AN6000 Series

Optical Line Terminal Equipment

Hardware Description

Version: A

Code: MN000004289

FiberHome Telecommunication Technologies Co., Ltd.

November 2019

5 Cards

This chapter introduces the basic information, panels, technical parameters, modules supported, functions and working principles of the cards for the AN6000 Series.

- ☑ Card Structure
- ☑ Card Overview
- ☑ Core Switch Card
- ☑ Uplink Card
- ☑ Power Card
- ☑ GPON Interface Card
- ☑ 10G EPON Interface Card
- ☑ XG-PON Interface Card
- ☑ PON Combo Interface Card
- ☑ Common Interface Card

5.1 Card Structure

Card Structure

Figure 5-1 illustrates card structure, using the GX8A card as an example.

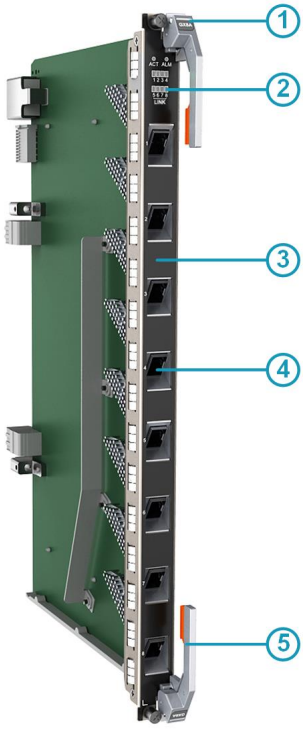
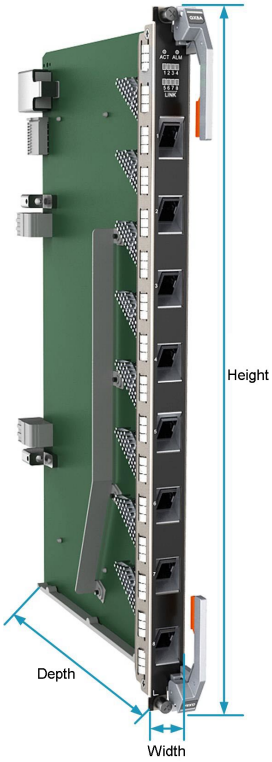


Figure 5-1 Card Structure

No.	Name	Function
①	Card name	Identifies the card.
②	Indicator LED area	Contains various indicator LEDs, such as the working status indicator and the port status indicator.
③	Card panel	Provides card-related identifiers; protects and secures the card.
④	Interface	Connects to different devices to implement the card functions.
⑤	Latch	Facilitates plugging or unplugging the card.

Card Dimensions

Figure 5-2 shows how card dimensions are measured.



Width: The height of the reed is not counted.

Depth: The maximum distance between the panel and the connector.

Figure 5-2 Card Dimensions

Table 5-1 describes card dimensions.

Table 5-1 Card Dimensions

Card Type	Card Name	Dimensions (H × W × D)
Core switch card	HSCA	392 mm × 29.7 mm × 230.6 mm
Uplink card	HU8A	392 mm × 23 mm × 230.6 mm
Power card	PIBA	98 mm × 25.1 mm × 255.5 mm
Service card	EX8A, EXOA, GPOA, GX8A, GM8A, GMOA, GNOA	392 mm × 23 mm × 230.6 mm
Common interface card	CIOA	194 mm × 25.1 mm × 230.6 mm

5.2 Card Overview

Cards can be divided into the following types according to their functions:

- The core switch card aggregates, switches and controls traffic flow, processes Layer 2 protocols, and manages faults, performance and configurations of the equipment.
- The uplink card provides uplink ports for connection to upper layer equipment.
- The power card inducts a DC power supply for the equipment.
- The service cards provide service ports, and work together with ONUs to enable integrated service connections.

The table below describes names, numbers, power consumptions, maximum frame lengths and weights of various cards.

