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Gazelle S1503i (A)
User Manual
(Rel_01)



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Preface

Objectives

This document describes overview, hardware structure, technical specifications, serial server features, hardware installation, networking application, and management and maintenance of the Gazelle S1503i. The appendix lists terms, acronyms, and abbreviations involved in this document.

Versions

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

Product name	Product version	Software version	Hardware version
Gazelle S1503i	P100R001	V2.1 or later	A.00 or later

Conventions

Symbol conventions

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

Symbol	Description
 Warning	Indicate a hazard with a medium or low level of risk which, if not avoided, could result in minor or moderate injury.
 Caution	Indicate a potentially hazardous situation that, if not avoided, could cause equipment damage, data loss, and performance degradation, or unexpected results.
 Note	Provide additional information to emphasize or supplement important points of the main text.
 Tip	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 .
<i>Italic</i>	Book titles are in <i>italics</i> .
Lucida Console	Terminal display is in Lucida Console.

Change history

Updates between document versions are cumulative. Therefore, the latest document version contains all updates made to previous versions.

Issue 01 (2014-09-30)

Initial commercial release

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1 Overview

This chapter describes basic information about the Gazelle S1503i, including the following sections:

- Introduction
- Features
- Models

1.1 Introduction

The network-manageable guide-rail Layer 2 industrial Ethernet switch Gazelle S1503i (hereinafter referred to as the Gazelle S1503i), is characterized by all-GE interfaces, guide-rail chassis, full metal shell, fan-free design for heat dissipation, small size, low power consumption, and easy installation. The Gazelle S1503i can address the needs of the access-layer guide-rail switch in industrial control, intelligent transportation, and electrical ring network scenarios.

The Gazelle S1503i supports complete Layer 2 features and network management performance, and provides multiple interface types, including electrical interface, optical interface, and serial interface.

The Gazelle S1503i has several models, which provides different form and number of interfaces. For details, see section 1.3 Models.

1.2 Features

1.2.1 High reliability

The Gazelle S1503i is characterized by high reliability:

- Adopt an industrial-level chip and power module, and is designed with lower power consumption
- Possess a guide-rail chassis, full metal shell, and fan-free heat dissipation design.
- Support IP40 protection level.
- Support wide-temperature working environment with the operating temperature in the range of -40 to 75 °C and storage temperature in the range of -40 to 85 °C.

- It is damp-proofing and corrosion-resisting, and works at 5%–95% relative humidity (non-condensing).
- Possess good anti-electromagnetic interference performance after IEC 61000-4 industrial-level electromagnetic compatibility test.
- Mean Time Between Failure (MTBF) is 35 years.

1.2.2 Various interface types

The Gazelle S1503i meets special on-site environment requirements with flexible interface configurations:

- Support SFP optical interface, RJ45 electrical interface, in all-GE rate.
- Support an alternative RS-232/RS-485 serial interface, and adopt industrial-grade Phoenix terminal.

1.2.3 Flexible networking performance

The Gazelle S1503i possesses flexible networking performance:

- Support chain, star, double-star, single ring, intersecting ring, and tangent ring, etc. networking schemes.
- Support Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP), and Multiple Spanning Tree Protocol (MSTP), which enhance the link redundant backup and fault-tolerant performance to ensure stable operation of the network.

1.2.4 Strict QoS guarantee

The Gazelle S1503i supports following flow traffic management technologies:

- Support QoS based on the IEEE 802.1p standard to provide users with reliable and effective methods for service optimization.
- Support interface trust mode; trust Class of Service (CoS) priority and Differentiated Services Code Point (DSCP) priority.
- Support interface-based priority mapping, CoS-to-local priority mapping, and DSCP-to-local priority mapping.
- Support scheduling 2 scheduling modes: Strict Priority (SP) and Weight Round Robin (WRR).

1.2.5 Complete security ensurance

The Gazelle S1503i provides complete security guarantee:

- Support user management at different levels and password protection to avoid unauthorized access.
- Support Remote Authentication Dial In User Service (RADIUS) authentication and Terminal Access Controller Access Control System (TACACS+) authentication, and provide integrated password management.
- Support static Address Resolution Protocol (ARP), that is, bind the MAC address with the interface to protect the network from ARP attacks.
- Support storm control (including broadcast, unknown multicast, and unknown unicast packets), which effectively ensures the Gazelle S1503i to work normally in bad network conditions.

- Support VLAN partition based on the IEEE 802.1Q to realize the physical interface isolation.
- Support interface protection to realize data isolation in the interface protection group and further perfect the protection mechanism of the user data.
- Support encrypted authentication and access security provided by SNMP v3.

1.2.6 Comprehensive management modes

The Gazelle S1503i supports the following management modes:

- Web mode: it employs the graphic management interface, which reduces the difficulty of Human-Computer Interaction (HCI) and facilitates management and maintenance of the device.
- SNMP/RMON mode: the Gazelle S1503i can be managed through the NView NNM platform, which can realizes alarm management of a single device or multiple devices to achieve the goal of managing all devices comprehensively.
- Support Telnet and SSH remote login to realize remote management and maintenance.
- Support multiple software upgrading modes, such as, TFTP, FTP, SFTP, Network Management System (NMS), and Web.

1.3 Models

The Gazelle S1503i can be divided by interface type into two models, as described in Table 1-1.

Table 1-1 Gazelle S1503i models

Model	Description
Gazelle S1503i-GF-2GE-R	• Support one 100BASE-FX/1000BASE-X SFP optical interface. • Support two 10/100/1000BASE-T auto-negotiation electrical interface. • Support one Phoenix terminal serial interface.
Gazelle S1503i-GF-2GE	• Support one 100BASE-FX/1000BASE-X SFP optical interface. • Support two 10/100/1000BASE-T auto-negotiation electrical interface.

2 Hardware structure

This chapter describes the hardware structure of the Gazelle S1503i, including the following sections:

- Appearance
- Interfaces
- Interface parameters
- Lookup table for optical module parameters
- LEDs
- Power module
- Cables

2.1 Appearance

Dimensions of the Gazelle S1503i chassis: 56 mm (Width) × 105 mm (Depth) × 135 mm (Height)

The Gazelle S1503i can be installed in the following scenarios:

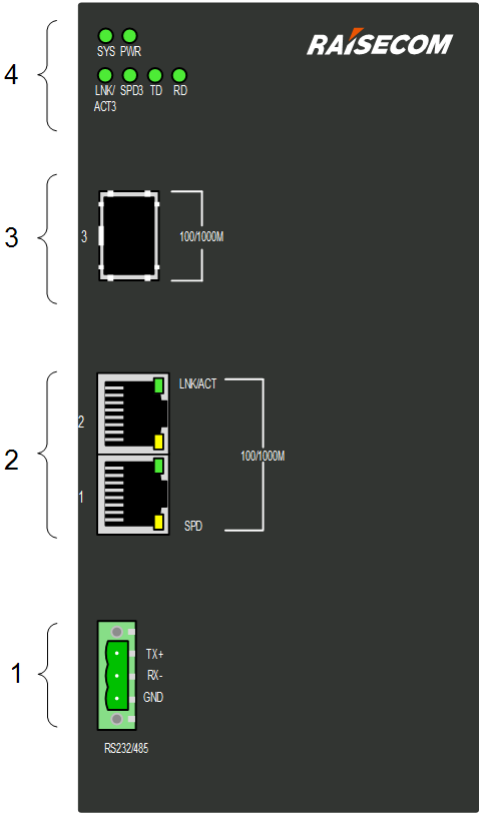
- Guide rail
- Wall

2.1.1 Front appearance

Gazelle S1503i -R

Figure 2-1 shows the front appearance of the Gazelle S1503i-GF-2GE-R AC model. The appearance of other models depends.

Figure 2-1 Front appearance of the Gazelle S1503i-GF-2GE-R AC model

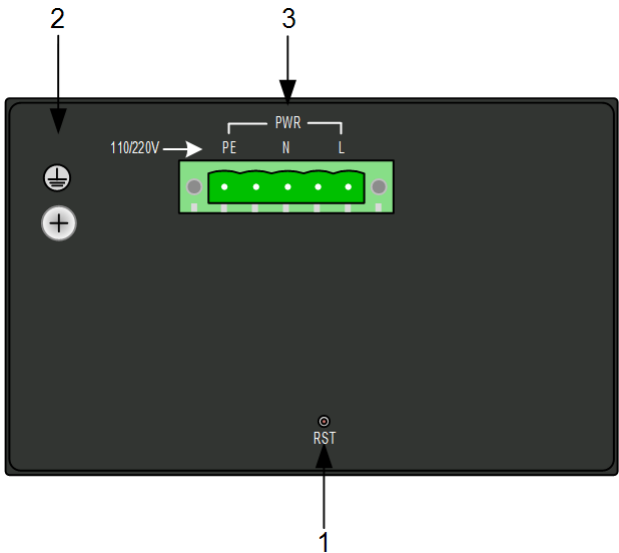


1	Service serial interface (RS-485/RS-232)
2	Service interfaces 1–2 (LNK/ACT and SPD)
3	Service interface 3 (SFP optical interface)
4	LEDs (SYS, PWR, LNK/ACT3, TD, and RD)

2.1.2 Top appearance

Figure 2-2 shows the top appearance of the Gazelle S1503i AC model.

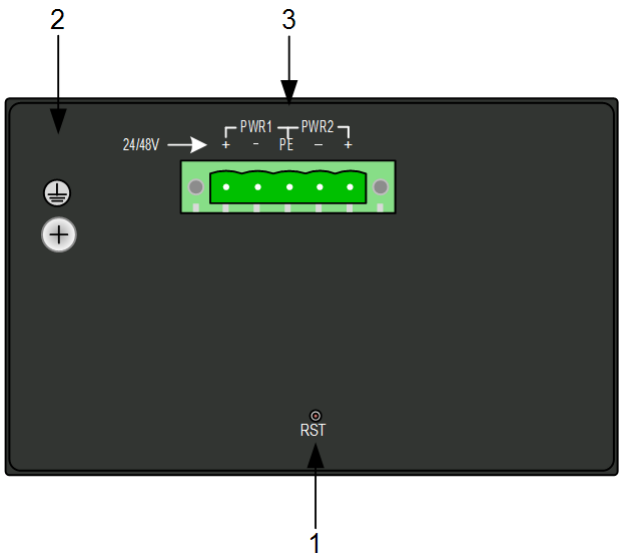
Figure 2-2 Top appearance of the Gazelle S1503i AC model



1	RST button
2	Grounding terminal
3	AC power interface (PWR)

Figure 2-3 shows the top appearance of the Gazelle S1503i DC model (taking 24V/48V model for example).

