

**SmartAX MA5600T/MA5603T/MA5608T
Multi-service Access Module
V800R016C00**

Product Description

Issue 01
Date 2015-04-30

Copyright © Huawei Technologies Co., Ltd. 2015. All rights reserved.

No part of this document may be reproduced or transmitted in any form or by any means without prior written consent of Huawei Technologies Co., Ltd.

Trademarks and Permissions



and other Huawei trademarks are trademarks of Huawei Technologies Co., Ltd.

All other trademarks and trade names mentioned in this document are the property of their respective holders.

Notice

The purchased products, services and features are stipulated by the contract made between Huawei and the customer. All or part of the products, services and features described in this document may not be within the purchase scope or the usage scope. Unless otherwise specified in the contract, all statements, information, and recommendations in this document are provided "AS IS" without warranties, guarantees or representations of any kind, either express or implied.

The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied.

Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base
Bantian, Longgang
Shenzhen 518129
People's Republic of China

Website: <http://www.huawei.com>

Email: support@huawei.com

About This Document

Product Version

Product Name	Product Version
MA5600T/MA5603T/MA5608T	V800R016C00
MxU	V800R016C00
ONT	V300R016C00
iManager U2000	V200R015C50

Intended Audience

This document describes the product positioning and features, architecture, function, network applications, device management, and technical specifications of the MA5600T/MA5603T/MA5608T.

This document is intended for:

- Network planning engineers
- Installation and commissioning engineers
- Field maintenance engineers
- Network monitoring engineers
- System maintenance engineers
- Data configuration engineers
- Application developers

Symbol Conventions

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

Symbol	Description
 DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 NOTICE	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
 NOTE	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Update History

Updates between document issues are cumulative. Therefore, the latest document issue contains all updates made in previous issues.

Issue 01 (2015-04-30)

Compared with issue 01 (2014-10-30) of V800R015C10, this issue has the following changes:

Position	Description
3.3 Board Datasheet	Add the H801TOPB, H80DVCPM, H80DVCPD, H80DVCPE, H80DCCPE, H807ADPE, H807ADPM, and H807ADPD Datasheet.
3.4 Port and Optical Module	Add the standards of optical and electrical module.

Contents

About This Document	ii
1 Product Positioning	1
2 Product Highlight and Application	5
2.1 HetAN.....	6
2.2 All in One.....	6
2.3 Aggregation Management for Remote Sites	9
2.4 High-Bandwidth Copper Access.....	10
2.5 Seamless Migration for PSTN Networks.....	11
2.6 Triple Protection	12
2.7 Environment-Friendly and Energy-Saving	14
2.8 Smooth Evolution from GPON to 10G GPON.....	15
3 Hardware Description	16
3.1 Product Specifications	16
3.2 Cabinet Supported	20
3.3 Board Datasheet.....	22
3.4 Port and Optical Module.....	22
3.4.1 PON Optical Module	23
3.4.2 GE Optical/Electrical Module.....	27
3.4.3 10GE Optical Module.....	32
3.4.4 FE Optical Module	35
3.4.5 FE/GE Adaptive Optical Module.....	37
3.4.6 STM-1 Optical Module.....	38
3.4.7 xDSL Port	39
3.4.8 POTS Port and ISDN Port	43
3.4.9 ATM Port	46
3.4.10 E1 Port	46
4 Product Features	47
4.1 System Architecture.....	47
4.2 Features at a Glance.....	48
5 Environment Requirement	49
5.1 Storage Environment	49

5.2 Transport Environment	51
5.3 Operation Environment.....	53
6 Standards Compliance	56
6.1 Environment Adaptability Standards	56
6.2 Electromagnetic Compatibility Standards	57
6.3 Safety Standards	59
6.4 Other International Standards	60

1 Product Positioning

This topic describes the product positioning and network applications of the SmartAX MA5600T/MA5603T/MA5608T series devices.

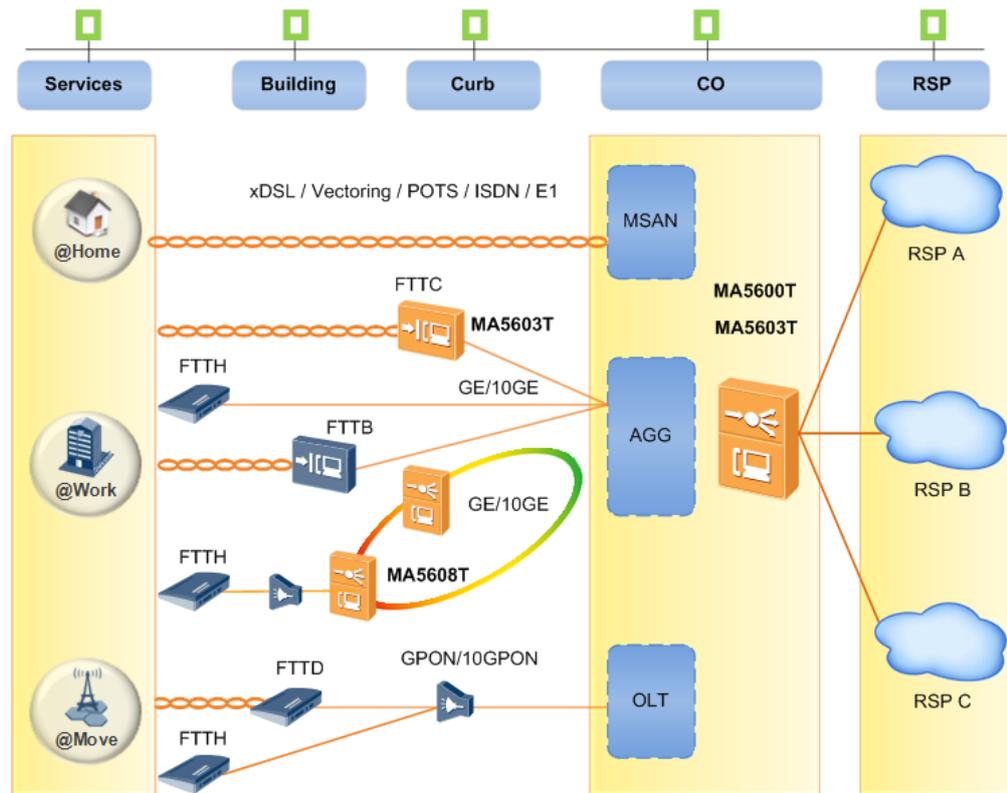
The MA5600T/MA5603T/MA5608T is a series of integrated fiber-copper access devices. They support ADSL2+, VDSL2, SHDSL, POTS, GPON, 10G GPON, and P2P access modes and provide Internet access, voice, and video services to subscribers. As a series of large-/medium-/small-capacity devices, they share the same software platform and service boards.

- Large-capacity device MA5600T
- Medium-capacity device MA5603T
- Small-capacity device MA5608T

Application

The MA5600T/MA5603T/MA5608T is a series of large-/medium-/small-capacity devices that support integrated fiber-copper access and access-aggregation integration. [Figure 1-1](#) shows their application network.

Figure 1-1 Application network



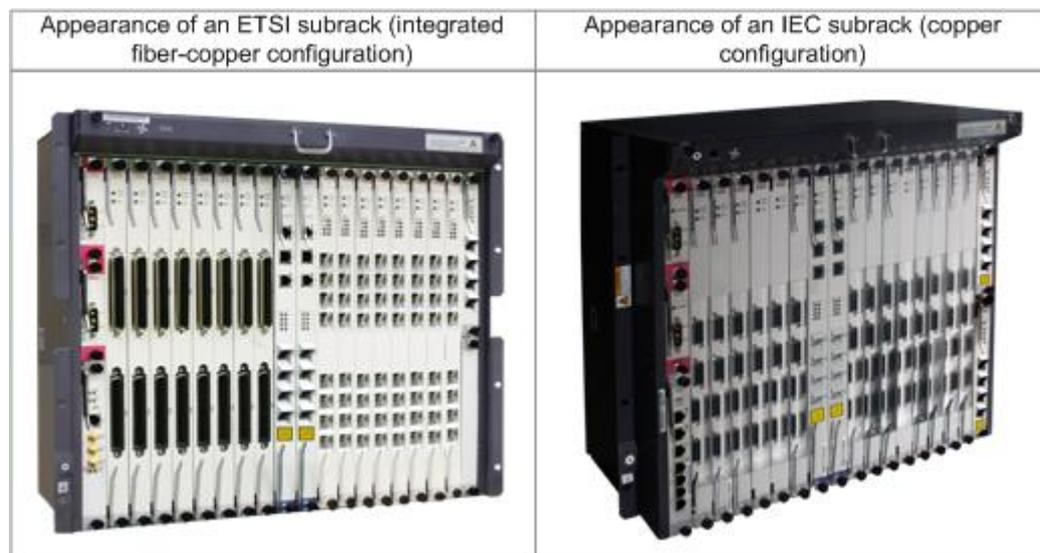
MA5600T

The MA5600T is an integrated fiber-copper access device, and can serve as a DSLAM, OLT, or aggregation OLT.

- The MA5600T, if serving as a large-capacity DSLAM, supports ADSL2+, VDSL2, SHDSL, and POTS access modes.
- The MA5600T, if serving as a large-capacity OLT, supports GPON, 10G GPON, and P2P access modes.
- The MA5600T, if serving as an aggregation OLT, supports FTTB/FTTC/DSLAM aggregation access, which simplifies the network architecture, reduces types and number of devices, and minimizes the CO equipment room space and energy consumption.

Figure 1-2 shows the appearance of the MA5600T.

Figure 1-2 Appearance of the MA5600T



MA5603T

The MA5603T is an integrated fiber-copper access device, and can serve as a DSLAM, OLT, or MDU.

- The MA5603T, if serving as an OLT, supports GPON and 10G GPON access modes. It can be installed at a residential district or a street side, which reduces the usage of ODN backbone optical cables, lowers the ODN deployment cost and difficulty, and minimizes the CO equipment room space.
- The MA5603T, if serving as a DSLAM, supports ADSL2+, VDSL2, SHDSL, and POTS access modes.
- The MA5603T, if serving as an MDU, supports ADSL2+, VDSL2, SHDSL, and POTS access modes and transmit packets upstream to the OLT through a GPON/10G GPON/GE/10 GE port.

Figure 1-3 shows the appearance of the MA5603T.

Figure 1-3 Appearance of the MA5603T configured with the xDSL boards



MA5608T

The MA5608T is an integrated fiber-copper access device, and can serve as a mini-OLT or mini-DSLAM.

- The MA5608T, if serving as a mini-OLT, supports GPON and 10G GPON access modes. It can be installed at a residential district or a street side, which reduces the usage of ODN backbone optical cables, lowers the ODN deployment cost and difficulty, and minimizes the CO equipment room space.
- The MA5608T, if serving as a mini-DSLAM, supports ADSL2+, VDSL2, SHDSL, and POTS access modes and provides Internet access, voice, and video services.

Figure 1-4 shows the appearance of the MA5608T.

Figure 1-4 Appearance of the MA5608T configured with the xPON boards



2 Product Highlight and Application

About This Chapter

The MA5600T/MA5603T/MA5608T supports the integrated fiber-copper access, aggregation capability, and various access modes, making the heterogeneous access network (HetAN) a new trend. New topologies (such as vectoring, IPv6, and 10G GPON) revive copper lines and mature optical applications.

2.1 HetAN

The MA5600T/MA5603T/MA5608T serves as the CO OLT and supports multiple network construction modes and diversified access media to provide access for home users, mobile users, and enterprise users. Such a heterogeneous access network (HetAN) wins popularity.

2.2 All in One

The integrated fiber-copper access platform and the access-aggregation integration capability of the MA5600T/MA5603T/MA5608T effectively ensure the smooth evolution of the access network.

2.3 Aggregation Management for Remote Sites

The OLT supports aggregation management and plug-and-play for remote sites. This eliminates the needs of onsite software commissioning and OSS system integration, which simplifies device management.

2.4 High-Bandwidth Copper Access

New technologies, such as VDSL2 and vectoring, increase the bandwidth over the existing copper lines. This revives the copper lines.

2.5 Seamless Migration for PSTN Networks

The MA5600T/MA5603T/MA5608T provides access for various traditional services, enabling a PSTN network seamlessly evolve to an IP network.

2.6 Triple Protection

The MA5600T/MA5603T/MA5608T provides 3 protection mechanisms on the network side, access side, and device to ensure that services are not interrupted.

2.7 Environment-Friendly and Energy-Saving

The MA5600T/MA5603T/MA5608T complies with the European Union's (EU's) Code of Conduct (CoC) standard. The MA5600T/MA5603T/MA5608T features the energy-saving

design, optimizing power consumption, noise, and heat dissipation. This makes the MA5600T/MA5603T/MA5608T an environment-friendly device and minimizes the total cost of operation (TCO).

