.1 Checking before the Device is Powered on

- The switch is fully grounded.
- The power cable is correctly connected.
- The DC power cable is attached to the wiring harness retainer on the rear panel using a cable tie.
- The power supply voltage complies with the requirement of the switch.
- The PC is properly connected to the switch and the parameters are correctly configured.

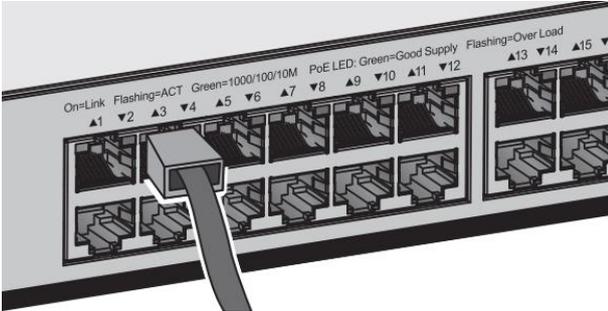
### 4.2.2 Checking after Program Startup (Recommended)

After power-on, you are recommended to perform the following checks to ensure the normal operation of follow-up configurations.

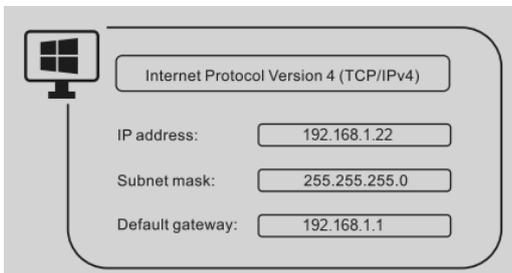
- Check whether the status of the switch indicator is normal.
- Check whether the main program of the device is normally loaded.
- Check whether the interface forwards data normally.

## 5 Web Configuration

1. Connect the PC to the switch using a network cable.



2. Configure the PC with an IP address 192.168.1.xxx. Please note that 192.168.1.200 is in use by the switch.



3. Open a command window by entering cmd in the Windows Start menu and then enter ping 192.168.1.200.

```
→ ~ ping 192.168.1.200
PING 192.168.1.200 (192.168.1.200) 56(84)bytes of data.
64 bytes from 192.168.1.200: icmp_seq=1 ttl=64 time=3.22 ms
```

4. Open a browser, enter 192.168.1.200 into the address bar of the browser and press Enter.

A screenshot of a web browser's address bar. It shows navigation icons (back, forward, refresh) and an information icon on the left, followed by the text '192.168.1.200'.

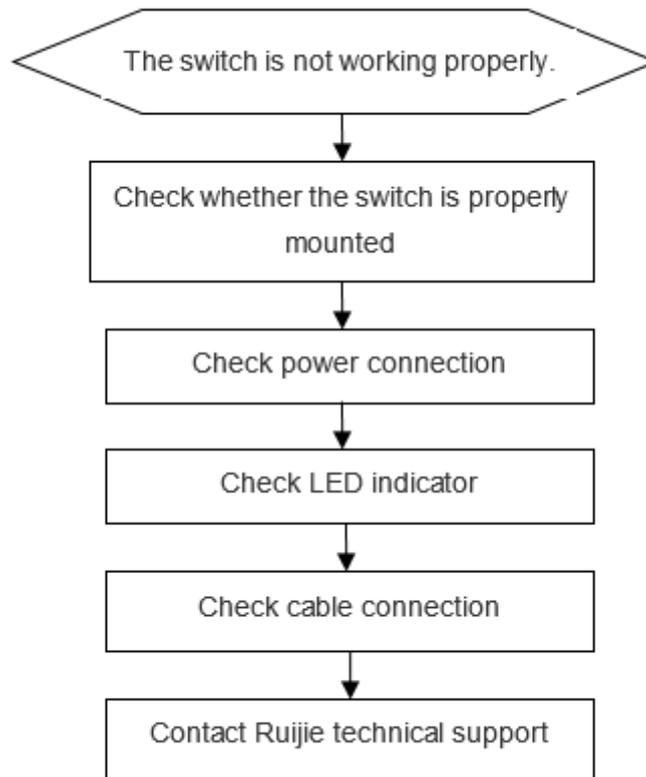
5. Enter username admin and password admin. Click Sign In.



6. Navigate to the Configure page to configure the device.

## 6 Maintenance and Troubleshooting

### 6.1 General Troubleshooting Procedure



### 6.2 Troubleshooting Common Faults

Symptom	Possible Causes	Solution
Forgetting the management interface login password	A password is manually configured but it is forgotten.	Press the reset button to restore the device to factory settings.
The status indicator is off after the switch is powered on.	The power supply module does not supply power.	Check whether the power socket at the equipment room is normal and whether the power cable of the switch is in good contact.
The RJ45 port is not connected or fails to receive or transmit data.	<ol style="list-style-type: none"> <li>The twisted pair cable is not in good contact.</li> <li>The uplink port is faulty.</li> </ol>	<ol style="list-style-type: none"> <li>Replace the twisted pair cable.</li> <li>Check whether the configurations (such as the port rate and duplex mode) of the port differ from that of the switch.</li> </ol>