Figure 2-3 Top appearance of the Gazelle S1503i DC model

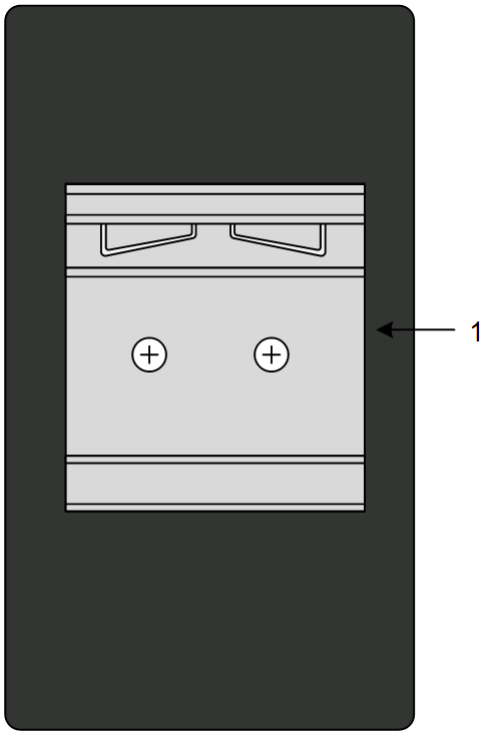


1	RST button
2	Grounding terminal
3	DC power interface (PWR1 and PWR2)

2.1.3 Rear appearance

Figure 2-4 shows the rear appearance of the Gazelle S1503i.

Figure 2-4 Rear appearance of the Gazelle S1503i



1	Clamping connector
---	--------------------

2.2 Interfaces

2.2.1 Service interface

The Gazelle S1503i provides multiple interfaces to carry services.

Table 2-1 lists interfaces on the Gazelle S1503i.

Table 2-1 Interfaces on the Gazelle S1503i

Model	Print	Interface type	Description
Gazelle S1503i-GF-2GE-R	RS-232/RS-485	RS-232/RS-485 (selected through software)	3-PIN Phoenix terminal (5.08 mm gap) serial interface  Note • In RS-232 mode, the Gazelle S1503i does not support hardware-based rate negotiation. • In RS-485 mode, the Gazelle S1503i supports 2-wire half duplex mode only. • The serial interface can be multiplexed as a Console interface through software configuration. For details, see <i>Gazelle S1503i (A) Configuration Guide</i>.
	1–2	RJ45	10/100/1000BASE-T electrical interface
	3	SFTP	Support the following optical modules: • 100BASE-FX • 1000BASE-X
Gazelle S1503i-GF-2GE	1–2	RJ45	10/100/1000BASE-T electrical interface
	3	SFP	Support the following optical module: • 100BASE-FX • 1000BASE-X

2.2.2 Management and auxiliary interfaces

Table 2-2 lists management and auxiliary interfaces on the Gazelle S1503i.

Table 2-2 Management and auxiliary interfaces on the Gazelle S1503i

Interface type	Description
Power interface	5-PIN Phoenix terminal (7.62 mm gap) for power input
RST button	• Short-press the button for less than 3s to reset the device. • Long-press the button for more than 3s to recover to factory settings and reset the device.

2.3 Interface parameters

2.3.1 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 scheme	8B/10B
Duplex mode	Full duplex
Compliant standard	IEEE 802.3
Supported network protocol	IP

2.3.2 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
Coding scheme	4B/5B
Duplex mode	Full duplex
Compliant standard	IEEE 802.3
Supported network protocol	IP

2.3.3 10/100/1000BASE-T electrical interface

Table 2-5 lists parameters of the 10/100/1000BASE-T electrical interface.

Table 2-5 Parameters of the 10/100/1000BASE-T electrical interface

Parameter	Description
Connector type	RJ45
Transmission rate	Support 10/100/1000 Mbit/s auto-negotiation.
Duplex mode	Support full duplex and half duplex modes.

Parameter	Description
Specifications	- When the transmission rate is 10/100 Mbit/s, we recommend using Cat 5 or better UTP cable. - When the transmission rate is 1000 Mbit/s, we recommend using Cat 5e or better UTP cable.
Compliant standard	IEEE 802.3
Supported network protocol	IP

2.3.4 Serial interface

Table 2-6 lists parameters of the RS-232 serial interface.

Table 2-6 Parameters of the RS-232 serial interface

Parameter	Description
Connector type	Phoenix terminal
Electrical feature	RS-232
Working mode	Full duplex
Baud rate	128 Baud–230 kBaud
Transmission distance	≤ 15 m

The RS-485 serial interface supports half duplex mode only. You can perform configurations through Web interface or command line. Table 2-7 lists parameters of the RS-485 serial interface.

Table 2-7 Parameters of the RS-485 serial interface

Parameter	Description
Connector type	Phoenix terminal
Electrical feature	RS-485
Working mode	Half duplex
Baud rate	128 Baud–1 MBaud
Transmission distance	≤ 1200 m

2.4 Lookup table for optical module parameters

All Raisecom optical modules comply with RoHS and support DDM.

2.4.1 GE optical module

Dual-fiber bidirectional (LC/PC)

Table 2-8 Parameters of the GE (1250 Mbit/s) dual-fiber bidirectional optical module

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (EOL) (dBm)	Overloading point (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)	Mode	Transmission distance (km)
USFP-Gb/M-I	850	830–870	-9.5 to -3	> 0	> 9	< -17	Multi-mode	0.55
USFP-Gb/S1-I	1310	1260–1620	-10 to -3	> -3	> 9	< -21	Single-mode	15
USFP-Gb/S2-I	1310	1260–1620	-2 to 3	> -3	> 9	< -21	Single-mode	40
USFP-Gb/S3-I	1550	1260–1620	0–5	> -3	> 9	< -22	Single-mode	80

Single-fiber bidirectional (LC/PC)

Table 2-9 Parameters of the GE (1250 Mbit/s) single-fiber bidirectional optical module

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (EOL) (dBm)	Overloading point (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)	Mode	Transmission distance (km)
USFP-Gb/SS13-I	1310	1500–1610	-10 to -3	> -3	> 9	< -21	Single-mode	15
USFP-Gb/SS15-I	1550	1260–1360	-10 to -3	> -3	> 9	< -21	Single-mode	15

2.4.2 FE optical modules

Dual-fiber bidirectional (LC/PC)

Table 2-10 Parameters of the FE (155 Mbit/s) dual-fiber bidirectional optical module

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (EOL) (dBm)	Overloading point (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)	Mode	Transmission distance (km)
USFP-03/M-I	1310	1270–1380	-20 to -14	> -10	> 10	< -29	Multi-mode	2
USFP-03/S1-I	1310	1260–1620	-15 to -8	> -8	> 10	< -34	Single-mode	15
USFP-03/S2-I	1310	1260–1620	-5 to 0	> -8	> 8.2	< -34	Single-mode	40
USFP-03/S3-I	1550	1260–1620	-5 to 0	> -8	> 10	< -34	Single-mode	80

Single-fiber bidirectional (LC/PC)

Table 2-11 Parameters of the FE (155 Mbit/s) single-fiber bidirectional optical module

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (EOL) (dBm)	Overloading point (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)	Mode	Transmission distance (km)
USFP-03/SS13-I	1310	1480–1580	-15 to -8	> -8	> 8.2	< -28	Single-mode	15
USFP-03/SS15-I	1550	1260–1360	-15 to -8	> -8	> 8.2	< -28	Single-mode	15

2.5 LEDs

Table 2-12 lists LEDs on the Gazelle S1503i.

Table 2-12 LEDs on the Gazelle S1503i

LEDs	Print	Color	Description
Electrical interface status LED	LNK/ACT	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.
Electrical interface rate LED	SPD	Yellow	- Yellow: the electrical interface is working at 100 Mbit/s. - Off: the electrical interface is working at 10 Mbit/s or working improperly.
Optical interface rate LED	SPD3	Yellow	- Yellow: the optical interface is working at 100 Mbit/s. - Off: the optical interface is working at 10 Mbit/s or abnormal.
Optical interface status LED	LNK/ACT3	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.
Power status LED	PWR1 (DC)	Green	- Green: power supply 1 is normal. - Off: power supply 1 is abnormal or off.
	PWR2 (DC)	Green	- Green: power supply 2 is normal. - Off: power supply 2 is abnormal or off.
	PWR (AC)	Green	- Green: AC power is normal. - Off: AC power is abnormal or off.
System status LED	SYS	Green	- Green: the system is being restarted or working improperly. - Blinking green: the system is working properly. - Off: the system is being restarted or working improperly.
Serial interface status LED	TD	Green	- Blinking green: the serial interface is sending data. - Off: the serial interface is not sending data.
	RD	Green	- Blinking green: the serial interface is receiving data. - Off: the serial interface is not receiving data.

2.6 Power modules

2.6.1 Functions

The Gazelle S1503i is embedded with a DC or AC power module. Based on related industrial standards, it meets strict specifications and supports functions as below:

The power module has the following functions:

- The DC power module supports redundant backup of 12/24 or 24/48 VDC power input.
- The AC power module supports 110/220 VAC single input.
- Support overload protection and reverse connection protection.
- Support overvoltage and surge protection.
- Support NMS alarm for battery failure.

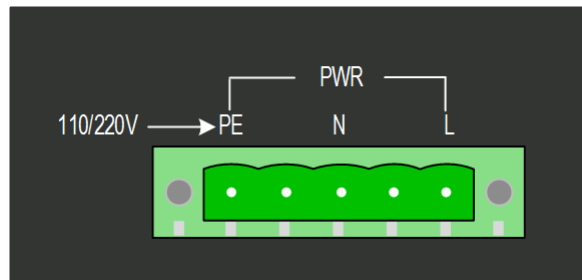
2.6.2 Appearance and interfaces

The power interface on the Gazelle S1503i is a 5-PIN Phoenix terminal interface, of which two PINs are 7.62 mm from each other.

AC power

Figure 2-5 shows appearance of the AC power interface.

Figure 2-5 Appearance of the AC power interface



There is one power input interface on the top of the AC power module.

Table 2-13 lists interface type and description of the AC power module.

Table 2-13 AC power module on the Gazelle S1503i

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

DC power

Figure 2-6 shows appearance of the 12/24 VDC power interface.

Figure 2-6 Appearance of the 12/24 VDC power interface

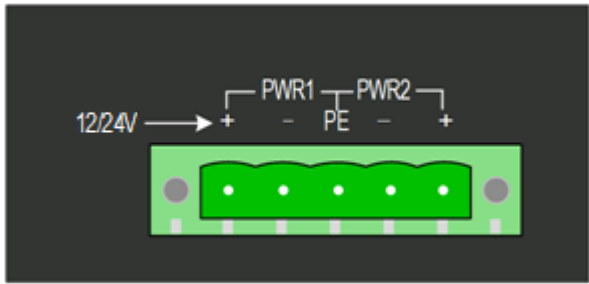
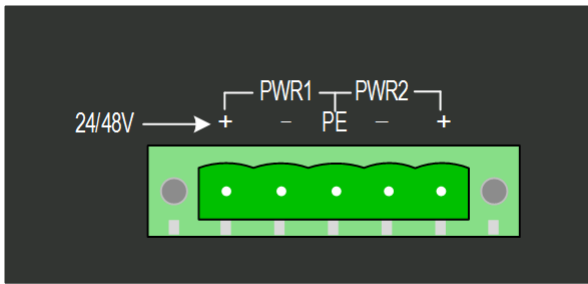


Figure 2-7 shows appearance of the 24/48 VDC power interface.