Card Type		Card	Card Number	Static Power Consumption	Typical Power Consumption	Maximum Power Consumption	Maximum Frame Length	Weight
Core switch card		HSCA	2202093	58 W	74 W	90 W	9600 bytes	2.2 kg
Uplink card		HU8A	2202094	12 W	17 W	24 W	9600 bytes	0.8 kg
Service card	10G EPON interface card	EX8A	2202597	37 W	50 W	64 W	9600 bytes	1.1 kg
		EXOA	2203230	51 W	75 W	110 W	9600 bytes	1.32 kg
	GPON interface card	GPOA	2202802	41 W	43 W	47 W	2000 bytes	1.2 kg
	XG-PON interface card	GX8A	2202647	44 W	52 W	62 W	9600 bytes	1.1 kg
	GPON & XG-PON Combo interface card	GM8A	2202648	42 W	55 W	68 W	9600 bytes	1.1 kg
		GMOA	2203110	51 W	75 W	110 W	9600 bytes	1.32 kg
	GPON & XGS-PON Combo interface card	GNOA	2203140	60 W	110 W	120 W	9600 bytes	1.32 kg
Common interface card		CIOA	2202096	3 W	3 W	3 W	-	0.4 kg

Card Type	Card	Card Number	Static Power Consumption	Typical Power Consumption	Maximum Power Consumption	Maximum Frame Length	Weight
Power card	PIBA	2203005	8 W	8 W	8 W	-	0.4 kg
Note 1: "-" indicates "not applicable".							

The normal working temperature for cards ranges from -40℃ to 65℃. Power consumptions of cards are measured under the following conditions:

- Working voltage: -53.5 V DC
- Room temperature: 25℃ (static and typical power consumptions) or 55℃ (maximum power consumption)
- Static power consumption: All the broadband ports are deactivated.
- Typical power consumption: 50% of the broadband ports are concurrently activated.
- Maximum power consumption: 100% of the broadband ports are concurrently activated.

Note:

- Actual power consumptions of these cards may deviate a little from the values mentioned above due to different power modules used and component discreteness.
- Generally for access equipment, power consumption is converted into heat output. The unit of the former is W, and that for the later is BTU/h. The two units are converted based on the formula 1 W = 3.412 BTU/h.

5.3 Core Switch Card

The core switch card aggregates, switches and controls traffic flow, processes Layer 2 protocols, and manages the faults, performance and configuration of the equipment.

5.3.1 HSCA

Basic Information

Refer to Card Overview for the number, power consumptions, maximum frame length and weight of the card.

Panel Description

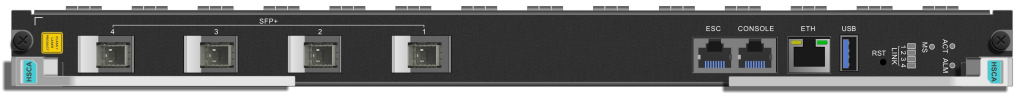


Table 5-2 Interfaces and Buttons

Identifier	Meaning	Description
RST	Reset button	Function reserved for future use.
USB	USB port	Connects to an USB port storage device.
ETH	GE out-of-band management network port	Connects to an out-of-band network management computer.
CONSOLE	Local debugging serial port	Connects to a CLI network management computer.
ESC	Environment monitoring serial port	Connects to an environment monitoring device and reports the environment status to the network management system.
SFP+ 1 to 4	10GE / GE uplink ports	Connect to upper-layer devices.

Table 5-3 Indicator LEDs

Identifier	Meaning	Color	Status	Description
ACT	Working indicator LED	Green	ON	The card is working normally.
			Blinking slowly	The card is being initialized.
			Blinking quickly	The card is standby and is receiving a configuration command from the active card.
			OFF	The card is not powered on normally.
ALM	Alarm indicator LED	Red	ON	The card is being reset or has an urgent alarm.
			OFF	The card has no urgent alarms.