<p>The G.hn port is not connected or fails to receive or transmit data.</p>	<ol style="list-style-type: none"> <li>1. The twisted pair cable is not in good contact.</li> <li>2. The G.hn port isn't configured correctly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the twisted pair cable.</li> <li>2. Check whether the device is installed correctly according the installation guide. If the device is correctly installed, reset the device by pressing the reset button.</li> </ol>
<p>The fiber port cannot be connected.</p>	<ol style="list-style-type: none"> <li>1. The Rx and Tx ends are connected reversely.</li> <li>2. The interconnected optical module type does not match.</li> <li>3. The fiber type is not correct.</li> <li>4. The length of the optical fiber exceeds that rated of the optical module.</li> </ol>	<ol style="list-style-type: none"> <li>1. Switch the Rx and Tx ends of the optical fiber.</li> <li>2. Replace the optical module with one of the matched type.</li> <li>3. Replace the optical fiber with one of the appropriate type.</li> <li>4. Replace the optical fiber with one of the appropriate length.</li> </ol>

# Appendix A Connectors and Connection Media

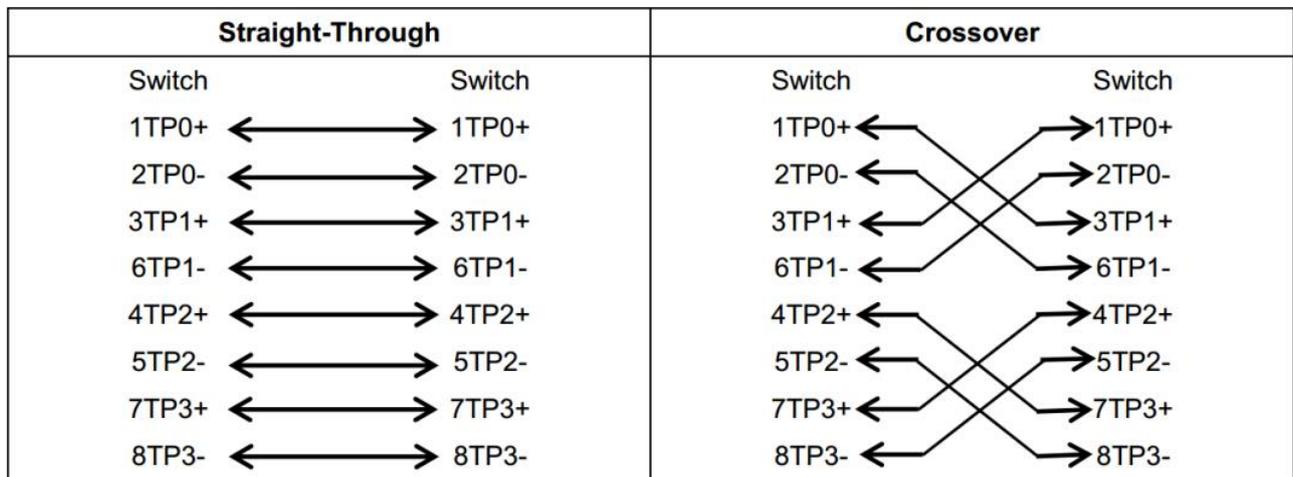
## 1000BASE-T/100BASE-TX/10BASE-T Ports

The 1000BASE-T/100BASE-TX/10BASE-T is a port that supports adaptation of three rates, and automatic MDI/MDIX Crossover at these three rates.

The 1000BASE-T complies with IEEE 802.3ab, and uses the cable of 100-ohm Category-5 or Supper Category-5 UTP or STP, which can be up to 100 m.

The 1000BASE-T port uses four pairs of wires for transmission, all of which must be connected. Figure A-1 shows the connections of the twisted pairs used by the 1000BASE-T port.

Figure A-1 Four Twisted Pairs of the 1000BASE-T



In addition to the above cables, the 100BASE-TX/10BASE-T can also use 100-ohm Category-3, 4, 5 cables for 10 Mbps, and 100-ohm Category-5 cables for 100 Mbps, both of which can be up to 100 m. Figure A-2 shows the pinouts of the 100BASE-TX/10BASE-T.

Figure A-2 Pinouts of the 100BASE-TX/10BASE-T

Pin	Socket	Plug
1	Input Receive Data+	Output Transmit Data+
2	Input Receive Data-	Output Transmit Data-
3	Output Transmit Data+	Input Receive Data+
6	Output Transmit Data-	Input Receive Data-
4,5,7,8	Not used	Not used

Figure A-3 shows the straight-through and crossover cable connections for the 100BASE-TX/10BASE-T.