Figure 2-7 Appearance of the 24/48 VDC power interface



There is one power input interface on the top of the DC power module. Interface type and description are as listed in Table 2-14.

Table 2-14 DC power module on the Gazelle S1503i

Power module	Print	Description
DC power module	+ (PWR1)	Positive input terminal of power 1
	- (PWR1)	Negative input terminal of power 1
	PE	Grounding terminal
	- (PWR2)	Negative input terminal of power 2
	+ (PWR2)	Positive input terminal of power 2

2.6.3 Specifications

Table 2-15 lists specifications of the power module.

Table 2-15 Specifications of the power module

Item		Parameter
DC power module 1	Rated voltage	12/24 VDC
	Voltage range	10–36 VDC

Item		Parameter
DC power module 2	Rated voltage	24/48 VDC
	Voltage range	20–72 VDC
AC power module	Rated voltage	110/220 VAC
	Voltage range	85–264 VAC
	Frequency	50/60 Hz

2.7 Cables

2.7.1 Fiber

Introduction

The Gazelle S1503i supports the single-mode fiber and multi-mode fiber. These two kinds of fiber are same in appearance while different in color. The yellow one is single-mode fiber and the orange one is the multi-mode fiber.

The Gazelle S1503i can be connected to the Optical Distribution Frame (ODF) or optical interfaces of other devices through fiber.

Table 2-16 lists the type and usage of the fiber.

Table 2-16 Type and usage of the fiber

Usage	Local connector	Remote connector	Type	Standard
- Connect the Gazelle S1503i to the ODF through the Ethernet optical interface. - Connect the Ethernet optical interface on the Gazelle S1503i to optical interfaces on other devices.	LC/PC	LC/PC	2 mm single-mode fiber	ITU-T G.652
			2 mm multi-mode fiber	
	LC/PC	FC/PC	2 mm single-mode fiber	
			2 mm multi-mode fiber	
	LC/PC	SC/PC	2 mm single-mode fiber	
			2 mm multi-mode fiber	



Note

- Choose the connector type and jumper cable length reasonably based on the on-site requirements.
- The supported connector of the optical interface depends on the optical module.

- Choose a connector suitable for the optical interface. Otherwise, it may increase additional loss of fiber links, reduce transmission quality of services, or even damage the connector and optical interface.

Connector

Fiber connectors are different in shape, ferrule end-face, and pigtail sheath color, as shown in Table 2-17.

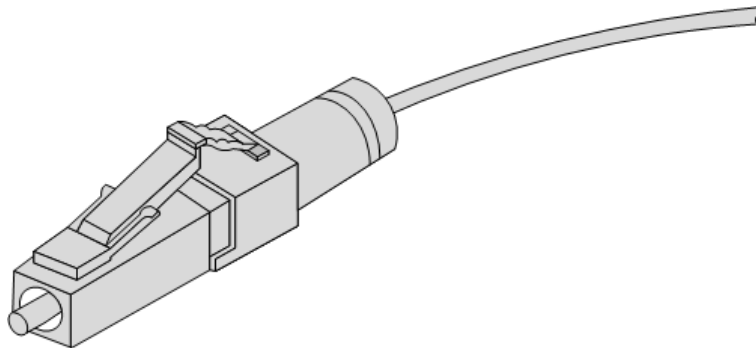
Table 2-17 Fiber connectors

Connector	Description	Pigtail sheath color
LC/PC	Clamping square fiber connector/micro-convex grinding-and-polishing ferrule end-face	Blue

LC/PC fiber connector

Figure 2-8 shows the appearance of the LC/PC fiber connector.

Figure 2-8 LC/PC fiber connector



When connecting or removing the LC/PC fiber connector, align the connector with the optical interface, and do not rotate the fiber. Operate as below:

- To connect the fiber, align the head of the fiber with the optical interface and insert the fiber into the interface gently.
- To remove the fiber, press down the clamping connector, and push the fiber head inwards, and then pull the fiber out.

Wiring

Table 2-18 lists the wiring of the fiber.

Table 2-18 Wiring of the fiber

Wiring relationship	Local optical interface	Direction of optical signals	Peer optical interface
Single-fiber connection	Optical interface	<->	Optical interface
Dual-fiber	Optical interface Tx	->	Optical interface Rx

Wiring relationship	Local optical interface	Direction of optical signals	Peer optical interface
connection	Optical interface Rx	<-	Optical interface Tx

2.7.2 Ethernet cable

Introduction

For the Gazelle S1503i, the Ethernet cable connects the Ethernet electrical interface and other devices.

The Ethernet interface on the Gazelle S1503i is self-adaptive to straight-through cable mode and crossover cable mode.



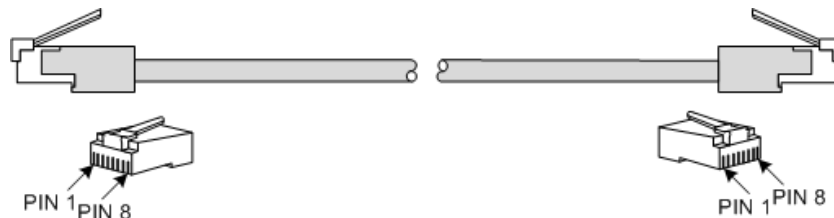
Note

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 2-19 lists the wiring of EIA/TIA 568A and EIA/TIA 568B standards.

Table 2-19 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 2-20 lists technical specifications of the Ethernet cable.

Table 2-20 Technical specifications of the Ethernet cable

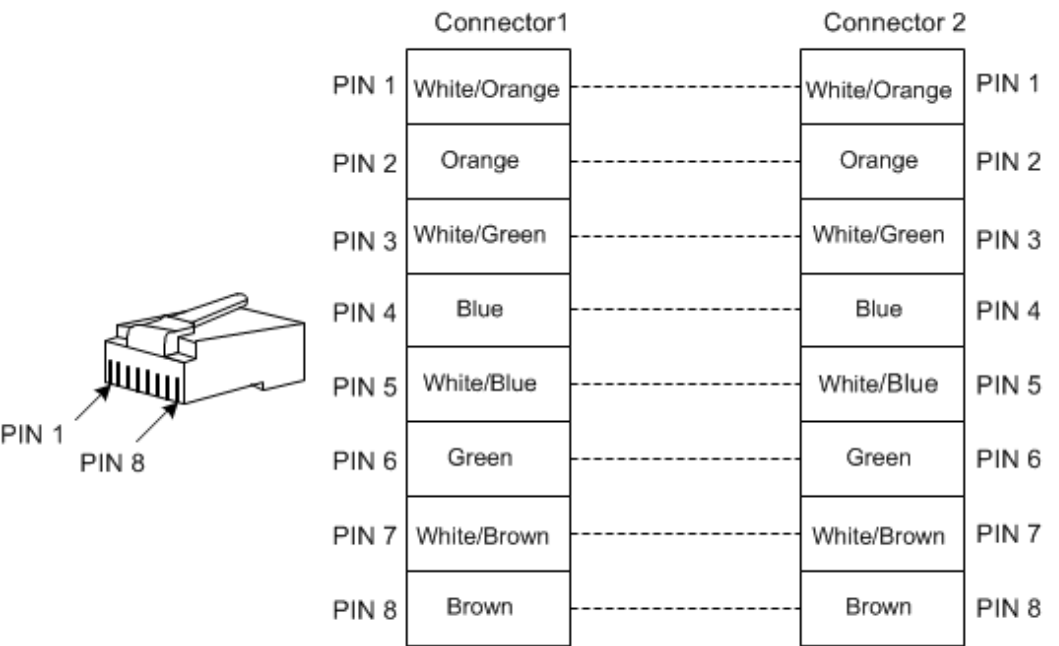
Item	Description
Name	CBL-ETH-RJ45/RJ45-D
Connector	RJ45 crystal head
Model	Cat 5 or better UTP (UTP-5 and UTP-5e) or STP cable
Number of cores	8
Length	The letter D is the length, indicating that the cable is customized. For example, if the customer requires 2-meter cables, they are named CBL-ETH-RJ45/RJ45-2m.

- Straight-through cable

Both two RJ45 connectors of the straight-through cable follow EIA/TIA 568B standard wiring.

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

Figure 2-10 Wiring of the straight-through cable



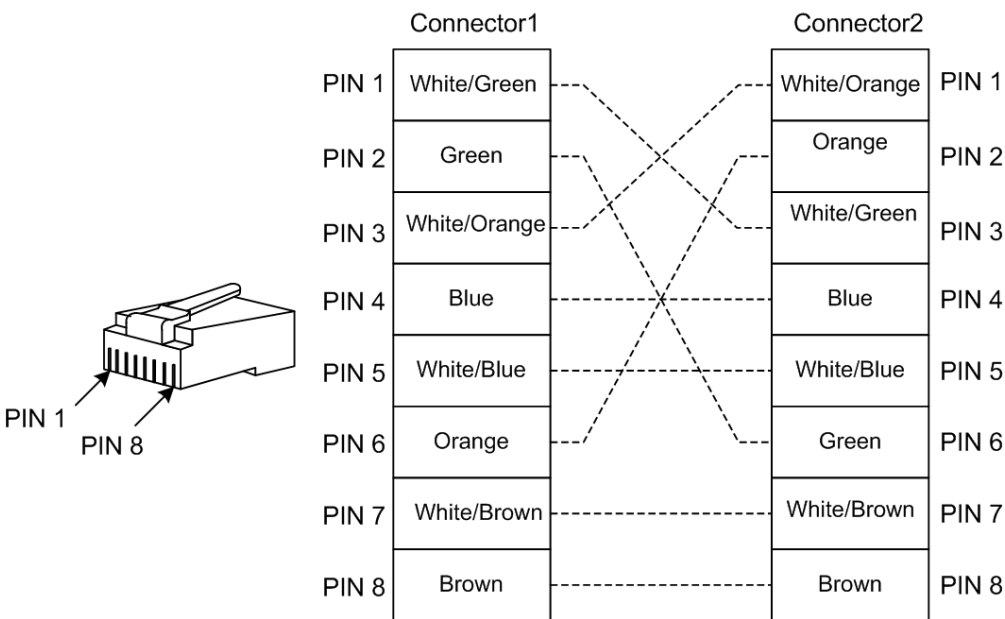
- Crossover cable

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.