Table 5-3 Indicator LEDs (Continued)

Identifier	Meaning	Color	Status	Description
MS	Active / standby status indicator LED	Green	ON	The card is active.
			OFF	The card is standby.
LINK 1 to 4	Port status indicator LED	Green	ON	The port is connected to an upper-layer device.
			Blinking	The port is transmitting or receiving data.
			OFF	The port is not connected to an upper layer device.

Technical Specifications

Item	Specification
Core switch card capacity (in the load sharing mode)	6.8 Tbit/s
Maximum bandwidth per slot (in the load sharing mode)	200 Gbit/s
Uplink or cascade ports	Four 10GE / GE ports
Maximum number of ONUs accessed	17408
Maximum number of MAC addresses	262144
Number of configurable static programs	4096
Maximum number of online programs	4096
Maximum number of IPv4 routing tables	16384
Maximum number of IPv6 routing tables	8192
Maximum number of ARP tables	18432
Maximum number of ND tables	9216
Switching time	≤ 50 ms
Switching mode	Store-and-forward
Network standards	IEEE 802.1ag, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z, IEEE 802.1D, IEEE 802.1p, IEEE 802.1Q, IEEE 802.3ae, IEEE Std 802.1s-2002, RFC 2236, RFC 3376, RFC 826, RFC 2328, RFC 2131, ITU-T Y.1731, etc.

Interface Specifications

Item		Specification
CONSOLE port	Interface type	RJ-45
	Interface standard	Asynchronous EIA / TIA-232
	Baud rate	9600 Bd

Matching Module

Item	Specification
GE optical module	1.25G-0.5km-850nm-eSFP (Single-Channel Two-Fiber Bidirectional Optical Module)
	1.25G-10km-1310nm-eSFP (Single-Channel Two-Fiber Bidirectional Optical Module)
	1.25G-40km-1310nm-eSFP (Single-Channel Two-Fiber Bidirectional Optical Module)
	1.25G-40km-1550nm-eSFP (Single-Channel Two-Fiber Bidirectional Optical Module)
	1.25G-80km-1550nm-eSFP (Single-Channel Two-Fiber Bidirectional Optical Module)
	1.25G-10km-1310nm/1490nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)
	1.25G-10km-1490nm/1310nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)
	1.25G-40km-1310nm/1490nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)
	1.25G-40km-1490nm/1310nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)
	1.25G-80km-1570nm/1490nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)
	1.25G-80km-1490nm/1570nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)
GE electrical module	1000M-100m-SFP (1000Base-T)
10GE optical module	10G-0.3km-850nm-SFP+ (Single-Channel Two-Fiber Bidirectional Optical Module)
	10G-10km-1310nm-SFP+ (Single-Channel Two-Fiber Bidirectional Optical Module)
	10G-40km-1550nm-SFP+ (Single-Channel Two-Fiber Bidirectional Optical Module)

Item	Specification
	10G-80km-1550nm-SFP+ (Single-Channel Two-Fiber Bidirectional Optical Module)
	10G-20km-1270nm/1330nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
	10G-20km-1330nm/1270nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
	10G-10km-1270nm/1330nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
	10G-10km-1330nm/1270nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
	10G-40km-1330nm/1270nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
	10G-40km-1270nm/1330nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
Note 1: GE Module and 10GE Optical Module describe the module specifications.	

Function

Classification	Function
Interface function	Provides an environment monitoring serial port for connection to environment monitoring equipment.
	Provides a local debugging serial port to meet the demand for CLI local management.
	Provides an out-of-band management network port for connection to an out-of-band network management system.
	Provides a USB port for connection with a storage device to upgrade the system and import / export configuration files.
	Provides uplink or cascade ports.
Multicast function	Supports four multicast modes: Proxy, Snooping, Proxy-Snooping and MLD.
	Supports multicast protocols such as PIM-SM / DM and IGMP V2 / V3.
Voice function	Supports NGN voice service and voice protocols SIP and H.248.
VLAN function	Supports port-based and IEEE 802.1q-based VLAN.
	Supports selective QinQ VLAN and VLAN translation.
Layer 2 switching function	Supports Layer 2 switching
Layer 3 function	Supports ARP and ARP Proxy.
	Supports DHCP Server / Relay / Snooping.

