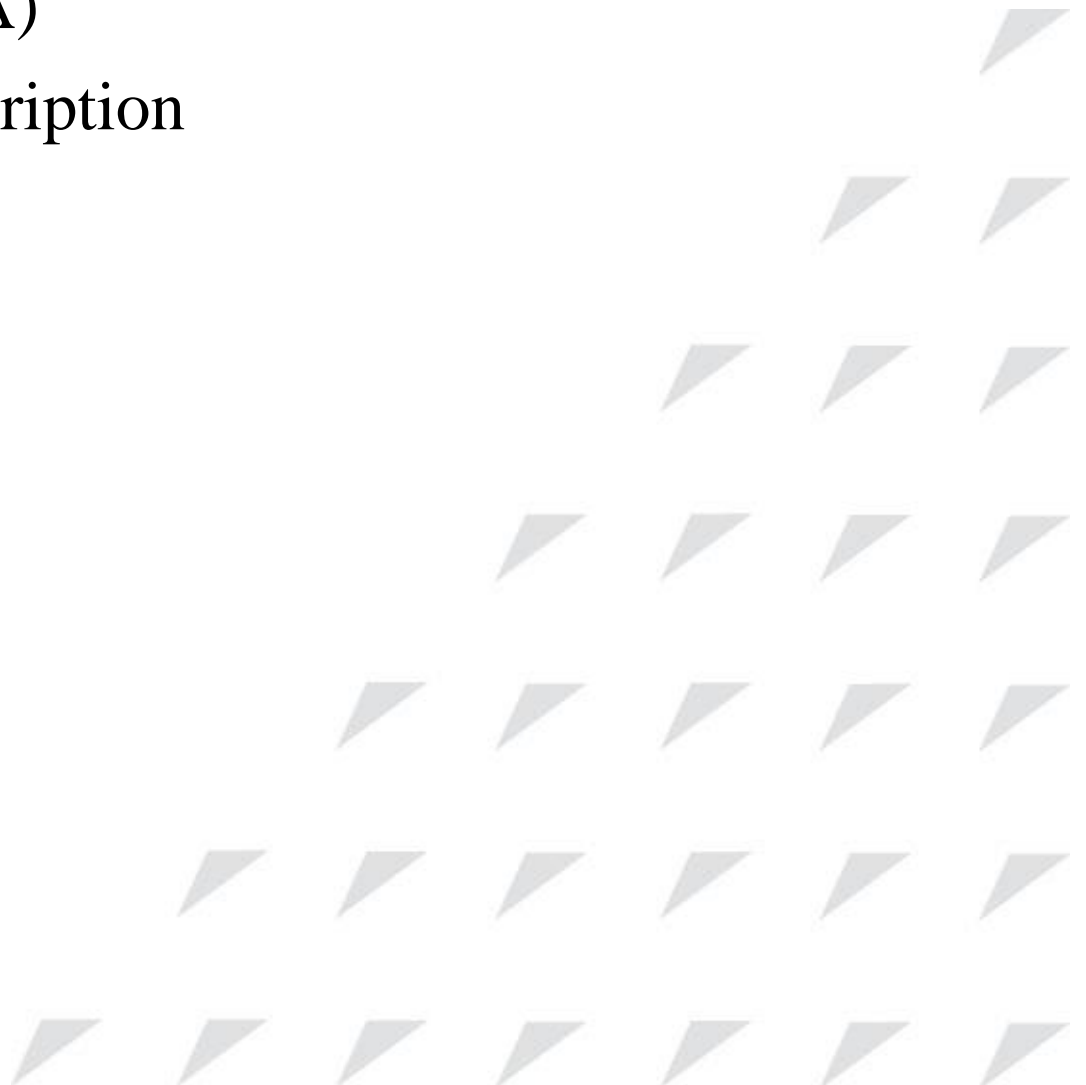


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iTN8600-I (A)  
Product Description  
(Rel\_01)



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# Preface

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## Objectives

This document describes the iTN8600-I in terms of overview, system structure, product features, and technical specifications. The appendix lists compliance standards and protocols, terms, acronyms, abbreviations involved in this document.

## Versions





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

Product name	Hardware version	Software version
iTN8600-I	A.00 or later	7.9 or later

## Conventions

### Symbol conventions

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

Symbol	Description
 <b>Warning</b>	Indicate a hazard with a medium or low level of risk which, if not avoided, could result in minor or moderate injury.
 <b>Caution</b>	Indicate a potentially hazardous situation that, if not avoided, could cause equipment damage, data loss, and performance degradation, or unexpected results.
 <b>Note</b>	Provide additional information to emphasize or supplement important points of the main text.
 <b>Tip</b>	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.
<b>Boldface</b>	Buttons and navigation path are in <b>Boldface</b> .
<i>Italic</i>	Book titles are in <i>italics</i> .
Lucida Console	Terminal display is in Lucida Console.
Book Antiqua	Heading 1, Heading 2, Heading 3, and Block are in Book Antiqua.

## Change history

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

### Issue 01 (2019-12-01)

Initial commercial release

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# 1 Overview

---

This chapter is an overview of the iTN8600-I, including the following sections:

- Introduction
- Networking application
- Ordering information

## 1.1 Introduction

The iTN8600-I is an OTN device which belongs to Intelligent Transport Network series. Cooperating with OTN devices, such as the iTN8600-A, the iTN8600-I provides an OTN access transport platform which carries high-bandwidth uplink services and multiple access services, meeting requirements for ever-increasing bandwidths and key customer service bearing.

The iTN8600-I adopts a standard 19-inch wide and 1U high chassis. It can be installed in the standard cabinet with depth of 600 mm and width of 19-inch, or on a workbench. The compact design not only makes the device highly integrated but also reduces the overall space.

- The iTN8600-I adopts front outgoing design. All interfaces and power supplies are located on the front panel. So is the air intake vent for heat dissipation (hollowed part), as shown in Figure 1-1 and Figure 1-2.
- The fan is located on the rear panel. So is the air outlet for heat dissipation, as shown in Figure 1-3.
- Two ground terminals are located on the right part of the left side and right part of the rear panel, thus facilitating selection of grounding location.

Figure 1-1 shows the front appearance of the iTN8600-I-XT4D-AC.

Figure 1-1 Front appearance of the iTN8600-I-XT4D-AC



Figure 1-2 shows the front appearance of the iTN8600-I-XT4D-DC.

Figure 1-2 Front appearance of the iTN8600-I-XT4D-DC



Figure 1-3 shows the appearance of the iTN8600-I-XT4D-AC and iTN8600-I-XT4D-DC.

Figure 1-3 Appearance of the iTN8600-I-XT4D-AC and iTN8600-I-XT4D-DC



## 1.2 Networking application

The iTN8600-I, oriented to the OTN access network, supports accessing services of 10 Gbit/s to 100 Gbit/s. It can network with OTN aggregation devices to implement service access, integration, and multiplexing at the network edge and transmit multi-point services uniformly with large granularities, thus effectively saving fiber resources on the network.

### Basic applications

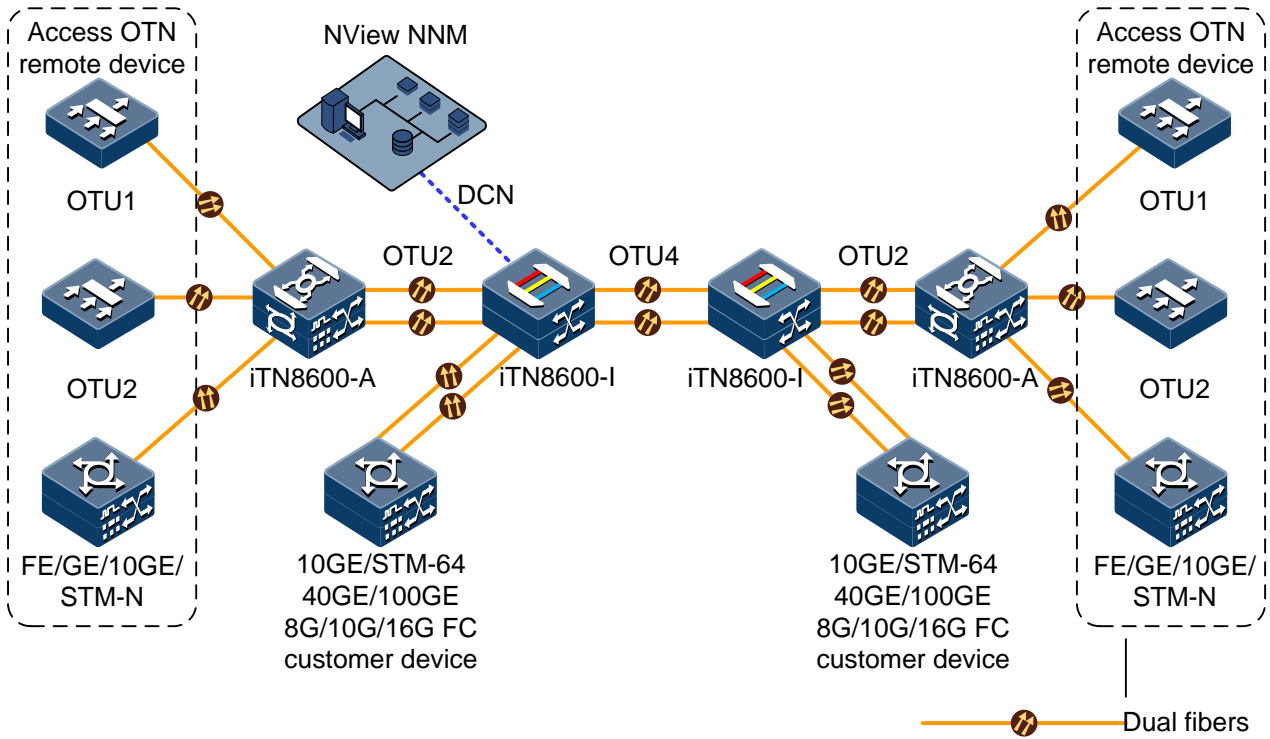
- The iTN8600-I supports accessing multiple types of services, and flexibly scheduling and forwarding them.
  - It supports the CFP2 optical module to transmit 2 ways of 100 Gbit/s OTU4 services at the line side.
  - It supports the QSFP28/QSFP+/SFP+ optical module to transmit 100/40/10 Gbit/s 100GE/OTU4/40GE/10GE/OTU2/OTU2e/STM-64 services and 8/10/16G FC services at the client side. All client-side interfaces share up to 200 Gbit/s bandwidth.

- The line-speed forwarding bandwidth is 200 Gbit/s.
- The OTN cross-connection capacity is 400 Gbit/s.
- The iTN8600-I supports multiple networking modes.
  - Point-to-point networking: two iTN8600-I devices can transmit services point to point. They adopt OCh 1+1 protection at the line side, or cooperate with other OLP devices to implement protection.
  - Ring networking: multiple iTN8600-I devices form a ring network to transmit services. Each can transmit services upstream and downstream and transparently transmit services. They adopt ODUk SNCP 1+1 protection at the line side to form the ring network service route in two directions.
  - Chain networking: multiple iTN8600-I devices form a chain network to transmit services. Each can transmit services upstream and downstream and transparently transmit services. No protection is adopted at the line side.
- The iTN8600-I or iTN8600-A and iTN remote devices support uniform network management, so they support services accessed through end-to-end management.
  - The iTN8600-I supports Data Communication Network (DCN) network management in both the in-band mode and out-of-band mode.
  - Two iTN8600-I devices support GCC management channel at the line side between them.
  - The iTN8600-I client side and iTN8600-A line side supports the GCC or VLAN management channel between them.
  - The iTN8600-A and iTN remote device support the GCC or VLAN management channel between them.

### Typical point-to-point application

- As shown in Figure 1-4, the iTN8600-I, as the access OTN device, can be directly connected to the iTN8600 or the client device with services of multiple rates, and access and carry services with high bandwidth.
- OTN interfaces at the line side are connected point to point to aggregate accessed services.

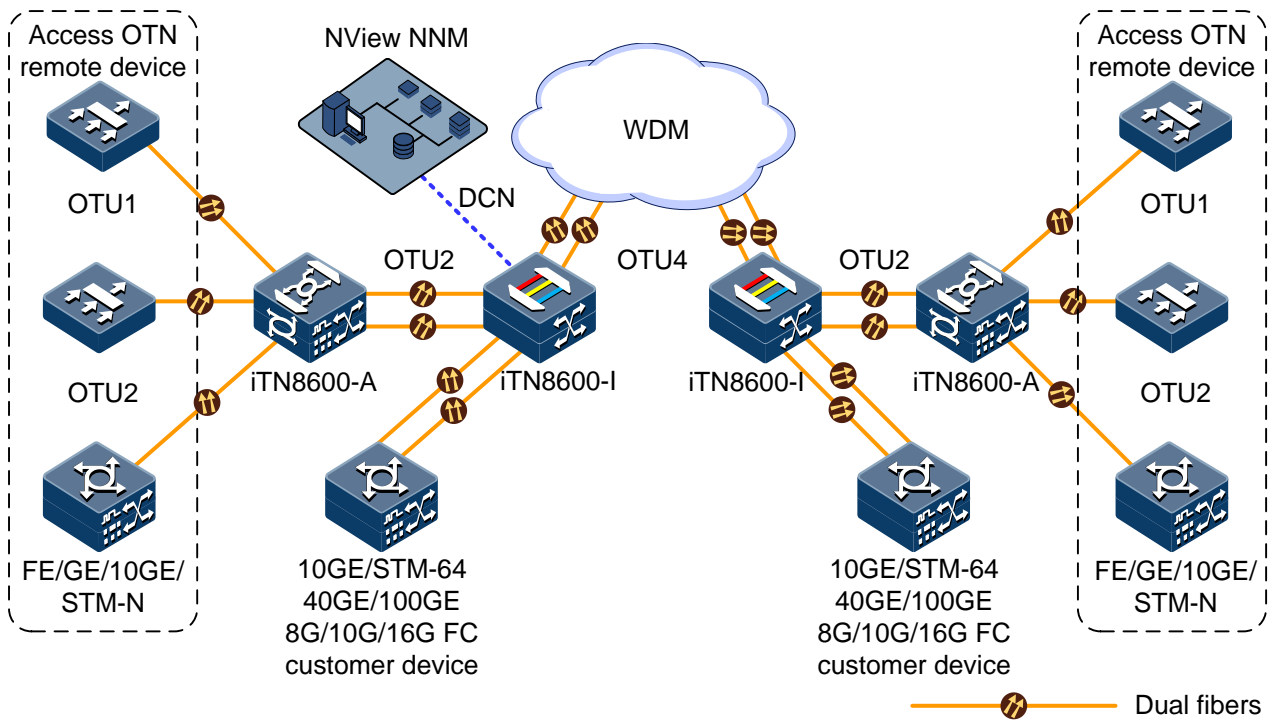
Figure 1-4 Typical point-to-point application



### Typical point-to-point WDM application

As shown in Figure 1-5, based on point-to-point application, the iTN8600-I is connected downstream to the WDM network, so it supports higher bandwidth, 10/100 Gbit/s hybrid transmission, and smooth upgrade.