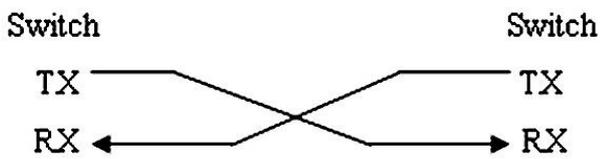
Figure A-3 Connections of the Twisted Pairs of the 100BASE-TX/10BASE-T

Straight-Through		Crossover	
Switch	Adapter	Switch	Switch
1 IRD+	1 OTD+	1 IRD+ ←	1 IRD+ →
2 IRD-	2 OTD-	2 IRD- ←	2 IRD- →
3 OTD+	3 IRD+	3 OTD+ ←	3 OTD+ →
6 OTD-	6 IRD-	6 OTD- ←	6 OTD- →

Optical Fiber Connection

For the optical fiber ports, select single-mode or multiple-mode optical fibers for connection according to the fiber module connected. The connection schematic diagram is shown in Figure A-4:

Figure A-4 Optical Fiber Connections



## Appendix B Mini-GBIC and SFP+ Module

SFP modules (Mini-GBIC module) modules are available to address the requirements of interface types of switch modules. You can select the Mini-GBIC module to suit your specific needs.

The models and technical specifications of some Mini-GBIC modules are listed below. For details, see *Ruijie Transceiver Installation and Reference Guide*.

Table B-1 Models and Technical Specifications of the 1000M Mini-GBIC(SFP) Module

Model	Wavelength (nm)	Fiber Type	Support DDM (Yes/No)	Sending Optical Density (dBm)		Receiving Optical Density (dBm)	
				min	max	min	max
MINI-GBIC-SX-MM850	850	MMF	No	-9.5	-3	-17	0
MINI-GBIC-LX-SM1310	1310	SMF	No	-9.5	-3	-20	-3
GE-eSFP-SX-MM850	850	MMF	Yes	-9.5	-3	-17	0
GE-eSFP-LX-SM1310	1310	SMF	Yes	-9.5	-3	-20	-3
GE-SFP-LX-SM1310	1310	SMF	No	-9.5	-3	-20	-3
MINI-GBIC-LH40-SM1310	1310	SMF	Yes	-2	3	-22	-3
GE-SFP-SX-SM1310-BIDI	1310	MMF	No	-10	-5	-17	-3
GE-SFP-SX-SM1550-BIDI	1550	MMF	No	-10	-5	-17	-3
GE-SFP-LX20-SM1310-BIDI	1310TX/1550RX	SMF	Yes	-9	-3	-20	-3
GE-SFP-LX20-SM1550-BIDI	1550TX/1310RX	SMF	Yes	-9	-3	-20	-3
GE-SFP-LH40-SM1310-BIDI	1310TX/1550RX	SMF	Yes	-5	0	-24	-1
GE-SFP-LH40-SM1550-BIDI	1550TX/1310RX	SMF	Yes	-5	0	-24	-1
MINI-GBIC-ZX50-SM1550	1550	SMF	Yes	-5	0	-22	-3
MINI-GBIC-ZX80-SM1550	1550	SMF	Yes	0	4.7	-22	-3
MINI-GBIC-ZX100-SM1550	1550	SMF	Yes	0	5	-30	-9
GE-SFP-SX	850	MMF	No	-9.5	-3	-17	0
GE-SFP-LX	1310	SMF	No	-9.5	-3	-20	-3
SFP-MM850	850	MMF	No	-9.5	-3	-17	0
SFP-SM1310	1310	SMF	No	-9.5	-3	-20	-3

Table B-2 Models of 1000M SFP Copper Module

Standard	Model	DDM (Yes/No)
1000Base-T	Mini-GBIC-GT	No

Table B-3 Module Cabling Specification

Model	Connector Type	Fiber Type	Core Size(um)	Cabling Distance
MINI-GBIC-SX-MM850	LC	MMF	62.5/125	275m
			50/125	550m
MINI-GBIC-LX-SM1310	LC	SMF	9/125	10km
GE-eSFP-SX-MM850	LC	MMF	62.5/125	275m
			50/125	550m
GE-eSFP-LX-SM1310	LC	SMF	9/125	10km
GE-SFP-LX-SM1310	LC	SMF	9/125	10km
MINI-GBIC-LH40-SM1310	LC	SMF	9/125	40km
GE-SFP-SX-SM1310-BIDI	LC	MMF	50/125	500m
GE-SFP-SX-SM1550-BIDI	LC	MMF	50/125	500m
GE-SFP-LX20-SM1310-BIDI	LC	SMF	9/125	20km
GE-SFP-LX20-SM1550-BIDI	LC	SMF	9/125	20km
GE-SFP-LH40-SM1310-BIDI	LC	SMF	9/125	40km
GE-SFP-LH40-SM1550-BIDI	LC	SMF	9/125	40km
MINI-GBIC-ZX50-SM1550	LC	SMF	9/125	50km
MINI-GBIC-ZX80-SM1550	LC	SMF	9/125	80km
MINI-GBIC-ZX100-SM1550	LC	SMF	9/125	100km
GE-SFP-SX	LC	MMF	62.5/125	275m
			50/125	550m
GE-SFP-LX	LC	SMF	9/125	10km
Mini-GBIC-GT	RJ45	Category 5 (or above ) UTP or STP		100m

 For the optical module with transmission distance exceeding 40 km and more, one on-line optical attenuator should be added on the link to avoid the overload of the optical receiver when short single-mode optical fibers are used.