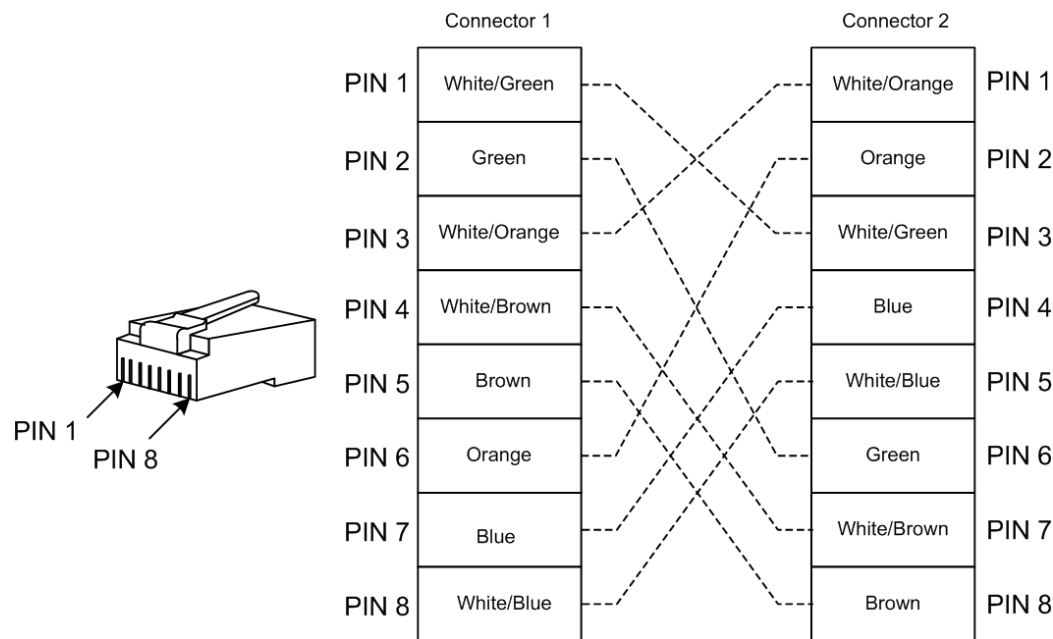
Figure 2-11 shows the wiring of the 100 Mbit/s crossover cable.

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



The 1000 Mbit/s crossover cable uses all 8 pins. The crossover is PIN1 to PIN3, PIN2 to PIN6, PIN4 to PIN7, and PIN5 to PIN8, as shown in Figure 2-12.

Figure 2-12 Wiring of the 1000 Mbit/s crossover cable



2.7.3 Serial cable

Introduction

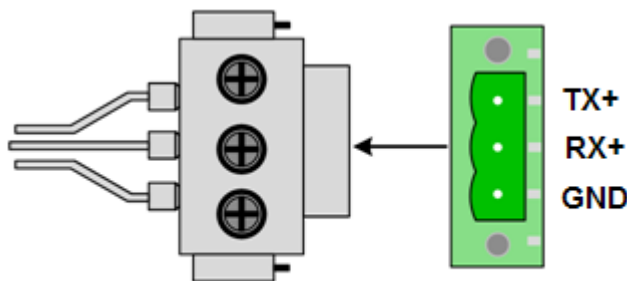
The serial cable is used to connect the serial interface of the Gazelle S1503i to the peer device. It transmits status information and data collected from devices, such as sensors, detectors, Programmable Logic Controllers (PLCs), and intelligent terminals, to the standard TCP/IP network.

The Gazelle S1503i supports RS-232 and RS-485 half duplex serial interface modes.

Appearance

Figure 2-13 shows the serial cable

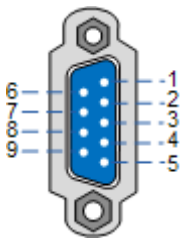
Figure 2-13 Serial cable



PIN definitions

Table 2-21 lists PIN definitions of the RS-232/RS-485DB-9 serial interface.

Table 2-21 PIN definitions of the RS-232/RS-485DB-9 serial interface

PIN	RS-232	RS-485 half duplex	PIN definitions
1	DCD	—	
2	RxD	—	
3	TxD	DATA+(B)	
4	DTR	DATA-(A)	
5	GND	GND	
6	DSR	—	
7	RTS	—	
8	CTS	—	
9	RI (optional)	—	



Note

Only the Phoenix terminal connector is delivered with the Gazelle S1503i. If you need the serial cable, you can prepare in advance or make it on site according to technical specifications.

2.7.4 AC power cable

Introduction

The AC power cable supplies 110/220 VAC power and 110/220 VDC power from the power sourcing equipment to the power interface on the Gazelle S1503i, and then transmits power to the entire device.

The AC power cables of the Gazelle S1503i are different according to local standards.

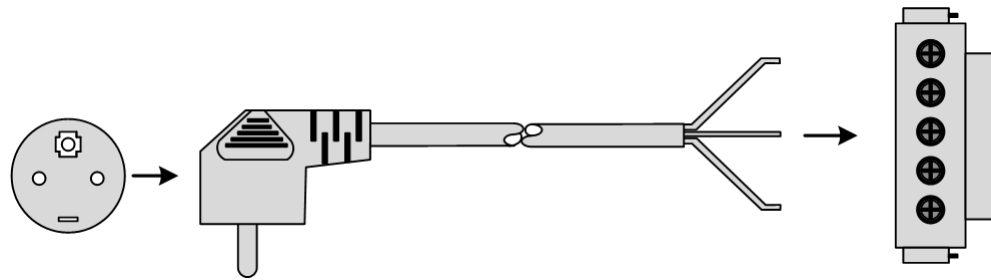
Table 2-22 AC power cables

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

Appearance

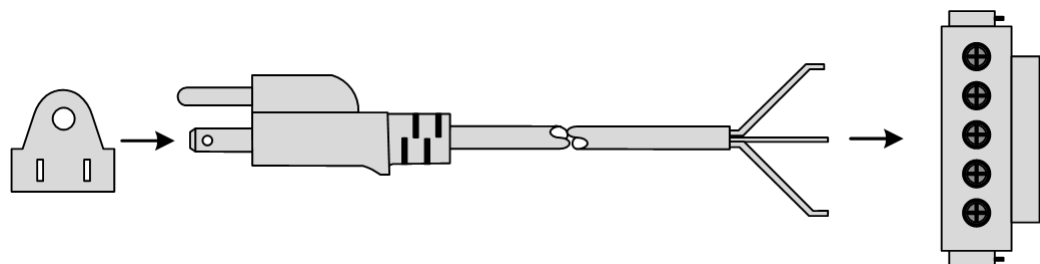
The AC power cable which meets European standard is composed of the European standard French-mode 3-pin plug and coaxial cable, as shown in Figure 2-14.

Figure 2-14 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 Figure 2-15.

Figure 2-15 American standard AC power cable



Technical specifications

Table 2-23 lists specifications of the European standard AC power cable.

Table 2-23 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), yellow/green strip (E)
Type		Copper core multi-strand power cable 18AWG (0.75 mm ²)
Length		1.5 m

Table 2-24 lists specifications of the American standard AC power cable.

Table 2-24 Specifications of the American standard AC power cable

Parameter		Description
Name		POL-AC-American standard-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), green (E)
Type		Copper core multi-strand power cable 18AWG (0.75 mm ²)
Length		1.5 m

2.7.5 DC power cable

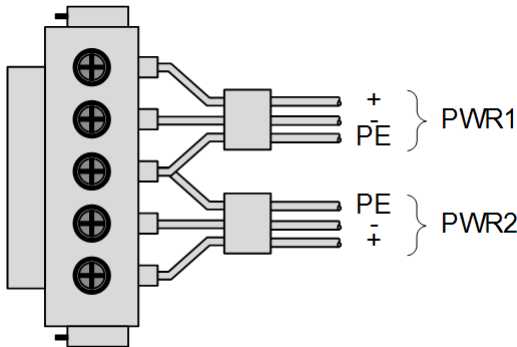
Introduction

The DC power cable transmits DC current from the power sourcing equipment to the power interface of the Gazelle S1503i, and then transmits power to the entire device.

Appearance

The DC power cable is composed of the connector and conducting wire, as shown in Figure 2-16.

Figure 2-16 DC power cable socket



Technical specifications

Table 2-25 lists technical specifications of the DC power cable.

Table 2-25 Technical specifications of the DC power cable

Item	Description
Connector	7.62-5Pin-head/RoHS
Type	Copper core multi-strand power cable 18AWG (0.75 mm ²)

2.7.6 Grounding cable

Introduction



Caution

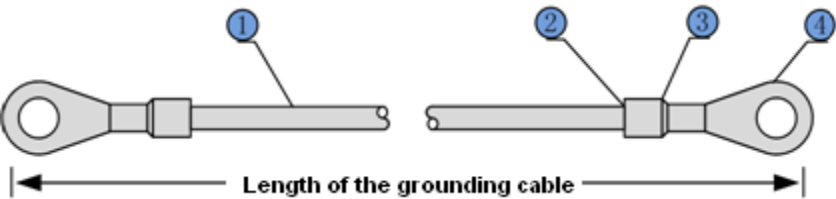
Connecting the grounding cable properly is an important guarantee to lightning protection, shock proof, and anti-interference. When installing and using the device, ensure that the grounding cable is properly connected; otherwise, personnel injury or equipment damage may be caused.

The grounding cable is used to connect the Gazelle S1503i to the ground.

Appearance

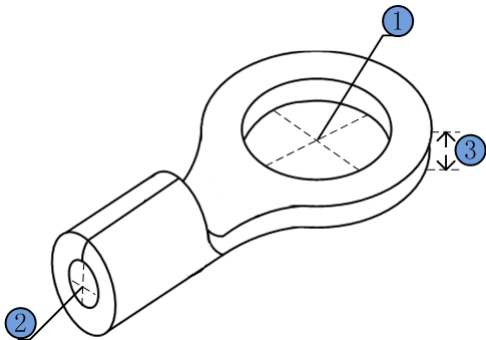
The grounding cable is composed of grounding terminals and the coaxial cable. The grounding terminal is usually an OT non-insulated terminal. The coaxial cable is a yellow/green copper soft flame-retardant conducting wire. Figure 2-17 and Figure 2-18 show the grounding cable and OT terminal.

Figure 2-17 Grounding cable



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

Figure 2-18 OT terminal



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

Table 2-26 lists technical specifications of the grounding cable.

Table 2-26 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 16AWG (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 2-27 lists technical specifications of the OT terminal.

Table 2-27 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 Gazelle S1503i 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.

3 Technical specifications

This chapter describes technical specifications of the Gazelle S1503i, including the following sections:

- Overall parameters
- EMC standards
- Environmental standards

3.1 Overall parameters

Table 3-1 lists overall parameters of the Gazelle S1503i.

Table 3-1 Overall parameters of the Gazelle S1503i

Item			Parameter
Dimensions			56 mm (Width) × 105 mm (Depth) × 135 mm (Height)
Maximum power consumption			< 5 W
Weight (without guide rail)			< 0.7 kg
Operating temperature			-40 to 75 °C
Operating Humidity			5%–95% RH (non-condensing)
Protection level			IP40
Power	DC power 1	Rated voltage	12/24 VDC
		Voltage range	10–36 VDC
	DC power 2	Rated voltage	24/48 VDC
		Voltage range	20–72 VDC
	AC power	Rated voltage	110/220 VAC
		Voltage range	85–264 VAC

Item			Parameter
		Frequency	50/60 Hz
	–	Overload protection	Supported
		Reverse connection protection	Supported

3.2 EMC standards

The Gazelle S1503i is compliant with the following Electromagnetic Compatibility (EMC) standards:

- Electro Magnetic Interference (EMI) meets CISPR 22 CLASS A related requirements.
- Static electricity meets IEC 61000-4-2 level 3 requirements.
- Radiated Immunity Test (RIT) meets IEC 61000-4-3 level 3 requirements.
- Electrical Fast Transient (EFT) meets IEC 61000-4-4 level 3 requirements.
- Damped oscillation meets IEC 61000-4-12 level 3 requirements.
- Surge (impact) meets IEC 61000-4-5 level 4 requirements.
- Power Frequency Magnetic Field meets IEC 61000-4-8 level 3 requirements.
- Pulse Magnetic Field meets IEC 61000-4-9 level 3 requirements.
- Damped Oscillation Magnetic Field meets IEC 61000-4-10 level 3 requirements.
- Conducted Immunity (CI) meets IEC 61000-4-6 level 3 requirements.
- DC power sag or temporary interruption immunity meets IEC 61000-4-29 requirements.
- AC power voltage falling and interruption meet IEC 61000-4-11 requirements.