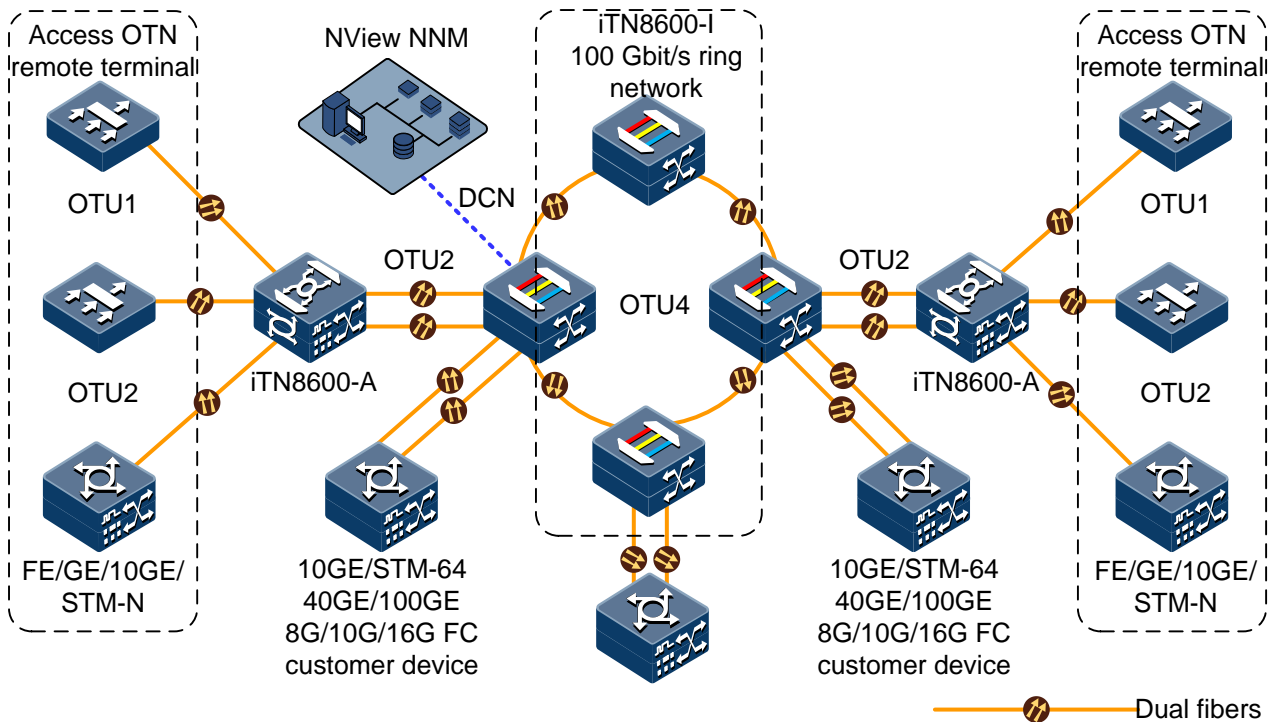
Figure 1-5 Typical point-to-point WDM application



### Typical ring network application

- As shown in Figure 1-6, line-side interfaces on the iTN8600-I support forming a ring network.
- The client-side interface supports transmitting multiple types of services upstream and downstream and form the ring network service route of two directions through ODUk SNCP 1+1 protection.

Figure 1-6 Typical ring network application



## 1.3 Ordering information

### 1.3.1 Device

错误!未找到引用源。 lists ordering information about the iTN8600-I.

Table 1-1 Ordering information about device

Model	Description
iTN8600-I-XT4D	<ul style="list-style-type: none"> <li>The iTN8600-I-XT4D supports OTN Muxponder, Transponder, and ADM applications.</li> <li>The line side supports the CFP2 optical module to transmit 2 ways of 100 Gbit/s OTU4 services at the line side.</li> <li>The client side supports the QSFP28/QSFP+/SFP+ optical module to transmit 100/40/10 Gbit/s 100GE/OTU4/40GE/10GE/OTU2/OTU2e/STM-64 services and 8/10/16G FC services. All client-side interfaces share up to 200 Gbit/s bandwidth.</li> <li>Client-side interfaces support up to 2 ways of 100 Gbit/s (QSFP28) services, 2 ways of 40 Gbit/s (QSFP+) services, 12 ways of 16G FC (SFP+), and 20 ways of 10G Any services (16 ways of SFP+ services and 1 way of QSFP+ PSM4 services).</li> <li>The line side supports OCh 1+1 protection and ODUk SNCP 1+1 protection.</li> <li>When the iTN8600-I-XT4D accesses OTU2/OTU4 services at the client side, it supports OCh 1+1 protection and ODUk SNCP 1+1 protection. When it accesses other services, it supports interface protection.</li> <li>The NMS channel supports SNMP out-of-band network management and</li> </ul>



Model	Description
	GCC or VLAN in-band network management. • Two types of power supplies support 1+1 protection. The iTN8600-I-XT4D-DC is the dual -48 VDC power model. The iTN8600-I-XT4D-AC is the dual 220 VDC power model.



**Note**

- The 10G Any services include 10GE/OTU2/OTU2e/STM-64/8G FC/10G FC services.
- Two power supplies support automatic 1+1 hot backup. They must be connected to different power sourcing equipment or lines to prevent the iTN8600-I from being powered off due to power failure of one power sourcing equipment or line.
- There are 6 modes for client-side services. The maximum total bandwidth of services on all client-side interfaces is 200 Gbit/s. Table 1-2 lists different modes, and corresponding customer services, available interfaces on panels, matching optical modules, and client-side ODUk cross connection.
- When the QSFP+ PSM4 and MPO-LC branch optical fiber jumper are used on interface 17 on the front panel, it supports being fanned out into four 10 Gbit/s Any service SFP+ interfaces (numbering 19 to 22).
- The iTN8600-I-XT4D does not support hybrid usage of one DC power supply and one AC power supply.

Table 1-2 Client-side service modes

Mode	Client-side service	Panel interface	Optical module encapsulation type	Client-side ODUk cross connection
100GE	100GE	17–18	QSFP28	Not supported
OTU4	OTU4	17–18	QSFP28	Supported
40GE	40GE	17–18	QSFP+	Not supported
	16G FC	5–16	SFP+(it needs to supports 16G FC, up to 6 ways)	
	10G Any	5–16	SFP+	
Mapper	16G FC	1–8	SFP+(it needs to supports 16G FC, up to 6 ways)	Not supported
		9–16	SFP+(it needs to supports 16G FC, up to 6 ways)	
	10G Any	1–16	SFP+	
		17 (fanned out into 4 interfaces numbering 19–22)	QSFP+ PSM4	

Mode	Client-side service	Panel interface	Optical module encapsulation type	Client-side ODUk cross connection
OTN	OTU2	1–16	SFP+	Supported
		17 (fanned out into 4 interfaces numbering 19–22)	QSFP+ PSM4	
Hybrid	16G FC	9–16	SFP+(it needs to supports 16G FC, up to 6 ways)	Not supported (namely, Mapper mode)
	10G Any	9–16	SFP+	
	OTU2	1–8	SFP+	Supported (namely, OTN mode)
		17 (fanned out into 4 interfaces numbering 19–22)	QSFP+ PSM4	

 **Note**

- The QSFP+ is a 40GE optical module, using the fiber with the Little Connector (LC) interface.
- The QSFP+ PSM4 is a 4×10GE optical module, using the fiber with the Multiple-Fiber Push-On (MPO) interface.
- QSFP+PSM4 fanout: when the QSFP+ PSM4 optical module uses the MPO-LC branch optical fiber jumper, one MPO interface fiber can be fanned out into 4 dual-fiber LC interface fibers to be connected to 4 SFP+ optical modules.

## 1.3.2 Purchased parts

### Parts

The power supplies, fans, rack mount kits (brackets) can be additionally purchased.

Table 1-3 Ordering information about purchased parts

Model	Description
RPD1304-48S12	<ul style="list-style-type: none"> <li>• -48 VDC power supply</li> <li>• Power input: -48 V, 4 A</li> </ul>
RPA1171-220S12	<ul style="list-style-type: none"> <li>• 220 VAC power supply</li> <li>• Power input: 100–240 V, 1.9 A, 50/60 Hz</li> </ul>
FANS383	Fan
Power supply black panel/RoHS	Power supply black panel, with the ordering model of RC8.041.1349
Rack mount kit/RoHS	Bracket used for the 19-inch cabinet, with the ordering model of RC8.043.169



When only one power supply is used, install a black panel over the position of the other power supply. The black panel has the following functions:

- Prevent human body from touching circuit boards inside the chassis, thus avoiding danger.
- Prevent dusty or foreign matter from entering the chassis.
- Keep the chassis meeting requirements for EMC and electrostatic shielding.
- Keep correct direction of cooling air flow inside the chassis.

## Cables

- The configuration cable and power cable are delivered with the iTN8600-I, and they can be additionally purchased.
- The power cable depends on the actual situation of the target area. When you order the iTN8600-I, specify one power cable. You can also purchase multiple power cables.
- For the DC power model, only the 3-pin connector, rather than the DC power cable, is delivered, so you need to make the DC power cable according to the regional standard and Table 5-19 by connecting the 3-pin connector with the DC power cable, as shown in Figure 5-10.

Table 1-4 Ordering information about purchased cables

Model	Description
CBL-USB-USB-AM/USB-AM-1.5m/RoHS	Configuration cable, used on the Console interface
POL-AC-European 3-pin/receptacle-AC power cable-0.75mm <sup>2</sup> -1.5m /RoHS	European AC power cable, used for the AC power supply
POL-AC-American 3-pin/receptacle-AC power cable-18AWG-1.5m/RoHS	American AC power cable, used for the AC power supply
POL-DC-unstripped/stripped-DC power cable-1.0mm <sup>2</sup> -4m/RoHS	DC power cable, used for the DC power supply, used with the 5.08-3Pin-header/RoHS connector.

## Optical modules

Optical modules are used according to actual situations, so purchase them additionally.

For Raisecom optical modules and lookup table, see section 5.1 Lookup table of optical module . For detailed parameters, see the corresponding user manual.

Table 1-5 Comparison table for services, quantity, panel interfaces, and optical modules

Class	Optical module
<ul style="list-style-type: none"> <li>• Services: client-side 10G Any services</li> <li>• Quantity: up to 20 ways (16 ways of SFP+ services and 1 way of QSFP+ PSM4 services)</li> <li>• Panel interfaces: C1–C16, C17 (fanned out into C19–C22)</li> </ul>	<p>USFP+ (universal-wavelength optical module):</p> <ul style="list-style-type: none"> <li>• Commercial dual-fiber (0.3/10/40/80 km): USFP+-192/M, USFP+-192/S1, USFP+-192/S2, and USFP+-192/S3</li> <li>• Commercial single-fiber (20/20/40/40/80/80 km): USFP+-192/SS12, USFP+-192/SS13, USFP+-192/SS22, USFP+-192/SS23, USFP+-192/SS34, and USFP+-192/SS35</li> <li>• Industrial dual-fiber (2/10/40 km): USFP+-192/S0-I, USFP+-192/S1-I, and USFP+-192/S2-I</li> <li>• Industrial single-fiber (20/20/40/40 km): USFP+-192/SS12-I, USFP+-192/SS13-I, USFP+-192/SS22-I, and USFP+-192/SS23-I</li> </ul> <p>DSFP+ (DWDM-wavelength optical module):</p> <ul style="list-style-type: none"> <li>• Commercial dual-fiber 40 km: DSFP+-192/S/21 to DSFP+-192/S/60</li> <li>• Commercial dual-fiber 80 km: DSFP+-192/L/21 to DSFP+-192/L/60</li> </ul> <p>RSP (CWDM-wavelength optical module):</p> <ul style="list-style-type: none"> <li>• Commercial dual-fiber 10 km: RSP-10C10-27 to RSP-10C10-37</li> <li>• Commercial dual-fiber 20 km: RSP-10C20-27 to RSP-10C20-37</li> <li>• Industrial dual-fiber 20 km: RSP-10C20-27-I to RSP-10C20-37-I</li> <li>• Commercial dual-fiber 40 km: RSP-10C40-47 to RSP-10C40-61</li> </ul> <p>UQSP (PSM4 optical module):</p> <ul style="list-style-type: none"> <li>• Commercial dual-fiber 0.0002–10 km: UQSP-40G/PSM4</li> </ul>
<ul style="list-style-type: none"> <li>• Services: client-side 16G FC services</li> <li>• Quantity: up to 12 ways</li> <li>• Panel interfaces: C1–C16</li> </ul>	<p>Commercial dual-fiber 0.5–10 km: USFP+-16G/S1</p>
<ul style="list-style-type: none"> <li>• Services: client-side 40GE services</li> <li>• Quantity: up to 2 ways</li> <li>• Panel interfaces: C17–C18</li> </ul>	<ul style="list-style-type: none"> <li>• Commercial dual-fiber 0.3 km: UQSP-40G/M3</li> <li>• Commercial dual-fiber 10 km: UQSP-40G/S1</li> </ul>
<ul style="list-style-type: none"> <li>• Services: client-side 100GE services</li> <li>• Quantity: up to 2 ways</li> <li>• Panel interfaces: C17–C18</li> </ul>	<ul style="list-style-type: none"> <li>• Commercial dual-fiber 0.0005–0.1 km: UQP-100G/SR4</li> <li>• Commercial dual-fiber 0.002–2 km: UQP-100G/CW4</li> <li>• Commercial dual-fiber 10 km: UQP-100G/LR4</li> <li>• Commercial dual-fiber 30 km: UQP-100G/ER4L</li> </ul>
<ul style="list-style-type: none"> <li>• Services: client-side OTU4</li> <li>• Quantity: up to 2 ways</li> <li>• Panel interfaces: C17–C18</li> </ul>	<p>Commercial dual-fiber 10 km: UQP-100G/LR4</p>