Classification	Function
	Supports the IPv6 protocol.
	Supports uplink based on routing protocols such as OSPF.
QoS function	Supports flow control.
	Supports priority queues and processes user services on the basis of priority.
Maintenance and management function	Supports uplink port mirroring.
	Supports remote software upgrade for all cards.
	Supports multiple management VLANs and multiple management IP addresses.
	Supports reporting the environment monitoring information and the alarm information for the equipment and the connected ONUs.
Reliability function	Supports protection for PON ports.
	Supports uplink port trunking and port dual-uplink protection.
	Supports RSTP to avoid generation of loops in the network.
	Supports Multiple Spanning Tree Protocol (MSTP) to avoid proliferation and infinite loop of packets in a loop network and enable load balance in a VLAN.
Security function	Supports classification and filtering of data packets at Layers 2 to 7.
	Supports ACL functions and has a strict security protection mechanism.
	Supports suppression of broadcast packets, multicast packets and unknown packets to prevent broadcast storms in the network.
Time and clock synchronization function	Supports synchronous Ethernet clock.
	Supports the 1588v2 clock.

Working Principle

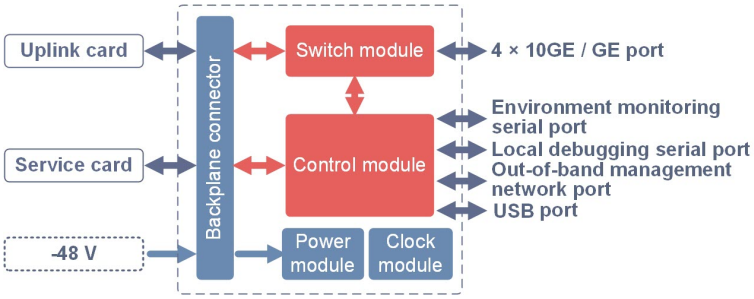


Figure 5-3 Working Principle of the HSCA Card

- The control module is used for configuring the entire system, collecting and reporting statuses, processing protocols, and providing an environment monitoring serial port, a local debugging serial port, an out-of-band management network port, and a USB port.
- The switch module switches service data, and provides uplink ports.
- The power module supplies power to each functional module of the card.
- The clock module provides working clock signals for each functional module of the card.

5.4 Uplink Card

The uplink cards provide uplink ports.

5.4.1 HU8A

Basic Information

Refer to Card Overview for the number, power consumptions, maximum frame length and weight of the card.

Panel Description

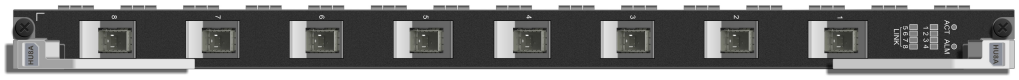


Table 5-4 Interfaces

Identifier	Meaning	Description
1 to 8	10GE / GE uplink ports	Connect to upper-layer devices.

Table 5-5 Indicator LEDs

Identifier	Meaning	Color	Status	Description
ACT	Working indicator LED	Green	ON	The card is working normally.
			Blinking slowly	The card is being initialized.
			Blinking quickly	The card is receiving a configuration command from the core switch card.
			OFF	The card is not powered on normally.

Table 5-5 Indicator LEDs (Continued)

Identifier	Meaning	Color	Status	Description
ALM	Alarm indicator LED	Red	ON	The card has an urgent alarm.
			OFF	The card has no urgent alarms.
LINK 1 to 8	Port status indicator LED	Green	ON	The port is connected to an upper-layer device.
			Blinking	The port is transmitting or receiving data.
			OFF	The port is not connected to an upper-layer device.