3.3 Environmental standards

The Gazelle S1503i is applicable to the industrial environment and environmental requirements are as shown in Table 3-2.

Table 3-2 Environmental requirements of the Gazelle S1503i

Item	Range
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 authentication	Comply with EU RoHS standard.

4 Serial server

This chapter describes features of the serial server of the Gazelle S1503i, including the following sections:

- Introduction
- Working modes
- Typical applications

4.1 Introduction

The serial server, also known as a serial-interface network access server or interface redirector, is a device that transfers data between a serial interface (COM interface) and an Ethernet Local Area Network (LAN). This makes it possible to use Ethernet in place of serial cables, allowing the PC to directly access serial devices in the network.

The serial server transmits data flow on the serial interface based on the TCP/IP. It can be connected to multiple serial devices to select and process the serial data flow. It transfers the serial data in support of the RS-485 protocol to IP interface data, and then performs IP management and data access. In this case, you can use the general IP channel to transmit traditional serial data without discarding the serial devices, thus, enhancing the utilization rate of the device as well as saving costs.

Serial servers can be used with all types of serial devices and peripherals, including printers, scanners, data collection terminals, display devices, modems, automatic equipment, security/alarm systems, and climate-control systems.

4.2 Working modes

The serial server works in the following modes.

TCP Server mode

In TCP Server mode, the TCP interface of the local device is in listening status and waits other terminal hosts or remote devices working in TCP Client mode to connect the local interface. After connection is established, the serial server will start sending/receiving data.

TCP Client mode

In TCP Client mode, the Gazelle S1503i will actively connect the TCP Server interface, such as, PC server and remote terminal, after being started normally. When TCP connection is established, the Gazelle S1503i can receive or send data through the serial interface.

UDP mode

In UDP mode, devices on the two ends need not to be connected in advance for point-to-point and point-to-multipoint transmission since they send/receive data by adopting the connectionless UDP protocol.

TCP Realport mode

The serial server maps the serial interface on the Gazelle S1503i to the virtual serial interface of the local host through the serial interface drive program (rcVirtualCom). The user terminal software uses the virtual terminal just like the real serial interface of the local host. Therefore, all software or communication modules running on the original serial interface device can be used directly without any modification.

Reverse Telnet mode

In Reverse Telnet mode, the serial server acts as the Telnet Server. In general, the serial interface of the serial server is connected to the Console interface of the serial device. After the management device establishes Telnet communication with the serial server, the serial server will transfer communication data to serial data for transmission to the sub-serial device. In this case, the management device can log in to the serial server through Telnet to manage the sub-serial device.

RFC2217 mode

The RFC2217 includes the general serial interface control option based on the Telnet protocol. In RFC2217 mode, you can remotely log in to the Gazelle S1503i through the terminal and check or configure serial interface parameters of the device.

4.3 Typical applications

The serial server can work in different scenarios to realize bidirectional transparent transmission of serial data and IP data as well as immediate networking feature of the serial device.

4.3.1 Managing remote serial devices through serial interface

As shown in Figure 4-1, you can manage the remote device by configuring the serial interface of the switch to RS-485 interface in half duplex mode without changing interfaces of the user terminal and remote device.

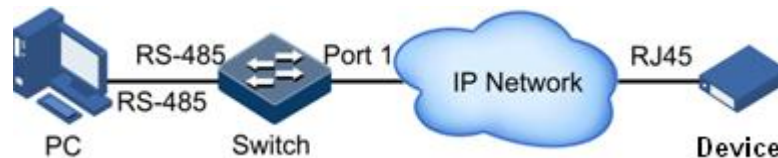
Figure 4-1 Managing the remote serial device through the serial interface



4.3.2 Managing remote network-interface devices through serial interface

As shown in Figure 4-2, you can manage the remote device by configuring the serial interface of the switch to the RS-485 interface in half duplex mode after changing the interface of the remote device to the network interface.

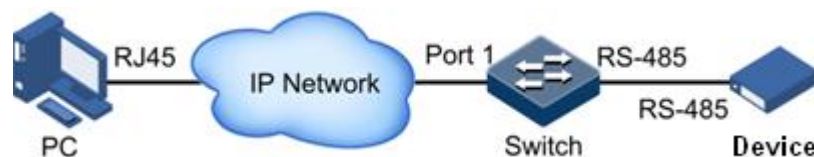
Figure 4-2 Managing remote network-interface device through serial interface



4.3.3 Managing remote serial devices through network interface

As shown in Figure 4-3, you can manage the remote device by configuring the serial interface of the switch to the RS-485 interface in half duplex mode after changing the interface of the user terminal to the network interface and connecting Port 1 of the switch to the PC terminal.

Figure 4-3 Managing remote serial device through network interface



5 Hardware installation

This chapter describes hardware installation of the Gazelle S1503i, including the following sections:

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

5.1 Preparing for installation

5.1.1 Enviromental conditions

The Gazelle S1503i can be installed in the following scenarios:

- Guide rail
- Wall



Note

Before installation, ensure the environmental conditions to meet the operating environment of the Gazelle S1503i. For details, see section 3.3 Environmental standards.

5.1.2 Power conditions

Table 5-1 lists power conditions of the Gazelle S1503i.

Table 5-1 Power conditions of the Gazelle S1503i

Item	Description
DC	• Rated voltage: 12/24 VDC, Voltage range: 10–36 VDC • Rated voltage: 24/48 VDC, Voltage range: 20–72 VDC

Item	Description
AC	• Rated voltage: 110/220 VAC • Voltage range: 85–264 VAC
Backup power	We recommend you to prepare the backup power to make sure that the Gazelle S1503i can work properly when the power is abnormal.
Power	The power should be more than 5 W.

5.1.3 Electrostatic conditions

To prevent human electrostatic from damaging the Gazelle S1503i, you must wear the Electrostatic Discharge (ESD) wrist strap before contacting the Gazelle S1503i. The ESD wrist strap should contact your skin properly and make sure that the other side of the ESD wrist strap is connected to the ground reliably.

5.1.4 Grounding conditions

The Gazelle S1503i must be grounded and the grounding resistance should be no more than 1 Ω . Grounding properly is a necessity for lightning protection and anti-interference.

5.1.5 Other conditions

Before installation, you should make sure that the corollary device is ready. For example, cables and supporting facilities are correctly installed.

5.1.6 Precautions before opening packet

The Gazelle S1503i is packed in a special box; you should note the following items:

- Place the packing box in the upright position.
- Check the device and accessories according to the packing list.

5.2 Installing device

5.2.1 Installing device on guide rail



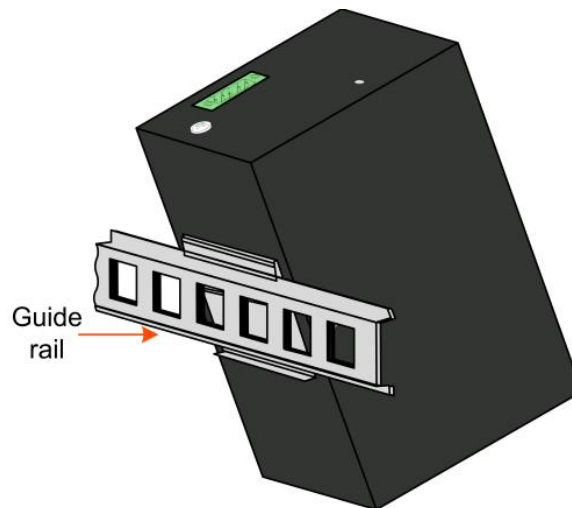
Note

When the Gazelle S1503i is brought out of the packing box, it is installed with the clamping rail connector on the rear panel. Take the DC model for example to illustrate the installation process.

Follow following steps to install the Gazelle S1503i on the guide rail:

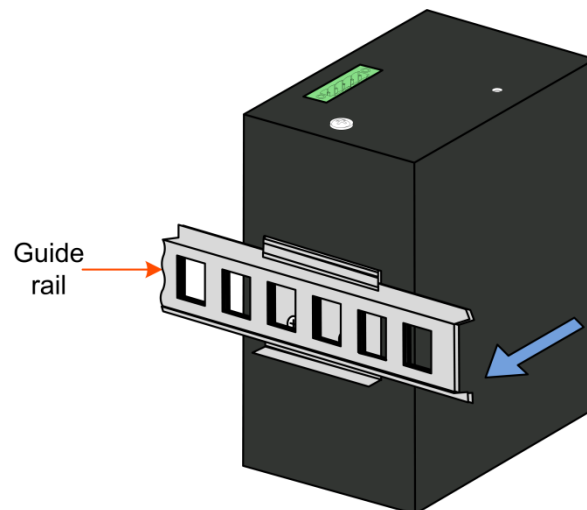
- Step 1 Attach the clamping rail connector to the guide rail, as shown in Figure 5-1.

Figure 5-1 Connecting the clamping rail connector to the guide rail



Step 2 Press hard to fix the Gazelle S1503i to the guide rail, as shown in Figure 5-2.

Figure 5-2 Installing the Gazelle S1503i to the guide rail



Step 3 Make sure that the clamping rail connector is connected to the guide rail tightly.

5.2.2 Installing device on wall



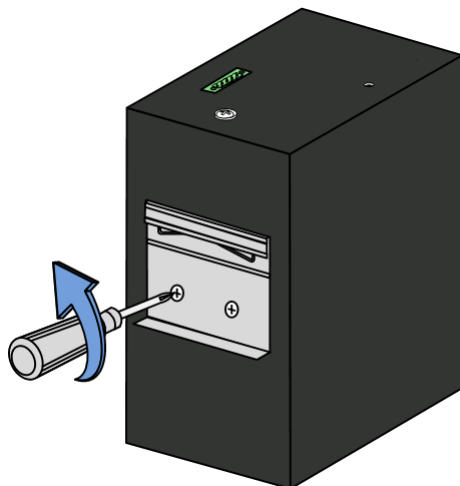
Note

- You can choose either guide-rail installation or wall-mount installation as needed. You need to remove the clamping rail connector on the rear panel before the wall-mount installation.
- The Gazelle S1503i is not delivered with the wall-mount plate. You can order it separately if needed.