2.8 Smooth Evolution from GPON to 10G GPON

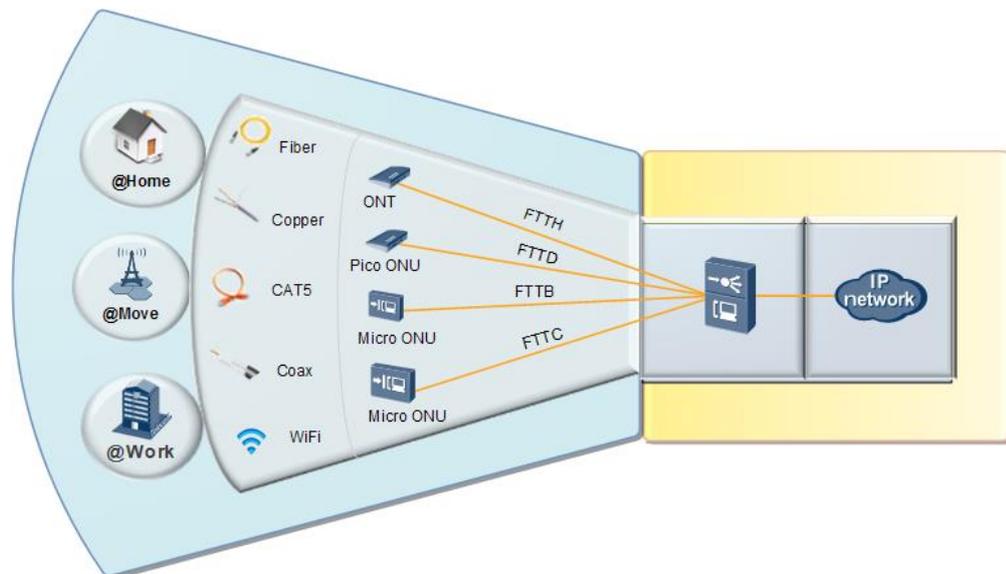
By adding the WDM1r component, the MA5600T/MA5603T/MA5608T can be smoothly upgraded from GPON to 10G GPON.

2.1 HetAN

The MA5600T/MA5603T/MA5608T serves as the CO OLT and supports multiple network construction modes and diversified access media to provide access for home users, mobile users, and enterprise users. Such a heterogeneous access network (HetAN) wins popularity.

Figure 2-1 shows the structure of the HetAN.

Figure 2-1 HetAN



User access: provides access for home users, mobile users, and enterprise users.

Network construction mode: supports FTTH, FTTB, FTTC, FTTW, FTTO, and FTTD networks.

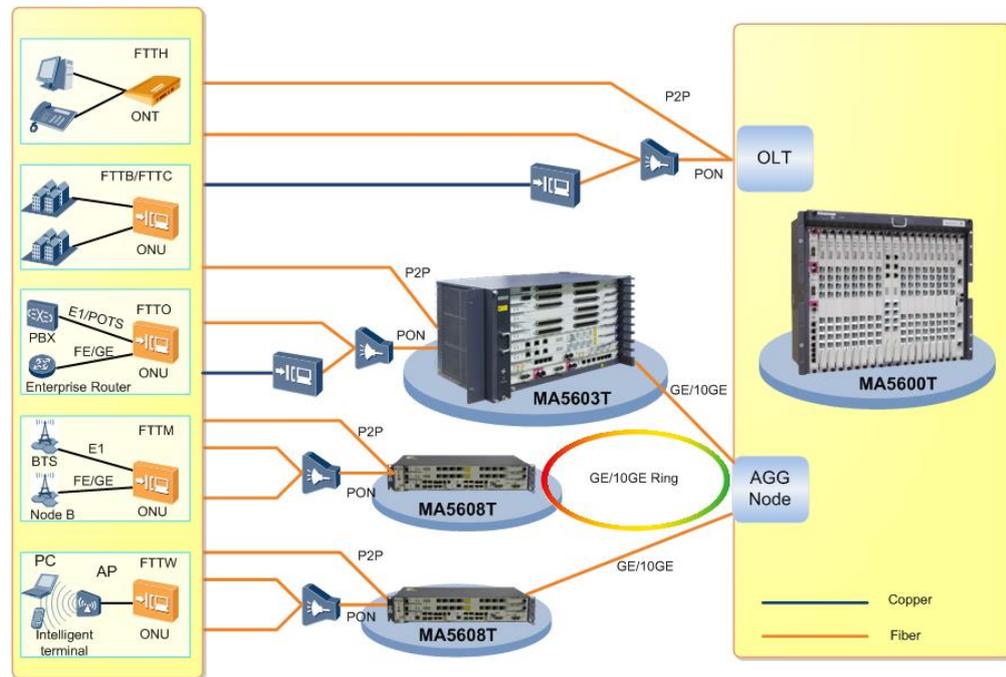
Access media: supports copper, fiber, cable, and Wi-Fi access.

2.2 All in One

The integrated fiber-copper access platform and the access-aggregation integration capability of the MA5600T/MA5603T/MA5608T effectively ensure the smooth evolution of the access network.

The MA5600T/MA5603T/MA5608T supports integrated fiber-copper access and access-aggregation integration, as shown in Figure 2-2.

Figure 2-2 MA5600T/MA5603T/MA5608T of the all in one platform



Fiber-Copper Integration

The MA5600T/MA5603T/MA5608T enables optical fibers and copper lines to be integrated in one platform, which ensures that the access network can smoothly evolve from copper line access to optical fiber access.

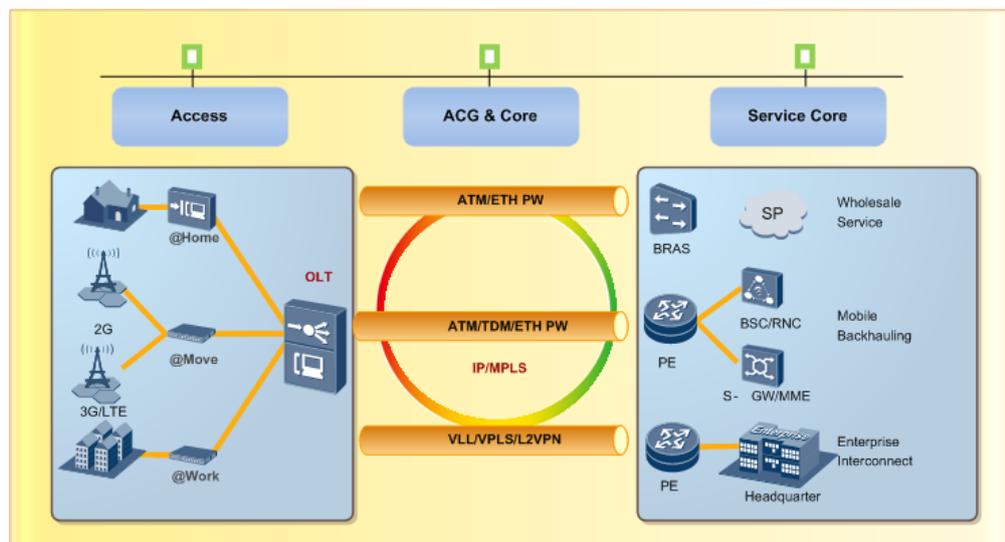
- Optical fiber access: The MA5600T/MA5603T/MA5608T supports GPON, 10G GPON, and P2P optical fiber access, satisfying the requirements of the FTTH, FTTB, FTTC, FTTO, FTTM, and FTTW scenarios.
- Copper line access: The MA5600T/MA5603T/MA5608T supports ADSL2+ (compatible with ADSL), VDSL2 (compatible with ADSL2+, SHDSL, and POTS voice services). The MA5600T/MA5603T/MA5608T supports multiple copper line access modes and makes full use of existing copper line resources to provide users with rich and flexible network services. In addition, the MA5600T/MA5603T/MA5608T can function as a DLSAM to be used in copper access only, or as an MSAN to be used in integrated fiber-copper access.

Access-Aggregation Integration

The MA5600T/MA5603T can implement FTTH/DSLAM access and FTTB/FTTC/DSLAM Ethernet aggregation in the same subrack to provide a unified traffic aggregation point on the FTTH/FTTC/FTTB/FTTD network, thereby achieving aggregation of different network construction modes, eliminating the need to construct an independent access-aggregation network layer, and simplifying the network architecture.

- The MA5600T supports a maximum non-aggregation forwarding capability of 40 Gbit/s x 16 GE.
- The MA5600T and MA5603T support the 48-port high-density aggregation board and provide access for a maximum of 768 GE ports.
- The OLT supports Layer 3 functions and can be used as an aggregation edge device. It possesses powerful Layer 3 service processing capabilities, such as 40G switching capability and 60 Mpps Layer 3 forwarding capability in the 8 x 10 GE upstream load-sharing mode. With these capabilities, the OLT can:
 - Reduce upper-layer service traffic and shorten network transmission delay. Specifically, the OLT can perform Layer 3 switching for local traffic, thereby lowering the traffic pressure of the upper-layer network and pressure of network traffic expansion.
 - Simplify the network architecture. Specifically, Layer 2 aggregation switches do not need to be deployed, thereby streamlining the network layers.
 - Improve network security. Specifically, the upper network does not learn the user-side MAC addresses, thereby eliminating the risks of MAC spoofing and broadcast storms.
- The MA5600T and MA5603T support the mature all-service MPLS solution, as shown in Figure 2-3.
 - The MA5600T and MA5603T support service transmission over ATM PWE3, TDM PWE3, ETH PWE3, VPLS, and L2VPN.
 - The MA5600T and MA5603T feature high service performance. Specifically, they support quick E2E service protection (service switching time: ≤ 200 ms).
 - The MA5600T and MA5603T do not have limitations on service authentication and terminal VLAN planning, simplifying network design and maintenance.

Figure 2-3 All-service MPLS solution



2.3 Aggregation Management for Remote Sites

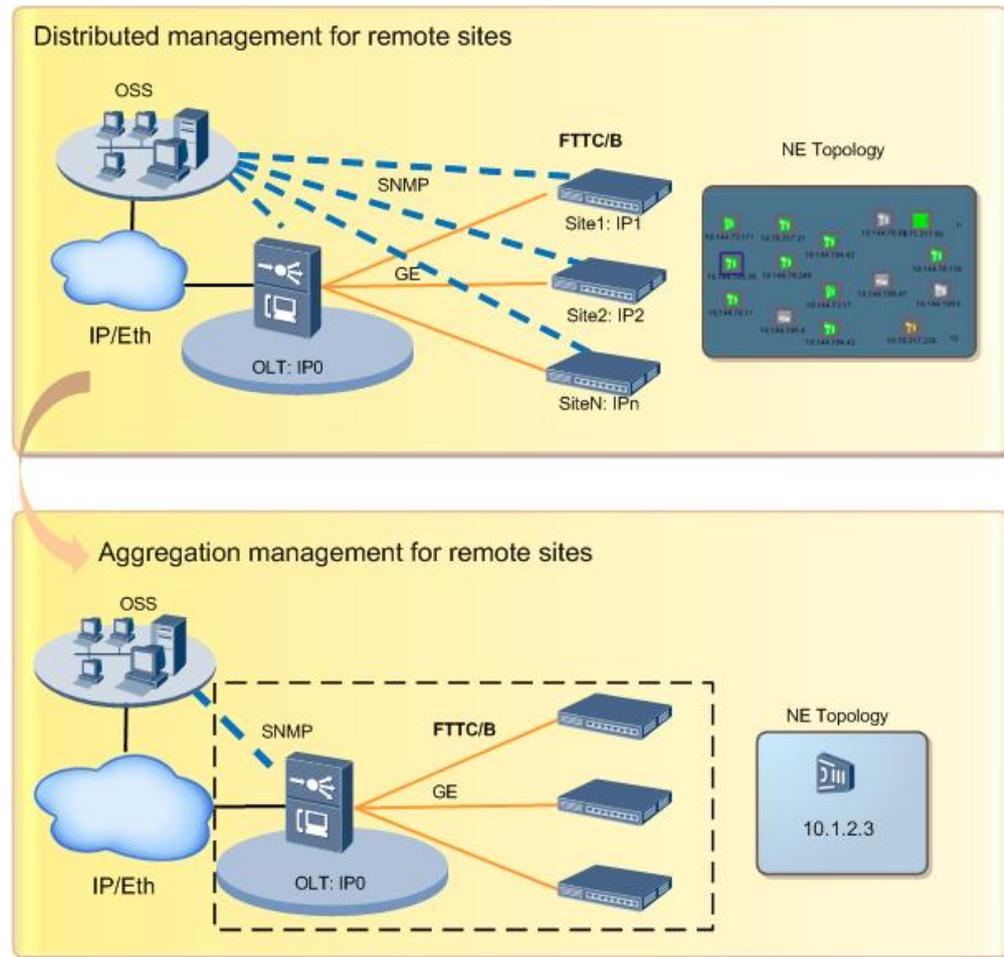
The OLT supports aggregation management and plug-and-play for remote sites. This eliminates the needs of onsite software commissioning and OSS system integration, which simplifies device management.

The management of remote devices is concentrated on the OLT through the GE aggregation. In this way, the service configuration, software upgrade, and maintenance for remote sites can be implemented using the OLT, which greatly reduces the management complexity of an FTTx network, as shown in [Figure 2-4](#).

The advantages of aggregation management for remote sites are as follows:

- **High-efficiency deployment:** There is no need to plan independent management IP addresses for remote sites, which saves the management IP address resources. Besides, pre-configuration for remote sites is not required. The remote sites, after being powered on, automatically register with the master subrack using the proprietary protocol.
- **Fast integration:** Remote sites are considered as the virtual service boards and managed by the OLT. They share the same MIB interface with the OLT. The OSS system integration is greatly simplified when new sites are added.
- **Easy OAM:** The remote sites and the main devices have a unified OAM user interface (UI), including the CLI and GUI. This relieves OAM engineers of learning OAM knowledge about new devices and saves the related costs.