Technical Specifications

Item	Specification
Network standards	IEEE 802.3, IEEE 802.3z, IEEE 802.3ae, etc.

Matching Module

Item	Specification
GE optical module	1.25G-0.5km-850nm-eSFP (Single-Channel Two-Fiber Bidirectional Optical Module)
	1.25G-10km-1310nm-eSFP (Single-Channel Two-Fiber Bidirectional Optical Module)
	1.25G-40km-1310nm-eSFP (Single-Channel Two-Fiber Bidirectional Optical Module)
	1.25G-40km-1550nm-eSFP (Single-Channel Two-Fiber Bidirectional Optical Module)
	1.25G-80km-1550nm-eSFP (Single-Channel Two-Fiber Bidirectional Optical Module)
	1.25G-10km-1310nm/1490nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)
	1.25G-10km-1490nm/1310nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)
	1.25G-40km-1310nm/1490nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)
	1.25G-40km-1490nm/1310nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)
	1.25G-80km-1570nm/1490nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)

Item	Specification
	1.25G-80km-1490nm/1570nm-eSFP (Single-Channel Single-Fiber Bidirectional Optical Module)
GE electrical module	1000M-100m-SFP (1000Base-T)
10GE optical module	10G-0.3km-850nm-SFP+ (Single-Channel Two-Fiber Bidirectional Optical Module)
	10G-10km-1310nm-SFP+ (Single-Channel Two-Fiber Bidirectional Optical Module)
	10G-40km-1550nm-SFP+ (Single-Channel Two-Fiber Bidirectional Optical Module)
	10G-80km-1550nm-SFP+ (Single-Channel Two-Fiber Bidirectional Optical Module)
	10G-20km-1270nm/1330nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
	10G-20km-1330nm/1270nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
	10G-10km-1270nm/1330nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
	10G-10km-1330nm/1270nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
	10G-40km-1330nm/1270nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
	10G-40km-1270nm/1330nm-SFP+ (Single-Channel Single-Fiber Bidirectional Optical Module)
Note 1: GE Module and 10GE Optical Module describe the module specifications.	

Function

- Provides uplink ports.
- Each uplink port can be used as a cascade port, allowing multiple devices to be cascaded to the IP network via a single IP port.
- Each uplink port can serve as a network management port for connection to a network management computer.

Working Principle

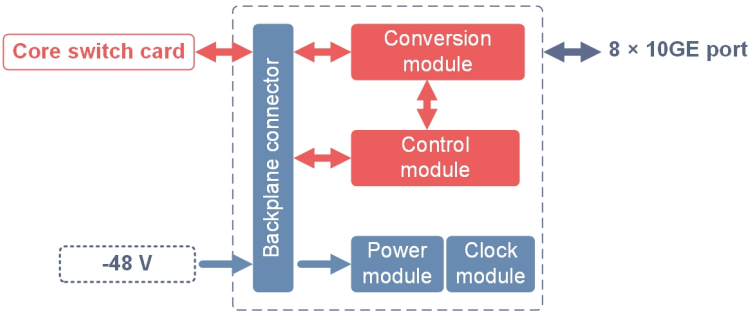


Figure 5-4 Working Principle of the HU8A Card

- The conversion module provides uplink ports and transmits data transparently.
- The control module loads the card software, controls the card operation, and manages the card.
- The power module supplies power to each functional module of the card.
- The clock module provides working clock signals for each functional module of the card.

5.5 Power Card

The power card inducts the DC power supply for the equipment.

5.5.1 PIBA

Basic Information

Refer to Card Overview for the number, power consumptions and weight of the card.

