SNR-S212i-8POE

Installation Guide

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Preface

Objectives

This document describes overview, hardware structure, technical specifications, hardware installation, networking applications, and management and maintenance of the network-manageable guide-rail Layer 2 PoE industrial Ethernet switch. The appendix lists compliant standards and protocols, terms, acronyms, and abbreviations involved in this document.

Versions

The following table lists the product versions related to this document.

Product name	Product version	Hardware version	Software version
SNR-S212i-8POE	P100R001	A.00 or later	V2.1.1 or later

Conventions

Symbol conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
	Indicate a hazard with a medium or low level of risk which, if not avoided, could result in minor or moderate injury.
	Indicate a potentially hazardous situation that, if not avoided, could cause equipment damage, data loss, and performance degradation, or unexpected results.
	Provide additional information to emphasize or supplement important points of the main text.
	Indicate a tip that may help you solve a problem or save time.

General conventions

Convention	Description
Times New Roman	Normal paragraphs are in Times New Roman.
Arial	Paragraphs in Warning, Caution, Notes, and Tip are in Arial.
Boldface	Names of files, directories, folders, and users are in **boldface**. For example, log in as user **root**.
Italic	Book titles are in *italics*.
`Lucida Console`	Terminal display is in `Lucida Console`.

Contents

Figures

Tables

1 Overview

This chapter is an overview of the SNR-S212i-8POE, including the following sections:

- Introduction
- Characteristics
- Models

1.1 Introduction

The network-manageable guide-rail Layer 2 PoE industrial Ethernet switch SNR-S212i-8POE (hereinafter referred to as the SNR-S212i-8POE) adopts a guide-rail chassis, with all-metal shell and fan-free design for heat dissipation (with cooling fin). It is of small size, low power consumption, and easy installation, thus suitable for scenarios with strong electromagnetic interference and difficult power supply.

The switch supports four 1000 Mbit/s SFP optical interfaces and eight 100 Mbit/s RJ45 electrical interfaces which support PoE. The Power Sourcing Equipment (PSE) can provide 125 W power in ambient temperature and at least 35 W power in high temperature (75°C). The switch supports guide-rail installation and wall-mount installation.

1.2 Characteristics

1.2.1 Outstanding industrial features

The SNR-S212i-8POE is of high reliability, with the following characteristics:

- Adopt an industrial-level chip and power module with low power consumption.
- Adopt guide-rail chassis, with all-metal shell and fan-free design for heat dissipation (with cooling fin).
- Support IP40 protection level.
- Support a wide range of operating temperature from -40 to +75°C and storage temperature from -40 to +85°C.
- Be dampproof and of corrosion resistance, and support humidity range from 5% to 95% in operation environment without condensing.

- Pass IEC 61000-4 industrial Electro-Magnetic Compatibility (EMC) detection, thus ready with strong anti-electromagnetic interference capability.
- Support a Mean Time Between Failure (MTBF) of 35 years.

1.2.2 Rich product types

The SNR-S212i-8POE, with flexible interface configurations, can meet special industrial environment requirements, with the following characteristics:

- Provide 8 RJ45 electrical interfaces and 4 SFP optical interfaces.
- The SFP optical interface supports 100 Mbit/s and 1000 Mbit/s optical modules.
- Provide 1 RJ45 Console interface.
- Provide 1 Phoenix-terminal external alarm output interface.

1.2.3 Powerful PoE power supply

The SNR-S212i-8POE supports PoE, with the following characteristics:

- Support Endpoint PSE (PoE integrated in the SNR-S212i-8POE).
- Comply with IEEE 802.3af standard (PoE).
- Comply with IEEE 802.3at standard (PoE+).
- Support standard PD and non-standard PD.
- Provide 8 IEEEE 802.3af PSE interfaces or 4 IEEE 802.3at PSE interfaces.
- Support enabling/disabling PoE and configuring maximum Tx power, power supply mode, and power supply priority of a power supply interface through software.
- Support overtemperature protection.

1.2.4 Flexible networking

The SNR-S212i-8POE supports flexible networking capabilities, with the following characteristics:

- Support chain, start, dual-star, single ring, intersecting ring, and tangent ring networking modes.
- Support Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), and Multiple Spanning Tree Protocol (MSTP), thus improving redundant backup and error tolerance and ensuring stable network operation.
- Support ITU-T G.8032 Ethernet Ring Protection Switching (ERPS) protocol. The network self-healing time is less than 50ms. ERPS solves the multi-ring protection, multi-topology, multi-domain protection, and multi-protocol problems.
- Support a leading industrial Redundant Ring Protection Switching (RRPS), with self-healing time less than 50ms

1.2.5 Strict QoS

The SNR-S212i-8POE supports static QoS technologies, with the following characteristics:

- Support IEEE 802.1p QoS, thus providing the customer with reliable and effective means for optimizing services.
- Support interface trust modes, trusted Class of Service (CoS) priority, and trusted Differentiated Services Code Point (DSCP) priority.

- Support interface-based priority mapping, mapping from CoS to local priority, and DSCP to local priority.
- Support 4 scheduling queues on the interface, Strict Priority (SP), and Weight Round Robin (WRR).

1.2.6 Complete security guarantee

The SNR-S212i-8POE supports security guarantee technologies, with the following characteristics:

- Support hierarchical user management and password protection to prevent unauthorized access.
- Support Remote Authentication Dial In User Service (RADIUS) and Terminal Access Controller Access Control System (TACACS+) authentication, and provide centralized password management.
- Support static ARP to prevent ARP attacks, namely, binding the MAC address with the interface.
- Support IEEE 802.1x security access control.
- Support storm control (over broadcast packets, unknown multicast packets, and unknown unicast packets), thus effectively guaranteeing proper operation of the SNR-S212i-8POE in bad network conditions.
- Support IEEE 802.1Q interface-based VLAN partitioning to implement isolation of physical interfaces.
- Provide interface protection to isolate data between interfaces in the interface protection group, thus further optimizing user data protection mechanism.
- Support IGMP Snooping, thus better supporting multicast services.
- Support SNMPv3 encrypted authentication and access security.

1.2.7 Overall management

The SNR-S212i-8POE supports the management and maintenance modes:

- Support Web management mode, provide Graphic User Interface (GUI) to facilitate man-to-machine interaction and management and maintenance of the SNR-S212i-8POE.
- Support cluster management, which can configure devices in batches, automatically discover devices, preplan network topology, take statistics of and analyze online or offline user rate, provide new management modes for customers, and simply management process.
- Provide the RJ45 Console interface, and support local login through the Console interface to implement local management and maintenance.
- Support Telnet and SSH remote login for remote management and maintenance.
- Support software upgrade in TFTP, FTP, SFTP, NNM, and Web modes.

1.3 Models

Table 1-1 lists models of the SNR-S212i-8POE.

Table 1-1 Models

Model	Description
SNR-S212i-8POE-AC	• Support eight 10/100 Mbit/s Ethernet electrical interfaces, support IEEE 802.3af and IEEE 802.3at, and non-standard PDs. It supports up to 8 interfaces with 15.54 W power on each interface or up to 4 interfaces with 30 W power on each interface. It supports a maximum PoE supply power of 125 W. • Support four 100Base-FX/1000Base-X SFP optical interfaces. • Support 110/220 VAC power or 220 VDC power.
SNR-S212i-8POE-DC	• Support eight 10/100 Mbit/s Ethernet electrical interfaces, support IEEE 802.3af and IEEE 802.3at, and non-standard PDs. It supports up to 8 interfaces with 15.54 W power on each interface or up to 4 interfaces with 30 W power on each interface. It supports a maximum PoE supply power of 125 W. • Support four 100Base-FX/1000Base-X SFP optical interfaces. • Support 48 VDC power.

2 Hardware structure

This chapter describes hardware structure of the SNR-S212i-8POE, including the following sections:

- Appearance
- Interfaces
- Reset button
- Interface parameters
- LEDs
- Power modules
- Cables

2.1 Appearance

The dimensions of the chassis is 98 mm (Width) × 155 mm (Depth) × 177 mm (Height), without cooling fin, or 123 mm (Width) × 155 mm (Depth) × 177 mm (Height), with cooling fin.

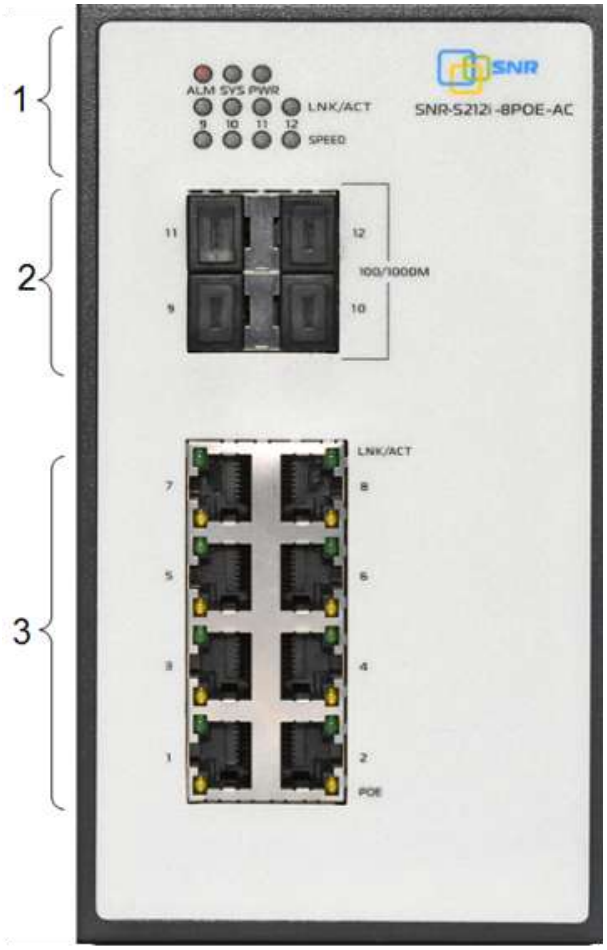
The switch supports the following installation modes:

- Guide-rail installation
- Wall-mount installation

2.1.1 Front appearance

Figure 2-1 shows the front appearance of the SNR-S212i-8POE.