 Optical modules generate laser. Do not stare at light source.

 To keep optical modules clean, please use dust caps when the modules are not connected with fibers.

Table B-4 Specifications of SFP BIDI Optical Module Pairs

Rate/Distance	Module Pairs
1000M/500m	GE-SFP-SX-SM1310-BIDI GE-SFP-SX-SM1550-BIDI
1000M/20km	GE-SFP-LX20-SM1310-BIDI GE-SFP-LX20-SM1550-BIDI
100M/40km	GE-SFP-LH40-SM1310-BIDI GE-SFP-LH40-SM1550-BIDI

10G/300m	XG-SFP-SR-SM1270-BIDI XG-SFP-SR-SM1330-BIDI
10G/10km	XG-SFP-LR-SM1270-BIDI XG-SFP-LR-SM1330-BIDI

 The BIDI modules must be used in pairs (e.g., GE-SFP-LX20-SM1310-BIDI and GE-SFP-LX20-SM1550-BIDI).

Table B-5 10-Gigabit SFP+ Models and Specifications

Model	Wavelength (nm)	Support DDM (Yes/No)	Cable Type	Intensity of Transmitted Light (dBm)		Intensity of Received Light (dBm)	
				Min	Max	Min	Max
XG-SFP-SR-MM850	850	Yes	MMF	-7.3	-1	-9.9	-1
XG-SFP-ZR V1	850	Yes	MMF	-7.3	-1	-9.9	-1
XG-SR-MM850	850	Yes	MMF	-7.3	-1	-9.9	-1
SFP+MM850	850	Yes	MMF	-7.3	-1	-9.9	-1
XG-SFP-SR-SM1270-BIDI	1270	No	MMF	-3	4	-9	0.5
XG-SFP-SR-SM1330-BIDI	1270	No	MMF	-3	4	-9	0.5
XG-SFP-LR-SM1270-BIDI	1270	No	SMF	-6.5	0.5	-14.4	0.5
XG-SFP-LR-SM1330-BIDI	1330	No	SMF	-6.5	0.5	-14.4	0.5
XG-LR-SM1310	1310	Yes	SMF	-8.2	0.5	-14.4	0.5
XG-SFP-LR-SM1310	1310	Yes	SMF	-8.2	0.5	-14.4	0.5
XG-eSFP-LR-SM1310	1310	Yes	SMF	-8.2	0.5	-14.4	0.5
XG-SFP-ER-SM1550	1550	Yes	SMF	-4.7	4	-11.3	-1
XG-SFP-ZR-SM1550	1550	Yes	SMF	0	4	-24	-7
XS-SFP-SR	850	Yes	MMF	-7.3	-1	-9.9	-1
XS-SFP-LR	1310	Yes	SMF	-8.2	0.5	-10.3	0.5

Table B-6 10-Gigabit SFP+ Cable Modules and Specifications

Model	Module Type	Connector Type	Cable Length (M)	Conductor Diameter (AWG)	Speed (Gb/s)	Support DDM (Yes/No)
XG-SFP-AOC1M	Active Fiber-Optic Cable	SFP+	1	\ /	10.3125	Yes
XG-SFP-AOC3M	Active Fiber-Optic Cable	SFP+	3	\	10.3125	Yes
XG-SFP-AOC5M	Active Fiber-Optic Cable	SFP+	5	\	10.3125	Yes
XG-SFP-AOC10M	Active Fiber-Optic Cable	SFP+	10	\	10.3125	Yes

 SFP+ module types/models are still being updated. If you need a more accurate model, please contact Ruijie networks marketing personnel or technical support personnel.

- i** No transmit power is reported in the DDM function of the AOC cable, and the TX power allows N/A to be displayed.