Class	Optical module
<ul style="list-style-type: none"><li>• Services: line-side OTU4 services</li><li>• Quantity: up to 2 ways</li><li>• Panel interfaces: L1-L2</li></ul>	<ul style="list-style-type: none"><li>• Commercial dual-fiber 10 km: UC2-100G/LR4</li><li>• Commercial dual-fiber 40 km: UC2-100G/ER4</li><li>• Commercial dual-fiber 2400 km: UC2-100G/DCO</li></ul>

# 2 System structure

This chapter describes the system structure, including the following sections:

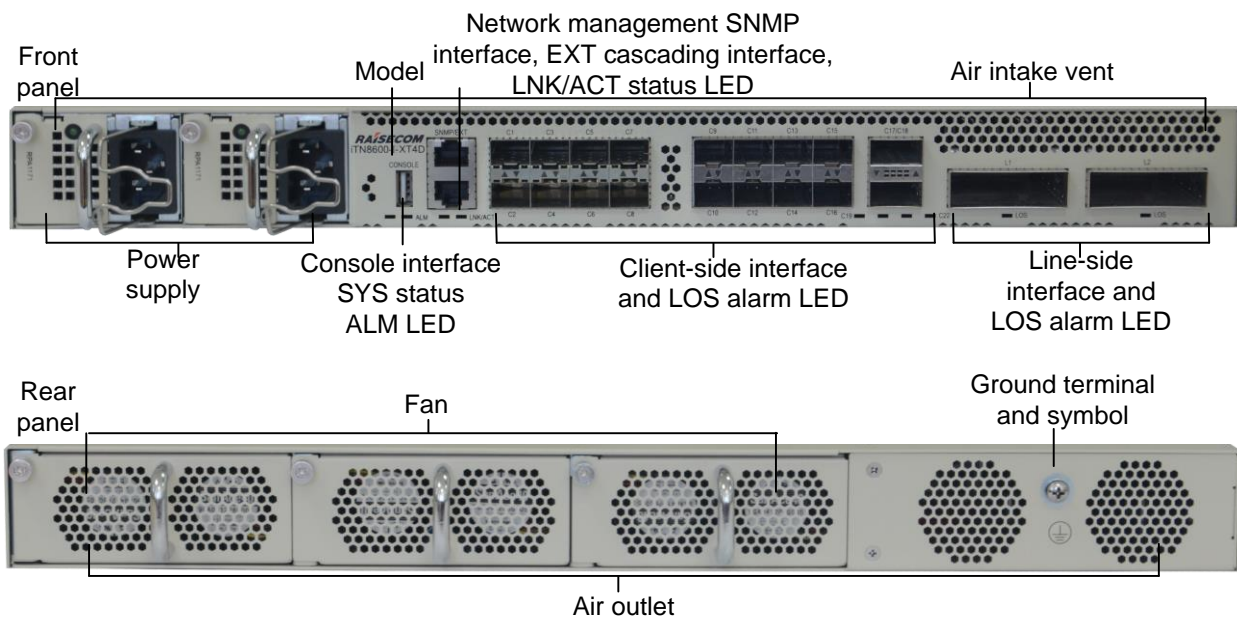
- Hardware structure
- Software structure

## 2.1 Hardware structure

The iTN8600-I is composed of the chassis (including the backplane), power supply, fan, and MCC.

Figure 2-1 shows the hardware structure of the iTN8600-I-XT4D. All modules are located on the front panel and rear panel. The two sides of the chassis are closed surface. Two ground terminals are located on the right part of the left side and right part of the rear panel

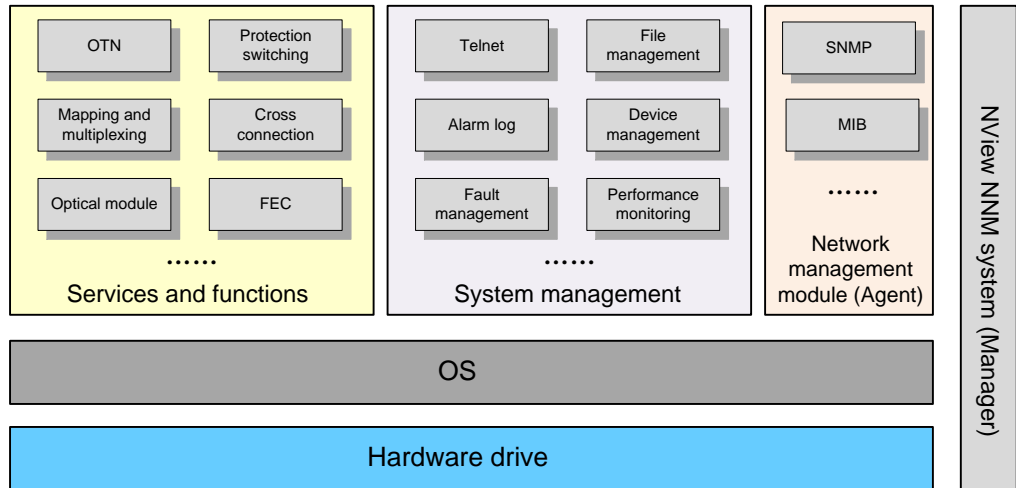
Figure 2-1 Hardware structure



## 2.2 Software structure

Based on the Operating System (OS) and hardware drive, the iTN8600-I supports multiple services and functions, and the NView NNM system. Figure 2-2 shows the software structure of the iTN8600-I.

Figure 2-2 Software structure



# 3 Cards and parts

This chapter describes MCCs of the iTN8600-I, including the following sections:

- iTN8600-I-XT4D
- DC power supply RPD1304-48S12
- AC power supply RPA1171-220S12
- Fan FANS383
- Default configurations

## 3.1 iTN8600-I-XT4D

### 3.1.1 Version

Table 3-1 shows the version of the iTN8600-I-XT4D

Table 3-1 Version of the iTN8600-I-XT4D

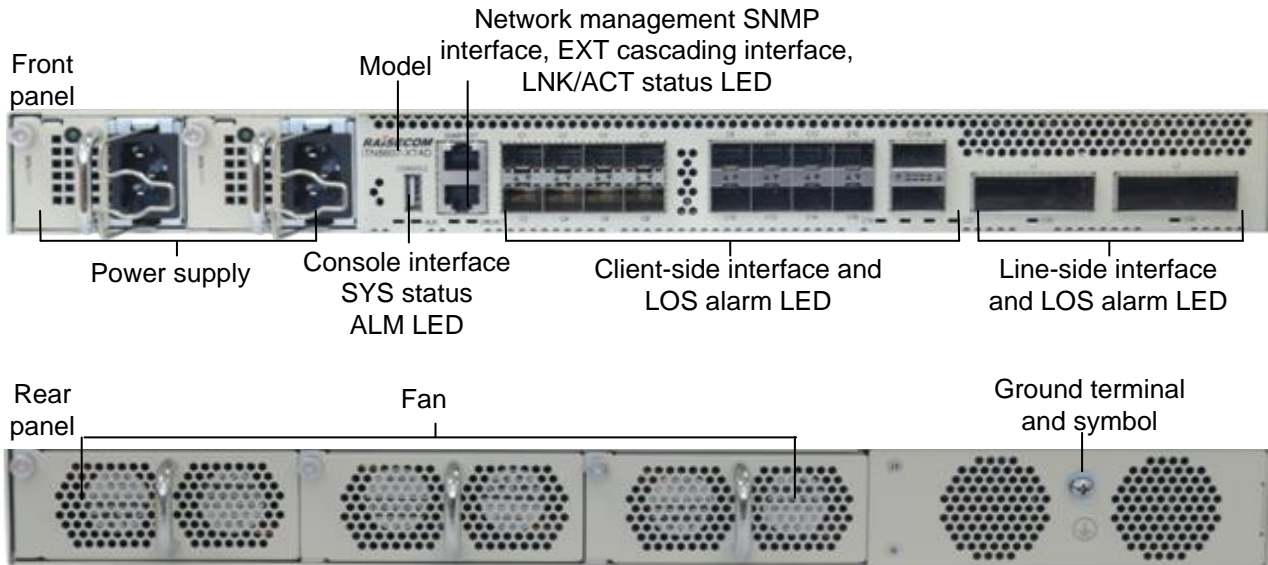
Model	Version	Software version
iTN8600-I-XT4D	A.00 or later	7.9.0 or later

### 3.1.2 Appearance

Figure 3-1 shows the appearance of the iTN8600-I-XT4D.



Figure 3-1 Appearance of the iTN8600-I-XT4D



### 3.1.3 Functions

Table 3-2 lists functions of iTN8600-I.

Table 3-2 Functions of iTN8600-I

Function	Description
Basic functions	<ul style="list-style-type: none"> <li>The iTN8600-I-XT4D supports OTN Muxponder, Transponder, and ADM applications.</li> <li>The line side supports the CFP2 optical module to transmit 2 ways of 100 Gbit/s OTU4 services at the line side.</li> <li>The client side supports the QSFP28/QSFP+/SFP+ optical module to transmit 100/40/10 Gbit/s 100GE/OTU4/40GE/10GE/OTU2/OTU2e/STM-64 services and 8/10/16G FC services. All client-side interfaces share up to 200 Gbit/s bandwidth.</li> </ul>
Mapping accessed services OTN	<ul style="list-style-type: none"> <li>Mapping 100GE services into ODUflex or OPU4 through GFP-F</li> <li>Mapping 100GE services into OPU4 through GMP</li> <li>Mapping 40GE services into ODUflex or OPU3 through GFP-F</li> <li>Mapping 40GE services into OPU3 through GMP</li> <li>Mapping 10GE services into ODUflex or OPU2 through GFP-F</li> <li>Mapping 10GE services into OPU2e through BMP</li> <li>Mapping STM-64 services into OPU2 through AMP or BMP</li> <li>Mapping 16G FC services into ODUflex through BMP</li> <li>Mapping 10G FC services into OPU2e through GFP-F</li> <li>Mapping 8G FC services into OPU2 through GMP</li> </ul>
Mapping and multiplexing OTN services	<ul style="list-style-type: none"> <li>Demapping OTU2 services into ODU0/1/2/flex services, and mapping and multiplexing these ODU0/1/2/flex services on the OTU4 interface</li> <li>Demapping OTU4 services into ODU0/1/2/2e/3/4/flex services, and mapping and multiplexing these ODU0/1/2/2e/3/4/flex services on the OTU4 interface</li> <li>Level-one multiplexing in 1.25G timeslot mode</li> </ul>

Function	Description
OTN cross connection	<ul style="list-style-type: none"> <li>• Support cross connection between the client side and line side or between the line side and line side.</li> <li>• Non-blocking cross connection of ODU0/1/2/2e/3/4/flex services</li> <li>• ODUk cross connection capacity of 400 Gbit/s</li> <li>• SNCP cross connection, unidirectional cross connection, and bidirectional cross connection</li> <li>• Transparent transmission of ODU0/1/2/2e/3/4/flex cross timeslots and timeslot loopback</li> </ul>
OTN overhead	<ul style="list-style-type: none"> <li>• FEC supports BER before FEC and BER after FEC. The client-side interface supports no FEC and GFEC. The line-side interface supports soft-decision (three modes) and GFEC.</li> <li>• The OTU4/OTU2 interface supports processing overheads at the SM, PM, or TCMi layer.</li> <li>• The OTN overhead supports frame alignment (FAS and MFAS), OTUk (TTI/ BIP/BEI/BIAE/BDI/IAE/GCC0/OTUk-AIS at the SM layer), ODUk (TTI/BIP/BEI/BDI/STAT at the PM layer, and TTI/BIP/BEI/BIAE/ BDI/STAT at TCM layers 1–6), GCC0/1/2, OPUk (PT and MSI).</li> </ul>
DCN management	<ul style="list-style-type: none"> <li>• Support 24 GCCs to implement in-band network management. Support choosing GCC/0/1/2, with MTU of 1518 bytes.</li> <li>• Support the VLAN management channel of the 10GE interface to implement in-band network management.</li> <li>• Support automatic topology discovery.</li> <li>• Support 2 FE interfaces to implement out-of-band network management. One FE interface is used for out-of-band network management while the other is used for cascading network management systems.</li> </ul>
Performance monitoring and alarm monitoring	<ul style="list-style-type: none"> <li>• Support processing OTN alarms, such as SM, PM, OPU, TCMi, and FEC, by reporting, suppressing, inversing, and shielding alarms.</li> <li>• Support statistics on OTN performance, such as SM, PM, OPU, TCMi, FEC, GCC, and GFP, in terms of current performance and history performance, with statistic period of 15min and 24h.</li> <li>• Support statistics on Ethernet performance, such as RFC2819 and RFC2665, including the number of received packets, number of received bytes, number of errored packets, and realtime traffic.</li> <li>• Support testing the DM delay performance based on PM or TCMi. The performance indexes support the maximum value, minimum value, and average value. The test period supports 15min and 24h.</li> <li>• Support SDH RS alarms and statistics, such as ES, SES, and UAS. The statistic period supports 15min and 24h.</li> <li>• Support statistics on FC performance, such as coding violation, the number of errored packets, and number of received frames.</li> <li>• Support performance statistics threshold and alarms.</li> <li>• Support performing PRBS bit error test on one way of services. The test period supports 60s, 60min, and 24h. Support multiple PRBS test patterns.</li> <li>• Support Layer 2 and Layer 3 dying gasp alarms.</li> <li>• Support link-state tracking on the line-side interface or client-side interface.</li> </ul>
Protection	<ul style="list-style-type: none"> <li>• The line side supports OCh 1+1 protection and ODUk SNCP 1+1 protection. By default, no protection is configured.</li> <li>• When the client-side interface accesses OTU2 services, it supports OCh 1+1 protection and ODUk SNCP 1+1 protection. When it</li> </ul>

Function	Description
	<p>accesses OTU4 services, it supports OCh 1+1 protection. When it accesses other services, it supports interface protection. By default, no protection is configured.</p> <ul style="list-style-type: none"> <li>• The protection switching time is smaller than 50ms.</li> <li>• The protection switching condition can be based on LOS, LOF, AIS, and BER.</li> </ul>
Loopback	<ul style="list-style-type: none"> <li>• Support interface loopback at the line side or client side.</li> <li>• Support ODU0/1/2/2e/3/4/flex timeslot loopback.</li> <li>• Support internal loopback and external loopback.</li> </ul>
Optical module management	<ul style="list-style-type: none"> <li>• Support DDM.</li> <li>• Support LOS alarms, in-position monitoring, shutting down laser, and ALS.</li> <li>• Support configuring relevant optical modules.</li> <li>• Support hot swapping.</li> </ul>
Upgrade	Support upgrading system software online.