Figure 2-1 Front appearance



1	LEDs (ALM, SYS, PWR, LNK/ACT, and SPD)
2	Service interfaces 9–12 (100/1000 Mbit/s SFP optical interface)
3	Service interfaces 1–8 (100 Mbit/s electrical interface, supporting PoE) and LEDs LNK/ACT and POE)

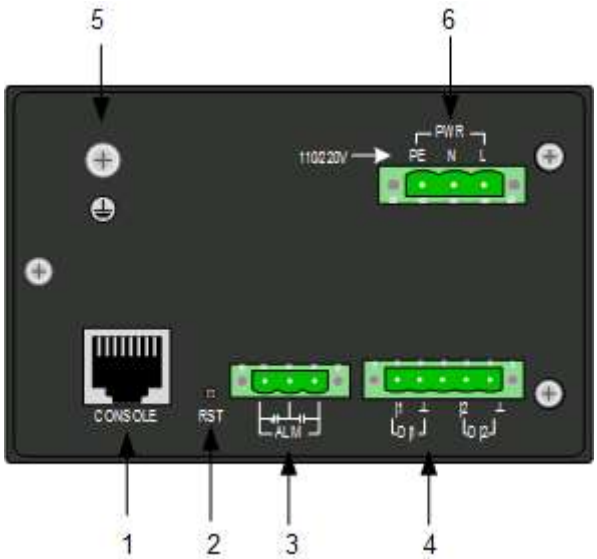
2.1.2 Side appearance

Figure 2-2 shows side appearance of the SNR-S212i-8POE.

Figure 2-2 Side appearance

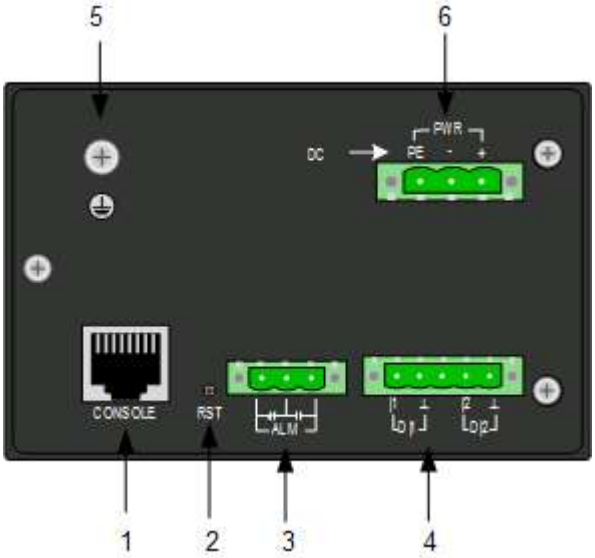
2.1.3 Top appearance

0 and Figure 2-3 show the top appearance of the SNR-S212i-8POE Top appearance of the SNR-S212i-8POE-AC



1	Console interface
2	RST button
3	Alarm interface (ALM)
4	Digital input interface
5	Grounding terminal
6	AC power interface (PWR)

Figure 2-3 Top appearance of the SNR-S212i-8POE –DC

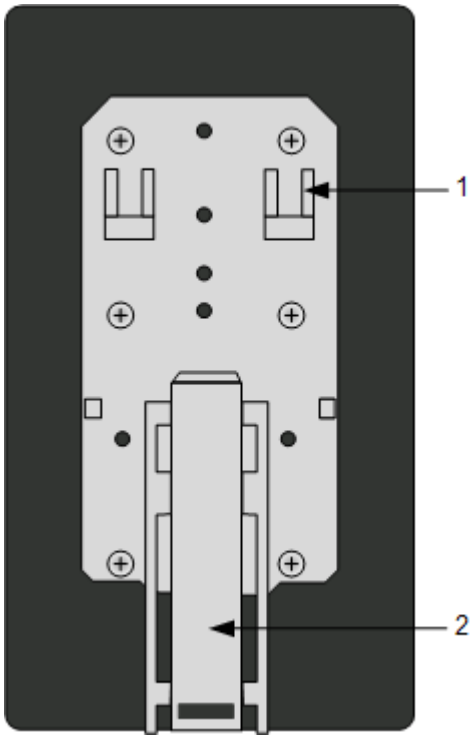


1	Console interface
2	RST button
3	Alarm interface (ALM)
4	Digital input interface
5	Grounding terminal
6	DC power interface (PWR)

2.1.4 Rear appearance

Figure 2-4 shows rear appearance of the SNR-S212i-8POE.

Figure 2-4 Rear appearance



1	Clamping connector
2	Sliding connector

2.2 Interfaces

2.2.1 Service interfaces

The SNR-S212i-8POE provides four 1000 Mbit/s SFP optical interfaces and eight 100 Mbit/s PoE RJ45 electrical interfaces.

Table 2-1 lists types and usage of interfaces on the SNR-S212i-8POE.

Table 2-1 Interfaces

Interface	Type	Description
1–8	RJ45	10/100BASE-TX self-adaptive electrical interface, supporting PoE
9–12	SFP optical interface	The interface supports the following optical modules: • 1000BASE-X • 100BASE-FX

2.2.2 Management and auxiliary interfaces

Table 2-1 lists management and auxiliary interfaces on the SNR-S212i-8POE.

Table 2-1 Management and auxiliary interfaces

Interface	Description
Console	Use the RJ45 Console cable to connect to the PC.
Alarm interface (ALM)	3-PIN Phoenix terminal (5.08 mm space) for outputting alarms **Note** Alarms generated on the SNR-S212i-8POE are output from the alarm interface to the monitor which records and monitors operation of the SNR-S212i-8POE.
Digital input interface	5-PIN Phoenix terminal (5.08 mm space) for outputting alarms, supporting 2 ways of digital input **Note** The interface is available in A.10 or later versions.
Power interface	3-PIN Phoenix terminal (7.62 mm space) for inputting power

2.3 Reset button

Table 2-2 describes the reset button.

Table 2-2 Reset button

Button	Description
RST (button)	• Short-press it to reset the system. • Long-press it over 5s to reset factory settings and restart the SNR-S212i-8POE.

2.4 Interface parameters

2.4.1 1000BASE-X SFP optical interface

Table 2-3 lists parameters of the 1000BASE-X SFP optical interface.

Table 2-3 Parameters of the 1000BASE-X SFP optical interface

Parameter	Description
Connector type	LC/PC
Optical interface properties	Depend on the selected SFP optical module.
Coding type	8B/10B
Working mode	Full duplex
Compliant standard	IEEE 802.3
Supported network protocol	IP

2.4.2 100BASE-FX SFP optical interface

Table 2-4 lists parameters of the 100BASE-FX SFP optical interface.

Table 2-4 Parameters of the 100BASE-FX SFP optical interface

Parameter	Description
Connector type	LC/PC
Optical interface properties	Depend on the selected SFP optical module.
Coding type	4B/5B
Working mode	Full duplex
Compliant standard	IEEE 802.3
Supported network protocol	IP

2.4.3 10/100BASE-TX electrical interface

Table 2-5 lists parameters of the 10/100BASE-TX RJ45 electrical interface.

Table 2-5 Parameters of the 10/100BASE-TX RJ45 electrical interface

Parameter	Description
Connector type	RJ45
Transmission rate	10/100 Mbit/s auto-negotiation
Duplex mode	• Full duplex • Half duplex
Cable specifications	Cat 5 or better twisted-pair cable

2.4.4 Console interface

Table 2-6 lists parameters of the RJ45 Console interface.

Table 2-6 Parameters of RJ45 Console interface

Parameter	Description
Connector type	RJ45
Working mode	Duplex UART
Electrical feature	RS-232
Baud rate	9600 Baud
Cable specification	4-core shielded cable

2.5 LEDs

Table 2-7 lists LEDs on the SNR-S212i-8POE.

Table 2-7 LEDs

LED	Print	Status	Description
Electrical interface status LED	LNK/ACT (1–8)	Green	• Green: the electrical interface is in Link Up status. • Blinking green: the electrical interface is receiving or sending data. • Off: the electrical interface is in Link Down status.
PoE remote power supply working status LED	POE	Yellow	• Yellow: the interface is supplying power to a remote PD. • Off: the interface stops supplying power to a remote PD or it is disconnected from the remote PD.
Optical interface status LED (optical interfaces 9–12)	LNK/ACT	Green	• Green: the optical interface is in Link Up status. • Blinking green: the optical interface is receiving or sending data. • Off: the optical interface is in Link Down status.
Optical interface rate LED (optical interfaces 9–12)	SPD	Green	• Green: the electrical interface is working at 1000 Mbit/s. • Off: the electrical interface is working at 10/100 Mbit/s or faulty.
Power LED	PWR	Green	• Green: the power supply is normal. • Off: the power supply is abnormal or off.

LED	Print	Status	Description
System LED	SYS	Green	• Green: the system is being started or working improperly. • Blinking green: the system is working properly. • Off: the system is being started or working improperly.
Alarm output LED	ALM	Red	• Red: alarms are generated. • Off: no alarms are generated or alarms are cleared.

2.6 Power modules

2.6.1 Introduction

The power module, designed based on industrial standards, meets strict parameter requirements. The power module supports the following functions:

- The AC power module provides 110/220 VAC power input and 220 VDC input. The DC power supports 48 VDC input.
- Support overload protection and reverse polarity protection.
- Support overvoltage protection and surge protection.
- Support relay alarms and Network Management System (NMS) alarms for faulty power module.

2.6.2 Appearance and interface

The AC or DC power interface is a 7.62 mm 3-PIN Phoenix terminal interface.

AC power interface

Figure 2-5 shows the AC power interface.

Figure 2-5 AC power interface

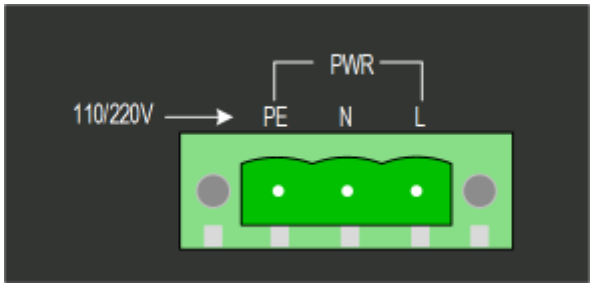


Table 2-8 describes the AC power interface on the top of the SNR-S212i-8POE.