Table B-7 Cabling Specifications

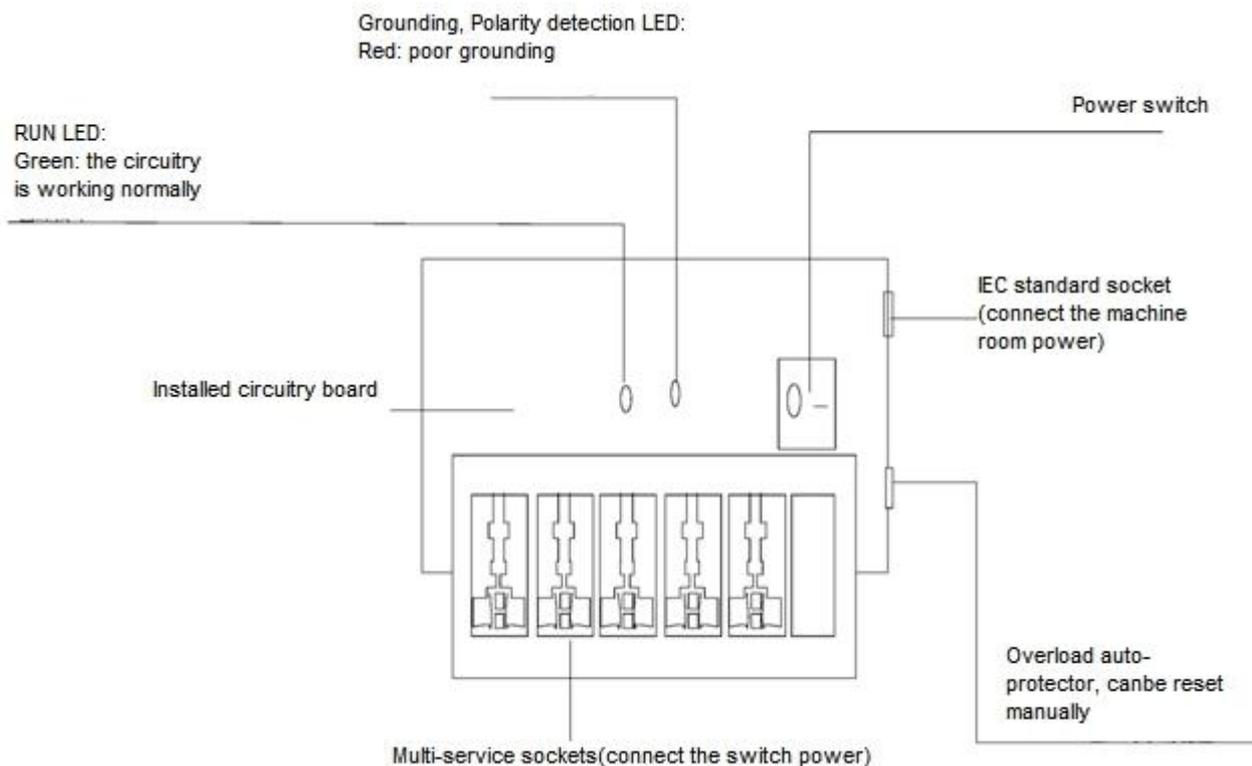
Model	Interface Type	Cable Type	Core Size (um)	Modular Bandwidth (MHz•km)	Max Distance	Cabling
XG-SFP-SR-MM850	LC	MMF	50/125	2000(OM3)	300m	
XG-SFP-ZR V1	LC	MMF	50/125	2000(OM3)	300m	
XG-SR-MM850	LC	MMF	50/125	2000(OM3)	300m	
SFP+MM850	LC	MMF	50/125	2000(OM3)	300m	
XG-SFP-SR-SM1270-BIDI	LC	MMF	50/125	2000(OM3)	300m	
XG-SFP-SR-SM1330-BIDI	LC	MMF	50/125	2000(OM3)	300m	
XG-SFP-LR-SM1270-BIDI	LC	SMF	9/125	N/A	10km	
XG-SFP-LR-SM1330-BIDI	LC	SMF	9/125	N/A	10km	
XG-SFP-LR-SM1310	LC	SMF	9/125	N/A	10km	
XG-SFP-ER-SM1550	LC	SMF	9/125	N/A	40km	
XG-SFP-ZR-SM1550	LC	SMF	9/125	N/A	80km	
XS-SFP-SR	LC	MMF	62.5 /125	200(OM1) 160	33m 26m	
			50/125	2000(OM3) 500(OM2) 400(OM1)	300m 82m 66m	
XS-SFP-LR	LC	SMF	9/125	N/A	10km	

## Appendix C Lightning Protection

### Installing AC Power Arrester (lightning protection cable row)

The external lightning protection cable row shall be used on the AC power port to prevent the switch from being struck by lightning when the AC power cable is introduced from the outdoor and directly connected to the power port of the switch. The lightning protection cable row is fixed on the cabinet, operating table or the wall in the machine room using the line buttons and screws.

Figure C-1 Schematic Diagram for the Power Arrester



**i** The power arrester is not provided and the user shall purchase it to address the practical requirement.

#### Precautions for installation:

- Make sure that the PE terminal of the power arrester has been well-grounded;
- After connecting the switch AC power plug to the socket of the power arrester (lightning protection cable row), lightning protection function implements if the RUN LED is Green and the ALARM LED is OFF.
- If the ALARM LED on the power arrester is Red, you shall check what the reason is, poor grounding connection or the reversed connection of the Null and Live lines: Use the multimeter to check the polarity of the power socket for the arrester when the LED is Red, if the N line is on the left and the L line is on the right, the arrester PE terminal is not grounded; if the L line is on the left and the N line is on the right, the polarity of the arrester power cable shall be reversed; if the LED is still Red, it is confirmed that the arrester PE terminal has not been grounded.