Figure 2-4 Aggregation management for remote sites



2.4 High-Bandwidth Copper Access

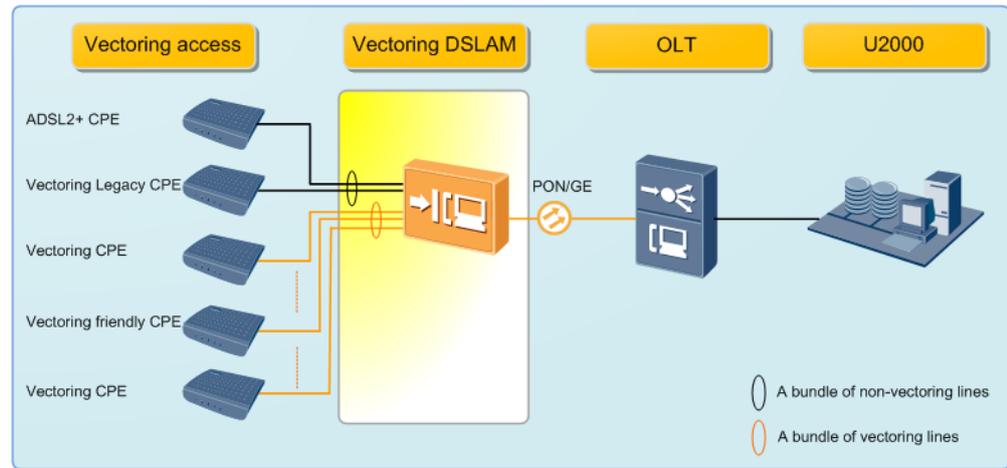
New technologies, such as VDSL2 and vectoring, increase the bandwidth over the existing copper lines. This revives the copper lines.

The bandwidth over copper lines can be boosted to about 30–50 Mbps within a distance of 500 m by upgrading the existing ADSL2+ access network to VDSL2 access network. The 64-channel high-density VDSL2 board provided by Huawei can satisfy this application.

The bandwidth of VDSL2 lines on an FTTB/FTTC network can be boosted to about 50–100 Mbps within a distance of 300 m by using the vectoring technology to eliminate the remote crosstalk of VDSL2 lines. In this way, copper lines can meet users' high-bandwidth requirement, as shown in [Figure 2-5](#).

- Plug-and-play of CPEs (of different types) and smooth vectoring evolution are supported.
- CPE auto-negotiation is supported. Smart-limit & forced friendly ensure that the bandwidth will not decrease when VDSL2 CPEs and vectoring CPEs are deployed on the same network.

Figure 2-5 Vectoring application



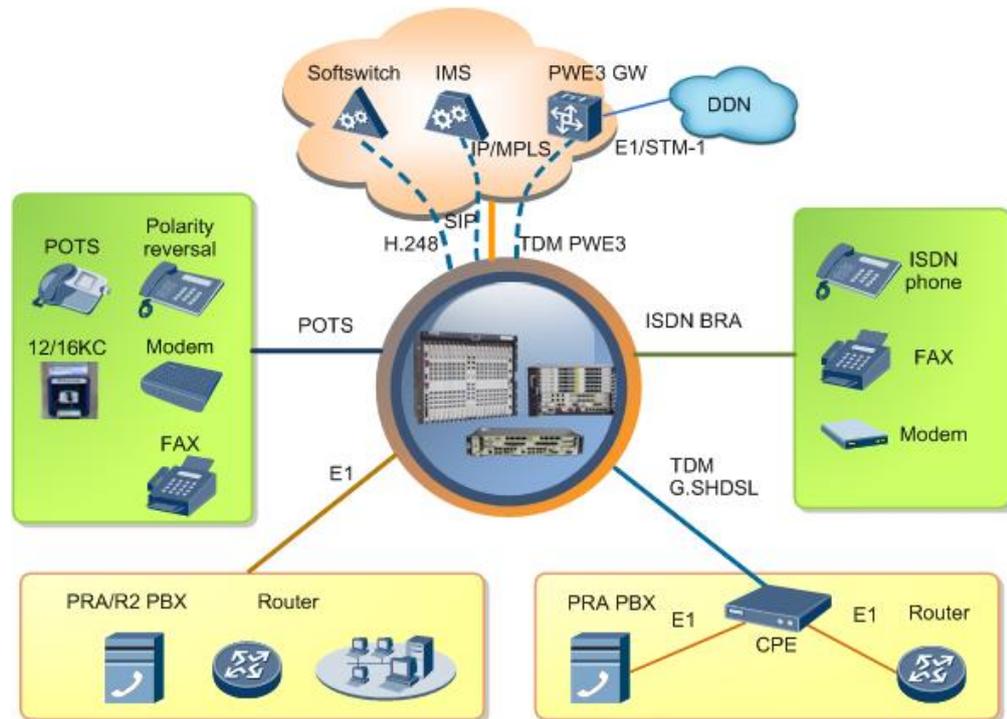
2.5 Seamless Migration for PSTN Networks

The MA5600T/MA5603T/MA5608T provides access for various traditional services, enabling a PSTN network seamlessly evolve to an IP network.

The following advantages of the MA5600T/MA5603T/MA5608T ensures the seamless evolution of a PSTN network (evolving from a PSTN to an IP network), as shown in [Figure 2-6](#).

- Supports integrated fiber-copper access and provides access for voice, ISDN, xDSL, and xPON services in one subrack, achieving smooth network evolution.
- Provides access for various traditional services, including POTS, ISDN, TDM private-line (E1 and N x 64K), and PBX services, ensuring that live network services will not be lost during the evolution from the PSTN network to IP network and that CPEs do not need to be replaced.
- Supports the 48-channel high-density combo board that implements ADSL2+ (or VDSL2), POTS, and SPL services in one board, which saves the main distribution frame (MDF) space and total cost of operation (TCO).
- Supports IMS- and SIP-oriented smooth evolution and IPTV services.

Figure 2-6 All-service migration for the PSTN network



2.6 Triple Protection

The MA5600T/MA5603T/MA5608T provides 3 protection mechanisms on the network side, access side, and device to ensure that services are not interrupted.

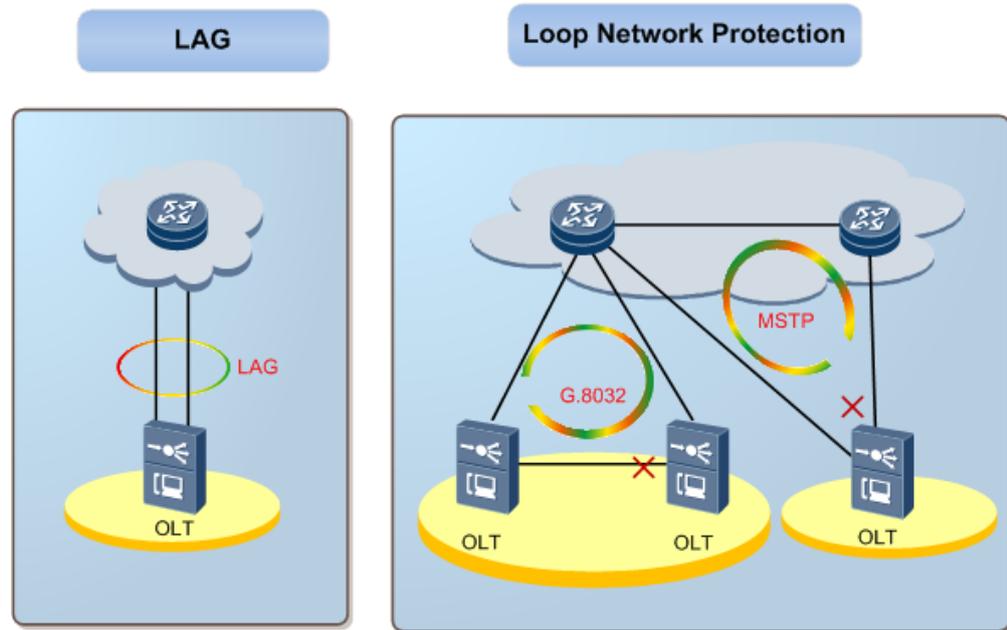
- **OLT Network Side**

On the network side, the OLT supports ring technologies, such as link aggregation, Multiple Spanning Tree Protocol (MSTP), and Ethernet ring protection switching (ERPS), to ensure uninterrupted service running. [Figure 2-7](#) shows the OLT network-side protection.

MSTP blocks redundant paths so that the loop network can be trimmed as a tree network to avoid proliferation and endless cycling of packets on the loop network. MSTP also enables redundant links to share load based on the VLAN.

ERPS ensures quick service restoration (service interruption time: ≤ 50 ms) during the interruption of an upstream physical link.

Figure 2-7 OLT network-side protection

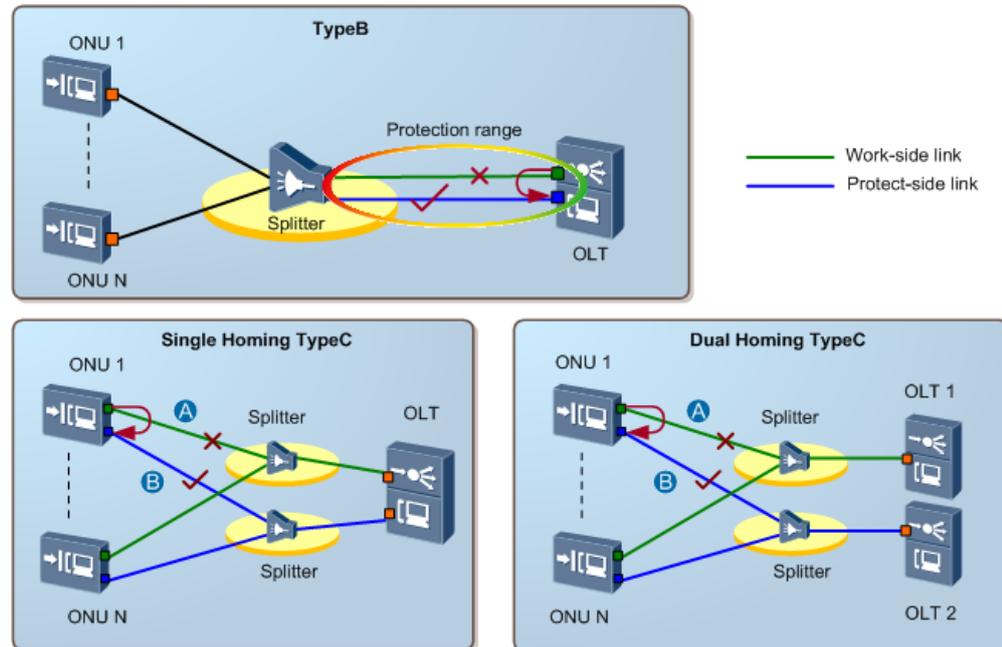


- **OLT Access Side**

On the access side, the OLT supports GPON type x protection, as shown in [Figure 2-8](#).

- The OLT supports type B protection, providing 1+1 protection for GPON ports and backbone optical cables.
- The OLT supports type C protection, providing 2 PON ports to connect to the ONU and providing 1+1 protection for backbone optical cables, optical splitters, and distribution optical cables.

Figure 2-8 OLT access-side protection



- **OLT**

The MA5600T and MA5603T support redundant backup of the control board, power board, and upstream board to improve device and service reliability. The MA5608T supports redundancy backup of the control board and DC power board.

2.7 Environment-Friendly and Energy-Saving

The MA5600T/MA5603T/MA5608T complies with the European Union's (EU's) Code of Conduct (CoC) standard. The MA5600T/MA5603T/MA5608T features the energy-saving design, optimizing power consumption, noise, and heat dissipation. This makes the MA5600T/MA5603T/MA5608T an environment-friendly device and minimizes the total cost of operation (TCO).

The following presents the environment-friendly and energy-saving design of the MA5600T/MA5603T/MA5608T.

- Uses the highest-density and highest-integration-level xDSL chipset in the industry, reducing the consumption of system resources.
- Uses the high-density board hardware design to improve port energy efficiency.
- Supports manual power-off of the board. (The faulty board in the equipment room of a site can be remotely powered off through the CLI or NMS.)
- Supports the delicacy board energy-saving features, as listed in the following:
 - The idle ports of the control board are automatically powered off, and they will be automatically powered on and restore to the normal state if they are put into use.
 - The idle boards can be automatically identified and powered off (or automatically enter the hibernation state). The idle boards can be automatically powered on/wakened up and restore to the normal state if they are put into use.

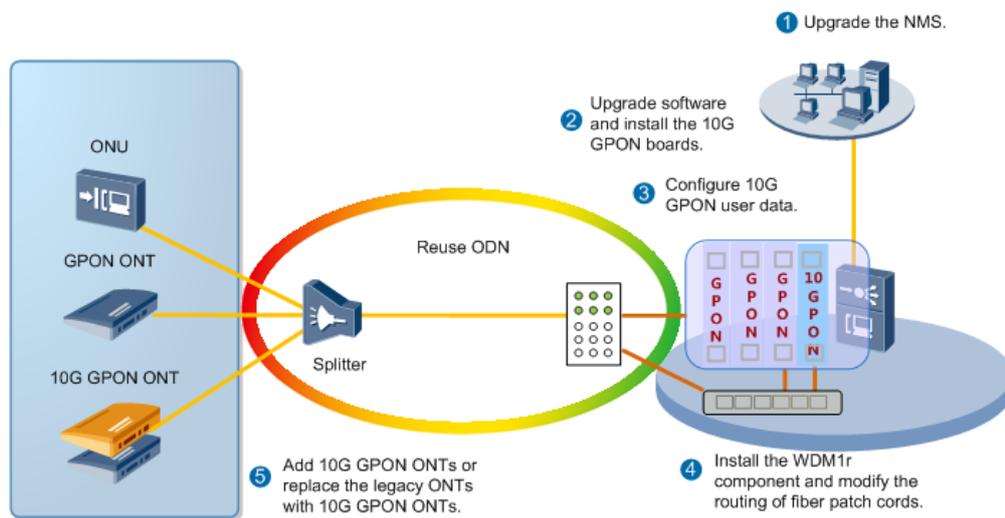
- The DSL user ports support Layer 2 low power consumption state and Layer 3 standby state.
- Supports automatic fan speed adjustment and stepless fan speed adjustment based on the component temperature.