### 3.1.4 Interfaces

Table 3-3 lists interfaces on the iTN8600-I.

Table 3-3 Interfaces on the iTN8600-I

Print	Type	Description
CONSOLE	USB	<ul style="list-style-type: none"> <li>• Debugging serial interface, connected to the management PC, with the baud rate of 9600</li> <li>• After logging in to the device through the Console interface, you can debug the device.</li> </ul>
SNMP/EXT	RJ45	<ul style="list-style-type: none"> <li>• 2 network management interfaces, all supporting out-of-band DCN SNMP or Telnet network management</li> <li>• One interface is used for SNMP out-of-band network management while the other is used for cascading network management systems.</li> </ul>
C1–C16	SFP+	<ul style="list-style-type: none"> <li>• Client-side SFP+ interface</li> <li>• Support SFP+ optical modules, such as Raisecom USFP+, RSP (CWDM SFP+), and DSFP+ optical modules.</li> </ul>
C17–C18	<ul style="list-style-type: none"> <li>• QSFP+</li> <li>• QSFP28</li> </ul>	<ul style="list-style-type: none"> <li>• Client-side SFP+ interface, compatible with QSFP+ and QSFP28</li> <li>• Support QSFP+ optical modules, such as Raisecom UQSP optical modules. The C17 interface supports being fanned out into 4 SFP+ interfaces through the QSFP+ PSM4 optical module.</li> <li>• Support QSFP28 optical modules, such as Raisecom UQP optical modules.</li> </ul>
L1–L2	CFP2	<ul style="list-style-type: none"> <li>• Line-side CFP2 interface</li> <li>• Support CFP2 optical modules, such as Raisecom UC2 optical modules.</li> </ul>

### 3.1.5 LEDs

Table 3-4 lists LEDs on the iTN8600-I.

Table 3-4 LEDs on the iTN8600-I

Print	Color	Description
SYS	Green	System working LED <ul style="list-style-type: none"> <li>• Green: the system works abnormally.</li> <li>• Off: the system works abnormally.</li> <li>• Blinking green: the system works normally.</li> </ul>
ALM	Red	Alarm LED <ul style="list-style-type: none"> <li>• Red: severe alarms are generated on the device.</li> <li>• Blinking: minor alarms are generated on the device.</li> <li>• Off: no alarm is generated on the device.</li> </ul>
LNK/ACT	Green	SNMP/EXT interface working LED <ul style="list-style-type: none"> <li>• Green: the interface is properly connected.</li> <li>• Off: the interface is not connected or improperly connected.</li> <li>• Blinking green: the interface is sending/receiving data.</li> </ul>
C1-C16, C19, C22	Red	Client-side interface alarm LED <ul style="list-style-type: none"> <li>• Red: LOS alarms are generated.</li> <li>• Off: no LOS alarm is generated.</li> </ul>
LOS	Red	Line-side interface alarm LED <ul style="list-style-type: none"> <li>• Red: LOS alarms are generated.</li> <li>• Off: no LOS alarm is generated.</li> </ul>

## 3.2 DC power supply RPD1304-48S12

### 3.2.1 Version

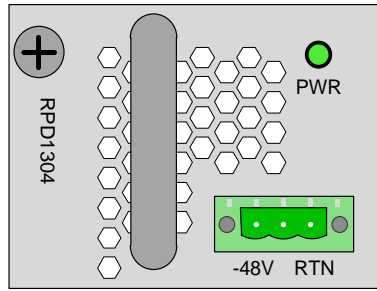
Table 3-5 Version of the DC power supply

Model	Version
RPD1304-48S12	A.00 or later

### 3.2.2 Appearance

Figure 3-2 shows the panel of the DC power supply, including the captive screw, heat dissipation holes, handle, power LED, and power interface.

Figure 3-2 Panel of the DC power supply



### 3.2.3 Functions

Table 3-6 Functions of the DC power supply

Function	Description
Basic functions	<ul style="list-style-type: none"> <li>• Support wide voltage input range of -40 to -57 VDC.</li> <li>• Support the maximum load of 175 W.</li> </ul>
Protection functions	<ul style="list-style-type: none"> <li>• Support dual power supply 1+1 protection.</li> <li>• Support dual power load balancing.</li> <li>• Support hot swapping.</li> </ul>

### 3.2.4 Interface

Table 3-7 Interface on the DC power supply

Print	Type	Description
-	3-pin Phoenix connector	<ul style="list-style-type: none"> <li>• Used with the 5.08-3Pin-header/RoHS connector</li> <li>• -48V: connected to the negative terminal</li> <li>• RTN: connected to the positive terminal</li> </ul>

### 3.2.5 LED

Table 3-8 LED on the DC power supply

Print	Color	Description
PWR	Green	Power LED <ul style="list-style-type: none"> <li>• Green: the power supply is normal.</li> <li>• Off: the power supply is abnormal.</li> </ul>

## 3.2.6 Technical specifications

Table 3-9 Technical specifications of the RPD2153-48D483V3

Parameter	Description
Rated input voltage (V)	-48
Input voltage range (V)	-40 to -57
Input surge current (A)	40
Power input	-48 V, 4 A

## 3.2.7 Cable

Table 3-10 DC power cable

Model	Description
POL-DC-unstripped/stripped-1.0mm2-4m/RoHS	DC power cable, used for the DC power supply, used with the 5.08-3Pin-header/RoHS connector

## 3.3 AC power supply RPA1171-220S12

### 3.3.1 Version

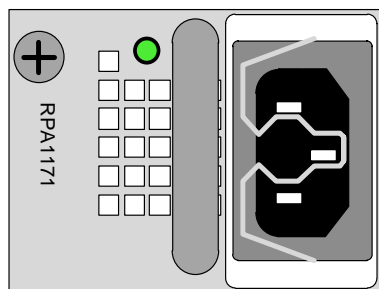
Table 3-11 Version of the AC power supply

Model	Version
RPA1171-220S12	A.00 or later

### 3.3.2 Appearance

Figure 3-3 shows the panel of the AC power supply, including the captive screw, heat dissipation holes, handle, power LED, power interface, and power cable clip.

Figure 3-3 Panel of the AC power supply



### 3.3.3 Functions

Table 3-12 Functions

Function	Description
Basic functions	<ul style="list-style-type: none"> <li>• Support wide voltage input range of 100–240 VAC</li> <li>• Support the maximum load of 175 W.</li> </ul>
Protection functions	<ul style="list-style-type: none"> <li>• Support dual power supply 1+1 protection.</li> <li>• Support dual power load balancing.</li> <li>• Support how swapping.</li> </ul>

### 3.3.4 Interface

Table 3-13 Interface on the AC power supply

Print	Type	Description
–	C13 connector interface	Equipped with a power cable clip

### 3.3.5 LED

Table 3-14 LED on the AC power supply

Print	Color	Description
–	Green	Power LED <ul style="list-style-type: none"> <li>• Green: the power supply is normal.</li> <li>• Off: the power supply is abnormal.</li> </ul>

### 3.3.6 Technical specifications

Table 3-15 Technical specifications of the AC power supply RPA1171-220S12

Parameter	Description
Rated input voltage (V)	110/220
Input voltage range (V)	100–240
Frequency (Hz)	50/60
Input surge current (A)	50
Power input	100–240 V, 1.9 A, 50/60 Hz

### 3.3.7 Cable

Table 3-16 AC power cable

Model	Description
<ul style="list-style-type: none"><li>• POL-AC-European 3-pin/receptacle-AC power cable-0.75mm<sup>2</sup>-1.5m /RoHS</li><li>• POL-AC-American 3-pin/receptacle-AC power cable-18AWG-1.5m/RoHS</li></ul>	AC power cable, used for the AC power supply

## 3.4 Fan FANS383

### 3.4.1 Version

Table 3-17 Version of the fan

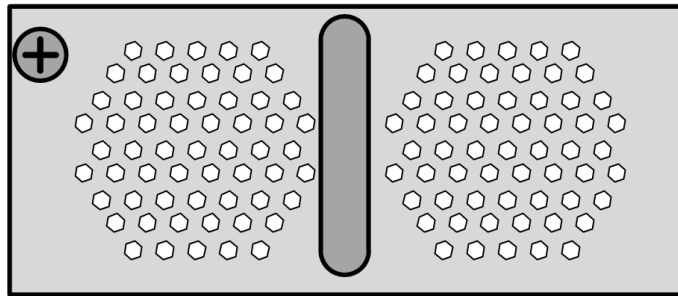
Model	Version
FANS383	A.00 or later

### 3.4.2 Appearance

Figure 3-4 shows the appearance of the fan, including the captive screw and handle.



Figure 3-4 Panel of the fan



### 3.4.3 Functions

Table 3-18 Functions of the fan

Function	Description
Basic functions	<ul style="list-style-type: none"> <li>• Each FANS383 is embedded with 2 fans.</li> <li>• Support hot swapping.</li> <li>• Each device must use 3 FANS383.</li> <li>• Support manually configuring the rotational speed to 4 gears.</li> </ul>
Alarm monitoring	<ul style="list-style-type: none"> <li>• Support speed feedback.</li> <li>• Support in-position monitoring.</li> <li>• Support fan fault alarms, including the alarm of decrease of the rotational speed due to fan stopping rotating and fan aging.</li> </ul>

## 3.5 Default configurations

Table 3-19 lists default configurations of the iTN8600-I-XT4D.

Table 3-19 Default configurations of the iTN8600-I-XT4D

Type	Default configuration
In-band NMS channel	<ul style="list-style-type: none"> <li>• GCC0 is enabled on L1 and L2.</li> <li>• GCC0 of L1 and L2 is added to the bridge interface to support automatic topology discovery.</li> </ul>
Client-side mapping mode	OTN



- By default, no cross connection and protection are configured on the device.
- For interfaces and services supported in client-side mapping mode, see Table 1-2.

# 4 Technical specifications

This chapter describes technical specifications of the iTN8600-I, including the following sections:

- Overall specifications
- Laser safety class
- Reliability specifications
- EMC specifications
- Security standards
- Environmental requirements

## 4.1 Overall specifications

Table 4-1 lists overall specifications of the iTN8600-I.

Table 4-1 Overall specifications

Parameter		Description
Dimensions		440 × 360 × 45 (Width × Depth × Height) (mm)
Weight (kg)		< 7.2
Overall power consumption (W)		≤ 150
DC input voltage (V)	Rated voltage	-48
	Voltage range	-40 to -57
AC input voltage (V)	Rated voltage	110/220
	Voltage range	100–240
	Frequency (Hz)	50/60
Power input		<ul style="list-style-type: none"> <li>• DC power supply: -48 V, 4 A</li> <li>• AC power supply: 100–240 VAC, 1.9 A, 50/60 Hz</li> </ul>

Parameter	Description
Operating temperature ( °C) (altitude: 0–1800 m)	-5 to 50
Operating humidity (relative humidity)	10%–90% (indoor), non-condensing
Lightning protection on the DC power interface	<ul style="list-style-type: none"> <li>• 2 kV in differential mode</li> <li>• 4 kV in common mode</li> </ul>
Lightning protection on the AC power interface	<ul style="list-style-type: none"> <li>• 2 kV in differential mode</li> <li>• 4 kV in common mode</li> </ul>
Noise	<ul style="list-style-type: none"> <li>• Telecom equipment room: 72–75 dB (A)</li> <li>• Manned equipment room: the A-weighted sound power-level Lwad of the entire device is 7.2 Bels at an ambient temperature of 23 ±2 °C.</li> </ul>
Application environment	<ul style="list-style-type: none"> <li>• Telecom equipment room</li> <li>• Small telecom center or corridor</li> </ul>



### Note

When the altitude increases by 220 m between 1800 m and 5000 m, the highest operating temperature of the device decreases by 1°C.

## 4.2 Laser safety class

According to the laser Tx optical power, the laser safety class used by the iTN8600-I is Class 1.

When the safety class of laser used by the iTN8600-I is Class 1, the maximum Tx optical power of the optical interface is smaller than 10 dBm (10 mW).



### Warning

The laser beam inside the fiber may burn your eyes. Do not stare at the optical interface during operation and maintenance.

## 4.3 Reliability specifications

Table 4-2 lists reliability specifications of the iTN8600-I.

Table 4-2 Reliability indexes

Parameter	Description
System availability	99.999%, with the annual downtime less than 5min
Average annual repair rate	< 1.5%

Parameter	Description
MTTR	< 2 hours

## 4.4 EMC specifications

- Pass the EMC Class A test.
- Comply with the CE certificate.

## 4.5 Security standards

- Comply with UL/EN 60950-1 standard.
- Refer to IEC 62368-1.
- Meet UL requirements.

## 4.6 Environmental requirements

The environmental requirements should comply with the following standards:

- NEBS GR-63-CORE: Network Equipment-Building System (NEBS) Requirements: Physical Protection
- European Telecommunication Standards Institute (ETSI) EN 300 019

### 4.6.1 Storage environment

#### Climatic environment

Table 4-3 lists requirements for climatic environment for storage.

Table 4-3 Requirements for climatic environment for storage

Parameter	Description
Air pressure (kPa)	86–106 (excluding the mine shaft environment)
Temperature ( °C) (altitude: 0–1800 m)	-45 to +70
Relative humidity (indoor)	10%–90%
Solar radiation (W/m <sup>2</sup> )	≤ 1120
Heat radiation (W/m <sup>2</sup> )	≤ 600
Wind speed (m/s)	≤ 20

## Waterproof requirements

Generally, the iTN8600-I should be installed indoor.

Ensure that there is no impounded water on the ground and avoid any liquid leakage on the device. Put the iTN8600-I away from the automatic fire-fighting facility and heating plants, etc.