## Installing the Ethernet Port Arrester

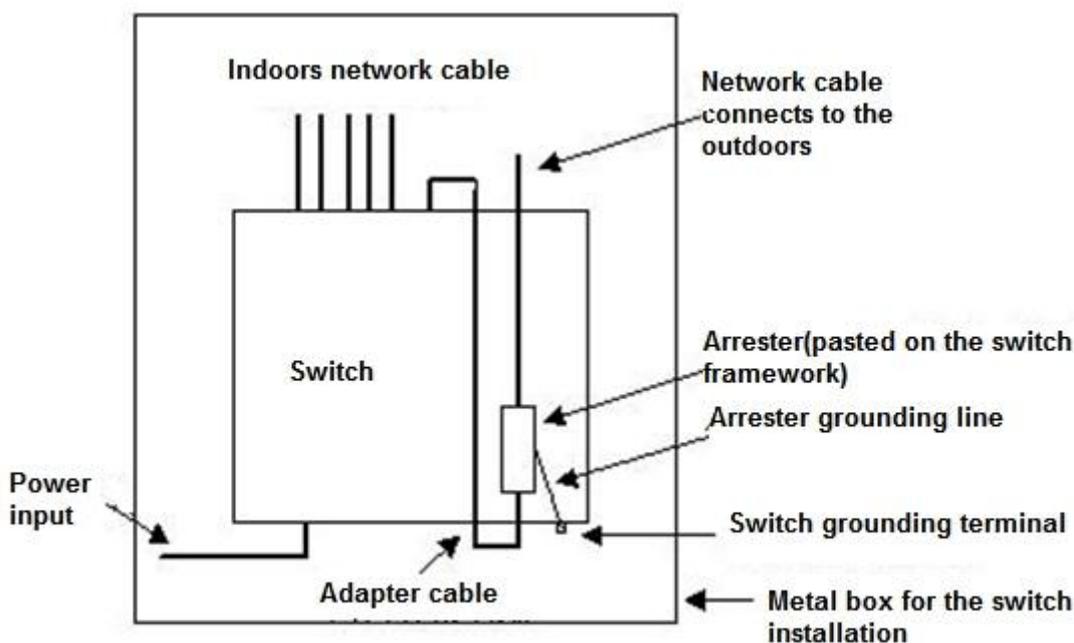
During the switch usage, the Ethernet port arrester shall be connected to the switch to prevent the switch damage by lightning before the outdoor network cable connects to the switch.

Tools: Cross or straight screwdriver, Multimeter, Diagonal pliers

Installation Steps:

1. Tear one side of the protection paper for the double-sided adhesive tape and paste the tape to the framework of the Ethernet port arrester. Tear the other side of the protection paper for the double-sided adhesive tape and paste the Ethernet port arrester to the switch framework. The paste location for the Ethernet port arrester shall be as close to the grounding terminal of the switch.
2. Based on the distance of the switch grounding terminal, cut the grounding line for the Ethernet port arrester and firmly tighten the grounding line to the grounding terminal of the switch.
3. Use the multimeter to check whether the grounding line for the arrester is in good contact with the switch grounding terminal and the framework.
4. According to the description on the Ethernet Port Arrester Hardware Installation Guide, connect the arrester using the adapter cable (note that the external network cable is connected to the end of IN, while the adapter cable connected to the switch is connected to the end of OUT) and observe whether the LED on the board is normal or not.
5. Use the nylon button to bundle the power cables.

Figure C-2 Schematic Diagram for the Ethernet port Arrester Installation



- i** The Ethernet port arrester is only for the 10M/100M copper Ethernet ports with the RJ45 connector.
- i** The Ethernet port arrester is not provided, the user can purchase them to address their own practical requirements. For the detailed information during the arrester installation, please refer to Ethernet Port Arrester Hardware Installation Guide, which contains the technical specification and the maintenance and installation of the arrester.

You may pay attention to the following conditions during the actual installation to avoid influencing the performance of the Ethernet port arrester:

- Reversed direction of the arrester installation. You shall connect the external network cable to the "IN" end and connect the switch Ethernet port to the "OUT" end.
- Poor arrester grounding. The length of the grounding line should be as short as possible to ensure that it is in good contact with the switch grounding terminal. Use the multimeter to confirm the contact condition after the grounding.
- Incomplete arrester installation. If there is more than one port connected to the peer device on the switch, it needs to install the arresters on all connection ports for the purpose of the lightning protection.

## Appendix D Cabling Recommendations in Installation

When HS2310-16GH2GT1XS switch is installed in standard 19-inch cabinets, the cables are tied in the binding rack on the cabinet by the cabling rack, and top cabling or bottom cabling is adopted according to the actual situation in the equipment room. All cable connectors should be placed at the bottom of the cabinet in an orderly manner instead of outside the cabinet easy to touch. Power cables are routed beside the cabinet, and top cabling or bottom cabling is adopted according to the actual situation in the equipment room, such as the position of the DC power distribution box, AC socket, or lightning protection box.

### Requirement for the minimum cable bend radius

- The bend radius of a power cord, communication cable, and flat cable should be greater than five times their respective diameters. The bend radius of these cables that often bend or suffer removal/insertion should be greater than seven times their respective diameters.
- The bend radius of a common coaxial cable should be greater than seven times its diameter. The bend radius of this type of cables that often bend or suffer removal/insertion should be greater than 10 times its diameter.
- The bend radius of a high-speed cable (SFP+ cable, for example) should be greater than five times its diameter. The bend radius of this type of cables that often bend or suffer removal/insertion should be greater than 10 times its diameter.