Table 2-8 AC power interface

Power module	Print	Description
AC power module (110/220V)	PE	Grounding terminal
	N	N-wire terminal connecting to the AC power
	L	L-wire terminal connecting to the AC power

DC power interface

Figure 2-6 shows the DC power interface.

Figure 2-6 DC power interface

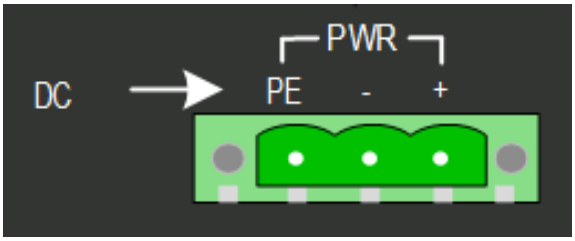


Table 2-9 describes the DC power interface on the top of the SNR-S212i-8POE.

Table 2-9 DC power interface

Power module	Print	Description
DC power interface (48V)	PE	Grounding terminal
	-	Negative input terminal connecting to the DC power
	+	Positive input terminal connecting to the DC power

2.6.3 Specifications

Table 2-10 lists specifications of power modules.

Table 2-10 Specifications of power modules

Item			Description
Power	AC	Rated voltage	110/220 VAC or 220 VDC
		Voltage range	90–264 VAC
		Frequency	50/60 Hz
	DC	Rated voltage	48 VDC

Item			Description
		Voltage range	36–75 VDC

2.7 Cables

2.7.1 Console cable

Introduction

With the Console cable, you can log in to the SNR-S212i-8POE through the Console interface, and then debug and maintain it from a PC.

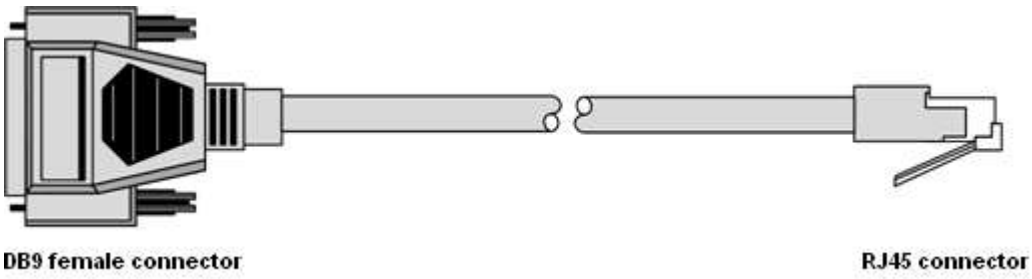
The RJ45 Console cable is an 8-core unshielded cable, with connectors as below:

- RJ45 connector: connected to the Console interface on the SNR-S212i-8POE
- DB9 female connector: connected to the Console interface on the PC

Appearance

Figure 2-7 shows the RJ45 Console cable.

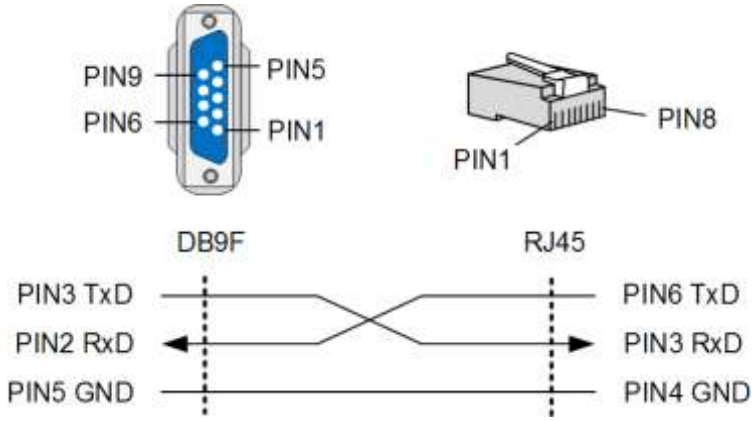
Figure 2-7 RJ45 Console cable



Wiring

Figure 2-8 shows wiring between the DB9 female connector and the RJ45 Console interface on the SNR-S212i-8POE.

Figure 2-8 Wiring between DB9 female connector and RJ45 Console interface



Technical specifications

Table 2-11 lists technical specifications of the RJ45 Console cable.

Table 2-11 Technical specifications of RJ45 Console cable

Item	Description
Name	CBL-RS232-DB9F/RJ45-2m/RoHS
Color	White
Type	Cat 3 UTP cable
Connector	• RJ45 connector • DB9 female connector
Number of cores	4
Length	2 m

2.7.2 Ethernet cable

Introduction

For the SNR-S212i-8POE, the Ethernet cable connects the Ethernet electrical interface and other devices.

The Ethernet interface on the SNR-S212i-8POE is self-adaptive to straight-through cable mode and crossover cable mode.

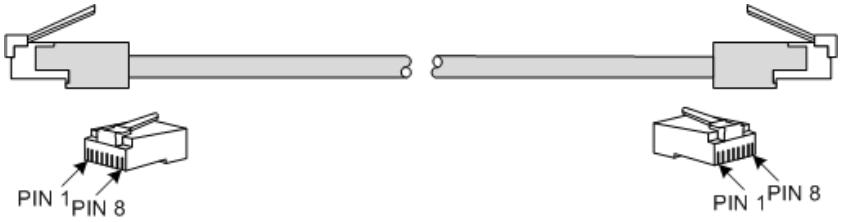
Note

If required, make the Ethernet cable on site according to technical specifications.

Appearance

Figure 2-9 shows the Ethernet cable.

Figure 2-9 Ethernet cable



Technical specifications

The Ethernet cables have two types:

- Straight-through cable: used to connect devices of different type, such as between a PC and a switch, between a switch and a router
- Crossover cable: used to connect devices of the same type, such as between PCs, between switches, between routers, between a PC and a router (they are of the same type)

Table 2-12 lists the wiring of EIA/TIA 568A and EIA/TIA 568B standards.

Table 2-12 Wiring of EIA/TIA 568A and EIA/TIA 568B standards

Connector (RJ45)	EIA/TIA 568A	EIA/TIA 568B
PIN 1	White/Green	White/Orange
PIN 2	Green	Orange
PIN 3	White/Orange	White/Green
PIN 4	Blue	Blue
PIN 5	White/Blue	White/Blue
PIN 6	Orange	Green
PIN 7	White/Brown	White/Brown
PIN 8	Brown	Brown

Table 2-13 lists technical specifications of the Ethernet cable.

Table 2-13 Technical specifications of the Ethernet cable

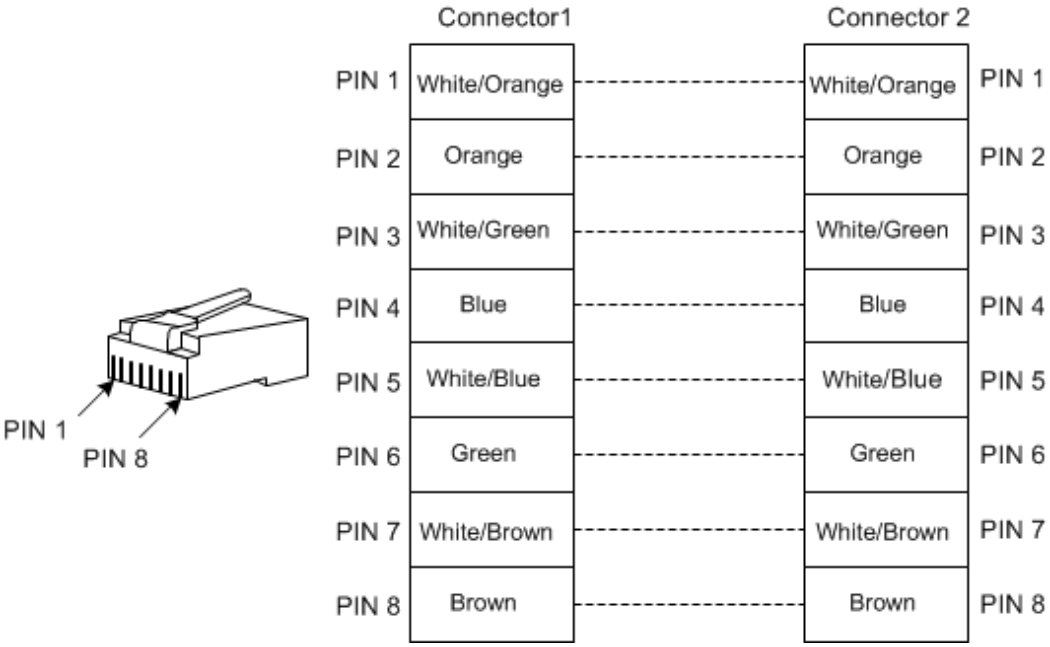
Item	Description
Connector	RJ45 crystal head
Model	Cat 5 or better STP cable
Number of cores	8
Length	The letter D is the length, indicating that the cable is customized. For example, if the customer requires 2-meter cables, they are named CBL-ETH-RJ45/RJ45-2m.

Straight-through cable

Both two RJ45 connectors of the straight-through cable follow EIA/TIA568 B standard wiring.

Figure 2-10 shows the wiring of the straight-through cable.