Follow following steps to install the Gazelle S1503i to the wall:

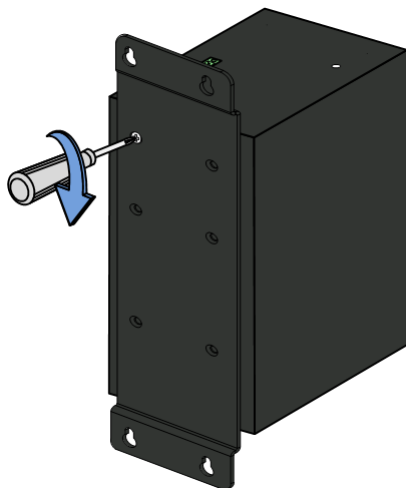
Step 1 Anticlockwise unscrew the clamping rail connector and remove it, as shown in Figure 5-3.

Figure 5-3 Removing the clamping rail connector



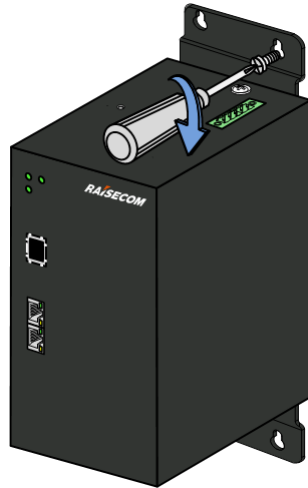
Step 2 Install the wall-mount plate to the rear panel of the Gazelle S1503i and clockwise screw the wall-mount plate tightly, as shown in Figure 5-4.

Figure 5-4 Installing the wall-mount plate to the rear panel of the Gazelle S1503i



Step 3 Install the wall-mount plate to the wall, as shown in Figure 5-5.

Figure 5-5 Installing the wall-mount plate to the wall



5.3 Grounding device



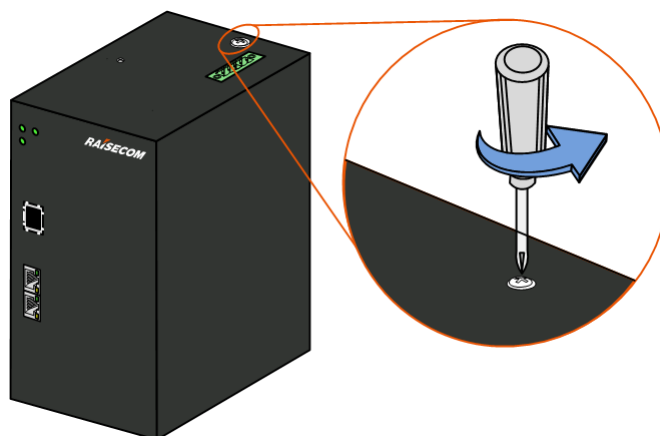
Warning

Connecting the protective grounding cable properly is an important guarantee to lightning protection, anti-electric shock and anti-interference. The Gazelle S1503i must be connected to the protective grounding cable correctly during installation, which helps avoid personal injury and equipment damage.

Follow following steps to connect the protective grounding cable:

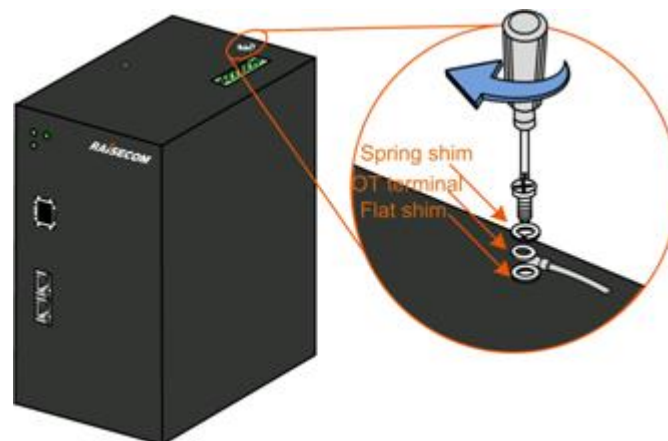
- Step 1 Anticlockwise untighten the screw of the grounding terminal and properly keep the screw and shims taken down, as shown in Figure 5-6.

Figure 5-6 Untightening the screw of the grounding terminal



- Step 2 Fit the OT terminal of the grounding cable and shims to the screw in order.
- Step 3 Install the screw to the grounding terminal again and clockwise tighten the screw, as shown in Figure 5-7.

Figure 5-7 Connecting the grounding cable



5.4 Connecting cables

5.4.1 Connecting fiber

The Gazelle S1503i supports the LC/PC fiber interface.

Caution

When the Gazelle S1503i is not used, you should to put the dustproof cover on the optical interface to prevent dust and dirt from entering the optical interface so as to make sure that the Gazelle S1503i works normally.

Warning

There is invisible laser in the Gazelle S1503i, which may cause eye injury. Therefore, you should not look directly at the optical interface, head of the optical connector, or breakage of the fiber.

Inserting optical module

Insert the SFP optical module into the optical interface on the Gazelle S1503i.

Connecting LC/PC fiber

When connecting or removing the LC/PC optical connector, align the connector with the optical interface, and do not rotate the fiber. The process is as below:

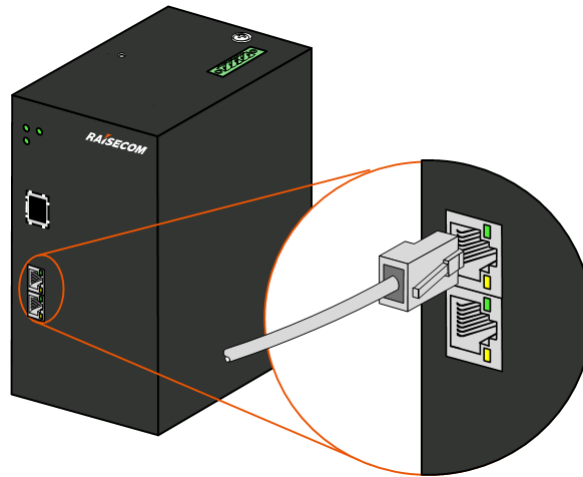
- Step 1 Remove the dustproof covers of the optical module and fiber, and keep it for later use.
- Step 2 Align the connector with the optical interface to insert the fiber into the optical interface gently.
- Step 3 To remove the fiber, push the fiber connector inwards slightly, and pull out the fiber.

5.4.2 Connecting Ethernet cable

Follow following steps to connect the Ethernet cable:

- Step 1 Make the Ethernet cable according to specifications.
- Step 2 Align the Ethernet cable head with the Ethernet interface of the Gazelle S1503i and insert the Ethernet cable into the Ethernet interface gently, as shown in Figure 5-8.

Figure 5-8 Connecting the Ethernet cable



5.4.3 Connecting power cable

Connecting DC power cable

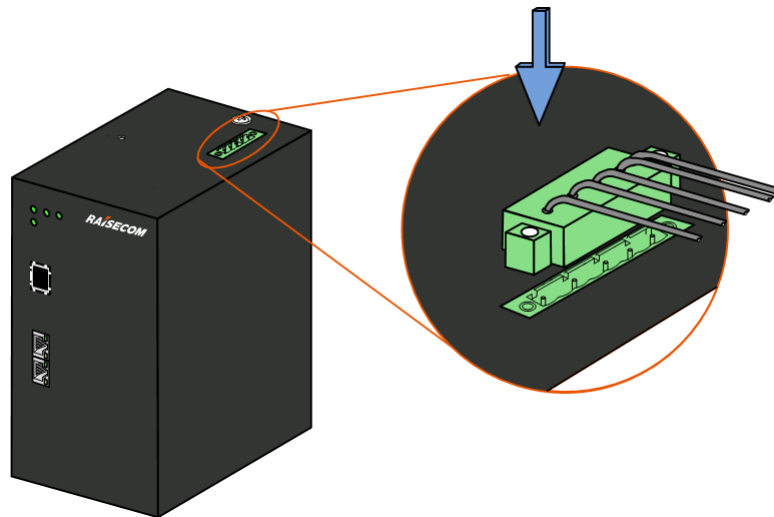


- Make sure the grounding cable is grounded correctly before connecting the power cable.
- Disconnect all power supplies before connecting or removing the power cable.
- Use the power cable which meets the technical specifications.

The DC power interface of the Gazelle S1503i is a 5-PIN Phoenix terminal. The process to connect the power cable is as below:

- Step 1 Make the DC power cable according to specifications.
- Step 2 Insert the DC power cable head into the power interface of the Gazelle S1503i and confirm full insertion, as shown in Figure 5-9.

Figure 5-9 Connector for connecting the DC power cable



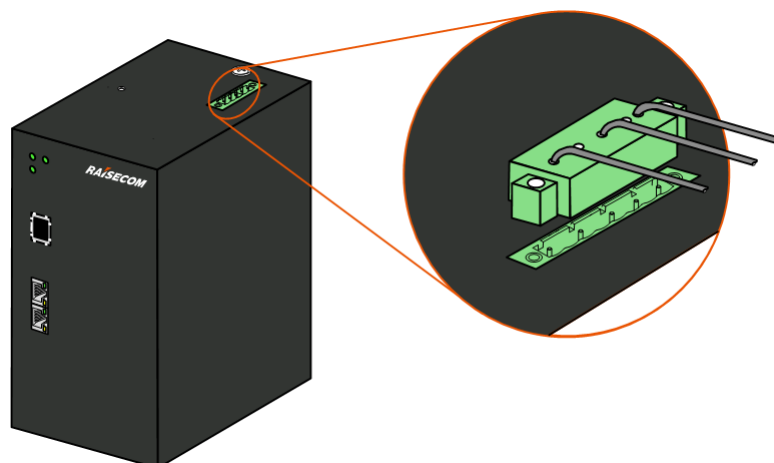
- Step 3 Connect the other end of the DC power cable to the cabinet or the powering equipment in the machine room.

Connecting AC power cable

The AC power cable of the Gazelle S1503i is a 5-PIN Phoenix terminal. The process to connect the power cable is as below:

- Step 1 Make the AC power cable according to specifications.
- Step 2 Insert the AC power cable head into the power interface of the Gazelle S1503i and confirm full insertion, as shown in Figure 5-10.

Figure 5-10 Connector for connecting the AC power cable



- Step 3 Connect the other end of the AC power cable to the cabinet or the powering equipment in the machine room.

5.5 Powering on device

Power on the Gazelle S1503i as below:

- Step 1 The Gazelle S1503i can be powered on after being inserted with the power cable and installed properly.
- Step 2 The Gazelle S1503i is powered on when the DC power LEDs (PWR1/PWR2) or AC power LED (PWR) is lightening up.
- Step 3 The Gazelle S1503i begins to operate properly after self-check and initialization. Interface LEDs indicate the working status of the interface (lightening up, off, or blinking).

5.6 Inspections after installation

Table 5-2 lists items to be inspected about the Gazelle S1503i after installation.