2.8 Smooth Evolution from GPON to 10G GPON

By adding the WDM1r component, the MA5600T/MA5603T/MA5608T can be smoothly upgraded from GPON to 10G GPON.

Carriers can newly construct a 10G GPON network or upgrade a GPON network to a 10G GPON network, as shown in Figure 2-9. Specifically, the WDM1r component is added to the OLT so that GPON and 10G GPON signals can be transmitted over the same ODN in the multiplexing mode.

Figure 2-9 Evolution from GPON to 10G GPON



3 Hardware Description

About This Chapter

This topic describes the system specifications, board datasheets, and optical module information about the MA5600T/MA5603T/MA5608T.

3.1 Product Specifications

3.2 Cabinet Supported

This topic describes the dimensions, power parameters, and capacity of the cabinets supported by the MA5600T/MA5603T/MA5608T.

3.3 Board Datasheet

A board datasheet mainly introduces the physical and technical specifications and the appearance of a board. The datasheet of a board is released as a PDF document.

3.4 Port and Optical Module

This topic describes the specifications, standards and protocols compliance of the ports and optical modules supported by the MA5600T/MA5603T/MA5608T.

3.1 Product Specifications

This topic describes the physical and technical specifications of MA5600T/MA5603T/MA5608T series products.

Item	MA5600T (ETSI)	MA5600T (IEC)	MA5603T	MA5608T
Appearance	See 1 Product Positioning .			
Supported cabinet	Indoor cabinet: N63E-22, N66E-18 Outdoor cabinet: F01D500, F01D2000	Indoor cabinet: N66E-22 Outdoor cabinet: none	Indoor cabinet: N66E-18 Outdoor cabinet: F01D500, F01S300	Indoor cabinet: N63E-22 Outdoor cabinet: F01S200

Item	MA5600T (ETSI)	MA5600T (IEC)	MA5603T	MA5608T
Board configuration	2 slots for control boards 16 slots for service boards 1 slot for the universal interface board 2 slots for upstream interface boards 2 slots for power interface boards.	2 slots for control boards 14 slots for service boards 1 slot for the universal interface board 2 slots for upstream interface boards 2 slots for power interface boards.	2 slots for control boards 6 slots for service boards 1 slot for the universal interface board 2 slots for upstream interface boards 2 slots for power interface boards.	2 slots for control boards 2 slots for service boards 2 slots for the power interface board.
Switching capacity of the backplane bus	3.2 Tbit/s		1.5 Tbit/s (H801MABO) 2 Tbit/s (H802MABO)	720 Gbit/s
Supported control board and its switching capacity	SCUN: 480 Gbit/s in active/standby mode or 960 Gbit/s in load-sharing mode SCUH: 960 Gbit/s in active/standby mode or 1920 Gbit/s in load-sharing mode SCUB: 48 Gbit/s SCUF: 128 Gbit/s			MCUD/MCUD 1: 128 Gbit/s in active/standby mode or 256 Gbit/s in load-sharing mode
System Layer 2 packet forwarding rate	SCUN: 726 Mpps in active/standby mode or 1452 Mpps in load-sharing mode SCUH: 1428 Mpps in active/standby mode or 2856 Mpps in load-sharing mode SCUB: 72 Mpps SCUF: 190 Mpps			MCUD/MCUD 1: 190 Mpps in active/standby mode or 380 Mpps in load-sharing mode
Switching/Forwarding delay	Short forwarding delay: The 100 Mbit/s Ethernet port sends the 64-byte Ethernet packets at a delay shorter than 20 μ s.			
BER in full load	BER of a port when the port transmits data in full load < 10 e-7			
System reliability specifications	System: redundant configuration. System availability for the typical configuration: > 99.999% Mean time between failures (MTBF): about 45 years. NOTE Due to different network environments and different boards used by devices, the preceding MTBF (45 years) of the MA5600T/MA5603T/MA5608T is only for reference. The average repair time for field replaceable units (FRUs) is about 2 hours. The preceding values are only for reference. For details, contact the related Huawei engineers.			

Item	MA5600T (ETSI)	MA5600T (IEC)	MA5603T	MA5608T
Maximum number of ADSL2+ ports in a subrack	1024	896	384	128
Maximum number of VDSL2 ports in a subrack	1024	896	384	128
Maximum number of EFM SHDSL ports in a subrack	512	448	192	64
Maximum number of TDM SHDSL ports in a subrack	256	224	96	32
Maximum number of POTS ports in a subrack	1024	896	384	128
Maximum number of ISDN BRA ports in a subrack	512	448	192	64
Maximum number of ISDN PRA ports in a subrack	64	56	64	64
Maximum number of GPON ports in a subrack	256	-	96	32
Maximum number of 10G GPON ports in a subrack	128	-	48	16
Maximum number of P2P FE ports in a subrack	768	-	288	96
Maximum number of P2P	768	-	288	96

Item	MA5600T (ETSI)	MA5600T (IEC)	MA5603T	MA5608T
GE ports in a subrack				
Maximum number of upstream ports (GE ports in the GIU slot) in a subrack	8	8	8	-
Maximum number of upstream ports (10GE ports in the GIU slot) in a subrack	4	4	4	-
Maximum number of upstream ports (PON ports in the GIU slot) in a subrack	2 (in the active/standby mode)	2 (in the active/standby mode)	2	-
Maximum number of upstream ports (ports on the control board) in a subrack	SCUN/SCUK: 8 x GE (in the load-sharing mode) SCUH: 8 x 10GE (in the load-sharing mode) SCUB/SCUF: 4 x GE (in the active/standby mode)			MCUD: 8 x GE (in the load-sharing mode) MCUD1: 4 x GE + 2 x 10GE (in the load-sharing mode)
Maximum number of extended subracks connected to a master subrack	32	32	32	-
Maximum number of ONUs supported by each subrack	<ul style="list-style-type: none"> For Layer 2 applications, the maximum number of ONUs supported by each subrack is determined based on the number of MAC addresses and service flows supported by the control board, as well as the number of MAC addresses and service flows planned for the ONUs. For Layer 3 applications, the maximum number of ONUs supported by each subrack is determined based on the number of routes and ARP entries supported by the control board. <p>For details about specifications, see "Specifications" in each section of the <i>Feature Guide</i>.</p>			

3.2 Cabinet Supported

This topic describes the dimensions, power parameters, and capacity of the cabinets supported by the MA5600T/MA5603T/MA5608T.

Table 3-1 describes the overview of the cabinets supported by the MA5600T/MA5603T/MA5608T.

Table 3-1 Overview of cabinets supported by the MA5600T/MA5603T/MA5608T

Cabinet	Description	Configuration
N63E-22	Indoor cabinet Dimensions (H x W x D): 2200 mm x 600 mm x 300 mm DC power supply: -48 V/-60 V Working voltage range: -38.4 V to -72 V Maximum input current: 80 A	Supported MA5600T ETSI service subrack configurations: <ul style="list-style-type: none"> • 1 ETSI service subrack • 2 ETSI service subracks • 1 ETSI service subrack and 1 SPL subrack Supported MA5608T chassis configurations: <ul style="list-style-type: none"> • 1 MA5608T chassis • 2 MA5608T chassis
N66E-18	Indoor cabinet Dimensions (H x W x D): 1800 mm x 600 mm x 600 mm Power supply: <ul style="list-style-type: none"> • DC power supply: -48 V/-60 V • AC power supply: 110 V/220 V Working voltage range: <ul style="list-style-type: none"> • DC power supply: -38.4 V to -72 V • AC power supply: 100 V to 240 V Maximum input current: <ul style="list-style-type: none"> • MA5600T: 80 A DC or 32 A AC • MA5603T: 32 A DC or 15 A AC 	Supported MA5600T ETSI service subrack configurations: <ul style="list-style-type: none"> • DC-powered cabinet with 2 ETSI service subracks • DC-powered cabinet with 1 ETSI service subrack and 1 SPL subrack • AC-powered cabinet with 2 ETSI service subracks • AC-powered cabinet with 1 ETSI service subrack • AC-powered cabinet with 1 ETSI service subrack and 1 SPL subrack Supported MA5603T chassis configurations: <ul style="list-style-type: none"> • DC-powered cabinet with 2 MA5603T chassis • AC-powered cabinet with 2 MA5603T chassis
N66-22	Indoor cabinet Dimensions (H x W x D): 2200 mm x 600 mm x 600 mm DC power supply: -48 V/-60 V Working voltage range: -38.4 V to -72 V Maximum input current: 80 A	Supported 2 MA5600T IEC service subracks

Cabinet	Description	Configuration
F01D500	<p>Outdoor cabinet</p> <p>Dimensions (H x W x D): 1650 mm x 1550 mm x 550 mm</p> <p>AC power supply: 200 V to 240 V</p> <p>Rated input voltage frequency: 50 or 60 Hz</p> <p>Maximum input current: 30 A</p>	<p>Supported 1 MA5600T ETSI service subrack</p> <p>Supported MA5603T chassis configurations:</p> <ul style="list-style-type: none"> • 1 MA5603T chassis • 2 MA5603T chassis
F01D2000	<p>Outdoor cabinet</p> <p>Dimensions (H x W x D): 1850 mm x 1750 mm x 800 mm</p> <p>AC power supply: 200 V to 240 V</p> <p>Rated input voltage frequency: 50 or 60 Hz</p> <p>Maximum input current: 55 A</p>	<p>Supported 2 MA5600T ETSI service subracks</p>
F01S300	<p>Outdoor cabinet</p> <p>Dimensions (H x W x D): 1350 mm x 850 mm x 450 mm</p> <p>AC power supply: 200 V to 240 V</p> <p>Rated input voltage frequency: 50 or 60 Hz</p> <p>Maximum input current: 13 A</p>	<p>Supported 1 MA5603T chassis</p>
F01S200	<p>Outdoor cabinet</p> <p>Dimensions (H x W x D): 850 mm x 750 mm x 350 mm</p> <p>AC power supply: 100 V to 240 V</p> <p>Rated input voltage frequency: 50 or 60 Hz</p> <p>Maximum input current:</p> <ul style="list-style-type: none"> • If the input voltage is within the range of 200 to 240 V, the maximum input current is 9 A. • If the input voltage is within the range of 100 to 240 V, the maximum input current is within the range of 9 to 16 A. 	<p>Supported 1 MA5608T chassis</p>

Cabinet capacity = Number of service subracks in a cabinet x Number of service boards in a subrack x Number of ports in a service board

Table 3-2 Maximum number of ports (channels) in each type of board

Port Type	Maximum Number of Ports
GPON	16
10G GPON	8
ADSL2+ ports (channels)	64
VDSL2 ports (channels)	64
SHDSL ports (channels)	EFM SHDSL: 32 TDM SHDSL: 16
Combo ports (channels)	ADSL2+&POTS: 48 VDSL2&POTS: 64
POTS ports (channels)	64
ISDN	ISDN BRA: 32 ISDN PRA: 16 (The system supports maximum 64 channels ISDN PRA access.)
E1	16
P2P FE/GE	Single-fiber bi-directional: 48 Two-fiber bi-directional: 24
Ethernet	GE: 40 10GE: 8

3.3 Board Datasheet

A board datasheet mainly introduces the physical and technical specifications and the appearance of a board. The datasheet of a board is released as a PDF document.

Please refer to **Board Datasheet**.