Figure 2-10 Wiring of the straight-through cable



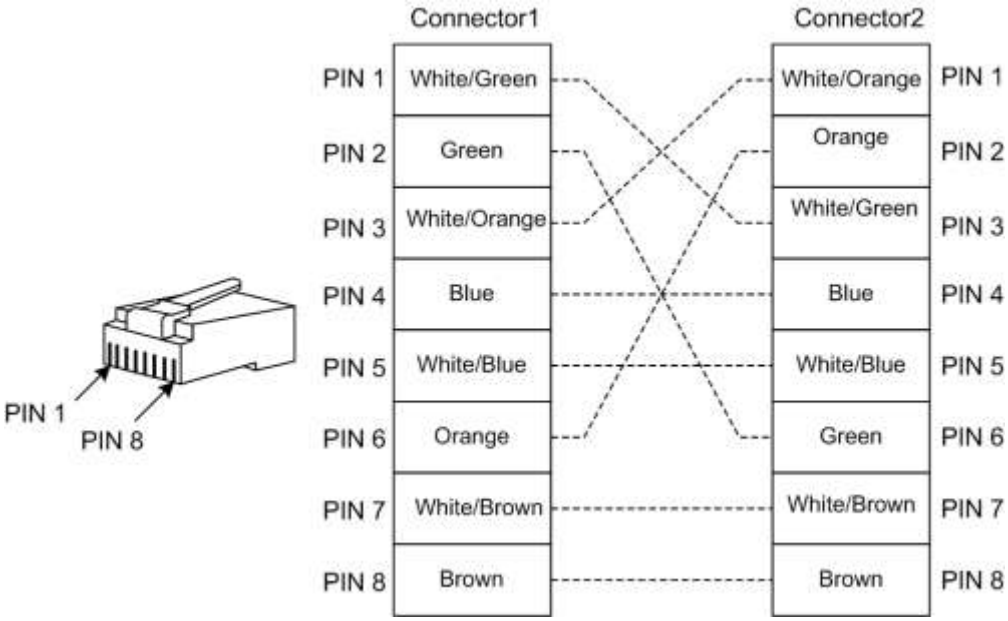
Crossover cable

The wiring of the 100 Mbit/s crossover cable is different from that of the 1000 Mbit/s crossover cable.

One RJ45 connector of the 100 Mbit/s crossover cable follows EIA/TIA 568A standard wiring; the other RJ45 connector follows EIA/TIA 568B standard wiring.

Figure 2-11 shows the wiring of the 100 Mbit/s crossover cable.

Figure 2-11 Wiring of the 100 Mbit/s crossover cable



2.7.3 AC power cable

Introduction

The AC power cable supplies 110 V/220 V AC power from the power souring equipment to the power interface on the SNR-S212i-8POE, and then transmits power to the entire device.

The AC power cables of the SNR-S212i-8POE are different according to regional standards.

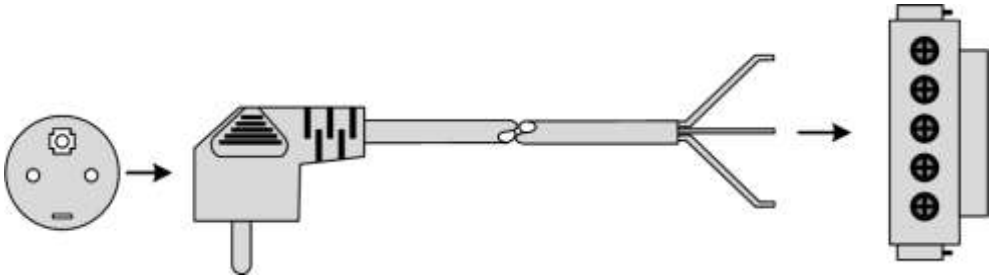
Table 2-14 AC power cables

Regional standard	Description
Europe	POL-AC-European standard-3-pin/stripped-0.75mm^2-1.5m/RoHS
America	POL-AC-American standard 3-pin/stripped-18AWG-1.5m/RoHS

Appearance

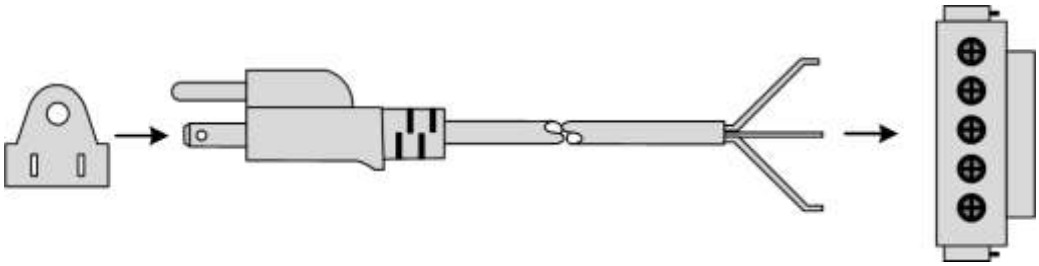
The AC power cable which meets European standard is composed of the European standard French-mode 3-pin plug and coaxial cable, as shown in Table 2-15.

Table 2-15 European standard AC power cable



The AC power cable which meets American standard is composed of the American standard 3-pin plug and coaxial cable, as shown in Table 2-16.

Table 2-16 American standard AC power cable



Technical specifications

Table 2-17 lists specifications of the European standard AC power cable.

Table 2-17 Specifications of the European standard AC power cable

Parameter		Description
Name		POL-AC-European standard-3-pin/stripped-0.75mm^2-1.5m/RoHS
Connector		• French mode 3-pin plug • 7.62-5PIN-head/RoHS
Color	Outer	Black (PVC insulating layer)
	Inner	Blue (N), brown (L), and yellow/green strip (E)
Type		Copper core multi-strand power cable 18AWG (0.75 mm^2)
Length		1.5 m

Table 2-18 lists specifications of the American standard AC power cable.

Table 2-18 Specifications of the American standard AC power cable

Parameter	Description
Name	POL-AC-American mode-3-pin/stripped-18AWG-1.5m/RoHS
Connector	• American standard 3-pin plug NEMA5-15 • 7.62-5Pin-head/RoHS

Parameter		Description
Color	Outer	Black (PVC insulating layer)
	Inner	White (N), black (L), and green (E)
Type		Copper core multi-strand power cable 18AWG (0.75 mm^2)
Length		1.5 m

2.7.4 DC power cable

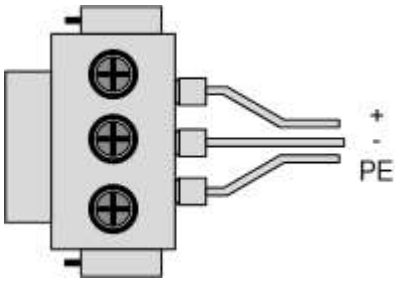
Introduction

The DC power cable supplies 48 VDC power from the power souring equipment to the power interface on the SNR-S212i-8POE, and then transmits power to the entire device.

Appearance

The DC power cable is composed of a connector and conducting wire, as shown in Figure 2-12.

Figure 2-12 DC power cable



Technical specifications

Table 2-19 lists technical specifications of the DC power cable.

Table 2-19 Technical specifications of the DC power cable

Item	Description
Connector	7.62-3Pin-head/RoHS
Model	Copper core multi-strand power cable 18AWG (0.75 mm^2)

Note

The SNR-S212i-8POE is delivered with power cable connectors instead of the power cable. If required, make the power cable on site according to technical specifications.

2.7.5 Grounding cable

Introduction

Caution

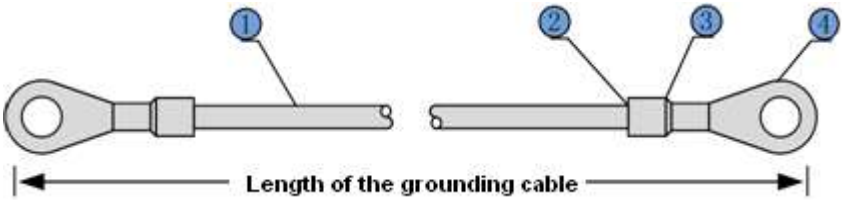
Connecting the grounding cable properly is an important guarantee to lightning protection, shock proof, and anti-interference. When installing and using the device, ensure that the grounding cable is properly connected; otherwise, personnel injury or equipment damage may be caused.

The grounding cable is used to connect the SNR-S212i-8POE to the ground.

Appearance

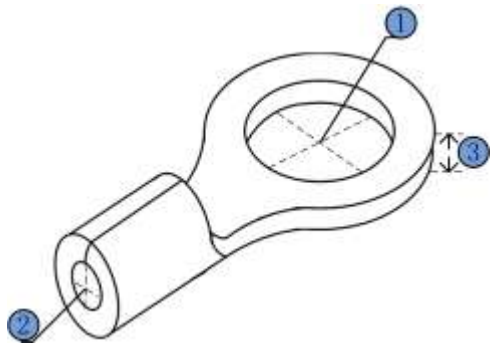
The grounding cable is composed of grounding terminals and the coaxial cable. The grounding terminal is usually an OT non-insulated terminal. The coaxial cable is a yellow/green copper soft flame-retardant conducting wire. Figure 2-13 and Figure 2-14 show the grounding cable and OT terminal.

Figure 2-13 Grounding cable



1	Conducting wire	2	Stripped end (connected to the OT terminal)
3	Insulating sheath	4	OT terminal

Figure 2-14 OT terminal



1	Inner radius of soldering lug	2	Inner radius of sheath	3	Thickness of soldering terminal

Technical specifications

Table 2-20 lists technical specifications of the grounding cable.

Table 2-20 Technical specifications of the grounding cable

Item	Description
Model (recommended)	PIL-grounding cable-Φ4-D. The letter D is the length, indicating that the cable is customized. For example, the customer requires a 2-m cable, and you can name the cable PIL-grounding cable-Φ4-2m.
Standard	Comply with the UL standard and meet RoHS requirements.
Conducting wire	Yellow/Green multi-strand copper-core conducting wire (1.25 mm^2) Electronic wire UL1007 or UL1005 is used.
Stripped end	10 mm long and plated with tin
Insulating sheath	3.5/1.75 black heat-shrink tubing. It is a 20 mm plastic tube which shrinks when being heated.
Welding technology	The conducting wire and OT terminals adopt solderless pressed connection.
Error in length of conducting wire	±5 mm

Table 2-21 lists technical specifications of the OT terminal.

Table 2-21 Technical specifications of the OT terminal

Item	Description
Model	Protective grounding round-pressed terminal (M4)
Compliant standard	JB2436-78
Technical specifications	• 4.3 soldering lug • Inner radius of soldering lug: 4 mm • Outer radius of soldering lug: ≤ 8 mm • Inner radius of sheath: 2.1 mm • Thickness of soldering lug: ≥ 0.6 mm
Cross-sectional area of the conducting wire	16–15 AWG (1.2–1.5 mm^2)

Note

- The SNR-S212i-8POE is delivered without the grounding cable. If required, make the grounding cable on site according to technical specifications.

- The grounding cable cannot be longer than 30 m and should be as short as possible; otherwise, a grounding bar should be used instead.