If the iTN8600-I is installed outdoor, you need to ensure the following matters:

- The packing case is intact.
- Take measurements to prevent water from entering the packing case.
- There is no ponding on the ground.
- No direct sunlight on the packing box

## Biotic environment

Keep the iTN8600-I away from:

- Microorganism, such as fungus and mould
- Rodent animals, such as rats

## Air cleanliness

There should not be any explosive, electro-conductive, magneto-conductive, or corrosive substance.

Table 4-4 lists concentration requirements for the mechanical active substance in storage.

Table 4-4 Concentration requirements for the mechanical active substance in storage

Mechanical active substance	Concentration
Suspending dust (mg/m <sup>3</sup> )	≤ 5.00
Droppable dust (mg/m <sup>2</sup> h)	≤ 20.0
Grit (mg/m <sup>3</sup> )	≤ 300

Table 4-5 lists concentration requirements for the chemical active substance in storage.

Table 4-5 Concentration requirements for the chemical active substance in storage

Chemical active substance	Concentration
SO <sub>2</sub> (mg/m <sup>3</sup> )	≤ 0.30
H <sub>2</sub> S (mg/m <sup>3</sup> )	≤ 0.10
NO <sub>2</sub> (mg/m <sup>3</sup> )	≤ 0.50
NH <sub>3</sub> (mg/m <sup>3</sup> )	≤ 1.00
Cl <sub>2</sub> (mg/m <sup>3</sup> )	≤ 0.10

Chemical active substance	Concentration
HCl (mg/m <sup>3</sup> )	≤ 0.10
HF (mg/m <sup>3</sup> )	≤ 0.01
O <sub>3</sub> (mg/m <sup>3</sup> )	≤ 0.05

## 4.6.2 Transport environment

### Climatic environment

Table 4-6 lists climatic environmental requirements in transport.

Table 4-6 Climatic environmental requirements in transport

Parameter	Description
Air pressure (kPa)	86–106
Temperature ( °C) (altitude: 0–1800 m)	-25 to +60
Temperature change rate ( °C/min)	≤ 1
Relative humidity	10%–90% RH
Solar radiation (W/m <sup>2</sup> )	≤ 1120
Heat radiation (W/m <sup>2</sup> )	≤ 600
Wind speed (m/s)	≤ 20

### Waterproof requirements

In transport, you need to ensure the following matters:

- The packing case is intact.
- Take measurements to prevent water from entering the packing case.
- There is no impounded water on the vehicle.

### Biotic environment

Keep the iTN8600-I away from:

- Microorganism, such as fungus and mould
- Rodent animals, such as rats

### Air cleanliness

There should not be any explosive, electro-conductive, magneto-conductive, or corrosive substance.

Table 4-7 lists concentration requirements for the mechanical active substance in transport.

Table 4-7 Concentration requirements for the mechanical active substance in transport

Mechanical active substance	Concentration
Suspending dust (mg/m <sup>3</sup> )	No requirement
Droppable dust (mg/m <sup>2</sup> h)	≤ 3.0
Grit (mg/m <sup>3</sup> )	≤ 100

Table 4-8 lists concentration requirements for the chemical active substance in transport.

Table 4-8 Concentration requirements for the chemical active substance in transport

Chemical active substance	Concentration
SO <sub>2</sub> (mg/m <sup>3</sup> )	≤ 0.30
H <sub>2</sub> S (mg/m <sup>3</sup> )	≤ 0.10
NO <sub>2</sub> (mg/m <sup>3</sup> )	≤ 0.50
NH <sub>3</sub> (mg/m <sup>3</sup> )	≤ 1.00
Cl <sub>2</sub> (mg/m <sup>3</sup> )	≤ 0.10
HCl (mg/m <sup>3</sup> )	≤ 0.10
HF (mg/m <sup>3</sup> )	≤ 0.01
O <sub>3</sub> (mg/m <sup>3</sup> )	≤ 0.05

## 4.6.3 Operating environment

### Climatic environment



#### Note

The temperature and humidity are measured 1.5 m above the ground and 0.4 m in front of the device.

Table 4-9 lists climatic environmental requirements during operation.

Table 4-9 Climatic environmental requirements during operation

Parameter	Description
Altitude (m)	≤ 3000
Air pressure (kPa)	86–106
Temperature ( °C) (altitude: 0–1800 m)	-5 to +50

Parameter	Description
Relative humidity	10%–90% RH (non-condensing)
Temperature change rate ( °C/min)	≤ 0.5
Solar radiation (W/m <sup>2</sup> )	≤ 700
Heat radiation (W/m <sup>2</sup> )	≤ 600
Wind speed (m/s)	≤ 5

## Biotic environment

Keep the iTN8600-I away from:

- Microorganism, such as fungus and mould
- Rodent animals, such as rats

## Air cleanliness

There should not be any explosive, electro-conductive, magneto-conductive, or corrosive substance.

Table 4-10 lists concentration requirements for the mechanical active substance in operation.

Table 4-10 Concentration requirements for the mechanical active substance in operation

Mechanical active substance	Concentration
Dust grain (grain/m <sup>3</sup> )	≤ 3 × 10 <sup>5</sup>
Suspending dust (mg/m <sup>3</sup> )	≤ 0.2
Droppable dust (mg/m <sup>3</sup> h)	≤ 15
Grit (mg/m <sup>3</sup> )	≤ 100

Table 4-11 lists concentration requirements for the chemical active substance in operation.

Table 4-11 Concentration requirements for the chemical active substance in operation

Chemical active substance	Concentration
SO <sub>2</sub> (mg/m <sup>3</sup> )	≤ 0.30
H <sub>2</sub> S (mg/m <sup>3</sup> )	≤ 0.10
NH <sub>3</sub> (mg/m <sup>3</sup> )	≤ 3.00
Cl <sub>2</sub> (mg/m <sup>3</sup> )	≤ 0.10
HCl (mg/m <sup>3</sup> )	≤ 0.10
HF (mg/m <sup>3</sup> )	≤ 0.01



Chemical active substance	Concentration
O <sub>3</sub> (mg/m <sup>3</sup> )	≤ 0.05

# 5 Appendix

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The appendix lists references, terms, acronyms, and abbreviations, including following sections:

- Lookup table of optical module parameters
- Cables
- Compliant standards and protocols
- Terms
- Acronyms and Abbreviations

## 5.1 Lookup table of optical module parameters



### Warning

- During any operation or maintenance process, pay attention to laser safety. Do not stare into the optical interface or fiber connector with eyes directly or through an instrument, to prevent laser from damaging eyes.
- Before connecting the fiber, use an optical power meter to measure the current optical power of the fiber. When the current optical power is smaller than the overload point of the optical module, you can connect the fiber. When the current optical power is greater than the overload point, bit error or device damage may occur. When the current optical power is lower than the sensitivity, services will be blocked. For the technical specifications of the optical module, refer to manuals of optical modules or this section.
- When using an optical module, do not use an optical fiber jumper to perform hard loopback (in other words, connect the Tx interface of the optical module to the Rx interface through a fiber); otherwise, the device may be damaged.
- When using a long-distance optical module with a target distance of 20 km or less, 40 km (dual-fiber model), 30/40 km (single-fiber module), 60 km, 80 km, or 100 km or more, you must use a 5 dB, 10 dB, 15 dB, 15 dB, 15 dB, or 20 dB fiber attenuator respectively to make the optical power smaller than the overload point, so that you can use the optical fiber jumper to perform hard loopback.

## 5.1.1 USFP+

### 10 Gbit/s (LC/PC, dual-fiber bidirectional and single-fiber bidirectional)

Table 5-1 Parameters of USFP+ module (10 Gbit/s, LC/PC, dual-fiber bidirectional and single-fiber bidirectional)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overlap (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)	Mode	Transmission distance (km)
Commercial dual-fiber								
USFP+-192/M	850	840–860	-8.2 to 1	> 1	> 4.5	< -11.1	MM	0.3
USFP+-192/S1	1310	1260–1600	-8.2 to 1	> 1	> 4.5	< -14.4	SM	10
USFP+-192/S2	1550	1260–1600	-3 to 4	> 1	> 6	< -16	SM	40
USFP+-192/S3	1550	1260–1600	-1 to 4	> -7	> 9	< -22	SM	80
Commercial single-fiber								
USFP+-192/SS12	1270	1320–1350	-4.5 to 1	> 1	> 4	< -14	SM	20
USFP+-192/SS13	1330	1260–1280	-4.5 to 1	> 1	> 4	< -14	SM	20
USFP+-192/SS22	1270	1320–1350	-1.5 to 5	> -7	> 6	< -19	SM	40
USFP+-192/SS23	1330	1260–1280	-1.5 to 5	> -7	> 6	< -19	SM	40
USFP+-192/SS34	1490	1530–1565	-0.5 to 5	> -7	> 8.2	< -20	SM	80
USFP+-192/SS35	1550	1470–1510	-0.5 to 5	> -7	> 8.2	< -20	SM	80
Industrial dual-fiber								
USFP+-192/S0-I	1310	1260–1600	-8.2 to 1	> 1	> 4	< -14.4	SM	2
USFP+-192/S1-I	1310	1260–1600	-8.2 to 1	> 1	> 4	< -15	SM	10
USFP+-192/S2-I	1550	1260–1600	-3.5 to 4	> 1	> 6	< -15	SM	40
Industrial single-fiber								
USFP+-192/SS12-I	1270	1320–1350	-4.5 to 1	> 1	> 4	< -14.4	SM	20

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)	Mode	Transmission distance (km)
USFP+-192/SS13-I	1330	1260–1280	-4.5 to 1	> 1	> 4	< -14.4	SM	20
USFP+-192/SS22-I	1270	1320–1350	-1.5 to 5	> -7	> 6	< -19	SM	40
USFP+-192/SS23-I	1330	1260–1280	-1.5 to 5	> -7	> 6	< -19	SM	40

## 5.1.2 DSFP+

10 Gbit/s (LC/PC, dual-fiber bidirectional, 40 km)

Table 5-2 Parameters of DSFP+ module (10 Gbit/s, LC/PC, dual-fiber bidirectional, 40 km)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Chan nel ID	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)
DSFP+-192/S/21	1560.61	1260–1600	C21	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/22	1559.79	1260–1600	C22	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/23	1558.98	1260–1600	C23	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/24	1558.17	1260–1600	C24	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/25	1557.36	1260–1600	C25	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/26	1556.55	1260–1600	C26	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/27	1555.75	1260–1600	C27	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/28	1554.94	1260–1600	C28	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/29	1554.13	1260–1600	C29	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/30	1553.33	1260–1600	C30	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/31	1552.52	1260–1600	C31	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/32	1551.72	1260–1600	C32	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/33	1550.92	1260–1600	C33	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/34	1550.12	1260–1600	C34	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/35	1549.32	1260–1600	C35	-1.0 to 4.0	> 1	> 6	< -15

Model	Tx wavelength (nm)	Rx wavelength (nm)	Channel ID	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)
DSFP+-192/S/36	1548.51	1260–1600	C36	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/37	1547.72	1260–1600	C37	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/38	1546.92	1260–1600	C38	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/39	1546.12	1260–1600	C39	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/40	1545.32	1260–1600	C40	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/41	1544.53	1260–1600	C41	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/42	1543.73	1260–1600	C42	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/43	1542.94	1260–1600	C43	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/44	1542.14	1260–1600	C44	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/45	1541.35	1260–1600	C45	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/46	1540.56	1260–1600	C46	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/47	1539.77	1260–1600	C47	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/48	1538.98	1260–1600	C48	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/49	1538.19	1260–1600	C49	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/50	1537.40	1260–1600	C50	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/51	1536.61	1260–1600	C51	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/52	1535.82	1260–1600	C52	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/53	1535.04	1260–1600	C53	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/54	1534.25	1260–1600	C54	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/55	1533.47	1260–1600	C55	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/56	1532.68	1260–1600	C56	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/57	1531.90	1260–1600	C57	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/58	1531.12	1260–1600	C58	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/59	1530.33	1260–1600	C59	-1.0 to 4.0	> 1	> 6	< -15
DSFP+-192/S/60	1529.55	1260–1600	C60	-1.0 to 4.0	> 1	> 6	< -15

10 Gbit/s (LC/PC, dual-fiber bidirectional, 80 km)

Table 5-3 Parameters of DSFP+ module (10 Gbit/s, LC/PC, dual-fiber bidirectional, 80 km)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Channel ID	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)
DSFP+-192/L/21	1560.61	1260–1600	C21	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/22	1559.79	1260–1600	C22	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/23	1558.98	1260–1600	C23	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/24	1558.17	1260–1600	C24	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/25	1557.36	1260–1600	C25	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/26	1556.55	1260–1600	C26	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/27	1555.75	1260–1600	C27	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/28	1554.94	1260–1600	C28	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/29	1554.13	1260–1600	C29	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/30	1553.33	1260–1600	C30	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/31	1552.52	1260–1600	C31	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/32	1551.72	1260–1600	C32	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/33	1550.92	1260–1600	C33	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/34	1550.12	1260–1600	C34	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/35	1549.32	1260–1600	C35	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/36	1548.51	1260–1600	C36	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/37	1547.72	1260–1600	C37	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/38	1546.92	1260–1600	C38	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/39	1546.12	1260–1600	C39	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/40	1545.32	1260–1600	C40	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/41	1544.53	1260–1600	C41	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/42	1543.73	1260–1600	C42	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/43	1542.94	1260–1600	C43	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/44	1542.14	1260–1600	C44	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/45	1541.35	1260–1600	C45	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/46	1540.56	1260–1600	C46	-1.0 to 4.0	> -7	> 10	< -23

Model	Tx wavelength (nm)	Rx wavelength (nm)	Channel ID	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)
DSFP+-192/L/47	1539.77	1260–1600	C47	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/48	1538.98	1260–1600	C48	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/49	1538.19	1260–1600	C49	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/50	1537.40	1260–1600	C50	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/51	1536.61	1260–1600	C51	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/52	1535.82	1260–1600	C52	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/53	1535.04	1260–1600	C53	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/54	1534.25	1260–1600	C54	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/55	1533.47	1260–1600	C55	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/56	1532.68	1260–1600	C56	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/57	1531.90	1260–1600	C57	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/58	1531.12	1260–1600	C58	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/59	1530.33	1260–1600	C59	-1.0 to 4.0	> -7	> 10	< -23
DSFP+-192/L/60	1529.55	1260–1600	C60	-1.0 to 4.0	> -7	> 10	< -23