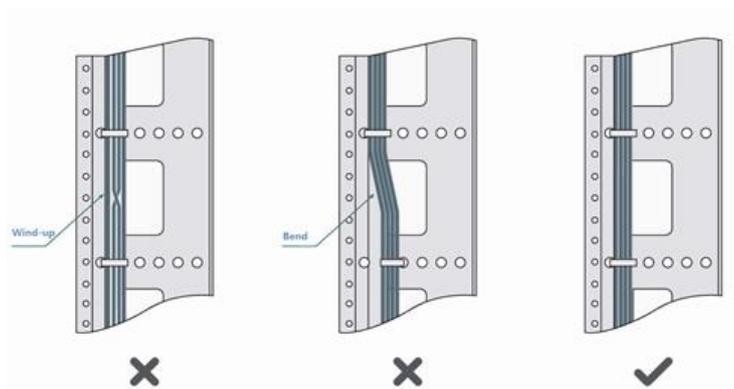
### Requirement for the minimum fiber bend radius

- The diameter of a fiber tray to hold fibers cannot be less than 25 times the diameter of the fiber.
- When moving an optical fiber, the bend radius of the fiber should be equal to or greater than 20 times the diameter of the fiber.
- During cabling of an optical fiber, the bend radius of the fiber should be equal to or greater than 10 times the diameter of the fiber.

### Precautions for Bundling up Cables

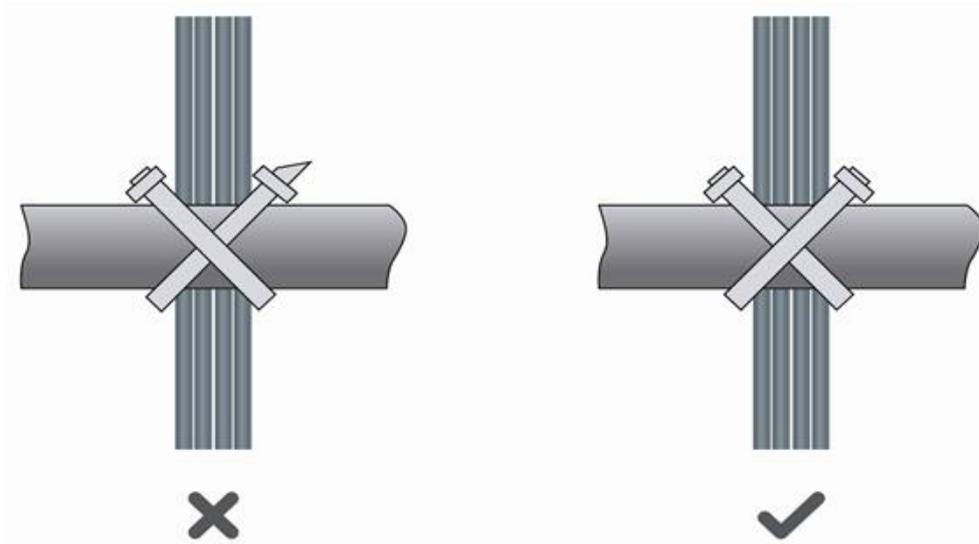
- Before bundling cables, correctly mark labels and stick the labels to cables where appropriate.
- Cables should be neatly and properly bundled, as shown in Figure D-1.

Figure D-1 Bundling Up Cables (1)



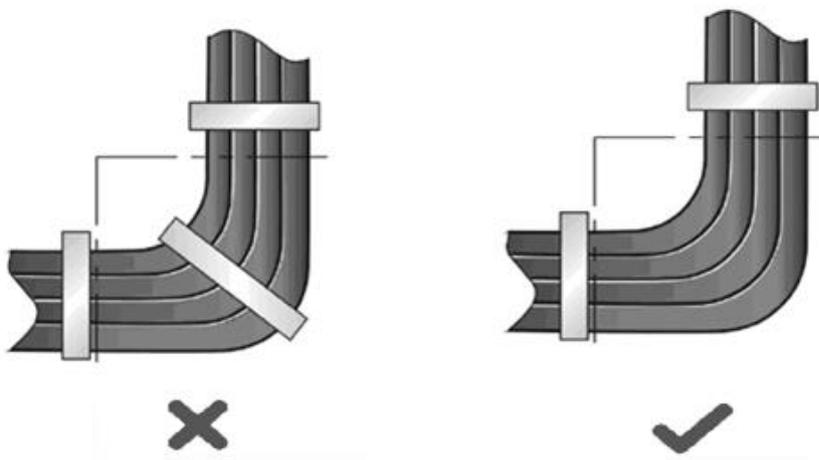
- Cables of different types (such as power cords, signal cables, and grounding cables) should be separated in cabling and bundling. When they are close, crossover cabling can be adopted. In the case of parallel cabling, power cords and signal cables should maintain a space equal to or greater than 30 mm.
- The binding rack and cabling slot inside and outside the cabinet should be smooth, without sharp corners.
- The metal hole traversed by cables should have a smooth and fully rounding surface or an insulated lining.
- Proper buckles should be selected to bundle up cables. It is forbidden to connect two or more buckles to bundle up cables.
- After bundling up cables with buckles, you should cut off the remaining part. The cut should be smooth and trim, without sharp corners, as shown in Figure D-2.