2.7.6 Alarm cable

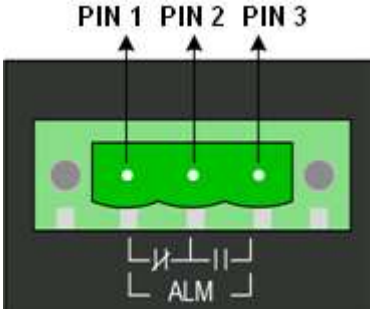
Introduction

The alarm interface on the SNR-S212i-8POE is a 3-PIN Phoenix terminal interface (5.08 mm space). When the SNR-S212i-8POE is in abnormal status (temperature, voltage, etc.), it can output alarms through the control terminal to the on-site maintenance personnel and the NMS.

Appearance

The alarm cable is composed of the connector and the alarm conducting wire, as shown in Figure 2-15.

Figure 2-15 Alarm output interface



- When an alarm is generated, PIN 1 and PIN 2 are connected by the embedded electromagnetic relay, and the alarm LED is Green.
- When no alarm is generated, PIN 3 and PIN 2 are connected by the embedded electromagnetic relay, and the alarm LED is Off.

Technical specifications

Table 2-22 lists technical specifications of the alarm cable.

Table 2-22 Technical specifications of the alarm cable

Item	Description
Connector type	5.08 mm × 3-PIN Phoenix terminal
Specifications	Copper core multi-strand conducting wire 16AWG (1.25 mm^2)

Note

Only a Phoenix terminal connector is delivered with the SNR-S212i-8POE. If you need the alarm cable, make it on site according to technical specifications.

2.7.7 Digital input cable

Introduction

The digital input interface on the SNR-S212i-8POE uses 4 PINs of the 5-PIN Phoenix terminal (5.08 mm space) to input external alarms from an external device.

The digital input interfaces supports dual way input. Each way supports two statuses:

- Status 1: the input voltage is 13–30 V.
- Status 2: the input voltage is -30 to 1 V.

The condition for triggering alarms can be configured as required. By default, it is status 1.

- If status 1 is configured as the alarm status, status 2 is the normal status.
- If status 2 is configured as the alarm status, status 1 is the normal status.

Appearance

The digital input cable is composed of the connector and alarm conducting wire, as shown in Figure 2-16.

Figure 2-16 Alarm interface

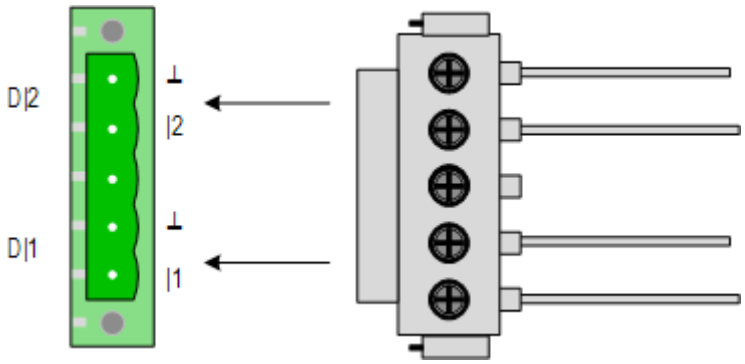


Table 2-23 describes the digital input interface.

Table 2-23 Digital input interface

Terminal	Description
|1	Positive terminal of the No. 1 way external digital input
|2	Positive terminal of the No. 2 way external digital input
⊥	Negative terminal

Technical specifications

Table 2-24 lists technical specifications of the digital input cable.

Table 2-24 Technical specifications of the digital input cable

Item	Description
Connector	5.08-8Pin-head/RoHS
Specifications	Copper core multi-strand conducting wire 18AWG (0.75 mm^2)

Note

The digital input cable is not delivered with the SNR-S212i-8POE. If you need it, make it on site according to technical specifications.

3 Technical specifications

This chapter describes technical specifications of the SNR-S212i-8POE, including the following sections:

- Overall parameters
- PoE power
- EMC standards
- Environmental standards

3.1 Overall parameters

Table 3-1 lists overall parameters of the SNR-S212i-8POE.

Table 3-1 Overall parameters

Parameter		Value
Dimensions		• Without cooling fin: 98 mm (Width) × 155 mm (Depth) × 177 mm (Height) • With cooling fin: 123 mm (Width) × 155 mm (Depth) × 177 mm (Height)
Power consumption	Maximum power consumption with PoE	150 W
	Maximum power consumption without PoE	13 W
	Standby power consumption	9 W
Weight (without rail-clamping kit)		< 2.2 kg
Operating temperature		-40 to +75°C
Storage temperature		-40 to +85°C
Operating humidity		5%–95% RH (non-condensing)
Protection level		IP40

Parameter			Value
Power	AC power	Rated voltage	110/220 VAC or 220 VDC
		Voltage range	90–264 VAC
		Frequency	50/60 Hz
	DC power	Rated voltage	48 VDC
		Voltage range	36–75 VDC
	–	Overload protection	Supported
		Reverse polarity protection	Supported
Alarm interface		Maximum switching voltage	250 VAC/220 VDC
		Maximum switching current	2 A
		Maximum switching capability	60 W

3.2 PoE power

The PSE can provide 125 W power in ambient temperature or at least 35 W power in high temperature (75°C). Table 3-2 lists the output power of the PSE in different temperatures.

Table 3-2 PoE power supply

Maximum supported operating temperature	Recommended long-time operating temperature	PoE output power
-40 to 60°C	-40 to 50°C	125 W
60–65°C	50–55°C	95 W
65–70°C	55–60°C	65 W
70–75°C	60–65°C	35 W
> 75°C	> 65°C	0 W

3.3 EMC standards

The SNR-S212i-8POE complies with the following EMC standards.

- Electro Magnetic Interference (EMI): CISPR 22 CLASS A

- Static electricity: IEC 61000-4-2 level 4
- Radiated susceptibility: IEC 61000-4-3 level 3
- Electrical fast transient pulse group: IEC 61000-4-4 level 4
- Damped oscillation: IEC 61000-4-12 level 3
- Surge (impact): IEC 61000-4-5 level 4
- Power Frequency Magnetic Field (PFMF): IEC 61000-4-8 level 4
- Pulsed magnetic field: IEC 61000-4-9 level 4
- Damped oscillation magnetic field: IEC 61000-4-10 level 4
- Conduction noise immunity: IEC 61000-4-6 level 3
- AC voltage DIPS and short interruptions noise immunity: IEC 61000-4-29

3.4 Environmental standards

The SNR-S212i-8POE is applied to an industrial environment, with environmental standards requirements as listed in Table 3-3.

Table 3-3 Environment standard requirements

Item	Description
Air pressure	86–106 kPa
Operating temperature	-40 to +75°C
Storage temperature	-40 to +85°C
Operating humidity	5%–95% RH (non-condensing)
Protection level	IP40
Environmental certification	Comply with EU RoHS standard.

4 Hardware installation

This chapter describes hardware installation, including the following sections:

- Preparing for installation
- Installing device
- Grounding device
- Connecting cables
- Powering on device
- Check after installation

4.1 Preparing for installation

4.1.1 Environment conditions

The switch supports the following installation modes:

- Guide-rail installation
- Wall-mounting installation

Note

Before installing the SNR-S212i-8POE, ensure that the environment where the SNR-S212i-8POE is to be installed complies with environment requirements. For details, see section 3.4 Environmental standards.

4.1.2 Power supply conditions

Table 4-1 lists power supply requirements for operation of the SNR-S212i-8POE.

Table 4-1 Power supply requirements for operation

Item	Requirements
AC power	• Rated voltage: 110/220 VAC or 220 VDC • Voltage range: 85–264 VAC
DC power	• Rated voltage: 48 VDC • Voltage range: 36–75 VAC

Item	Requirements
Backup power module	A backup power module is recommended, which can supply power in case of power failure.
Power supply	The power supplied by the power module must be greater than the maximum power consumption.

4.1.3 Static electricity conditions

To prevent bodily static electricity from damaging the SNR-S212i-8POE, wear the Anti-Static Discharge (ASD) wrist properly any time when you contact the SNR-S212i-8POE, with the other end of the ASD wrist well grounded.

4.1.4 Grounding conditions

The switch must be grounded, and the grounding resistance should be no smaller than 1 Ω. Well grounding is the first guarantee to lightning protection and anti-interference.

4.1.5 Other conditions

Before installing the SNR-S212i-8POE, check whether auxiliary parts are ready. For example, ensure that cables and supporting devices are properly installed.

4.2 Installing device

4.2.1 Guide-rail installation

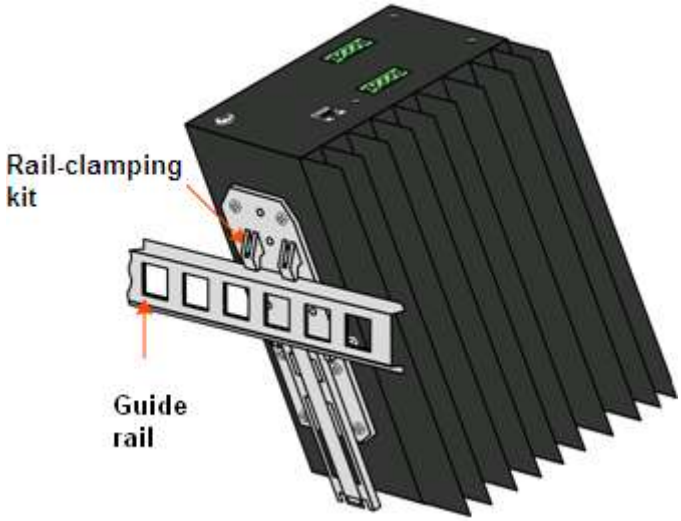
Note

When you take the SNR-S212i-8POE from the package, it is installed with a guide-rail kit at its rear panel.