### 5.1.3 RSP

10 Gbit/s (LC/PC, dual-fiber bidirectional, 10 km)

Table 5-4 Parameters of RSP module (10 Gbit/s, LC/PC, dual-fiber bidirectional, 10 km)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)
RSP-10C10-27	1271	1260–1600	-3.5 to 2	> 1	> 4	< -13.5
RSP-10C10-29	1291					
RSP-10C10-31	1311					
RSP-10C10-33	1331					
RSP-10C10-35	1351					
RSP-10C10-37	1371					

10 Gbit/s (LC/PC, dual-fiber bidirectional, 20 km)

Table 5-5 Parameters of RSP module (10 Gbit/s, LC/PC, dual-fiber bidirectional, 20 km)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)
RSP-10C20-27	1271	1260–1600	-2 to 3	> 1	> 4	< -14.4
RSP-10C20-29	1291					
RSP-10C20-31	1311					
RSP-10C20-33	1331					
RSP-10C20-35	1351					
RSP-10C20-37	1371					

10 Gbit/s (LC/PC, dual-fiber bidirectional, 20 km, industrial level)

Table 5-6 Parameters of RSP module (10 Gbit/s, LC/PC, dual-fiber bidirectional, 20 km)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)
RSP-10C20-27-I	1271	1260–1600	-2 to 3	> 1	> 4	< -14.4
RSP-10C20-29-I	1291					
RSP-10C20-31-I	1311					
RSP-10C20-33-I	1331					
RSP-10C20-35-I	1351					
RSP-10C20-37-I	1371					

10 Gbit/s (LC/PC, dual-fiber bidirectional, 40 km)

Table 5-7 Parameters of RSP module (10 Gbit/s, LC/PC, dual-fiber bidirectional, 40 km)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)
RSP-10C40-47	1471	1260–1600	-1 to 4	> 1	> 6	< -15
RSP-10C40-49	1491					



Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)
RSP-10C40-51	1511					
RSP-10C40-53	1531					
RSP-10C40-55	1551					
RSP-10C40-57	1571					
RSP-10C40-59	1591					
RSP-10C40-61	1611					

### 5.1.4 UQSP

#### 41.2 Gbit/s (LC/PC, dual-fiber bidirectional)

Table 5-8 Parameters of the UQSP module (41.2Gbit/s, LC/PC, dual-fiber bidirectional)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)	Mode	Transmission distance (km)
UQSP-40G/M3	850	840–860	-7.6 to 2.4	> 1	> 3	< -9.5	MM	<ul style="list-style-type: none"> <li>• OM3: 0.3</li> <li>• OM4: 0.4</li> </ul>

#### 41.2 Gbit/s (MPO)

Table 5-9 Parameters of the UQSP module (41.2 Gbit/s, MPO)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)	Mode	Transmission distance (km)
UQSP-40G/S1	<ul style="list-style-type: none"> <li>• 1271</li> <li>• 1291</li> <li>• 1311</li> <li>• 1331</li> </ul>	1260–1600	-7 to 2.3 (single channel)	> 1	> 3.5	< -13	SM	10

## 44.6 Gbit/s (MPO)

Table 5-10 Parameter of the UQSP module (44.6 Gbit/s, MPO)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)	Mode	Transmission distance (km)
UQSP-40G/PSM4	1310	1260–1355	-7 to 1.5 (single channel)	> 0.5	> 3.5	< -11	SM	0.002 to 10

## 5.1.5 UQP

Table 5-11 Parameters of the UQP module (103.1 Gbit/s and 111.8 Gbit/s, LC/PC, dual-fiber bidirectional, UQP-100G/LR4 compatible with 100GE and OTU4, with other models supporting 100GE only)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)	Mode	Transmission distance (km)
UQP-100G/SR4	850	840–860	-8.4 to 2.4	> 3.4	> 2	< -9	MM	0.0005 to 0.1
UQP-100G/CW4	<ul style="list-style-type: none"> <li>• 1271</li> <li>• 1291</li> <li>• 1311</li> <li>• 1331</li> </ul>	<ul style="list-style-type: none"> <li>• 1264.5–1277.5</li> <li>• 1284.5–1297.5</li> <li>• 1304.5–1317.5</li> <li>• 1324.5–1337.5</li> </ul>	<ul style="list-style-type: none"> <li>• Single channel: -6.5 to 2.5</li> <li>• Total: &lt; 8.5</li> </ul>	> 3.5	> 3.5	< -10.0	SM	0.002 to 2
UQP-100G/LR4	<ul style="list-style-type: none"> <li>• 1295.56</li> <li>• 1300.05</li> <li>• 1304.58</li> <li>• 1309.14</li> </ul>	<ul style="list-style-type: none"> <li>• 1294.53–1296.59</li> <li>• 1299.02–1301.09</li> <li>• 1303.54–1305.63</li> <li>• 1308.09–1310.19</li> </ul>	<ul style="list-style-type: none"> <li>• 100GE single channel: -4.3 to 4.5</li> <li>• OTU4 single channel: -0.6 to 4.0</li> <li>• 100GE total: &lt; 10.5</li> <li>• OTU4 total: &lt; 10.0</li> </ul>	> 5.5	<ul style="list-style-type: none"> <li>• 100GE: &gt; 4</li> <li>• OTU4: 4–6.5</li> </ul>	<ul style="list-style-type: none"> <li>• 100GE: &lt; -8.6</li> <li>• OTU4: &lt; -8.4</li> </ul>	SM	10

Mode 1	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity (dBm)	Mode	Transmission distance (km)
UQP-100G/ER4L	<ul style="list-style-type: none"> <li>• 1295.56</li> <li>• 1300.05</li> <li>• 1304.58</li> <li>• 1309.14</li> </ul>	<ul style="list-style-type: none"> <li>• 1294.53–1296.59</li> <li>• 1299.02–1301.09</li> <li>• 1303.54–1305.63</li> <li>• 1308.09–1310.19</li> </ul>	<ul style="list-style-type: none"> <li>• Single channel: -2.9 to 4.5</li> <li>• Total: &lt; 10.5</li> </ul>	> -3.0	> 7	<ul style="list-style-type: none"> <li>• BER=1E-12: &lt; -14.5</li> <li>• BER=5E-5: &lt; -18.5</li> </ul>	SM	30

### 5.1.6 UC2

103.1 Gbit/s and 111.8 Gbit/s (LC/PC, dual-fiber bidirectional, compatible with 100GE and OTU4)

Table 5-12 Parameters of the UC2 module (103.1 Gbit/s and 111.8 Gbit/s, LC/PC, dual-fiber bidirectional, compatible with 100GE and OTU4)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power per channel (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity per channel (dBm)	Mode	Transmission distance (km)
UC2-100G/LR4	<ul style="list-style-type: none"> <li>• 1295.56</li> <li>• 1300.05</li> <li>• 1304.58</li> <li>• 1309.14</li> </ul>	<ul style="list-style-type: none"> <li>• 1294.53–1296.59</li> <li>• 1299.02–1301.09</li> <li>• 1303.54–1305.63</li> <li>• 1308.09–1310.19</li> </ul>	<ul style="list-style-type: none"> <li>• 100GE: -4.3 to 4.5</li> <li>• OTU4: -0.6 to 4.0</li> </ul>	> 5.5	> 4	<ul style="list-style-type: none"> <li>• 100GE: &lt; -8.6</li> <li>• OTU4: &lt; -8.4</li> </ul>	SM	10
UC2-100G/ER4	<ul style="list-style-type: none"> <li>• 1295.56</li> <li>• 1300.05</li> <li>• 1304.58</li> <li>• 1309.14</li> </ul>	<ul style="list-style-type: none"> <li>• 1294.53–1296.59</li> <li>• 1299.02–1301.09</li> <li>• 1303.54–1305.63</li> <li>• 1308.09–1310.19</li> </ul>	<ul style="list-style-type: none"> <li>• 100GE: -2.9 to 2.9</li> <li>• OTU4: -2.7 to 2.9</li> </ul>	> 5.5	> 7	<ul style="list-style-type: none"> <li>• 100GE: &lt; -21.4</li> <li>• OTU4: &lt; -23.2</li> </ul>	SM	40

## 103.1 Gbit/s and 111.8 Gbit/s (MPO, compatible with 100GE and OTU4)

Table 5-13 Parameters of the UC2 module (103.1 Gbit/s and 111.8 Gbit/s, MPO, compatible with 100GE and OTU4)

Model	Tx wavelength (nm)	Rx wavelength (nm)	Tx optical power per channel (dBm)	Overload (dBm)	Extinction ratio (dB)	Rx sensitivity per channel (dBm)	Mode	Transmission distance (km)
UC2-100G/DCO	1567.54 (191.25 THz) to 1528.77 (196.10 THz)	1567.54 (191.25 THz)–1528.77 (196.10 THz)	>-5	> 0	-	< -30	SM	2400

## 5.2 Cables

### 5.2.1 Fiber



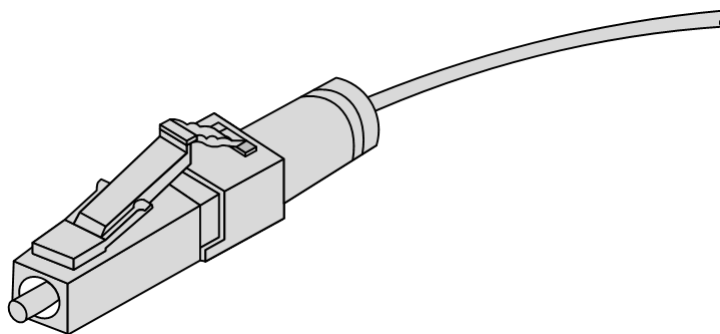
Choose the length of the fiber reasonably according to actual situations on site.

#### LC fiber

The optical module on the iTN8600-I supports the 2-mm single-mode or multi-mode fiber that uses the LC connector.

Figure 5-1 shows the LC/PC fiber connector used by the iTN8600-I.

Figure 5-1 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 the fiber as below:

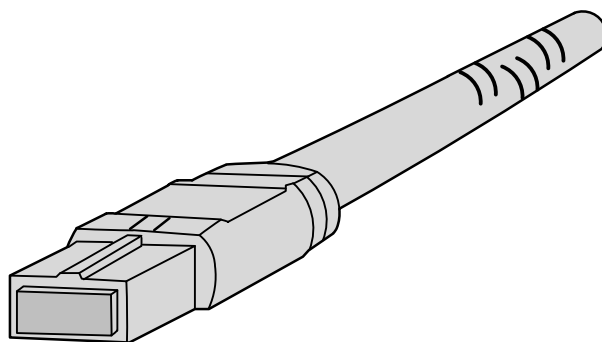
- To insert the fiber, align the fiber connector with the optical interface and insert the fiber into the interface gently.
- To remove the fiber, press the latch on the fiber connector, push the fiber inwards slightly, and pull the fiber out.

## MPO fiber

When the iTN8600-I accesses 100GE, OTU4, and 40GE services, it can use the single-mode or multi-mode fiber that uses the MPO fiber connector.

Figure 5-2 shows the appearance of the MPO fiber connector.

Figure 5-2 MPO fiber connector



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

- To insert the fiber, hold the colored grab handle of the fiber header, align the alignment point of the fiber connector with the groove of the interface on the optical module, insert the fiber gently.
- To remove the fiber, hold the colored grab handle of the fiber header, and pull the fiber out.

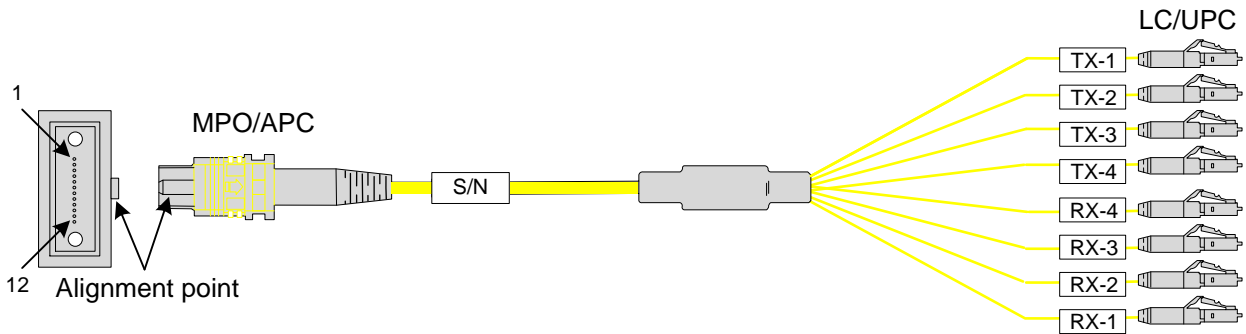
## MPO-LC branch optical fiber jumper

When the iTN8600-I accesses 4×10GE services through the QSFP PSM4 optical module, it can use the single-mode MPO-LC branch optical fiber jumper.

Figure 5-3 shows the appearance of the MPO-LC branch optical fiber jumper.

- There is an alignment point on the upper part of the MPO fiber connector for alignment.
- The connector grab handle and fiber are colored. Take yellow for example here.
- There is an S/N label attached on the thick fiber.
- The fiber fanout is connected with multiple thin fibers and LC connectors of the UPC connector.
- There is a label on the thin fiber, marking the Rx and Tx channels.
- The fiber connector of the MPO connector is Angel Physical Connect (APC). The fiber connector of the LC connector is Ultra Physical Contact (UPC).

Figure 5-3 MPO-LC branch optical fiber jumper



## Wiring

Table 5-14 shows the wiring of the fiber.

Table 5-14 Wiring of the fiber

Wiring	Local optical interface	Optical signal direction	Peer optical interface
Single-fiber connection	Optical interface	<->	Optical interface
Dual-fiber connection	Optical interface Tx	->	Optical interface Rx
	Optical interface Rx	<-	Optical interface Tx
MPO	MPO optical interface	<->	MPO optical interface
MPO-LC	For the MPO optical interface, fibers 1–4 are attached with the Tx-1 to Tx-4 labels respectively.	->	LC optical interface Rx 1–Rx 4
	Fibers 5–8 (reserved)	–	–
	For the MPO optical interface, fibers 9–12 are attached with the Rx-4 to Rx-1 labels respectively.	<-	LC optical interface Tx 4–Tx 1

### Note

- Generally, the insertion loss of each MPO connector is smaller than 0.35 dB, and that of each LC connector is smaller than 0.15 dB.
- The MPO connector is a high-precision connector with alignment function, so do not insert and pull it at will or repeatedly; otherwise, the lifecycle of the fiber will be shortened.