Figure D-2 Bundling Up Cables (2)



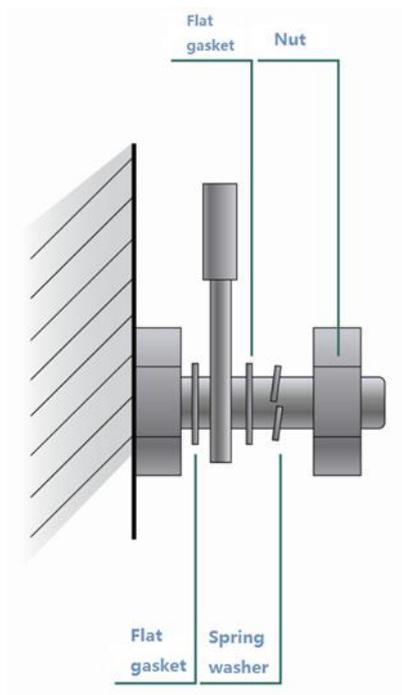
- When cables need to bend, you should first bundle them up. However, the buckle cannot be bundled within the bend area. Otherwise, significant stress may be generated in cables, breaking cable cores. As shown in Figure D-3.

Figure D-3 Bundling Up Cables (3)



- Cables not to be assembled or remaining parts of cables should be folded and placed in a proper position of the cabinet or cabling slot. The proper position indicates a position that will not affect device running or cause device damage or cable damage during commissioning.
- The power cords cannot be bundled on the guide rails of moving parts.
- The power cables connecting moving parts such as door grounding wires should be reserved with some access after assembled. When the moving part reaches the installation position, the remaining part should not touch heat sources, sharp corners, or sharp edges. If heat sources cannot be avoided, high-temperature cables should be used.
- When using screw threads to fasten cable terminals, the bolt or screw must be tightly fastened, and anti-loosening measures should be taken, as shown in Figure D-4.

Figure D-4 Cable Fastening



- The hard power cable should be fastened by the terminal connection area to prevent stress.
- Do not use self-tapping screws to fasten terminals.
- Power cables of the same type and in the same cabling direction should be bundled up into cable bunches, with cables in cable bunches clean and straight.
- Binding by using buckles should be performed according to Table D-1.

Cable Bunch Diameter (mm)	Binding Space (mm)
10	80-150
10-30	150-200
30	200-300

- No knot is allowed in cabling or bundling.
- For solder-less terminal blocks (such as air switches) of the cold pressing terminal type, the metal part of the cold pressing terminal should not be exposed outside the terminal block when assembled.

## Appendix E Site Selection

- The machine room should be at least 5 km away from the heavy pollution source such as the smelter, coal mine and thermal power plant, 3.7 km away from the medium pollution source such as the chemical industry, rubber industry and electroplating industry, and 2 km away from the light pollution source such as the food manufacturer and leather plant. If the pollution source is unavoidable, the machine room should be located on the windward side of the pollution source perennially with advanced protection.
- The machine room should be at least 3.7 km away from the sea or salt lake. Otherwise, the machine room must be sealed, with air conditioner installed for temperature control. Saline soil cannot be used for construction. Otherwise, you should select devices with advanced protection against severe environment.
- Do not build the machine room in the proximity of livestock farms. Otherwise, the machine room should be located on the windward side of the pollution source perennially. The previous livestock house or fertilizer warehouse cannot be used as the machine room.
- The machine room should be firm enough to withstand severe weather conditions such as windstorm and heavy rain as well as away from dust. If the dust is unavoidable, keep the door and window away from the pollution source.
- The machine room should be away from the residential area. Otherwise, the machine room should meet the construction standard in terms of noise.
- Make sure the air vent of the machine room is away from the sewage pipe, septic tank, and sewage treatment tank. Keep the machine room under positive pressure to prevent corrosive gas from entering the machine room to corrode components and circuit boards.
- Keep the machine room away from industrial boiler and heating boiler.
- The machine room had better be on the second floor or above. Otherwise, the machine room floor should be 600 mm higher than the highest flood level ever recorded.
- Make sure there are no cracks or holes in the wall and floor. If there are cable entries in the wall or window, take proper sealing measures. Ensure that the wall is flat, wear-resistant, and dust-free, which should be up to the standard for flame retarding, soundproofing, heat absorption, dust reduction, and electromagnetic shielding.
- Keep the door and the window closed to make the machine room sealed.
- The steel door is recommended for soundproofing.
- Sulfur-containing materials are forbidden.
- Pay attention to the location of the air conditioner. Keep the air conditioner from blowing wind straight toward the device or blowing water drops from the window or air vent toward the device.