Install the SNR-S212i-8POE on the guide rail as below:

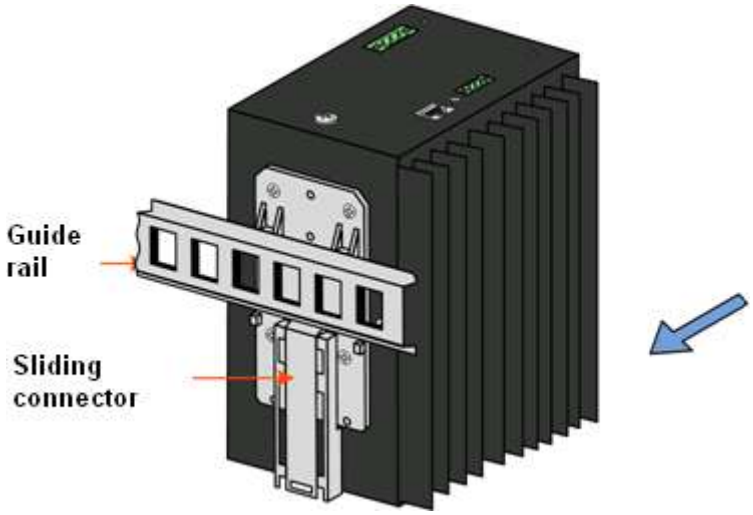
Step 1 Hang the sliding connector on the guide rail.

Figure 4-1 Hanging the rail-clamping kit on the guide rail



Step 2 Install the device on the guide rail firmly, as shown in Figure 4-2.

Figure 4-2 Installing the SNR-S212i-8POE on the guide rail



Step 3 Check whether the sliding connector is properly installed on the guide rail.

4.2.2 Wall-mounting installation

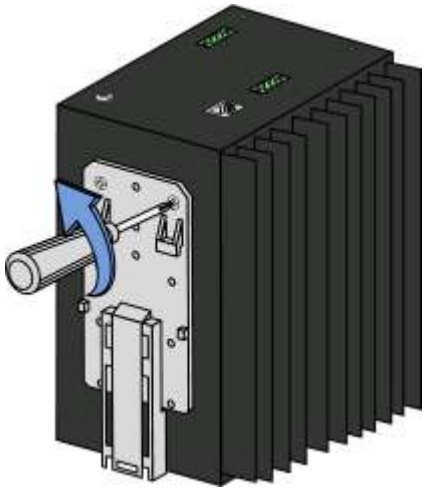
Note

- Before install the SNR-S212i-8POE on the wall, remove the rail-clamping kit from the SNR-S212i-8POE.
- The wall-mount plane is not delivered with the SNR-S212i-8POE. Purchase one if needed.

Install the SNR-S212i-8POE on the wall as below:

Step 1 Unfasten the screws from the rail-clamping kit counterclockwise, and remove the rail-clamping kit from the SNR-S212i-8POE, as shown in Figure 4-3.

Figure 4-3 Removing the rail-clamping kit



Step 2 Install the wall-mount plane against the rear panel of the SNR-S212i-8POE, and fasten screws clockwise, as shown in Figure 4-4.

Figure 4-4 Installing the wall-mount plane against the rear panel

Step 3 Install the wall-mount plane on the wall.

Figure 4-5 Installing the wall-mount plane on the wall

4.3 Grounding device

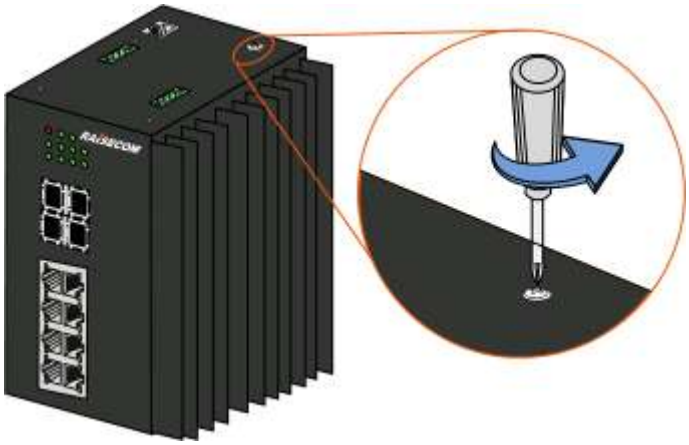
Warning

Connecting the grounding cable properly is an important guarantee to lightning protection, shock proof, and anti-interference. When installing and using the device, ensure that the grounding cable is properly connected; otherwise, personnel injury or equipment damage may be caused.

Install the grounding cable as below:

Step 1 Unscrew the grounding terminal counterclockwise, remove the screws and shims, and keep them for later use, as shown in Figure 4-6.

Figure 4-6 Unscrewing the grounding terminal



Step 2 Sheathe the flat shim, grounding OT terminal, and spring shim in sequence over the screw.

Step 3 Reinstall the screw to the grounding terminal, and tighten the screws clockwise, as shown in Figure 4-7.

Figure 4-7 Connecting the grounding cable

4.4 Connecting cables

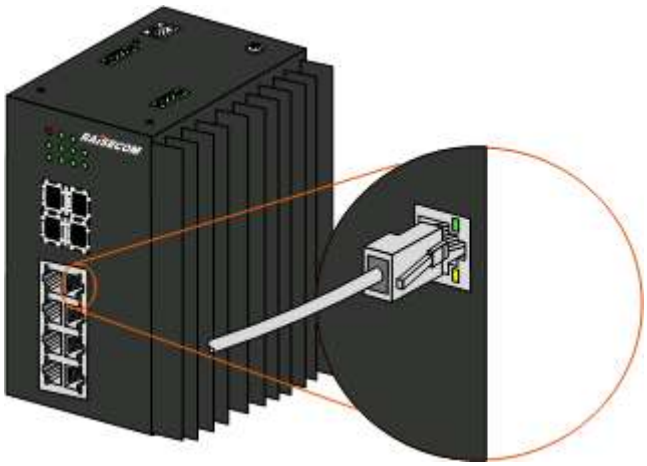
Connecting Ethernet cable

Connect the Ethernet cable as below:

Step 1 Choose a proper length for the Ethernet cable according to cabling path, and make an Ethernet cable accordingly.

Step 2 Insert the RJ45 connector of the Ethernet cable into the Ethernet interface of the SNR-S212i-8POE, as shown in Figure 4-8.

Figure 4-8 Connecting the Ethernet cable



4.4.2 Connecting fiber

The SNR-S212i-8POE support LC/PC fiber connectors.

Caution

When the SNR-S212i-8POE is idle, cover the optical interface with a dustproof cover to prevent dust and dirty objects from entering the optical interface, which may result in malfunction of the SNR-S212i-8POE.

Warning

There is invisible laser inside the SNR-S212i-8POE and it harms eyes. Do not directly stare into the optical interface, fiber connector, or breakage of fiber.

Inserting optical module

Insert the SFP optical module into the optical interface of the SNR-S212i-8POE.

Connecting LC/PC fiber

When inserting or removing the LC/PC fiber connector, conduct axial operations rather than rotating operations, with details as below:

Step 1 Remove the dustproof cover from the SFP optical interface, and keep it for later use.

Step 2 Insert the fiber into the optical interface, and insert the fiber slightly into the SFP optical interface.

Step 3 When removing the fiber, push the fiber head slightly, and pull out the fiber.

4.4.3 Connecting power

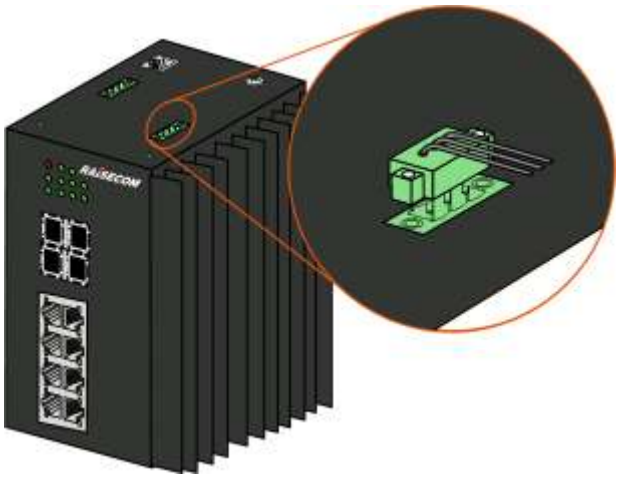
The power interface on the SNR-S212i-8POE is a 3-PIN Phoenix terminal.

Connect the power cable as below:

Step 1 Make the power cable as required.

Step 2 Insert the 3-PIN Phoenix terminal properly into the power interface on the SNR-S212i-8POE, as shown in Figure 4-9.

Figure 4-9 Connecting the 3-PIN Phoenix terminal



Step 3 Insert the AC power plug into the power socket of the cabinet or the power sourcing equipment in the equipment room.

4.5 Powering on device

Power on the SNR-S212i-8POE as below:

Step 1 After the SNR-S212i-8POE is properly installed, power on the device.

When the PWR LED is Green, the SNR-S212i-8POE is working with power.

Step 2 After self-check and initialization, the SNR-S212i-8POE enters the working status.

The interface LED indicates the working status (Green, Blinking green, or Off).

4.6 Check after installation

After installation is complete, check the SNR-S212i-8POE and environment as listed in Table 4-2.

Table 4-2 Check after installation

No.	Item	Method
1	Components are installed properly without loose ends or shedding phenomenon.	View.
2	Screws are tightened.	View.
3	Cables are correctly connected without loose ends or shedding phenomenon.	View.
4	The wiring of cables should meet design requirements.	View.
5	No damage, breakage, or middle connector for signal cables	View.
6	Labels on both ends of the signal cable should be correct, distinct, and neat.	View.
7	The radius of curvature of an optical fiber should be 20 times greater than the diameter. In general, it should be greater than 40 mm.	View.
8	The power cable and grounding cable should comply with engineering design documents, to facilitate network expansion.	View.
9	Power cables and signal cables are laid separately.	View.
10	No stains or scratches on the surface of the device	View.
11	The fuse is big enough so that the device works properly under the maximum power consumption.	Use a multimeter.
12	When making the wiring nose of the power cable, grounding cable, or the alarm cable, weld or clamp it tightly.	View.
13	The power cable and the grounding cable are properly connected. The spring shim sheathes the flat shim.	View.

No.	Item	Method
14	Space for heat dissipation is reserved around the device. No heavy object is laid on the device.	View.