3.4 Port and Optical Module

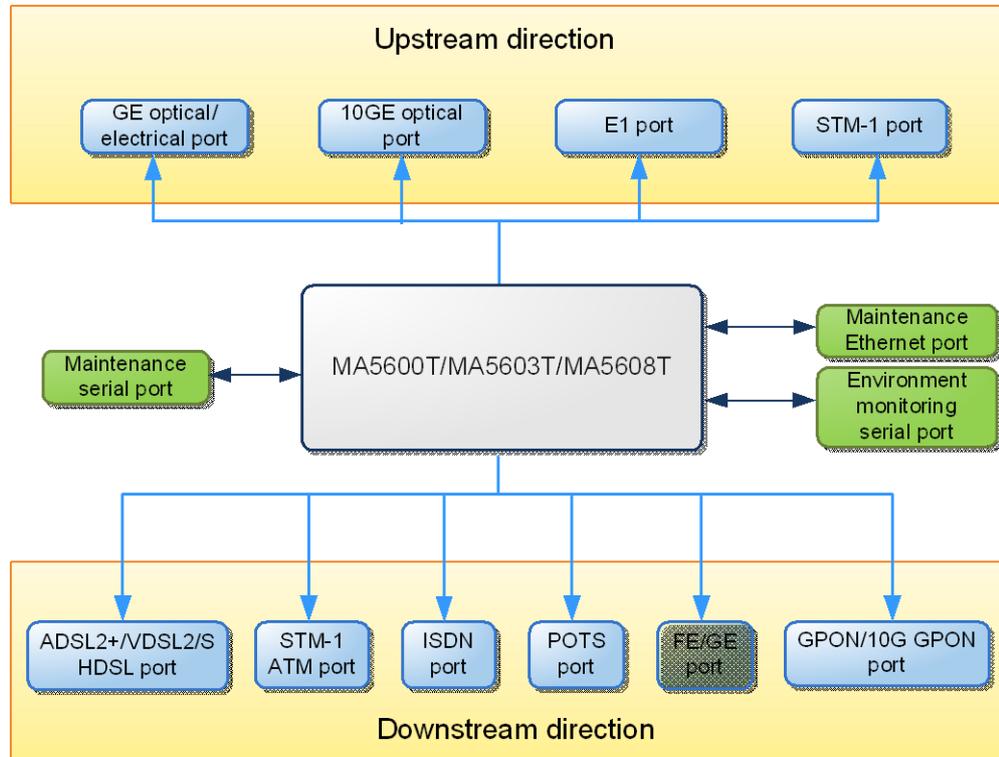
This topic describes the specifications, standards and protocols compliance of the ports and optical modules supported by the MA5600T/MA5603T/MA5608T.

[Figure 3-1](#) shows the ports supported by the MA5600T/MA5603T/MA5608T.



The commonly used ports are listed here. For information about more ports, see the *Hardware Description*.

Figure 3-1 Ports supported by the MA5600T/MA5603T/MA5608T



3.4.1 PON Optical Module

This topic describes the types, parameters, and relation with boards of PON optical modules.

Table 3-3 shows the relation between PON optical modules and boards.

Table 3-3 Relation between PON optical modules and boards

Board Type	Board Name	Module Type
Upstream interface board	P2CA	PON Upstream Optical Module
GPON interface board	GPBC/GPBD/GPFD/GPBH/GPMD	GPON Optical Module
	XGBC/XGBD	10G-GPON Optical Module

GPON Optical Module

A GPON optical module is connected to one SC optical fiber to provide GPON access service.

Table 3-4 lists the specifications of GPON optical modules.

Table 3-4 Specifications of GPON optical modules

No.	1	2	3
Type	One-fiber bi-directional optical module, class B+	One-fiber bi-directional optical module, class C+	eOTDR One-fiber bi-directional optical module, class B+
Operating Wavelength	Tx: 1490 nm Rx: 1310 nm	Tx: 1490 nm Rx: 1310 nm	Tx: 1490 nm Rx: 1310 nm
Encapsulation Type	SFP	SFP	SFP
Port Rate	Tx: 2.49 Gbit/s Rx: 1.24 Gbit/s	Tx: 2.49 Gbit/s Rx: 1.24 Gbit/s	Tx: 2.49 Gbit/s Rx: 1.24 Gbit/s
Minimum Output Optical Power	1.50 dBm	3.00 dBm	1.50 dBm
Maximum Output Optical Power	5.00 dBm	7.00 dBm	5.00 dBm
Maximum Receiver Sensitivity	-28.00 dBm	-32.00 dBm	-28.00 dBm
Optical Connector Type	SC/PC	SC/PC	SC/UPC
Optical Fiber Type	Single-mode	Single-mode	Single-mode
Overload Optical Power	-8.0 dBm	-12.0 dBm	-8.0 dBm
Extinction Ratio	8.2 dB	8.2 dB	8.2 dB

10G-GPON Optical Module

A 10G-GPON optical module is connected to one SC optical fiber to provide 10G-GPON access service. [Table 3-5](#) lists the specifications of 10G-GPON optical modules.

Table 3-5 Specifications of 10G-GPON optical modules

No.	1	2
Type	One-fiber bi-directional optical module	One-fiber bi-directional optical module
Operating Wavelength	Tx: 1577 nm Rx: 1270 nm	Tx: 1577 nm Rx: 1270 nm
Encapsulation Type	XFP	SFP+
Port Rate	Tx: 9.95 Gbit/s Rx: 2.49 Gbit/s	Tx: 9.95 Gbit/s Rx: 2.49 Gbit/s
Minimum Output Optical Power	2 dBm	2 dBm
Maximum Output Optical Power	6 dBm	6 dBm
Maximum Receiver Sensitivity	-27.5 dBm	-27.5 dBm
Optical Connector Type	SC/UPC	SC/PC
Optical Fiber Type	Single-mode	Single-mode
Overload Optical Power	-7 dBm	-7 dBm
Extinction Ratio	8.2 dB	8.2 dB

PON Upstream Optical Module

A PON upstream optical module is applicable to the P2CA board. It is connected to one SC optical fiber to provide PON upstream transmission. [Table 3-6](#) lists a specifications of a PON upstream optical module.

Table 3-6 Specifications of a PON upstream optical module

Type	One-fiber bi-directional optical module, ONU class B+
Operating Wavelength	Tx: 1310 nm Rx: 1490 nm

Encapsulation Type	SFP
Port Rate	Tx: 1.24 Gbit/s Rx: 2.49 Gbit/s
Minimum Output Optical Power	0.50 dBm
Maximum Output Optical Power	5.00 dBm
Maximum Receiver Sensitivity	-27.00 dBm
Optical Connector Type	SC/UPC
Optical Fiber Type	Single-mode

Standards Compliance of the GPON Port

Standard ID	Description
ITU-T G.984.1	Gigabit-capable Passive Optical Networks (GPON) General Characteristics
ITU-T G.984.2	Gigabit-capable Passive Optical Networks (GPON) Physical Media Dependent (PMD) Layer Specification
ITU-T G.984.3	Gigabit-capable Passive Optical Networks (GPON) Transmission Convergence Layer Specification
ITU-T G.984.4	Gigabit-capable Passive Optical Networks (GPON) ONU Management and Control Interface Specification

Standards Compliance of the 10G GPON Port

Standard ID	Description
ITU-T G.987.1	10Gigabit-capable Passive Optical Networks (XG-PON) General Requirements
ITU-T G.987.2	10Gigabit-capable Passive Optical Networks (XG-PON) Physical Media Dependent (PMD) Layer Specification
ITU-T G.987.3	10Gigabit-capable Passive Optical Networks (XG-PON) Transmission Convergence Layer Specification

Standard ID	Description
ITU-T G.988	10Gigabit-capable Passive Optical Networks (XG-PON) ONU Management and Control Interface Specification

3.4.2 GE Optical/Electrical Module

This topic describes the types, parameters, and relation with boards of GE optical/electrical modules.

Table 3-7 shows the relation between GE optical/electrical modules and boards.

Table 3-7 Relation between GE optical/electrical modules and boards

Board Type	Board Name	One-channel Two-fiber Bi-directional GE Optical Module	One-channel One-fiber Bi-directional GE Optical Module	Two-channel One-fiber Bi-directional GE Optical Module	One-channel Two-fiber Bi-directional GE CWDM Optical Module	GE Electrical Module
Control board	SCUB/SCUN/SCUK	√	√	×	√	√
	SCUF	√	√	×	√	√
	SCUH	√	√	×	√	√
	MCUD/MCUD1/MCUE	√	√	×	√	√
Upstream interface board	GICF	√	√	×	√	√
	GICK	√	√	×	√	×
	GICD	√	√	×	√	√
	GSCA	√	√	×	√	×
SPU board	SPUA/SPUF	√	√	×	√	×
	SPUC	√	√	√	√	×
Ethernet service access board	ETHA	√	×	×	×	×
	ETHB	√	√	×	√	√
P2P interface board	OPGD/OPGE	√	√	√	√	√

One-channel Two-fiber Bi-directional GE Optical Module

A one-channel two-fiber bi-directional GE optical module is connected to two LC optical fibers (one for transmission and the other for reception) to provide one GE channel. [Table 3-8](#) lists the specifications of one-channel two-fiber bi-directional GE optical modules.

Table 3-8 Specifications of one-channel two-fiber bi-directional GE optical modules

Type	One-channel two-fiber bi-directional optical module						
No.	1	2	3	4	5	6	7
Operating Wavelength	850 nm	850 nm	1310 nm	1310 nm	1310 nm	1550 nm	1550 nm
Encapsulation Type	eSFP	SFP	eSFP	eSFP	eSFP	eSFP	eSFP
Port Rate	2.13 Gbit/s 1.25 Gbit/s 1.06 Gbit/s	1.25 Gbit/s	1.25 Gbit/s	1.25 Gbit/s	1.25 Gbit/s	1.25 Gbit/s	1.25 Gbit/s
Minimum Output Optical Power	-9.50 dBm	-9.50 dBm	-9.50 dBm	-9.00 dBm	-5.00 dBm	-5.00 dBm	-2.00 dBm
Maximum Output Optical Power	-2.50 dBm	0 dBm	-3.00 dBm	-3.00 dBm	0 dBm	0 dBm	5.00 dBm
Maximum Receiver Sensitivity	-17.00 dBm	-17.00 dBm	-20.00 dBm	-20.00 dBm	-23.00 dBm	-22.00 dBm	-23.00 dBm
Optical Connector Type	LC	LC	LC	LC	LC	LC	LC
Optical Fiber Type	Multi-mode	Multi-mode	Single-mode	Single-mode	Single-mode	Single-mode	Single-mode
Reach	0.50 km	0.55 km	10.00 km	10.00 km	40.00 km	40.00 km	80.00 km
Overload Optical Power	-3.0 dBm	-3.0 dBm	-3.0 dBm	-3.0 dBm	-3.0 dBm	-3.0 dBm	-3.0 dBm
Extinction Ratio	9.0 dB	9.0 dB	9.0 dB	9.0 dB	9.0 dB	8.5 dB	9.0 dB

One-channel One-fiber Bi-directional GE Optical Module

A one-channel one-fiber bi-directional GE optical module is connected to one LC optical fiber (for both transmission and reception) to provide one GE channel. [Table 3-9](#) lists the specifications of one-channel one-fiber bi-directional GE optical modules.

Table 3-9 Specifications of one-channel one-fiber bi-directional GE optical modules

Type	One-channel one-fiber bi-directional optical module				
No.	1	2	3	4	5
Operating Wavelength	Tx: 1310 nm Rx: 1490 nm	Tx: 1490 nm Rx: 1310 nm	Tx: 1310 nm Rx: 1490 nm	Tx: 1490 nm Rx: 1310 nm	Tx: 1570nm Rx: 1490nm
Encapsulation Type	eSFP	eSFP	eSFP	eSFP	eSFP
Port Rate	1.25 Gbit/s	1.25 Gbit/s	1.25 Gbit/s	1.25 Gbit/s	1.25 Gbps
Minimum Output Optical Power	-9.00 dBm	-9.00 dBm	-2.00 dBm	-2.00 dBm	-2 dBm
Maximum Output Optical Power	-3.00 dBm	-3.00 dBm	3.00 dBm	3.00 dBm	4 dBm
Maximum Receiver Sensitivity	-19.50 dBm	-19.50 dBm	-23.00 dBm	-23.00 dBm	-26 dBm
Optical Connector Type	LC	LC	LC	LC	LC
Optical Fiber Type	Single-mode	Single-mode	Single-mode	Single-mode	Single-mode
Reach	10.00 km	10.00 km	40.00 km	40.00 km	80 km
Overload Optical Power	-3.0 dBm	-3.0 dBm	-3.0 dBm	-3.0 dBm	-3 dBm
Extinction Ratio	6.0 dB	6.0 dB	9.0 dB	9.0 dB	9 dB

Two-channel One-fiber Bi-directional GE Optical Module

A two-channel one-fiber bi-directional GE optical module is connected to two LC optical fibers (each for both transmission and reception) to provide two GE channels. [Table 3-10](#) lists the specifications of a two-channel one-fiber bi-directional GE optical module.

Table 3-10 Specifications of a two-channel one-fiber bi-directional GE optical module

Type	Two-channel one-fiber bi-directional optical module
Operating Wavelength	Tx: 1490 nm Rx: 1310 nm
Encapsulation Type	CSFP
Port Rate	1.25 Gbit/s
Minimum Output Optical Power	-9.00 dBm
Maximum Output Optical Power	-3.00 dBm
Maximum Receiver Sensitivity	-19.50 dBm
Optical Connector Type	LC
Optical Fiber Type	Single-mode
Reach	10.00 km
Overload Optical Power	-3.0 dBm
Extinction Ratio	6.0 dB

One-channel Two-fiber Bi-directional GE CWDM Optical Module

A GE CWDM optical module is connected to two LC optical fibers (one for transmission and the other for reception) to provide one GE channel. [Table 3-11](#) lists the specifications of GE CWDM optical modules.

Table 3-11 Specifications of one-channel two-fiber bi-directional GE CWDM optical modules

Type	One-channel two-fiber bi-directional optical module
Operating Wavelength	1471 nm, 1491 nm, 1511 nm, 1531 nm, 1551 nm, 1571 nm, 1591 nm, 1611 nm
Encapsulation Type	eSFP
Port Rate	100 M ~ 2.67 Gb/s

Minimum Output Optical Power	0 dBm
Maximum Output Optical Power	-5.0 dBm
Maximum Receiver Sensitivity	-28.0 dBm
Optical Connector Type	LC
Optical Fiber Type	Single-mode
Reach	80.0 km
Overload Optical Power	-9.0 dBm
Extinction Ratio	8.5 dB



NOTE

There are different types of GE CWDM optical modules, and these types of optical modules vary with the operating wavelength.