## 5.2.2 Ethernet cable

### Introduction

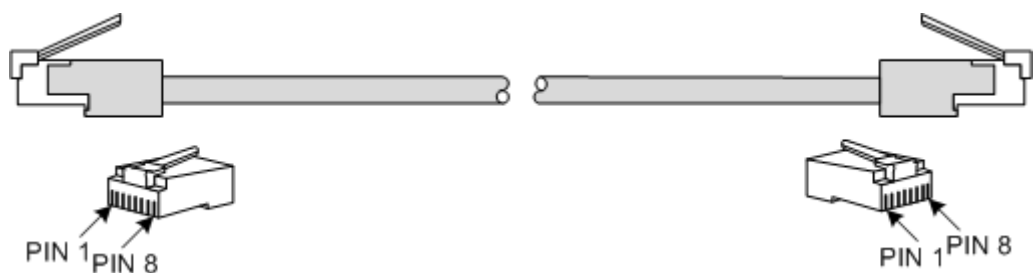
The Ethernet cable used on the iTN8600-I has the following functions:

- Connect the iTN8600-I with the out-of-band network management network through the SNMP interface.
- Connect one iTN8600-I with the out-of-band network management interface on another iTN8600-I through the EXT interface to form cascaded network management. The other iTN8600-I do not need to be connected to the out-of-band network management network.

### Appearance

Figure 5-4 shows the Ethernet cable.

Figure 5-4 Ethernet cable



### Wiring

Table 5-15 lists the wiring of EIA/TIA 568A and EIA/TIA 568B standards.

Table 5-15 Wiring of EIA/TIA 568 A and EIA/TIA 568 B 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

Both RJ45 connectors of the straight-through cable follow EIA/TIA568 B standard wiring, as shown in Figure 5-5.

Figure 5-5 Wiring of the straight-through cable

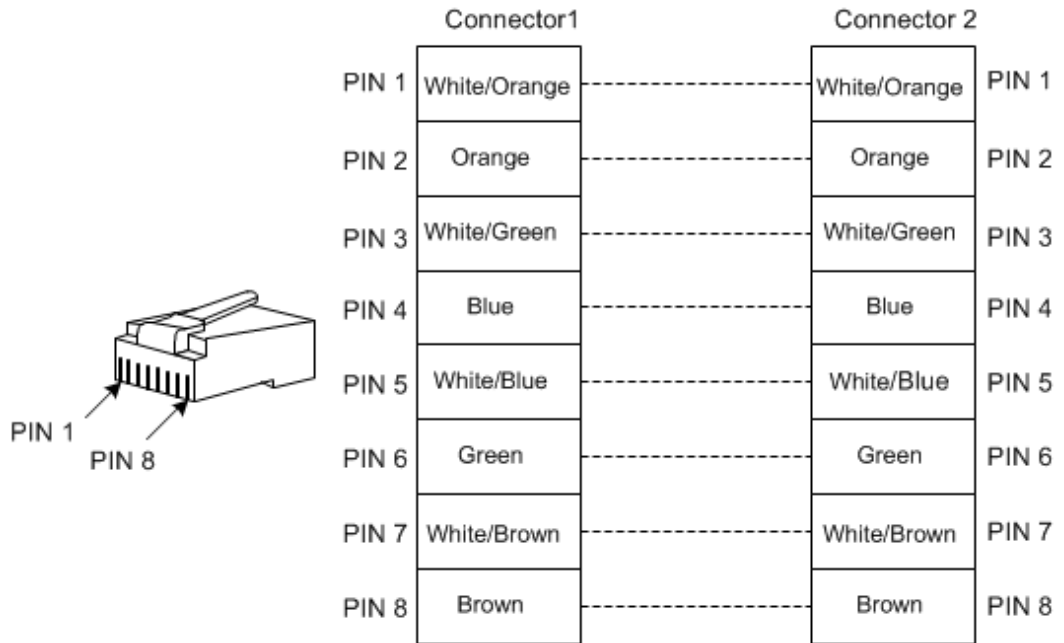


Figure 5-6 shows the wiring of the 100 Mbit/s crossover cable.

Figure 5-6 Wiring of the 100 Mbit/s crossover cable

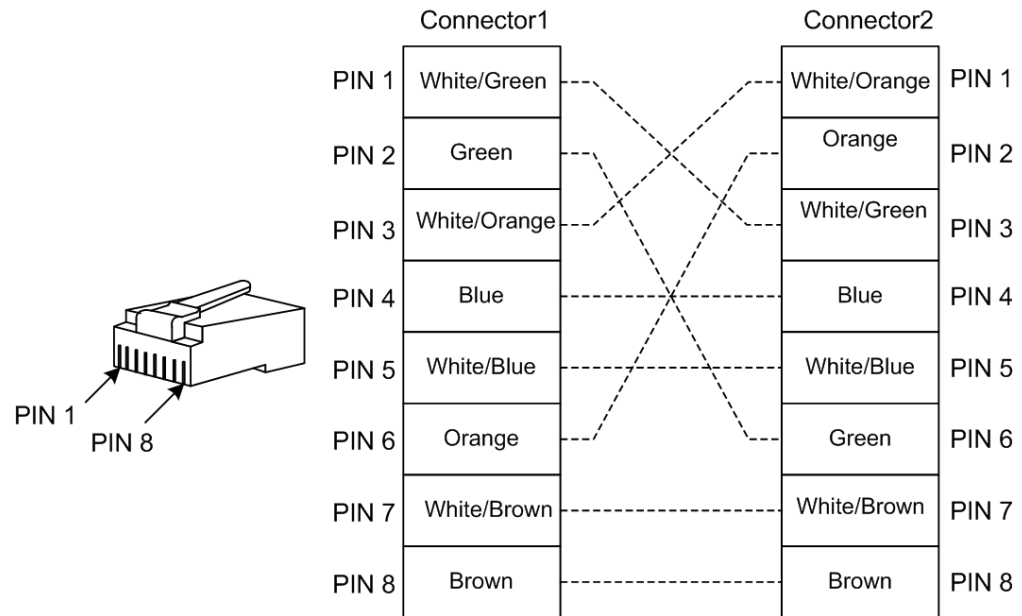
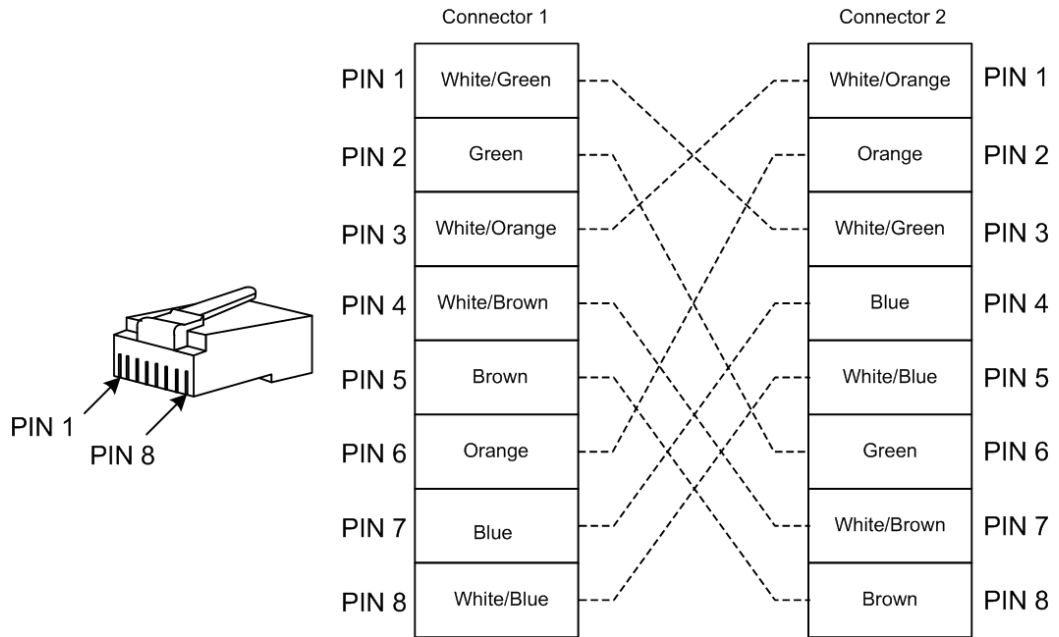


Figure 5-7 shows the wiring of the 1000 Mbit/s crossover cable.



Figure 5-7 Wiring of the 1000 Mbit/s crossover cable



## Technical specifications

Table 5-16 lists technical specifications of the Raisecom straight-through cable.

Table 5-16 Technical specifications of the Raisecom straight-through cable

Parameter	Description
Name	<ul style="list-style-type: none"> <li>• Straight-through cable: CBL-ETH-RJ45/RJ45-D</li> <li>• Crossover cable: CBL-ETH-RJ45/RJ45-X-D</li> </ul>
Connector	RJ45
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, which can be customized. For example, if the customer requires a 2-meter cable, you can name it CBL-ETH-RJ45/RJ45-2m.

## 5.2.3 Configuration cable

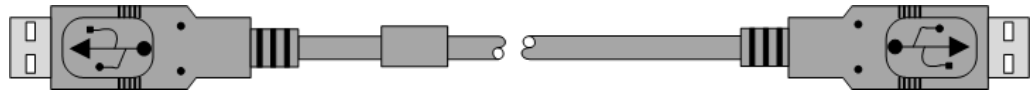
### Introduction

The configuration cable is used to connect the Console interface on the iTN8600-I to PC.

### Appearance

Connectors at both ends of the configuration cable are USB A-type male connectors, as shown in Figure 5-8.

Figure 5-8 Configuration cable



## Technical specifications

Table 5-17 lists technical specifications of the configuration cable.

Table 5-17 Technical specifications of the configuration cable

Parameter	Description
Cable name	CBL-USB-USB-AM/USB-AM-1.5m/RoHS
Connector type	USB2.0 AM connector+USB2.0 AM connector
Cable type	UL2725
Length	1.5 m

## 5.2.4 Power cables

### DC power cable

The DC power cable transmits -48 VDC power to the DC terminal block on the front panel of the iTN8605, and supplies power for the entire device. The DC power cable consists of the DC power connector and the coaxial cable, as shown in Table 5-18.

Figure 5-9 DC power cable



## Technical specifications

Table 5-18 lists technical specifications of the DC power cable.

Table 5-18 Technical specifications of the DC power cable

Parameter	Description
Name	POL-DC-unstripped/stripped-1.0mm <sup>2</sup> -D/RoHS
Cable	<ul style="list-style-type: none"> <li>• 3-wire ordinary RVV</li> <li>• 3×1.0mm<sup>2</sup> 60227 IEC 53 (RVV)</li> <li>• Flame-retardant tube equipped at the stripped end</li> <li>• +Vin positive wire: brown</li> <li>• -Vin negative wire: blue</li> <li>• PGND ground wire: yellow/green</li> </ul>
Rated voltage (V)	300/500
Insulation and voltage resistance (RVV)	AC2000V, 5min

Parameter	Description
Insulation and voltage resistance (wire)	AC1500V, 5min
Authentication standard	CCC
RoHS	Compliant
Customized length	Supported, indicated by D in the cable name, being 4 m by default
Connector	5.08-3Pin-header/RoHS

## Connecting DC power cable and connectors

In China, the DC-power-model iTN8605 is delivered with the DC power cable and 3-pin connector. In other countries and regions, only 3-pin connector is provided, so you need to make the DC power cable according to local standard and parameters in Table 5-18. Connect the 3-pin connector to the DC power cable, as shown in Figure 5-10.

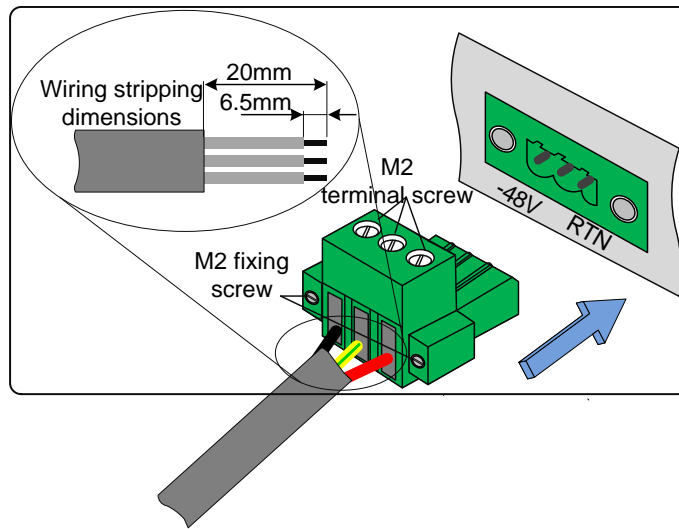


### Caution

Connect the power cable according to the positive pole, negative pole, and ground terminal on the panel. Connect the positive pole, negative pole, and ground end of the power sourcing equipment to the positive pole (RTN), negative pole (-48 V), and ground terminal of the DC power supply of the iTN8600-I respectively. The conducting wire must be fully inserted into the connector.

- Step 1 Use a wire stripper to strip the protective sheath at the end of the DC power cable, leaving 20-mm conducting wire.
- Step 2 Use the wire stripper to strip the external coat of the conducting wire, leaving 6.5-mm conductor.
- Step 3 Insert the power cable into the 3-pin connector. Fasten the screw to fix the connector and DC power cable.

Figure 5-10 Stripping dimensions and connector



## AC power cable

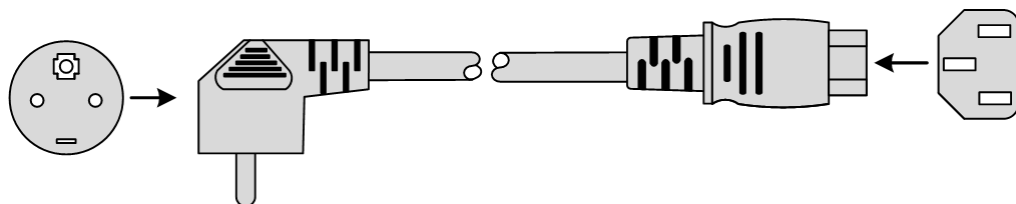
The AC power cable transmits 110/220 VAC power from the power sourcing equipment to the AC power terminal block of the iTN8605, and supplies power to the entire device. The iTN8605 uses different AC power cables in different countries or regions.