5 Management and maintenance

This chapter describes how to manage and maintain the SNR-S212i-8POE, including the following sections:

- Management modes
- Maintenance modes

5.1 Management modes

You can manage and maintain the SNR-S212i-8POE in the following modes:

- Command Line Interface (CLI)
- Web
- SNMP

5.1.1 CLI mode

Console interface management

Console interface management refers to configure and manage the SNR-S212i-8POE through a terminal or a PC that runs the terminal emulation program. This is out-of-band management mode and does not rely on the service network. Though the service network is operating improperly, you can configure and manage the SNR-S212i-8POE through the Console interface.

Telnet management

The Telnet protocol, one of the TCP/IP protocol suites, is a standard protocol for remote login via the Internet. Applied with the Telnet protocol, a local PC can be a terminal for the remote host system. You can log in to the SNR-S212i-8POE through the PC which runs the Telnet program. You can type commands through Telnet, and these commands will be executed on the SNR-S212i-8POE as you directly execute commands on the SNR-S212i-8POE.

SSH management

SSH is a protocol that provides secure remote login and other secure network services on unsecure networks. When you remotely log in to the SNR-S212i-8POE on an unsecure

network, SSH automatically encrypts data every time you send. When data reach the destination, SSH automatically decrypts data. In this way, SSH protects the SNR-S212i-8POE from attacks such as plain text interception.

SSH can replace Telnet to manage remote devices or provide secure channel for applications such as FTP.

5.1.2 Web mode

The switch supports Web management, through which you can access it for management and maintenance.

Web management mode adopts GUI, thus easier to use than CLI.

5.1.3 SNMP mode

Simple Network Management Protocol (SNMP) is designed by the Internet Engineering Task Force (IETF) to resolve problems in managing network devices connected to the Internet. Through SNMP, a network management system that can manage all network devices that support SNMP, including monitoring network status, modifying configurations of a network device, and receiving network alarms. SNMP is the most widely used network management protocol in TCP/IP networks.

Till now, SNMP has three versions: v1, v2c, and v3, described as below.

- SNMP v1 uses community name authentication mechanism. The community name, a string defined by an agent, acts like a secret. The network management system can visit the agent only by specifying its community name correctly. If the community name carried in a SNMP packet is not accepted by the SNR-S212i-8POE, the packet will be dropped.
- Compatible with SNMP v1, SNMP v2c also uses community name authentication mechanism. SNMP V2c supports more operation types, data types, and errored codes, and thus better identifying errors.
- SNMP v3 uses User-based Security Model (USM) authentication mechanism. You can configure whether USM authentication is enabled and whether encryption is enabled to provide higher security. USM authentication mechanism allows authenticated senders and prevents unauthenticated senders. Encryption is to encrypt packets transmitted between the network management system and agents, thus preventing interception.

The switch supports v1, v2c, and v3 of SNMP.

5.2 Maintenance modes

The switch supports diagnoses and debugging of software and hardware faults.

5.2.1 Ping

Packet Internet Grope (Ping) is the most widely used command for fault diagnosis and removal. It is usually used to detect whether two hosts are connected or not. Ping is achieved with ICMP echo packets. If an Echo Reply packet is sent back to the source address during a valid period after the Echo Request packet is sent to the destination address, it indicates the route between source and destination address is reachable.

5.2.2 Traceroute

Traceroute is used to discover the real route taking by the packet to transmit to the destination. Although the Ping feature can test the connectivity, it cannot record all network devices on the route limited by the IP head. Traceroute can be used to test routing information from the source host to the destination host.

5.2.3 Environment monitoring

By monitoring key environment parameters of the SNR-S212i-8POE, such as temperature and voltage, you can take measures accordingly to avoid faults.

5.2.4 RMON management

Remote Network Monitoring (RMON) is a standard developed by the Internet Engineering Task Force (IETF). RMON is used to monitor network data through different agents and NMS. RMON is an extension of SNMP, but ROMN is more active and efficient for monitoring remote devices. The administrator can quickly trace faults generated on the network, network segments or devices.

At present, RMON implements four function groups:

- Statistic group
- History group
- Alarm group
- Event group

5.2.5 System log

The system log refers that the SNR-S212i-8POE records the system information and debugging information in a log and sends the log to the specified destination. When the SNR-S212i-8POE fails to work, you can check and locate the fault easily.

The system information and some scheduling output will be sent to the system log to deal with. According to the configuration, the system will send the log to various destinations. The destinations that receive the system log are divided into:

- Console: send the log message to the local console through Console interface.
- Host: send the log message to the host.
- Monitor: send the log message to the monitor, such as Telnet terminal.
- File: send the log message to the Flash of the device.
- Buffer: send the log message to the buffer.
- SNMP server: convert logs into Trap to output them to the SNMP server.

5.2.6 Optical module monitoring

The SFP optical module is an optical transceiver. SFP provides a performance monitoring method for the SNR-S212i-8POE. By analyzing monitoring data provided by SFP, the network administrator can predict the life of the SFP module, isolate system fault, and verify module compatibility during on-site installation.

Each SFP provides five performance parameters:

- Transceiver temperature

- Internal voltage
- Tx bias current
- Tx optical power
- Rx optical power

With this function, you can globally configure optical modules on the SNR-S212i-8POE, view and export the following tables:

- Optical module information table
- Optical module detection table
- Optical module current period detection table
- Optical module period detection table.

5.2.7 Watchdog

By configuring Watchdog, you can prevent the system program from dead circulation due to uncertain fault and thus improve the stability of system.

5.2.8 Port mirroring

Port mirroring refers to mirroring packets of the source port to the monitor port without affecting packets forwarding. You can use this function to monitor the receiving and sending status of one or more port and analyze the network situation.

The switch supports port mirroring based on ingress and egress ports. When port mirroring is enabled, packets on ingress/egress mirroring port will be mirrored to the monitor port. The monitor port and mirroring port cannot be the same one.

6 Appendix

This chapter lists terms, acronyms, and abbreviations involved in this document, including the following sections:

- Terms
- Acronyms and abbreviations

6.1 Terms

A

Access Control List (ACL)	A series of ordered rules composed of permit | deny sentences. These rules are based on the source MAC address, destination MAC address, source IP address, destination IP address, interface ID, etc. The device decides to receive or refuse the packets based on these rules.
Automatic Laser Shutdown (ALS)	The technology that is used for automatically shutting down the laser to avoid the maintenance and operation risks when the fiber is pulled out or the output power is over great.
Auto-negotiation	The interface automatically chooses the rate and duplex mode according to the result of negotiation. The auto-negotiation process is: the interface adapts its rate and duplex mode to the highest performance according to the peer interface, that is, both ends of the link adopt the highest rate and duplex mode they both support after auto-negotiation.
Automatic Protection Switching (APS)	APS is used to monitor transport lines in real time and automatically analyze alarms to discover faults. When a critical fault occurs, through APS, services on the working line can be automatically switched to the protection line, thus the communication is recovered in a short period.

C

Challenge Handshake Authentication Protocol (CHAP)	CHAP is a widely supported authentication method in which a representation of the user's password, rather than the password itself, is sent during the authentication process. With CHAP, the remote access server sends a challenge to the remote access client. The remote access client uses a hash algorithm (also known as a hash function) to compute a Message Digest-5 (MD5) hash result based on the challenge and a hash result computed from the user's password. The remote access client sends the MD5 hash result to the remote access server. The remote access server, which also has access to the hash result of the user's password, performs the same calculation using the hash algorithm and compares the result to the one sent by the client. If the results match, the credentials of the remote access client are considered authentic. A hash algorithm provides one-way encryption, which means that calculating the hash result for a data block is easy, but determining the original data block from the hash result is mathematically infeasible.

D

Dynamic ARP Inspection (DAI)	A security feature that can be used to verify the ARP data packets in the network. With DAI, the administrator can intercept, record, and discard ARP packets with invalid MAC address/IP address to prevent common ARP attacks.
Dynamic Host Configuration Protocol (DHCP)	A technology used for assigning IP address dynamically. It can automatically assign IP addresses for all clients in the network to reduce workload of the administrator. In addition, it can realize centralized management of IP addresses.

E

Bracket	A component installed on both sides of the chassis, used for install the chassis to the rack.
Ethernet in the First Mile (EFM)	Complying with IEEE 802.3ah protocol, EFM is a link-level Ethernet OAM technology. It provides the link connectivity detection, link fault monitoring, and remote fault notification, etc. for a link between two directly-connected devices. EFM is mainly used for the Ethernet link on edges of the network accessed by users.
Ethernet Ring Protection Switching (ERPS)	It is an APS protocol based on ITU-T G.8032 standard, which is a link-layer protocol specially used for the Ethernet ring. In normal conditions, it can avoid broadcast storm caused by the data loop on the Ethernet ring. When the link or device on the Ethernet ring fails, services can be quickly switched to the backup line to enable services to be recovered in time.

F

Failover	Failover provides an interface linkage scheme, extending the range of link backup. Through monitoring upstream links and synchronizing downstream links, faults of the upstream device can be transferred quickly to the downstream device, and primary/backup switching is triggered. In this way, it avoids traffic loss because the downstream device does not sense faults of the upstream link.
Full duplex	In a communication link, both parties can receive and send data concurrently.

G

GFP encapsulation	Generic Framing Procedure (GFP) is a generic mapping technology. It can group variable-length or fixed-length data for unified adaption, making data services transmitted through multiple high-speed physical transmission channels.

H

Half duplex	In a communication link, both parties can receive or send data at a time.

I

Institute of Electrical and Electronics Engineers (IEEE)	A professional society serving electrical engineers through its publications, conferences, and standards development activities. The body responsible for the Ethernet 802.3 and wireless LAN 802.11 specifications.
Internet Assigned Numbers Authority (IANA)	The organization operated under the IAB. IANA delegates authority for IP address-space allocation and domain-name assignment to the NIC and other organizations. IANA also maintains a database of assigned protocol identifiers used in the TCP/IP suite, including autonomous system numbers.
Internet Engineering Task Force (IETF)	A worldwide organization of individuals interested in networking and the Internet. Managed by the Internet Engineering Steering Group (IESG), the IETF is charged with studying technical problems facing the Internet and proposing solutions to the Internet Architecture Board (IAB). The work of the IETF is carried out by various working groups that concentrate on specific topics, such as routing and security. The IETF is the publisher of the specifications that led to the TCP/IP protocol standard.