GE Electrical Module

A GE electrical module is connected to a network cable to provide one GE channel. [Table 3-12](#) lists the specifications of a GE electrical module.

Table 3-12 Specifications of a GE electrical module

Type	1000Base-T RJ45 electrical port
Encapsulation Type	SFP
Port Rate	Full-duplex 1000 Mbit/s
Reach	100.00 m

Standards Compliance of the GE Optical Module

Standard ID	Description
IEEE 802.3z	1000BASE-X Gbit/s Ethernet over Fiber-Optic at 1 Gbit/s
SFF-8472	Specification for Diagnostic Monitoring Interface for

Standard ID	Description
	Optical Transceivers

Standards Compliance of the GE Electrical Module

Standard ID	Description
IEEE 802.3ab	1000BASE-T Gbit/s Ethernet over twisted pair at 1 Gbit/s

3.4.3 10GE Optical Module

This topic describes the types, parameters, and relation with boards of 10GE optical modules.

[Table 3-13](#) shows the relation between 10GE optical modules and boards.

Table 3-13 Relation between 10GE optical modules and boards

Board Type	Board Name	10GE Optical Module (SFP+)	10GE Optical Module (XFP)	10GE CWDM Optical Module (SFP+)
Control board	SCUH/SCUV	√	×	√
	MCUD1	√	×	√
Upstream interface board	X1CA	×	√	×
	X2CA	×	√	×
	X2CS	√	×	√
SPU board	SPUA/SPUC /SPUF	√	×	√

10GE Optical Module (SFP+)

A 10GE optical module (SFP+) is connected to two LC optical fibers to provide one GE channel. [Table 3-14](#) lists the specifications of 10GE optical modules (SFP+).

Table 3-14 Specifications of 10GE optical modules (SFP+)

Type	One-channel two-fiber bi-directional optical module			
No.	1	2	3	4
Operating Wavelength	850 nm	1310 nm	1550 nm	1550 nm
Encapsulation Type	SFP+	SFP+	SFP+	

Port Rate	10 Gbit/s	10 Gbit/s	9.95-11.10 Gbit/s	9.95-11.10 Gbit/s
Minimum Output Optical Power	-7.30 dBm	-8.20 dBm	-4.70 dBm	0 dBm
Maximum Output Optical Power	-1.00 dBm	0.50 dBm	4.00 dBm	4.00 dBm
Maximum Receiver Sensitivity	-11.10 dBm	-12.60 dBm	-14.10 dBm	-24.00 dBm
Optical Connector Type	LC	LC	LC	LC
Optical Fiber Type	Multi-mode	Single-mode	Single-mode	Single-mode
Reach	0.30 km	10.00 km	40.00 km	80.00 km
Overload Optical Power	-1.0 dBm	0.5 dBm	0.5 dBm	-7.0 dBm
Extinction Ratio	3.0 dB	3.5 dB	3.5 dB	9.0 dB

10GE Optical Module (XFP)

A 10GE optical module (XFP) is connected to two LC optical fibers to provide one GE channel. [Table 3-15](#) lists the specifications of 10GE optical modules (XFP).

Table 3-15 Specifications of 10GE optical modules (XFP)

Type	One-channel two-fiber bi-directional optical module			
No.	1	2	3	4
Operating Wavelength	850 nm	1310 nm	1550 nm	1550 nm
Encapsulation Type	XFP	XFP	XFP	XFP
Port Rate	10.30 Gbit/s	9.95-10.71 Gbit/s	9.95-11.10 Gbit/s	9.95-11.10 Gbit/s
Minimum Output Optical Power	-7.30 dBm	-6.00 dBm	-1.00 dBm	0 dBm
Maximum Output Optical Power	-1.30 dBm	-1.00 dBm	2.00 dBm	4.00 dBm

Maximum Receiver Sensitivity	-7.50 dBm	-14.40 dBm	-15.00 dBm	-24.00 dBm
Optical Connector Type	LC	LC	LC	LC
Optical Fiber Type	Multi-mode	Single-mode	Single-mode	Single-mode
Reach	0.30 km	10.00 km	40.00 km	80.00 km
Overload Optical Power	-1.0 dBm	0.5 dBm	-1.0 dBm	-7.0 dBm
Extinction Ratio	3.0 dB	6.0 dB	8.2 dB	9.0 dB

One-channel Two-fiber Bi-directional 10GE CWDM Optical Module

A 10GE CWDM optical module is connected to two LC optical fibers (one for transmission and the other for reception) to provide one 10GE channel. [Table 3-16](#) lists the specifications of 10GE CWDM optical modules.

Table 3-16 Specifications of one-channel two-fiber bi-directional 10GE CWDM optical modules

Type	One-channel two-fiber bi-directional optical module
Operating Wavelength	1471 nm, 1491 nm, 1511 nm, 1531 nm, 1551 nm, 1571 nm, 1591 nm, 1611 nm
Encapsulation Type	SFP+
Port Rate	9.95 Gb~11.1 Gb/s
Minimum Output Optical Power	0 dBm
Maximum Output Optical Power	4.0 dBm
Maximum Receiver Sensitivity	-23.0 dBm
Optical Connector Type	LC
Optical Fiber Type	Single-mode

Reach	70.0 km
Overload Optical Power	-7.0 dBm
Extinction Ratio	8.2 dB



NOTE

There are different types of 10GE CWDM optical modules, and these types of optical modules vary with the operating wavelength.

Standards Compliance of the 10GE Optical Port

Standard ID	Description
IEEE 802.3ae	10 Gbit/s (1,250 MB/s) Ethernet over fiber
SFF-8431	Specifications for Enhanced Small Form Factor Pluggable Module SFP+
INF-8432	Specification for SFP+ Module and Cage

3.4.4 FE Optical Module

This topic describes the types, parameters, and relation with boards of FE optical modules.

Table 3-17 shows the relation between FE optical modules and boards.

Table 3-17 Relation between FE optical modules and boards

Board Type	Board Name	One-channel One-fiber Bi-directional FE Optical Module	Two-channel One-fiber Bi-directional FE Optical Module
P2P interface board	OPFA	√	×
	OPGD	√	√
	OPGE	√	√

One-channel One-fiber Bi-directional FE Optical Module

A one-channel one-fiber bi-directional FE optical module is connected to one LC optical fiber to provide one FE channel. Table 3-18 lists the specifications of an FE optical module.

Table 3-18 Specifications of one-channel one-fiber bi-directional FE optical modules

Type	One-channel one-fiber bi-directional optical module	
No.	1	2

Operating Wavelength	Tx: 1550 nm Rx: 1310 nm	Tx: 1310 nm Rx: 1550 nm
Encapsulation Type	eSFP	eSFP
Port Rate	STM-1	155 Mbit/s
Minimum Output Optical Power	-15.00 dBm	-15.00 dBm
Maximum Output Optical Power	-8.00 dBm	-8.00 dBm
Maximum Receiver Sensitivity	-32.00 dBm	-32.00 dBm
Optical Connector Type	LC/PC	LC/PC
Optical Fiber Type	Single-mode	Single-mode
Reach	15.00 km	15.00 km
Overload Optical Power	-8.0 dBm	-8.0 dBm
Extinction Ratio	8.5 dB	8.5 dB

Two-channel One-fiber Bi-directional FE Optical Module

A two-channel one-fiber bi-directional FE optical module is connected to two LC optical fibers to provide two FE channels. [Table 3-19](#) lists the specifications of an FE optical module.

Table 3-19 Specifications of Two-channel One-fiber Bi-directional FE optical modules

Type	Two-channel one-fiber bi-directional optical module
Operating Wavelength	Tx: 1550 nm Rx: 1310 nm
Encapsulation Type	CSFP
Port Rate	125-155 Mbit/s
Minimum Output Optical Power	-14.00 dBm
Maximum Output Optical Power	-8.00 dBm
Maximum Receiver	-28.2 dBm

Sensitivity	
Optical Connector Type	LC
Optical Fiber Type	Single-mode
Reach	10.00 km
Overload Optical Power	-8.0 dBm
Extinction Ratio	8.2 dB

Standards Compliance of the FE Optical Modules

Standard ID	Description
IEEE 802.3	100BASE-BX Fast Ethernet at 100 Mbit/s
SFF-8472	Specification for Diagnostic Monitoring Interface for Optical Transceivers

3.4.5 FE/GE Adaptive Optical Module

This topic describes the parameters and relation with boards of FE/GE adaptive optical modules.

An FE/GE adaptive optical modules is applicable to the OPGD and OPGE board.

A two-channel one-fiber bi-directional FE/GE adaptive optical module is connected to two LC optical fibers to provide two FE/GE channels. [Table 3-20](#) lists specifications of FE/GE adaptive optical module.

Table 3-20 Specifications of an FE/GE Adaptive Optical Module (Two-channel One-fiber Bi-directional)

Type	Two-channel one-fiber bi-directional optical module	
No.	1	2
Operating Wavelength	Tx: 1490 nm Rx: 1310 nm	Tx: 1490 nm Rx: 1310 nm
Encapsulation Type	CSFP	CSFP
Port Rate	125 Mbit/s–1.25 GBit/s	125 Mbit/s–1.25 GBit/s
Minimum Output Optical Power	-9.00 dBm	-9.00 dBm

Maximum Output Optical Power	-3.00 dBm	-3.00 dBm
Maximum Receiver Sensitivity	-23.00 dBm	-19.50 dBm
Optical Connector Type	LC	LC
Optical Fiber Type	Single-mode	Single-mode
Reach	10.00 km	10.00 km
Overload Optical Power	-3.00 dBm	-3.00 dBm
Extinction Ratio	6.60 dB	6.00 dB

3.4.6 STM-1 Optical Module

This topic describes the parameters and relation with boards of STM-1 optical modules.

An STM-1 optical module is applicable to the TOPA (O2CE/CSSA) board, AIUG (O2CS) board and TOPB board. It is connected to two LC optical fibers to provide one STM-1 channel. [Table 3-21](#) lists specifications of STM-1 optical modules.

Table 3-21 Specifications of STM-1 optical modules

Type	One-channel two-fiber bi-directional optical module			
No.	1	2	3	4
Operating Wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Encapsulation Type	eSFP	SFP	eSFP	eSFP
Port Rate	STM-1	STM-1	STM-1	STM-1
Minimum Output Optical Power	-15.00 dBm	-19.00 dBm	-5.00 dBm	-5.00 dBm
Maximum Output Optical Power	-8.00 dBm	-14.00 dBm	0 dBm	0 dBm
Maximum Receiver	-31.00 dBm	-30.00 dBm	-37.00 dBm	-37.00 dBm

Sensitivity				
Optical Connector Type	LC	LC	LC	LC
Optical Fiber Type	Single-mode	Multi-mode	Single-mode	Single-mode
Reach	15.00 km	2.00 km	40.00 km	80.00 km
Overload Optical Power	-8.0 dBm	-14.0 dBm	-10.0 dBm	-10.0 dBm
Extinction Ratio	8.2 dB	10.0 dB	10.5 dB	10.5 dB

3.4.7 xDSL Port

This topic describes the specifications and the standards compliance of xDSL (including ADSL2+, SHDSL, and VDSL2) ports.

Specifications of the ADSL2+ over POTS Port

Parameter	Specification
Transmission rate	Attainable upstream rate: 1.3 Mbit/s Attainable downstream rate: 29 Mbit/s
Port type	Champ 64-pin, Delander 64-pin
Maximum transmission distance	6500 m
Cable type	Twisted pair
Frequency	Downstream: 138 kHz to 2.208 MHz Upstream: 26 kHz to 138 kHz
Modulation	Discrete multitone (DMT)
Service supported	ADSL2+ over POTS
Frame protocol supported	ATM
Standards compliance	ITU-T G.992.1 ITU-T G.992.2 ITU-T G.992.3 ITU-T G.992.5 ANSI T1.413

Specifications of the ADSL2+ over ISDN Port

Parameter	Specification
Transmission rate	Attainable upstream rate: 1.3 Mbit/s Attainable downstream rate: 27 Mbit/s
Port type	Champ 64-pin
Maximum transmission distance	4500 m
Cable type	Twisted pair
Frequency	Upstream: 26 kHz to 274 kHz Downstream: 274 kHz to 2.208 MHz
Modulation	DMT
Service supported	ADSL2+ over ISDN
Frame protocol supported	ATM
Standards compliance	ITU-T G.992.1 Annex B ITU-T G.992.3 Annex B/J ITU-T G.992.5 Annex B/J ETSI TS 101 388

Specifications of the SHDSL Port

Parameter	Specification
Transmission rate	192 kbit/s to 5696 kbit/s (symmetrical)
Port type	Champ 64-pin
Maximum transmission distance	3 km to 6 km
Cable type	Twisted pair
Rate adjustment step	64 kbit/s
Line coding	16TC-PAM, 32TC-PAM
Frame protocol supported	ATM, EFM
Standards compliance	ITU-T G.991.2 Annex B ETSI TS 101 524

Specifications of the TDM SHDSL Port

Parameter	Specification
Transmission rate	192 kbit/s~2048 kbit/s(symmetrical)
Port type	Champ 64-pin
Maximum transmission distance	3 km to 6 km
Cable type	Twisted pair
Rate adjustment step	64 kbit/s
Line coding	16TC-PAM
Frame protocol supported	FE1 and V.35
Standards compliance	ITU-T G.991.2 Annex B And ITU-T G.991.2 Annex A ETSI TS 101 524