Regional standard	Cable name
CE	POL-AC-European 3-pin/receptacle-AC power cable-0.75mm <sup>2</sup> -1.5m /RoHS
UL	POL-AC-American 3-pin/C13 connector-18AWG-1.5m/RoHS

- CE-standard AC power cable

The AC power cable which meets European standard is composed of the European 3-pin plug and C13 connector, as shown in Figure 5-11.

Figure 5-11 European AC cable



## Technical specifications

Table 5-19 lists technical specifications of the European AC power cable.

Table 5-19 Technical specifications of the European AC power cable

Parameter		Description
Name		POL-AC-European 3-pin/receptacle-AC power cable-0.75mm <sup>2</sup> -1.5m /RoHS
Connector 1		European 3-pin plug
Connector 2		IEC60320-C13 connector
Color	Outer	Black (PVC insulating layer)
	Inner	Blue (N), brown (L), and yellow/green strip (E)
Type		3×0.75 mm <sup>2</sup>
Length		The letter D indicates the length, which can be customized. For example, if the customer requires a 1.5-m cable, you can name it POL-AC-European 3-pin/receptacle-AC power cable-0.75mm <sup>2</sup> -1.5m/RoHS.

- UL-standard AC power cable

The AC power cable which meets American standard is composed of the American 3-pin plug and C13 connector, as shown in Figure 5-12.

Figure 5-12 American AC cable

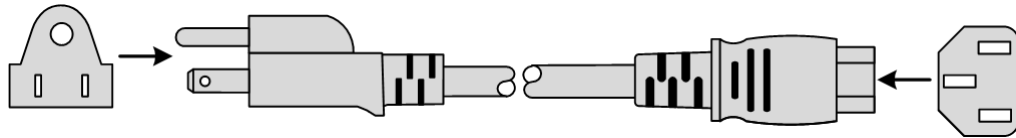


Table 5-20 lists technical specifications of the American AC power cable.

Table 5-20 Technical specifications of the American AC power cable

Parameter		Description
Name		POL-AC-American 3-pin/receptacle-AC power cable-18AWG-1.5m/RoHS
Connector 1		NMEA5-15 American 3-pin plug
Connector 2		IEC60320-C13 connector
Color	Outer	Black (PVC insulating layer)
	Inner	White (N), black (L), and green (E)
Wire gauge		18AWG/3C
Length		The letter D indicates the length, which can be customized. For example, if the customer requires a 1.5-m cable, you can name it POL-AC-American 3-pin/ receptacle-AC power cable-1.5m/RoHS.

## 5.2.5 Ground cable

Two ground terminals are located on the right part of the left side and right part of the rear panel, thus facilitating selection of grounding location. The ground cable is used to connect the iTN8600-I to the ground.



### Warning

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

### Introduction

The ground cable is used to connect the iTN8600-I to the ground. There is a ground terminal screw on the iTN8600-I panel. Press and connect one end of the ground cable with the OT terminal. Use the screw to fix the OT terminal to the ground terminal. Connect the other end of the group cable with the ground.

### Appearance

The ground cable is composed of ground lugs and the coaxial cable. The ground lug is usually an OT non-insulated terminal. The coaxial cable is a yellow/green multistrand copper soft flame-retardant conducting wire. Figure 5-13 and Figure 5-14 show the ground cable and OT terminal.

Figure 5-13 Ground cable

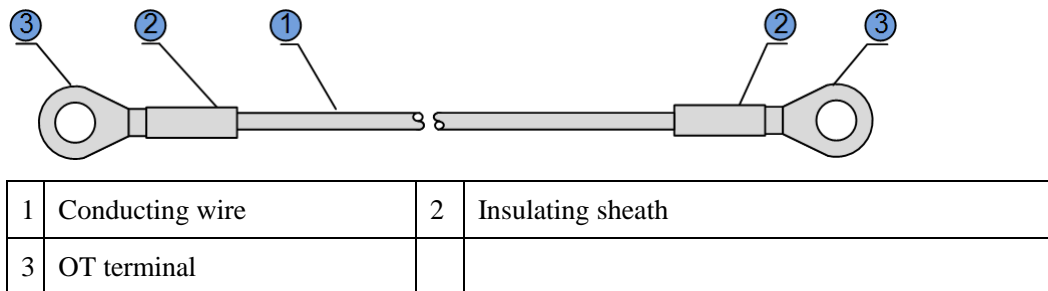
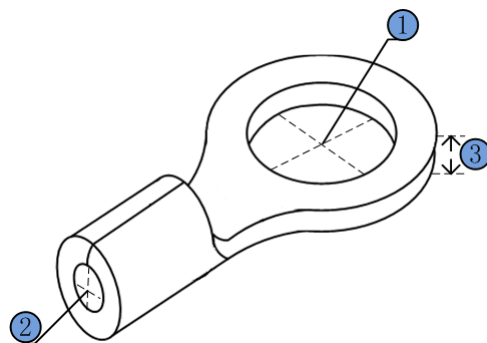


Figure 5-14 OT terminal



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

Table 5-21 lists technical specifications of the ground cable.

Table 5-21 Technical specifications of the ground cable

Parameter	Description
Cable model	PIL-ground cable-Φ4/Φ4-D/RoHS
Cable standard	Comply with the UL standard and RoHS requirements.
Conducting wire	Yellow/Green multistrand copper 16AWG (1×1.25mm <sup>2</sup> ) wire Comply with UL1007 standard.
Cable length	240 mm or customized. The letter D in the cable name indicates the length, which can be customized. For example, if the customer requires a 2-m cable, you can name it PIL-ground cable-Φ4/Φ4-2000mm/RoHS.

Table 5-22 lists technical specifications of the OT terminal.

Table 5-22 Technical specifications of the OT terminal

Parameter	Description
Model	Ground round-pressed terminal (M4)/RoHS
Technical specifications	<ul style="list-style-type: none"> <li>• Inner diameter of soldering lug: 4 mm</li> <li>• Outer diameter of soldering lug: ≤ 8 mm</li> <li>• Inner diameter of sheath: 2.1 mm</li> <li>• Thickness of soldering lug: ≥ 0.6 mm</li> </ul>
Cross-sectional area of the conducting wire	16–15 AWG (1.2–1.5 mm <sup>2</sup> )



### Note

- The iTN8600-I is delivered without the ground cable but with the OT terminal (ground round-pressed terminal (M4)/RoHS). You can prepare the ground cable by yourself or make it on site according to technical specifications.
- The ground cable cannot be longer than 30 m and should be as short as possible; otherwise, a ground bar should be used instead.

## 5.3 Compliant standards and protocols

<b>Standard and protocol</b>	<b>Description</b>
IEEE 802.1p	Traffic Class Expediting and Dynamic Multicast Filtering
IEEE 802.3	Carrier sense multiple access with collision detection(CSMA/CD) access method and physical lay specification
IETF RFC2012	SNMPv2 Management Information Base for the Transmission Control using SMIV2. K. McCloghrie, Ed.. November 1996
IETF RFC2013	SNMPv2 Management Information Base for the User Datagram Protocol using SMIV2. K. McCloghrie, Ed.. November 1996
IETF RFC2233	The Interfaces Group MIB using SMIV2. K. McCloghrie, F. Kastenholz. November 1997
IETF RFC2574	User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3). U. Blumenthal, B. Wijnen. April 1999
IETF RFC2819	Remote Network Monitoring Management Information Base. S. Waldbusser. May 2000
IETF RFC3273	Remote Network Monitoring Management Information Base for High Capacity Networks. S. Waldbusser. July 2002
IETF RFC3418	Management Information Base (MIB) for the Simple Network Management Protocol (SNMP). R. Presuhn, Ed. December 2002
ITU-T G.695	Optical interfaces for coarse wavelength division multiplexing applications
ITU-T G.698.2	Amplified multichannel DWDM applications with single channel optical interfaces
ITU-T G.709	Interfaces for the Optical Transport Network
ITU-T G.813	Timing characteristics of SDH equipment slave clocks (SEC)
ITU-T G.825	The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)
ITU-T G.8251	The control of jitter and wander within the optical transport network (OTN)
ITU-T G.841	Types and characteristics of SDH network protection architectures
ITU-T G.873.1	Optical Transport Network (OTN): Linear protection
ITU-T G.873.2	ODUk shared ring protection
ITU-T G.959.1	Optical transport network physical layer interfaces



## 5.4 Terms

### B

**Backplane** A kind of electrical circuit board, including the circuit and socket. Other circuit boards or electrical devices on the board can be inserted into the circuit or socket. In the computer system, the backplane is synonymous with the mother board or belongs to the mother board.

**Baud rate** Times of signal changes every second on a transmission link. In general, there are only two types of signal status, so the baud rate is the number of bits transmitted every second. Since lower-layer transmission will occupy some bandwidth, so user data are not necessarily transmitted according to the rated baud rate.

### C

**Card** An electronic module, composed of the chip and other electronic components installed on a flat and hard Printed Circuit Board (PCB). The PCB has conductive circuits for connecting these components.

### E

**Ethernet** It is founded by Xerox Corporation and defined by DEC, Intel, and Xerox. Ethernet is the most widely used LAN. Its rates include 10 Mbit/s, 100 Mbit/s, and 1000 Mbit/s. Ethernet adopts CSMA/CD mechanism and complies with IEEE 802.3 standard.

### F

**Fiber** Filamentous optical waveguide composed of electrical materials, used to conduct electromagnetic energy in the form of optical wave.

**Frame** It is a data transmission unit, composed of several parts, each of which has different functions.

### I

**In-band Network Management** The NMS exchanges information with a device through service networks.

### L

**Light Amplification by Stimulated Emission of Radiation (LASER)** A laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation.

Link-state tracking	Link-state tracking is used to provide interface linkage scheme for specific application and it can extend range of link backup. By monitoring uplinks and synchronizing downlinks, add uplink and downlink interfaces to a link-state group. Therefore, the fault of the upstream device can be informed to the downstream device to trigger switching. Link-state tracking can be used to prevent traffic loss due to failure in sensing the uplink fault by the downstream device.
Loopback	It is the process that a signal is sent out and then sent back to the sender. It is used to detect and analyze potential faults in a ring network.

## M

Mapping	A virtual data corresponding relationship
Multi-Mode Fiber (MMF)	In this fiber, multi-mode optical signals are transmitted.
Multiplexing	Multiplexing is a method by which multiple analog message signals or digital data streams are combined into one signal over a shared medium. Generally, it is used to adapt multiple lower-order path layer signals into a higher-order path or the multiple higher-order path layer signals into a multiplex section.

## N

Node	A joint name for the subnet, NE, and symbol in a NMS
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## O

Optical channel	It refers to an independent channel for transmitting optical information.
Optical power	The work done by light within a time unit Units of optical power include mW and dBm, of which the former is a linear unit and the latter is a logarithmic unit. The relationship between the two units is: $P(\text{dBm})=10\text{Log}(P(\text{mW})/1\text{mW})$
Out-of-band network management	Out-of-band network management refers that the NView NNM system and the device communicate with each other through a network, which is independent from the service network.

## P

Protection switching It is a feature of transport entities. It can transmit traffic of a failed device or link to another device or link, which is a bidirectional feature. After you establish M protection lines for N ( $1 \leq M \leq N$ ) working lines, when the working line fails, one of the M protection lines is determined according to the usage of locally saved protection lines and protocol signaling transmission, to replace the working line.

## R

Relative Humidity (RH) Ratio of absolute humidity to saturated humidity in the air within a certain period, in unit of percentage

## S

Single-Mode Fiber (SMF) In this fiber, single-mode optical signals are transmitted.

## T

Timeslot Time is divided into periodical frames. Each frame is divided into multiple timeslots. Each timeslot is a communication channel which can be assigned to a user.

Topology Topology includes routes and devices, describing the interconnection relationship among network nodes. It also refers to the network structure in general sense, namely, the physical layout of connected devices.

## U

User A user using the NMS client, with available NMS features determined by a set of management domains of users and user groups, and operation rights

## 5.5 Acronyms and Abbreviations

### A

AC Alternating Current

ADM Add-Drop Multiplexer

AIS Alarm Indication Signal

ALS Automatic Laser Shutdown

### B

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BER	Bit Error Rate
BIP	Bit Interleaved Parity
<b>C</b>	
CCC	China Compulsory Certification
CE	Customer Edge
CSMA/CD	Carrier Sense Multiple Access/Collision Detection
CWDM	Coarse Wavelength Division Multiplexing
<b>D</b>	
DC	Direct Current
DCN	Data Communication Network
DWDM	Dense Wavelength Division Multiplexing
<b>E</b>	
EMC	Electro Magnetic Compatibility
ES	Errored Second
ETSI	European Telecommunications Standards Institute
<b>F</b>	
FAS	Frame Alignment Signal
FC	Fiber Channel
FE	Fast Ethernet
FEC	Forwarding Error Correction
<b>G</b>	
GFP	Generic Framing Procedure
<b>I</b>	
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
iTN	intelligent Transport Network
ITU-T	International Telecommunications Union - Telecommunication Standardization Sector

**L**

LC	Little Connector
LOF	Loss of Frame
LOS	Loss of Signal

**M**

MIB	Management Information Base
MM	Multi-Mode
MTU	Maximum Transmission Unit

**N**

NView NNM	NView Network Node Management
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**O**

OC	Optical Carrier
OLP	Optical Line Protection
OTN	Optical Transport Network
OTU	Optical Channel Transport Unit
OTU2	Optical Channel Transport Unit of Level 2
OTUk	Optical Channel Transport Unit-k

**P**

PC	Personal Computer
PIN	P type-intrinsic-n type
PM	Performance Monitoring
PVC	Polyvinyl Chloride

**R**

RH	Relative Humidity
----	-------------------

**S**

SDH	Synchronous Digital Hierarchy
SES	Severely Errored Second
SFP	Small Form-factor Pluggable
SM	Single-Mode

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SNCP	Sub-Network Connection Protection
SNMP	Simple Network Management Protocol
STM	Synchronous Transport Module
STP	Spanning Tree Protocol
<b>T</b>	
TCM	Tandem Connection Monitoring
<b>U</b>	
UAS	Unavailable Seconds
UL	Underwriter Laboratories
USM	User-Based Security Model
<b>V</b>	
VLAN	Virtual Local Area Network