L

Label	Symbols for cable, chassis, and warnings
Link Aggregation	With link aggregation, multiple physical Ethernet interfaces are combined to form a logical aggregation group. Multiple physical links in one aggregation group are taken as a logical link. Link aggregation helps share traffic among member interfaces in an aggregation group. In addition to effectively improving the reliability on links between devices, link aggregation can help gain greater bandwidth without upgrading hardware.
Link Aggregation Control Protocol (LACP)	A protocol used for realizing link dynamic aggregation. The LACPDU is used to exchange information with the peer device.

M

Multi-mode fiber	In this fiber, multi-mode optical signals are transmitted.

N

Network Time Protocol (NTP)	A time synchronization protocol defined by RFC1305. It is used to synchronize time between distributed time server and clients. NTP is used to perform clock synchronization on all devices that have clocks in the network. Therefore, the devices can provide different applications based on a unified time. In addition, NTP can ensure a very high accuracy with an error of 10ms or so.

O

Open Shortest Path First (OSPF)	An internal gateway dynamic routing protocol, which is used to decide the route in an Autonomous System (AS)
Optical Distribution Frame (ODF)	A distribution connection device between the fiber and a communication device. It is an important part of the optical transmission system. It is mainly used for fiber splicing, optical connector installation, fiber adjustment, additional pigtail storage, and fiber protection.

P

Password Authentication Protocol (PAP)	PAP is an authentication protocol that uses a password in Point-to-Point Protocol (PPP). It is a twice handshake protocol and transmits unencrypted user names and passwords over the network. Therefore, it is considered unsecure.
Point-to-point Protocol over Ethernet (PPPoE)	PPPoE is a network protocol for encapsulating PPP frames in Ethernet frames. With PPPoE, the remote access device can control and account each access user.
Private VLAN (PVLAN)	PVLAN adopts Layer 2 isolation technology. Only the upper VLAN is visible globally. The lower VLANs are isolated from each other. If you partition each interface of the switch or IP DSLAM device into a lower VLAN, all interfaces are isolated from each other.
Grounding cable	The cable to connect the device to ground, usually a yellow/green coaxial cable. Connecting the grounding cable properly is an important guarantee to lightning protection, anti-electric shock, and anti-interference.

Q

QinQ	802.1Q in 802.1Q (QinQ), also called Stacked VLAN or Double VLAN, is extended from 802.1Q and defined by IEEE 802.1ad recommendation. This VLAN feature allows the equipment to add a VLAN tag to a tagged packet. The implementation of QinQ is to add a public VLAN tag to a packet with a private VLAN tag, making the packet encapsulated with two layers of VLAN tags. The packet is forwarded over the ISP's backbone network based on the public VLAN tag and the private VLAN tag is transmitted as the data part of the packet. In this way, the QinQ feature enables the transmission of the private VLANs to the peer end transparently. There are two QinQ types: basic QinQ and selective QinQ.
Quality of Service (QoS)	A network security mechanism, used to solve problems of network delay and congestion. When the network is overloaded or congested, QoS can ensure that packets of important services are not delayed or discarded and the network runs high efficiently. Depending on the specific system and service, it may relate to jitter, delay, packet loss ratio, bit error ratio, and signal-to-noise ratio.

R

Rapid Spanning Tree Protocol (RSTP)	Evolution of the Spanning Tree Protocol (STP), which provides improvements in the speed of convergence for bridged networks
Remote Authentication Dial In User Service (RADIUS)	RADIUS refers to a protocol used to authenticate and account users in the network. RADIUS works in client/server mode. The RADIUS server is responsible for receiving users' connection requests, authenticating users, and replying configurations required by all clients to provide services for users.

S

Simple Network Management Protocol (SNMP)	A network management protocol defined by Internet Engineering Task Force (IETF) used to manage devices in the Internet. SNMP can make the network management system to remotely manage all network devices that support SNMP, including monitoring network status, modifying network device configurations, and receiving network event alarms. At present, SNMP is the most widely-used network management protocol in the TCP/IP network.
Simple Network Time Protocol (SNTP)	SNTP is mainly used for synchronizing time of devices in the network.
Single-mode fiber	In this fiber, single-mode optical signals are transmitted.
Spanning Tree Protocol (STP)	STP can be used to eliminate network loops and back up link data. It blocks loops in logic to prevent broadcast storms. When the unblocked link fails, the blocked link is re-activated to act as the backup link.

V

Virtual Local Area Network (VLAN)	VLAN is a protocol proposed to solve broadcast and security issues for Ethernet. It divides devices in a LAN into different segments logically rather than physically, thus implementing multiple virtual work groups which are based on Layer 2 isolation and do not affect each other.
VLAN mapping	VLAN mapping is mainly used to replace the private VLAN Tag of the Ethernet service packet with the ISP's VLAN Tag, making the packet transmitted according to ISP's VLAN forwarding rules. When the packet is sent to the peer private network from the ISP network, the VLAN Tag is restored to the original private VLAN Tag according to the same VLAN forwarding rules. Thus, the packet is sent to the destination correctly.

6.2 Acronyms and abbreviations

A

AAA	Authentication, Authorization, and Accounting
ABR	Area Border Router
AC	Alternating Current
ACL	Access Control List
ANSI	American National Standards Institute
APS	Automatic Protection Switching
ARP	Address Resolution Protocol
AS	Autonomous System
ASE	Autonomous System External
AWG	American Wire Gauge

B

BC	Boundary Clock
BDR	Backup Designated Router
BITS	Building Integrated Timing Supply System
BOOTP	Bootstrap Protocol
BPDU	Bridge Protocol Data Unit
BTS	Base Transceiver Station

C

CAR	Committed Access Rate
CAS	Channel Associated Signaling
CBS	Committed Burst Size

CE	Customer Edge
CHAP	Challenge Handshake Authentication Protocol
CIDR	Classless Inter-Domain Routing
CIR	Committed Information Rate
CIST	Common Internal Spanning Tree
CLI	Command Line Interface
CoS	Class of Service
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CSMA/CD	Carrier Sense Multiple Access/Collision Detection
CST	Common Spanning Tree

D

DAI	Dynamic ARP Inspection
DBA	Dynamic Bandwidth Allocation
DC	Direct Current
DHCP	Dynamic Host Configuration Protocol
DiffServ	Differentiated Service
DNS	Domain Name System
DRR	Deficit Round Robin
DS	Differentiated Services
DSL	Digital Subscriber Line

E

EAP	Extensible Authentication Protocol
EAPoL	EAP over LAN
EFM	Ethernet in the First Mile
EMC	Electro Magnetic Compatibility
EMI	Electro Magnetic Interference
EMS	Electro Magnetic Susceptibility
ERPS	Ethernet Ring Protection Switching
ESD	Electro Static Discharge

F

FCS	Frame Check Sequence
FE	Fast Ethernet
FIFO	First Input First Output

FTP	File Transfer Protocol

G

GARP	Generic Attribute Registration Protocol
GE	Gigabit Ethernet
GMRP	GARP Multicast Registration Protocol
GPS	Global Positioning System
GVRP	Generic VLAN Registration Protocol

H

HDLC	High-level Data Link Control
HTTP	Hyper Text Transfer Protocol

I

IANA	Internet Assigned Numbers Authority
ICMP	Internet Control Message Protocol
IE	Internet Explorer
IEC	International Electro technical Commission
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IGMP	Internet Group Management Protocol
IP	Internet Protocol
IS-IS	Intermediate System to Intermediate System Routing Protocol
ISP	Internet Service Provider
ITU-T	International Telecommunications Union - Telecommunication Standardization Sector

L

LACP	Link Aggregation Control Protocol
LACPDU	Link Aggregation Control Protocol Data Unit
LAN	Local Area Network
LCAS	Link Capacity Adjustment Scheme
LLDP	Link Layer Discovery Protocol
LLDPDU	Link Layer Discovery Protocol Data Unit

M

MAC	Medium Access Control
MDI	Medium Dependent Interface
MDI-X	Medium Dependent Interface cross-over
MIB	Management Information Base
MSTI	Multiple Spanning Tree Instance
MSTP	Multiple Spanning Tree Protocol
MTBF	Mean Time Between Failure
MTU	Maximum Transmission Unit
MVR	Multicast VLAN Registration

N

NMS	Network Management System
NNM	Network Node Management
NTP	Network Time Protocol

O

OAM	Operation, Administration, and Management
OC	Ordinary Clock
ODF	Optical Distribution Frame
OID	Object Identifiers
Option 82	DHCP Relay Agent Information Option
OSPF	Open Shortest Path First

P

P2MP	Point to Multipoint
P2P	Point-to-Point
PADI	PPPoE Active Discovery Initiation
PADO	PPPoE Active Discovery Offer
PADS	PPPoE Active Discovery Session-confirmation
PAP	Password Authentication Protocol
PDU	Protocol Data Unit
PE	Provider Edge
PIM-DM	Protocol Independent Multicast-Dense Mode
PIM-SM	Protocol Independent Multicast-Sparse Mode
Ping	Packet Internet Grope
PPP	Point to Point Protocol

PPPoE	PPP over Ethernet
PTP	Precision Time Protocol

Q

QoS	Quality of Service

R

RADIUS	Remote Authentication Dial In User Service
RED	Random Early Detection
RH	Relative Humidity
RIP	Routing Information Protocol
RMON	Remote Network Monitoring
RPL	Ring Protection Link
RRPS	Redundant Ring Protection Switching
RSTP	Rapid Spanning Tree Protocol
RSVP	Resource Reservation Protocol

S

SCADA	Supervisory Control And Data Acquisition
SF	Signal Fail
SFP	Small Form-factor Pluggable
SFTP	Secure File Transfer Protocol
SLA	Service Level Agreement
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
SP	Strict-Priority
SPF	Shortest Path First
SSH	Secure Shell
STP	Spanning Tree Protocol

T

TACACS+	Terminal Access Controller Access Control System
TC	Transparent Clock
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
TLV	Type Length Value

ToS	Type of Service
TPID	Tag Protocol Identifier
TTL	Time To Live

U

UDP	User Datagram Protocol
USM	User-Based Security Model

V

VLAN	Virtual Local Area Network
WAN	Wide Area Network
WRR	Weight Round Robin