Specifications of the VDSL2 over POTS Port

Parameter	Specification
Transmission rate	Attainable upstream rate: 40 Mbit/s Attainable downstream rate: 80 Mbit/s
Port type	Champ 64-pin, Delander 64-pin
Maximum transmission distance	3500 m (U0 enable)
Cable type	Twisted pair
Modulation	DMT
Service supported	VDSL2 over POTS
Frame protocol supported	PTM
Standard compliance	ITU-T G.993.2

Specifications of the VDSL2 over ISDN Port

Parameter	Specification
Transmission rate	Attainable upstream rate: 40 Mbit/s Attainable downstream rate: 80 Mbit/s
Port type	Champ 64-pin
Maximum transmission distance	3500 m (U0 enable)

Parameter	Specification
Cable type	Twisted pair
Modulation	DMT
Service supported	VDSL2 over ISDN
Standard compliance	ITU-T G.993.2

Standards Compliance of xDSL Port

Standard ID	Description
ITU-T G.992.1	Asymmetrical Digital Subscriber Line (ADSL) Transceivers
ITU-T G.992.2	Splitterless Asymmetric Digital Subscriber Line (ADSL) Transceivers
ITU-T G.992.3	Asymmetric Digital Sub Scriber Line (ADSL) Transceivers-2 (ADSL2)
ITU-T G.992.5	Asymmetric Digital Subscriber Line (ADSL) transceivers - Extended bandwidth ADSL2 (ADSL2plus)
ITU-T G.993.2	Very High Speed Digital Subscriber Line 2
ITU-T G.993.5	Very high speed digital subscriber line 2 with vectoring or Self-FEXT cancellation
ITU-T G.994.1	Handshake Procedures for Digital Subscriber Line (DSL) Transceivers
ITU-T G.996.1	Test Procedures for Digital Subscriber Line (DSL) Transceivers
ITU-T G.997.1	Physical Layer Management for Digital Subscriber Line (DSL) Transceivers
ANSI T1.413	Network and customer installation interface - Asymmetric Digital Subscriber Line (ADSL) Metallic Interface
ETSI TS 101 388	Access transmission systems on metallic access cables; Asymmetric Digital Subscriber Line (ADSL) - European specific requirements
ITU G.991.2	Single-Pair High-Speed Digital Subscriber Line (SHDSL) Transceivers
G.991.2 ANNEX A	-
G.991.2 ANNEX B	-

DSL Forum

Standard ID	Description
TR-034	Alternative OAM Communications Channel Across the U interface
TR-037	Auto-Configuration for the Connection Between the DSL Broadband Network Termination (B-NT) and the Network Using ATM
TR-048	Test specifications (DSL Forum)
TR-056	Network Migration to Next Generation DSL Networks
TR-058	Multi-Service Architecture & Framework Requirements
TR-059	DSL Evolution - Architecture Requirements for the Support of QoS Enabled IP Services
TR-066	DSL Network Element Management
TR-101	Technical Report DSL Forum TR-101 Migration to Ethernet-Based DSL Aggregation
TR 129	Protocol-Independent Management Model for Next Generation DSL Technologies
WT 147	Layer 2 Control Mechanism

3.4.8 POTS Port and ISDN Port

This topic describes the specifications and voice service standards compliance of the POTS port and the ISDN port.

Specifications of the POTS Port

Parameter	Specification
Transmission rate	64 kbit/s
Port type	Champ 64-pin, Delander 64-pin
Maximum transmission distance	5.5 km
Cable type	Twisted pair
Frame protocol supported	TDM
Standard compliance	Q.552

Specifications of the ISDN Port

Parameter	Specification
Port type	Champ 64-pin
Maximum transmission distance	4200 m
Cable type	Twisted pair
Line coding	2B1Q
Frame protocol supported	G.711 a-law/ μ -law
Standards compliance	ETSI TS 102 080, Annex B ITU-T G.961, Annex 1

H.248 Protocol

Standard ID	Description
ITU-T H.248 Annex M2	Media gateway resource congestion handling package
ITU-T H.248 Annex M4	H.248 packages for H.323 and H.324 interworking

SIP Protocol

Standard ID	Description
RFC 2976	The SIP INFO method
RFC 3261	Session Initiation Protocol (SIP)
RFC 3262	Reliability Of Provisional Responses in the Session Initiation Protocol (SIP)
RFC 3263	Locating SIP servers
RFC 3265	Specific Event Notification
RFC 3331	The Session Initiation Protocol (SIP) UPDATE method
RFC 3312	Integration of Resource Management and Session Initiation Protocol (SIP)
RFC 3320	Signaling Compression
RFC 3321	Signaling Compression (SigComp) - Extended Operations
RFC 3323	A Privacy Mechanism for the Session Initiation Protocol (SIP)
RFC 3325	Private Extensions to the Session Initiation Protocol (SIP) for Asserted Identity within Trusted Networks

Standard ID	Description
RFC 3326	The Reason Header Field for the Session Initiation Protocol (SIP)
RFC 3420	Internet Media Type message/sipfrag
RFC 3428	Session Initiation Protocol (SIP) Extension for Instant Messaging
RFC 3455	Private Header (P-Header) Extensions to the Session Initiation Protocol (SIP) for the 3rd-Generation Partnership Project (3GPP)
RFC 3485	The Session Initiation Protocol (SIP) and Session Description Protocol (SDP) Static Dictionary for Signaling Compression (SigComp)
RFC 3486	Compressing the Session Initiation Protocol (SIP)
RFC 3515	The Session Initiation Protocol (SIP) Refer Method
RFC 3581	An Extension to the Session Initiation Protocol (SIP) for Symmetric Response Routing
RFC 3608	Session Initiation Protocol (SIP) Extension Header Field for Service Route Discovery During Registration
RFC 3960	Session Initiation Protocol (SIP) Basic Call Flow Examples
RFC 3680	A Session Initiation Protocol (SIP) Event Package for Registrations
RFC 3841	Caller Preferences for the Session Initiation Protocol (SIP)
RFC 3842	A Message Summary and Message Waiting Indication Event Package for the Session Initiation Protocol (SIP)
RFC 3891	The Session Initiation Protocol (SIP) "Replaces" Header
RFC 3903	Session Initiation Protocol (SIP) Extension for Event State Publication
RFC 3960	Early Media and Ringing Tone Generation in the Session Initiation Protocol (SIP)
RFC 4028	Session Timers in the Session Initiation Protocol (SIP)
RFC 4083	Input 3GPP Release 5 Requirements on the SIP
RFC 4168	The Stream Control Transmission Protocol (SCTP) as a Transport for the Session Initiation Protocol (SIP)
RFC 4320	Actions Addressing Identified Issues with the Session Initiation Protocol's (SIP) Non-INVITE Transaction
RFC 4321	Problems Identified Associated with the Session Initiation Protocol's (SIP) Non-INVITE Transaction

3.4.9 ATM Port

This topic describes the standards compliance of the ATM port.

Standards Compliance of the ATM Port

Standard ID	Description
ITU-T I.363.5	AAL5 Service Adaptation Protocol
ITU-T I.370	Traffic and Congestion Control Protocol
AF-TM-0056.000	Traffic Management Specification Version 4.0
RFC2613	Remote Network Monitoring MIB Extensions for Switched Networks

3.4.10 E1 Port

This topic describes the standards compliance of the E1 port.

Specifications of the E1 Port

Parameter	Specification
Transmission rate	2048 kbit/s
Cable type	Coaxial cable/Twisted pair
Standard of physical/electrical characteristics	ITU-T G.703
Protection standard	ITU K.20, CISPR 24, EN300386 NOTE The MA5600T/MA5603T/MA5608T complies with the preceding standards in indoor protection.

4 Product Features

About This Chapter

This topic describes new features of the products and applications and values of product key features.

4.1 System Architecture

4.2 Features at a Glance

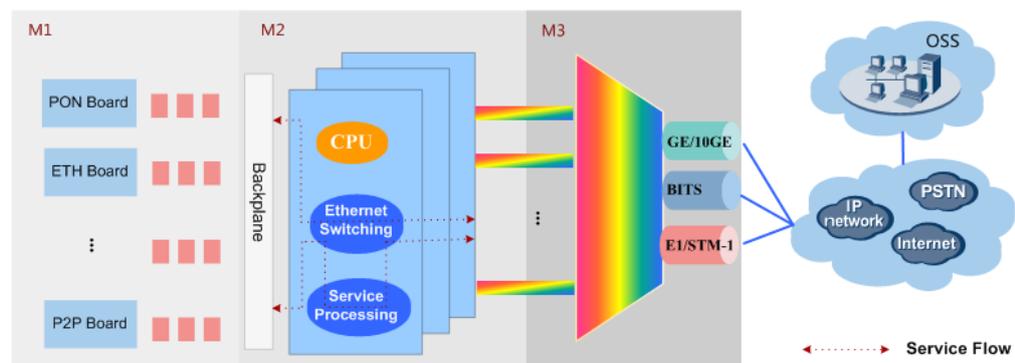
This topic describes the values, applications, and highlights of features. The glance of each feature is released as a PDF document.

4.1 System Architecture

The MA5600T/MA5603T/MA5608T uses the system architecture containing three modules: M1, M2, and M3.

- The M1 service port module provides various service access ports, such as PON, P2P, POTS, and xDSL service ports.
- The M2 core processing module implements CPU processing, Ethernet switching, and service processing.
- The M3 uplink port module transmits service flows upstream to network-side devices.

Figure 4-1 System architecture



In the preceding figure:

- The M1 service port module and M3 uplink port module connect to different boards. For details of working principles of each module, see board description in the *Hardware Description*.
- For details of service flow directions in the M1 service port module, see board working principles in the *Hardware Description*.
- The service flows processed by the M2 core processing module are classified into two types: One type of service flows are transmitted upstream after they are processed by the Ethernet switching module and the M3 uplink port module; the other type of service flows are transmitted upstream after they are processed by the Ethernet switching module, service processing module, and then Ethernet switching module again.

4.2 Features at a Glance

This topic describes the values, applications, and highlights of features. The glance of each feature is released as a PDF document.

Please refer to **Feature Glance**.

5 Environment Requirement

About This Chapter

This appendix describes the requirements on storage environment, transportation environment, and running environment.

The environment can be classified into three types: storage environment, transportation environment, and running environment. The environment requirements are regulated according to the following:

- ETSI EN 300 019
- ETSI EN 300 753
- IEC 60068-2

5.1 Storage Environment

The storage environment must comply with ETSI EN 300 019-1-1.

5.2 Transport Environment

The transport environment must comply with ETSI EN 300 019-1-2.

5.3 Operation Environment

The operation environment must comply with ETSI EN 300 019-1-3.

5.1 Storage Environment

The storage environment must comply with ETSI EN 300 019-1-1.

Climate Requirements

Table 5-1 Requirements on climate

Item	Range
Atmospheric pressure ⁷⁰	70 kPa to 106 kPa
Temperature	-40 °C (-104 °F) to +70 °C (+158 °F)

Item	Range
Temperature change rate	$\leq 1^{\circ}\text{C} / \text{min}$
Relative humidity	5% to 100%
Solar radiation	$\leq 1120 \text{ W/m}^2$
Heat radiation	$\leq 600 \text{ W/m}^2$

Waterproof Requirements

- The equipment must be protected from water ingress. It should be stored indoors on a dry floor away from fire-fighting and heating facilities and places where water leaks may occur.
- If storing the equipment outdoors, ensure that the following conditions are met:
 - The packing boxes are intact.
 - Appropriate measures are taken to prevent the ingress of rainwater.
 - The ground where the packing boxes are stored is dry.
 - The packing boxes are protected from direct sunlight.

Biological Requirements

- The environment must be free of mold and mildew.
- The environment must be free of rodents (such as mice).

Air Quality Requirements

- The environment must be free of explosive, conductive, magnetic conductive, and corrosive dust.
- The density of mechanically active substances must meet the requirements listed in [Table 5-2](#).
- The density of chemically active substances must meet the requirements in ETSI EN 300019-1-1 and IEC 60721-3-1.

Table 5-2 Requirements on the density of mechanically active substances

Mechanically Active Substance	Density
Suspended dust	$\leq 5.00 \text{ mg/m}^3$
Deposited dust	$\leq 20.0 \text{ mg}/(\text{m}^2 \cdot \text{h})$
Sand	$\leq 300 \text{ mg/m}^3$

Mechanical Stress Requirements

Table 5-3 Requirements on mechanical stress

Item	Subitem	Range		
Random vibration	Acceleration spectral density	-	0.02m ² /s ³	-
	Frequency range	5–10 Hz	10–50 Hz	50–100 Hz
	dB/oct	12	-	-12

5.2 Transport Environment

The transport environment must comply with ETSI EN 300 019-1-2.

Climate Requirements

Table 5-4 Requirements on climate

Item	Range
Atmospheric pressure	55 kPa to 106 kPa
Temperature	-40 °C (-104 °F) to +70 °C (+158 °F)
Temperature change rate	≤ 1 °C /min
Relative humidity	5% to 95%
Solar radiation	≤ 1120 W/m ²
Heat radiation	≤ 600 W/m ²

Waterproof Requirements

During transportation, ensure that the following conditions are met:

- The packing boxes are intact.
- Appropriate measures are taken to prevent the ingress of rainwater.
- The transportation facilities are dry.