Table 5-2 Items to inspected after installation

No.	Item	Method
1	Components of the Gazelle S1503i are installed properly and do not loose or fall off.	Check
2	All screws are tightened properly.	Check
3	Cables are connected correctly without looseness or virtual connection.	Check
4	Wiring of signal cables is compliant with the engineering design documents.	Check
5	Signal cables are not damaged, disconnected, or intermediately connected.	Check
6	Labels on the two ends of the signal cable are correct, distinct, and neat.	Check
7	Pigtail of fiber should be fit into a pipe sleeve or groove for protection and it should not be extruded by other cables or objects when it is placed outside the cabinet.	Check
8	The curvature radius of the fiber should be greater than 20 times of the diameter of the fiber. In general, the curvature radius of the fiber is greater than 40 mm.	Check
9	The power cable and grounding cable are compliant with the engineering design documents for convenience of dilatation.	Check
10	The power cable and signal cable should be laid out separately.	Check
11	No stains or scratches on the Gazelle S1503i.	Check
12	The insurance capacity of the power can support the Gazelle S1503i to work normally as the maximum power consumption.	Instrument detection
13	When making the nose of the power cable or grounding cable, you should make sure that it is welded or crimped firmly.	Check
14	The power cable and grounding cable are connected reliably and the spring shim of the grounding terminal is placed upon the flat shim.	Check
15	There is enough room for heat dissipation around the Gazelle S1503i and no heavy object is placed on it.	Check

6 Networking applications

This chapter describes networking applications of the Gazelle S1503i, including the following sections:

- Rail transportation ISCS
- Secure campus SDS
- Serial server

6.1 Rail transportation ISCS

Integrated Supervisory Control System (ISCS) is a powerful, open, modular, extended, and distributed control system. ISCS integrates and interconnects multiple sub-systems, such as, Supervisory Control And Data Acquisition (SCADA), Building Automation System (BAS), Fire Alarm System (FAS), Platform Screen Door System (PSDS), and Automatic Fare Collection System (AFCS). Rail transportation ISCS realizes transportation information communication and resource sharing, and enhances the automatic level, security, reliability, and responsiveness.

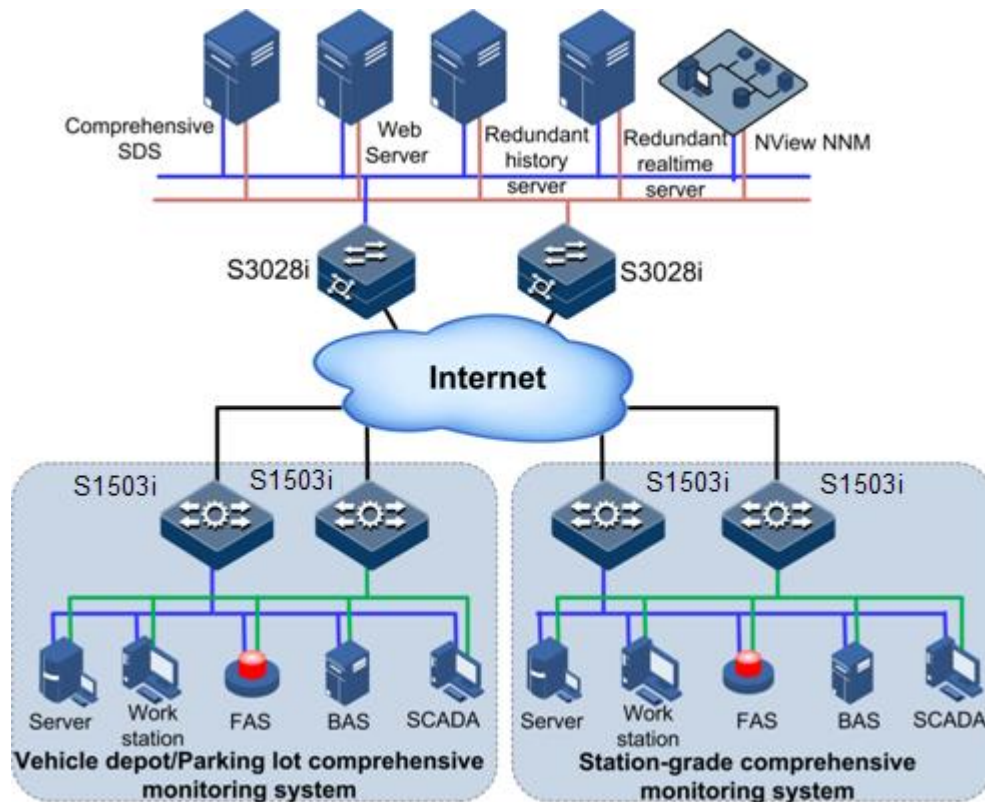
ISCS has the following two levels:

- Level 1: the centralized ISCS. It is located in the control center of the subway line and adopts the 100/1000 Mbit/s double-star redundant Ethernet.
- Level 2: the station-level ISCS, including the station, vehicle depot, and parking lot. It adopts the 100/1000 Mbit/s double-star redundant Ethernet.

The Gazelle S3028i provides redundant guarantee for routers on the whole system through the VRRP protocol. The Gazelle S1503i is adopted to establish the redundant network and provide redundant channel for service transmission, thus enhancing network reliability. When the working device fails, the backup device can take charge of the data forwarding and provide transparent switching for users. In this case, the network service quality is greatly enhanced.

Figure 6-1 shows the networking scheme of rail transportation ISCS by using the Gazelle S1503i.

Figure 6-1 Networking scheme of rail transportation ISCS by using the Gazelle S1503i



6.2 Secure campus SDS

Campus security is one of the fields attracting the most attention from the society at present. Local governments have gradually included the security monitoring of the campus gate into the range of urban security monitoring. By integrating the public security alarm system and video monitoring system, security inspection and responsiveness to emergencies on campus will be greatly enhanced.

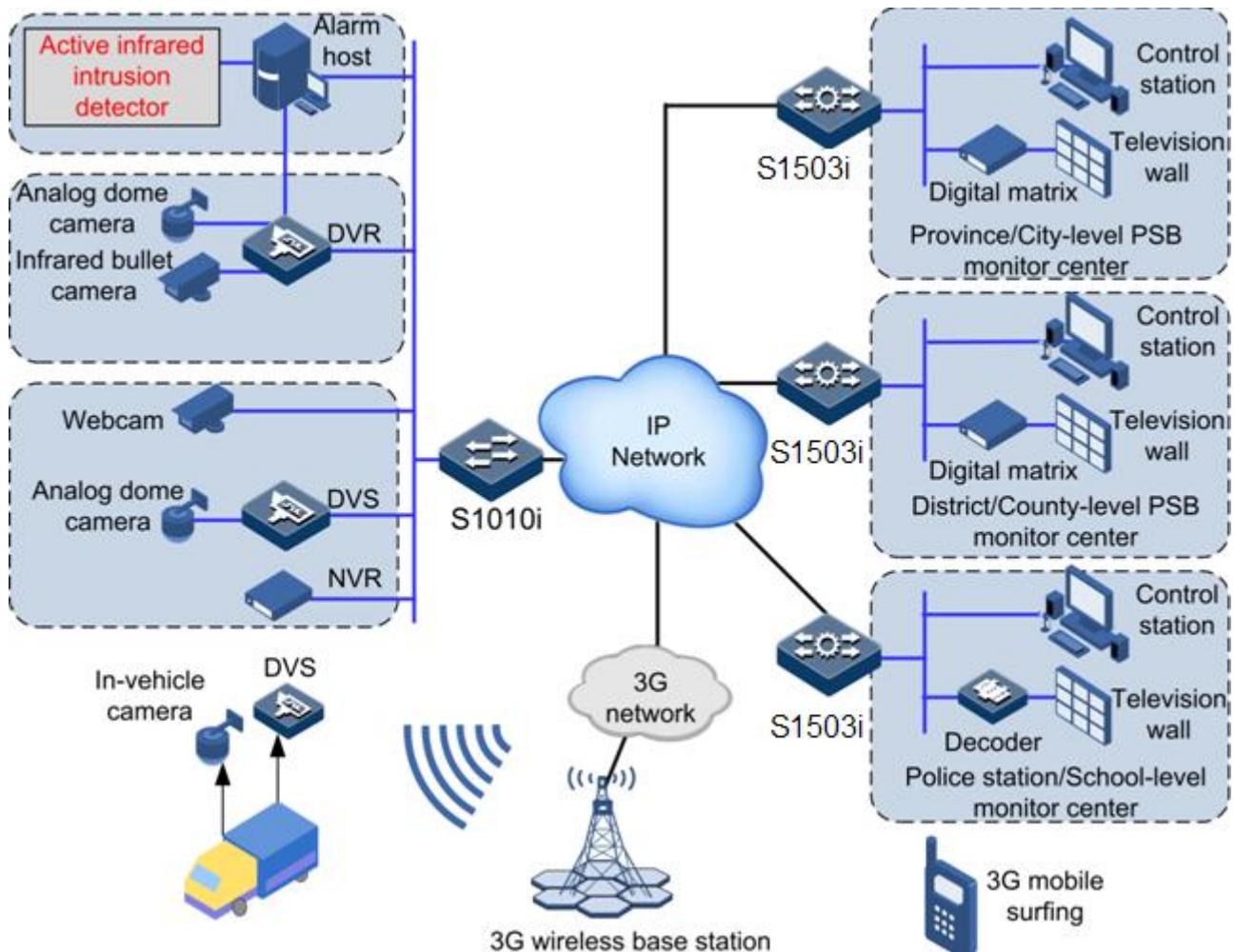
Security and Defence System (SDS) on campus includes the front-end data collection system, transmission network system, and control center.

- The front-end data collection system collects and standardizes data, such as, video, audio, and alarms.
- The transmission network system transmits control information, alarms, and video information through the network according to the workflow. It transmits images and alarms received from the front-end device to the control center through the network.
- The control center manages all users, data, and control signals. It is responsible for displaying, saving, and processing data, issuing user control order, and user authentication and authorization.

The Gazelle S1010i transmits data of audio, video, alarms, and locations collected by the front-end device to the control center. Meanwhile, the Gazelle S1503i displays the information on the monitoring terminal of the control center. The star networking scheme is simple in structure and easy for front-end device access. The whole scheme is complete digital for convenience of data collection, transmission, saving, and processing. The linear and wireless transmission modes cooperate together to avoid blind zone in monitoring.

Figure 6-2 shows the networking scheme of secure campus SDS by using the Gazelle S1503i.