Biological Requirements

- The environment must be free of mold and mildew.
- The environment must be free of rodents (such as mice).

Air Quality Requirements

- The environment must be free of explosive, conductive, magnetic conductive, and corrosive dust.
- The density of mechanically active substances must meet the requirements listed in [Table 5-5](#).
- The density of chemically active substances must meet the requirements in ETSI EN 300019-1-2 and IEC 60721-3-2.

Table 5-5 Requirements on the density of mechanically active substances

Mechanically Active Substance	Density
Suspended dust	No requirement
Deposited dust	$\leq 3.0 \text{ mg}/(\text{m}^2 \cdot \text{h})$
Sand	$\leq 100 \text{ mg}/\text{m}^3$

Mechanical Stress Requirements

Table 5-6 Requirements on mechanical stress

Item	Subitem	Range	
Random vibration	Acceleration spectral density	$1 \text{ m}^2/\text{s}^3$	-
	Frequency range	5–20 Hz	20–200 Hz
	dB/oct	-	-3
Impulse	response spectrum I (mass > 50 kg)	100 m/s ² , 11ms, 100 in each direction	
	response spectrum II (mass ≤ 50 kg)	180 m/s ² , 6ms, 100 in each direction	
NOTE			
Impulse response spectrum refers to the maximum response curve of the acceleration generated by the equipment under the specified impulse motivation.			

Packaging Materials

Boards must be packed with the original packaging materials during transportation. If the original packaging materials are lost, contact Huawei.

5.3 Operation Environment

The operation environment must comply with ETSI EN 300 019-1-3.

Climate Requirements

Table 5-7 Requirements on MA5600T temperature and humidity

Temperature		Relative Humidity	
Long-Term Operation	Short-Term Operation	Long-Term Operation	Short-Term Operation
-5 °C to 45 °C	<ul style="list-style-type: none"> A indoor cabinet configured with a subrack: -25 °C to +65 °C A indoor cabinet configured with 2 subracks: -25 °C to +55 °C 	5% to 85%	5% to 95%
<p>NOTE</p> <p>The point where temperature and humidity values are taken is 1.5 meters above floor level and 0.4 meters in front of the cabinet when there is no protection board in either the front or back of the cabinet.</p> <p>Short-term operation means that the continuous operating time does not exceed 96 hours and the accumulated time per year does not exceed 15 days.</p>			

Table 5-8 Requirements on MA5603T/MA5608T temperature and humidity

Temperature	Relative Humidity
-40 °C to 65 °C	5% to 95%
<p>NOTE</p> <p>The point where temperature and humidity values are taken is 1.5 meters above floor level and 0.4 meters in front of the cabinet when there is no protection board in either the front or back of the cabinet.</p>	

To improve product application reliability, it is recommended that a dedicated precise air-conditioner be installed in an equipment room and the temperature and relative humidity be controlled within the following ranges:

- Temperature range: 15 °C to 30 °C
- Relative humidity range: 40% to 75%



NOTE

Do not install the air-conditioner above the equipment and ensure that the air exhaust vent of the air-conditioner is not directly towards the equipment. Keep the air-conditioner away from a window as possible to ensure that no moisture from the window is blown towards the equipment through the air-conditioner.

Table 5-9 Requirements on climate

Item	Range
Altitude	≤4000 m
Temperature change rate	≤0.5°C/min
Wind speed	≤5 m/s
<p>NOTE</p> <p>The air density varies with the altitude, which affects the heat dissipation capabilities of devices. Therefore, the working temperature of the device changes with the altitude.</p>	

Biological Requirements

- The environment must be free of mold and mildew.
- The environment must be free of rodents (such as mice).

Air Quality Requirements

- The environment must be free of explosive, conductive, magnetic conductive, and corrosive dust.
- The density of mechanically active substances must meet the requirements listed in [Table 5-10](#).
- The density of chemically active substances must meet the requirements in ETSI EN 300019-1-3, IEC 60721-3-3, and GR-63-CORE.

Table 5-10 Requirements on the density of mechanically active substances

Mechanical Active Substance	Content
Suspended dust	≤0.4 mg/m ³
Deposited dust	≤15 mg/(m ² h)
Sand	≤300 mg/m ³

Mechanical Stress Requirements

Table 5-11 Requirements on mechanical stress

Item	Subitem	Range	
Sinusoidal vibration	Displacement	≤ 5 mm/s	-
	Acceleration	-	≤ 2 m/s ²
	Frequency range	5 Hz to 62 Hz	62 Hz to 200 Hz
Impulse	Impulse response spectrum II	Half-sine wave, 30 m/s ² , 11 ms, and three times on each face	
NOTE Impulse response spectrum refers to the maximum response curve of the acceleration generated by the equipment under the specified impulse motivation.			

6 Standards Compliance

About This Chapter

This topic lists the environment standards, electromagnetic compatibility standards, and security standards that the MA5600T/MA5603T/MA5608T complies with.

6.1 Environment Adaptability Standards

This topic lists the environment adaptability standards that the MA5600T/MA5603T/MA5608T complies with.

6.2 Electromagnetic Compatibility Standards

This topic lists the electromagnetic compatibility (EMC) standards that the MA5600T/MA5603T/MA5608T complies with.

6.3 Safety Standards

This topic lists the safety standards that the MA5600T/MA5603T/MA5608T complies with.

6.4 Other International Standards

This topic lists other international standards that the MA5600T/MA5603T/MA5608T complies with.

6.1 Environment Adaptability Standards

This topic lists the environment adaptability standards that the MA5600T/MA5603T/MA5608T complies with.

Standard ID	Description
ETSI EN 300 019-1-1	Environmental Engineering (EE) Environmental conditions and environmental tests for telecommunications equipment Part 1-1: Classification of environmental conditions: Storage Class 1.1: Weatherprotected, partly temperature-controlled storage locations Class 1.2: Weatherprotected, not temperature-controlled storage

Standard ID	Description
	locations
ETSI EN 300 019-1-2	Environmental Engineering (EE) Environmental conditions and environmental tests for telecommunications equipment Part 1-2: Classification of environmental conditions: Transportation Class 2.2: Careful transportation
ETSI EN 300 019-1-3	Environmental Engineering (EE) Environmental conditions and environmental tests for telecommunications equipment Part 1-3: Classification of environmental conditions: Stationary use at weatherprotected locations Class 3.1: Temperature-controlled locations Class 3.2: Partly temperature-controlled location
IEC 60068-2	Basic Environmental Testing Procedures
IEC 60721-2-6	Environmental conditions appearing in nature - Earthquake vibration
IEC 60721-3-1	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 1: Storage
IEC 60721-3-3	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 3: Stationary use at weatherprotected locations
ETSI EN 300 753	Equipment Engineering (EE) Acoustic noise emitted by telecommunications equipment
NEBS GR-63-CORE	Network Equipment-Building System (NEBS) Requirements: Physical Protection
ROHS	Restriction of the use of certain hazardous substance in electrical and electronic equipment.

6.2 Electromagnetic Compatibility Standards

This topic lists the electromagnetic compatibility (EMC) standards that the MA5600T/MA5603T/MA5608T complies with.

Standard ID	Description
IEC 61000-4-2	Electromagnetic compatibility - Part4-2: Testing and measurement techniques-Electrostatic discharge immunity test

Standard ID	Description
IEC 61000-4-3	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
IEC 61000-4-4	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques-Electrical fast transient/burst immunity test
IEC 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques-Surge immunity test
IEC 61000-4-6	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques-Immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-29	Electromagnetic compatibility (EMC) - Part4-29: Testing and measurement techniques-Voltage dips, shot interruptions and voltage variations on d.c. input power port immunity tests
EN 61000-4-2	Electromagnetic compatibility (EMC) Section 4.2 Electrostatic discharge immunity test - Basic EMC Publication
EN 61000-4-3	Electromagnetic compatibility - Part4-3: Testing and measurement techniques-Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4	Electromagnetic compatibility - Part 4: Testing and measurement techniques Section 4: Electrical fast transient/burst immunity test-Basic EMC publication
EN 61000-4-5	Electromagnetic compatibility (EMC) - Part4-5: Testing and measurement techniques-Surge immunity test
EN 61000-4-6	Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques Section 6: immunity to conducted disturbance, induced by radio-frequency fields
IEC 61000-4-29	Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques-Voltage dips, shot interruptions and voltage variations on d.c. input power port immunity tests
ETSI EN 300 386 V1.5.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; Electromagnetic Compatibility (EMC) requirements
ETSI ES 201 486 V1.3.1	Electromagnetic compatibility and Radio spectrum Matters (ERM);Additional ElectroMagnetic Compatibility (EMC) requirements and resistibility requirements for telecommunications equipment for enhanced availability of service in specific applications
VCCI V-3	Spectrum Management and Telecommunications Interference-Causing Equipment Standard Information Technology Equipment (ITE) – Limits and methods of measurement

Standard ID	Description
EN 55022	Information technology equipment-Radio disturbance characteristics - Limits and methods of measurement
EN 55024	Information technology equipment - Immunity characteristics - Limits and methods of measurement
ITU-T K.20	Resistibility of telecommunication equipment installed in a telecommunications center to overvoltages and overcurrents
CISPR 22	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
CISPR24	Information technology equipment - Immunity characteristics - Limits and methods of measurement
ITU-T K.32	Immunity requirements and test methods for electrostatic discharge to telecommunication equipment - Generic EMC Recommendation
ITU-T K.44	SERIES K: PROTECTION AGAINST INTERFERENCE Resistibility test for telecommunication equipment exposed to overvoltages and overcurrents - Basic Recommendation
FCC part 15	class A The Federal Code Of Regulation (CFR) FCC Part 15 is a common testing standard for most electronic equipment.. Class A Digital Device. "A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home."
ICES-003	VCCI COUNCIL RULES Normative Annex 1:Technical Requirements

6.3 Safety Standards

This topic lists the safety standards that the MA5600T/MA5603T/MA5608T complies with.

Standard ID	Description
EN 60950-1	Information Technology Equipment - safety - Part 1: General Requirements
EN 60825-1	Safety of laser products - Part 1 - Equipment classification, requirement and user's guide
EN 60825-2	Safety of laser products - Part 2 - Safety of optical fiber communication
IEC 60825-1	Safety of laser products - Part 1 - Equipment classification, requirement and user's guide
IEC 60825-2	Safety of laser products - Part 2 - Safety of optical fibre

Standard ID	Description
	communication
IEC 60950-1	Information Technology Equipment - safety - Part 1: General Requirements
UL 60950-1	2nd Edition, 2007-03-27 (Information Technology Equipment - Safety - Part 1: General Requirements)

6.4 Other International Standards

This topic lists other international standards that the MA5600T/MA5603T/MA5608T complies with.

Reliability Standards

Standard ID	Description
MIL-HDBK-217F	Reliability Prediction of Electronic Equipment
BELLCORE TR-332/SR-332	Reliability Prediction Procedure for Electronic Equipment

Packaging Standards

Standard ID	Description
ISTA Procedure 2A/2B	ISTA: International Safe Transit Association LEVEL 2A/2B

Encapsulation Protocols

Standard ID	Description
RFC1483	Multiprotocol Encapsulation over ATM Adaptation Layer 5
RFC2684	Multiprotocol Encapsulation over ATM Adaptation Layer 5
RFC1626	Default IP MTU for use over AAL5
RFC1661	Point to Point Protocol (PPP)
RFC2516	PPPoE
RFC2364	PPPoA
RFC2225	Classical IP and ARP over ATM

Standard ID	Description
RFC3046	DHCP Relay
RFC2236	IGMPv2
RFC3376	IGMPv3
TR101	PPPOE+, DHCP Option82
TR156	Using GPON Access in the context of TR-101
RFC2132	DHCP Option60

IP Protocols

Standard ID	Description
RFC768	UDP protocol
RFC783	TFTP protocol (Revision 2)
RFC791	IP protocol
RFC792	ICMP protocol
RFC793	TCP protocol
RFC826	ARP protocol
RFC854	Telnet protocol
RFC894	Standard for transmitting IP packet on Ethernet
RFC2131	DHCP protocol
RFC1119	NTP protocol
RFC1858	Security Considerations for IP Fragment Filtering
RFC2453	RIP protocol
RFC2362	PIM-SM
RFC2328	OSPF
RFC2474	Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers
RFC2475	An architecture for differentiated services, including edge-conditioning functions such as packet classification, policing, shaping, marking, and metering

OAM Protocols

Standard ID	Description
RFC1155	Structure and identifier of the Internet management information based on TCP/IP
RFC1157	Simple Network Management Protocol (SNMP)
RFC1213	Internet Network Management Information Base based on TCP/IPMIB-II
RFC1212	Concise MIB Definitions
RFC1757	Remote Network Monitoring Management Information Base
RFC1906	Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2)
RFC1907	Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2)
RFC2571	An Architecture for Describing SNMP Management Frameworks
RFC2572	Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
RFC2573	SNMP Applications
RFC1643	Definitions of Managed Objects for the Ethernet-like Interface Types
RFC2662	Definitions of Managed Objects for DSL Lines
GR-474-CORE	Network Maintenance, Alarm and Control
RFC2578	Structure of Management Information Version 2 (SMIV2)
RFC2819	Remote Network Monitoring
IEEE 802.1ag	Connectivity Fault Management
IEEE 802.3ah	Media Access Control Parameters, Physical Layers, and Management Parameters for Subscriber Access Networks