Figure 6-2 Networking scheme of secure campus SDS by using the Gazelle S1503i



6.3 Serial server

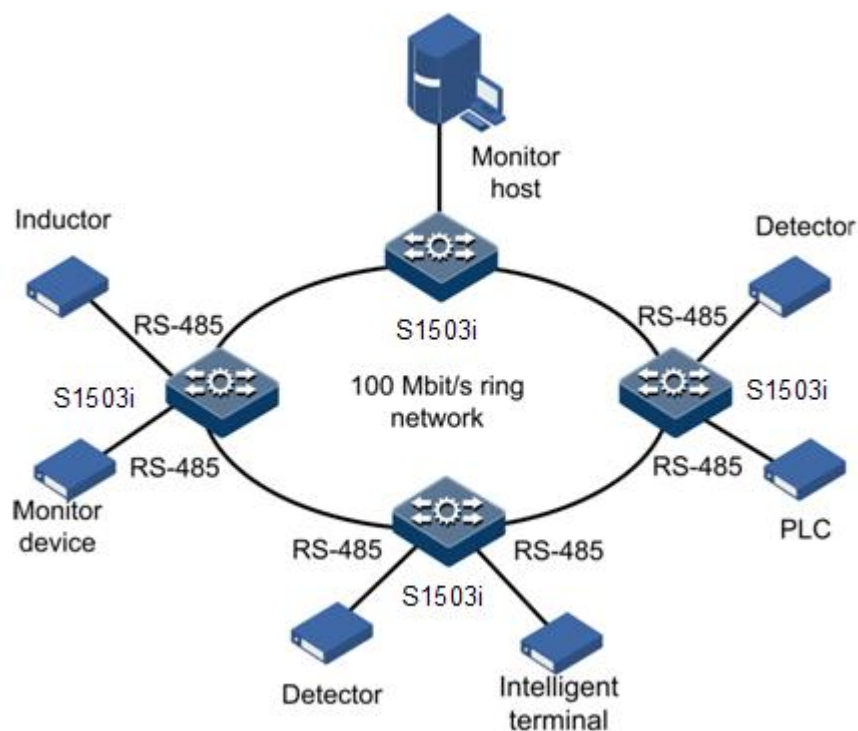
The serial server enables the serial device to access the open network. It transmits the status and status information about the inductor, detector, Programmable Logic Controller (PLC), and intelligent terminal collected by the RS-485 bus through the standard TCP/IP network, thus forming the automatic system communication.

The serial server can bidirectionally transmit data between the serial interface and Ethernet based on the TCP/IP protocol. By connecting the traditional serial interface to the Ethernet, you can check and manage the remote device through the network. The administrator can visit multiple serial devices from the remote control host through the TCP connection.

The Gazelle S1503i can be applied in the scenario when not only the Ethernet but also the bus asynchronous serial interface accesses the network. You can configure the serial interface mode of the serial server to the RS-485 interface for data transmission in various fields, such as factory automation, power network distribution and converter station system automation, and intelligent transportation.

Figure 6-3 shows the networking scheme of serial server by using the Gazelle S1503i.

Figure 6-3 Networking scheme of serial server by using the Gazelle S1503i



7 Management and maintenance

This chapter describes management and maintenance of the Gazelle S1503i, including the following sections:

- Management methods
- Maintenance methods
- NView NNM system

7.1 Management methods

You can use the following methods to access the Gazelle S1503i for management and maintenance:

- Command Line Interface (CLI)
- Web
- SNMP

7.1.1 CLI

Telnet management

The Telnet protocol is one of TCP/IP protocols and the standard protocol for Internet remote login. You can transfer the PC used by the local user to a terminal in remote host system through the Telnet protocol. Using the Telnet program on the terminal user's PC, you can log in to and manage the Gazelle S1503i.

SSH management

Secure Shell (SSH) is a protocol for secure remote login and other secure network services over an insecure network. When users undergo remote logins, SSH will automatically encrypt the data before transmission and decrypt them when the data arrive at the destination. By this way, SSH protects network devices from various attacks, such as plaintext password interception.

Moreover, SSH can replace Telnet to manage the remote device or provide a secure channel for FTP, etc.

7.1.2 Web

The Gazelle S1503i provides Web management feature. You can log in to, manage, and maintain the Gazelle S1503i through the Web browser.

Web management employs the graphic management interface and is more easily to access compared with the CLI mode.

7.1.3 SNMP

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 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 password. 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 authorized by the Gazelle S1503i, the packet will be discarded.
- Compatible with SNMP v1, SNMP v2c also uses community name authentication mechanism. SNMP v2c supports more operation types, data types, and error codes, and thus better identifying errors.
- SNMP v3 uses User-based Security Model (USM) and View-based Access Control Model (VACM) security 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 Gazelle S1503i supports v1, v2c, v3 of SNMP.

7.2 Maintenance methods

The Gazelle S1503i caters to users' requirements on operation and maintenance in the aspects of hardware design and function configuration, thus providing users with powerful maintenance performance.

The Gazelle S1503i supports diagnosing and testing failures regarding software and hardware.

7.2.1 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.

7.2.2 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.

7.2.3 Enviromental monitoring

Environmental monitoring is to monitor key parameters of the device, including, temperature and voltage, etc. When those parameters are abnormal, you can take corresponding measurements to prevent failures.

7.2.4 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, and it mainly realizes statistical and alarm reporting functions. RMON is an extension of SNMP. However, compared with SNMP, ROMN is more active and efficient for monitoring remote devices. The administrator can quickly trace faults generated on the network, network segment, or device.

At present, RMON implements four function groups: statistic group, historical group, alarm group, and event group.

7.2.5 System log

System log refers that the device records the system information and debugging information in a log and sends the log to the specified destination. When the device fails, you can check and locate the fault easily.

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

- Host: send the log message to the host.
- Monitor: send the log information to the monitor, such as Telnet terminal.
- File: send the log information to the Flash of the device.
- Buffer: send the log information to the buffer.
- SNMP server: transfer the log information into Trap and send it to the SNMP server.

7.2.6 Watchdog

Through configuring the watchdog feature, you can prevent the system program from dead circulation caused by uncertain faults so as to improve the stability of system.

7.2.7 Port mirroring

Port mirroring refers to mirroring some packets of a specified source interface to the destination interface, i.e. the monitor port, without affecting forwarding of normal packets. You can monitor packets sending and receiving on one interface by this function and analyze the relevant network status or fault conditions.

The Gazelle S1503i is in support of data stream mirroring on the ingress interface, egress interface, and both the ingress and egress interfaces. Packets received and sent by the mirroring port will be copied to the monitor port for analysis and monitoring after port mirroring is enabled. The monitor port and mirroring port cannot be the same one.

7.3 NView NNM system

7.3.1 Functions

"Comprehensive Access, Overall Network Management" is a vision that Raisecom has been in pursuit of. The NView NNM system is developed to meet overall and efficient OAM requirements. It is of complete functions, friendly User Interface (UI), and easy operations, and can meet requirements by service activation and daily maintenance.

The NView NNM system, based on SNMP, can perform centralized configurations and fault detection over all manageable devices of Raisecom. It has the following functions:

- Topology management: displays network topology graphically, organizes and manages nodes of various types and links between these nodes, and supports automatic or manual planning of network functions.
- Alarm management: collects, classifies and displays, and manages all alarms reported by managed devices. It supports query, sorting, filtering, statistics, forwarding, and voice prompt.
- Performance management: enables you to view realtime or historical performance metrics, such as interfaces, traffic, and bandwidth utilization.
- Inventory management: manages physical inventory, such as devices, chassis, and interfaces.
- User management: manages information about all connected users, and allows building relation between the customer and the device as well as the interface. This function helps quickly locate affected customers.
- Security management: supports user account and password rules according to security management features in network management; controls authorized access from a client according to the *Client Access Control List*; provides the Invalid Login Verification function, which will lock a user if the times of typing incorrect user name and password exceeds the configured number; provides security control policies based on level, authority, and domain; provides detailed system/device operation logs to facilitate you to control operation authorities.
- Service management: manages predefined system services through the application service management framework, such as Trap receiving service, alarm storm prevention service, and alarm forwarding service.
- Data center: enables you to manage devices, such as backing up, restoring, rolling back, and activating; also enables you to manage upgradable files, backup files, operations, and logs for backup. The backup operation is easy, simple and with high security.
- Data downloading: downloads logs, historical alarms, and performance data from database as viewable files and then deletes these data from database. This ensures efficient operation of database in the NView NNM system.

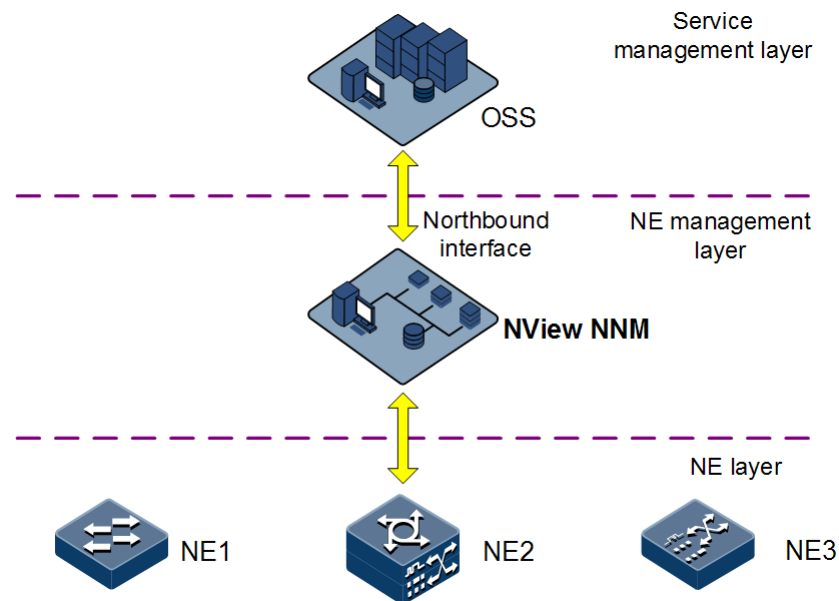
7.3.2 Features

The NView NNM system has the following features:

- Work as the uniform platform for all manageable devices of Raisecom.
- Uniformly manage data network and transport network.
- Provide strong NE-level management and subnet-level management.
- Provide northbound interfaces for integration with the OAM system, such as COBRA, SNMP, JDBC, and SOCKET interfaces.
- Communicate with NE-level devices through SNMP in southbound. With module design, it supports flexible deployment according to actual situation.
- Be able to be interconnected to the Operation Support System (OSS). It implements OAM functions between the OSS and NEs through the northbound interface, such as service activation, alarm reporting, alarm synchronization, fault diagnosis, and periodical inspection.

Figure 7-1 shows the orientation of the NView NNM system.

Figure 7-1 Orientation of the NView NNM system



8 Appendix

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

- Terms
- Acronyms and abbreviations

8.1 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

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

Ear hanging 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.

Protection
ground wire

Cable to connect device to ground, usually it is co-axial cable in yellow and green

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.
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8.2 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
NView NNM	NView Network Node Management

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
RCMP	Raisecom Cluster Management Protocol
RED	Random Early Detection
RH	Relative Humidity
RIP	Routing Information Protocol
RMON	Remote Network Monitoring
RNDP	Raisecom Neighbor Discover Protocol
ROS	Raisecom Operating System
RPL	Ring Protection Link
RRPS	Raisecom Ring Protection Switching

RSTP	Rapid Spanning Tree Protocol
RSVP	Resource Reservation Protocol
RTDP	Raisecom Topology Discover 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
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VRRP Virtual Router Redundancy Protocol

W

WAN Wide Area Network

WRR Weight Round Robin