Panel Description

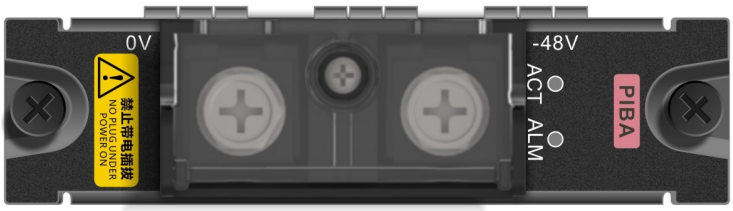


Table 5-6 Interfaces

Identifier	Meaning	Description
0V, -48V	DC power interface	Inputs the -48 V DC power supply. 0 V corresponds to the high potential of the DC power supply while -48 V the low potential of the DC power supply.

Table 5-7 Indicator LEDs

Identifier	Meaning	Color	Status	Description
ACT	Working indicator LED	Green	ON	The -48 V power input is provided.
			OFF	The -48 V power input is not provided.
ALM	Alarm indicator LED	Red	ON	The lightning protection function fails.
			OFF	The card has no alarms.

Function

The PIBA card provides the -48 V DC power supply for the equipment, and performs the lightning protection and power filtering functions.

Working Principle

The PIBA card inducts the -48 V DC power from the PDP and supplies power to the equipment.

5.6 GPON Interface Card

The GPON interface cards provide service interfaces to access GPON services by working together with ONUs.

5.6.1 GPOA

Basic Information

Refer to Card Overview for the number, power consumptions, maximum frame length and weight of the card.

Panel Description

Table 5-8 Interfaces

Identifier	Meaning	Description
1 to 16	GPON ports	Connect to ONUs via an ODN.

Table 5-9 Indicator LEDs

Identifier	Meaning	Color	Status	Description
ACT	Working indicator LED	Green	ON	The card is working normally.
			Blinking slowly	The card is being initialized.
			Blinking quickly	The card is receiving a configuration command from the core switch card or the communication between the active and standby cards is being set up.
			OFF	The card is not powered on normally or is reset abnormally.
ALM	Alarm indicator LED	Red	ON	The card has an urgent alarm.
			OFF	The card has no urgent alarms.
1 to 16	Port status indicator LED	Green	ON	The ONU under the PON port is registered and authorized.
			OFF	No ONU under the PON port is registered or authorized.

Technical Specifications

Item	Specification
Port quantity	16
Forwarding performance	40 Gbit/s
Port rate	◆ Uplink: 1.244 Gbit/s ◆ Downlink: 2.488 Gbit/s
Maximum split ratio	1:128
Maximum number of T-CONTs supported by each PON port	1024
Maximum number of MAC addresses	32768

Item	Specification
Maximum differential fiber distance (maximum difference of ONU-to-PON port distance between two ONUs under the same PON port)	40 km
Supported ONU types	2.5G / 1.25G (downlink rate / uplink rate)
Maximum number of ONUs supported by each PON port	256
Bandwidth allocation granularity of DBA	64 kbit/s
Minimum bandwidth of each T-CONT	1024 kbit/s
Number of GEM ports supported by each card	16384
Switching mode	Store-and-forward
Network standards	IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z, IEEE 802.1d, IEEE 802.1p, IEEE 802.1q, etc.

Matching Module

Module Type	Module Code
GPON optical module	2.5/1.25G-20km-GPON OLT-SFP (CLASS B+)
	2.5/1.25G-20km-GPON OLT-SFP (CLASS C+)
	2.5/1.25G-20km-GPON OLT-SFP (CLASS C++)
Note 1: GPON Optical Module describes the module specifications.	

Function

Classification	Function
Interface function	GPON service ports
Access feature	Triple Play, including data, voice and IPTV
Multicast function	IGMP Proxy / Snooping multicast and controlled multicast
QoS function	Real-time DBA
	Selective QoS and SLA
	Service rate control
	HQoS
	Queue shaping based on ONUs or queues
Maintenance and management function	Local and remote loopback tests
	Remote upgrade of the card software
	Automatic discovery and detection of ONUs

Classification	Function
	Pre-authorization and pre-configuration of ONUs
	ONU configuration in a batch manner
	Automatic upgrade of the ONU software
	Variable-length OMCI
	Light emission control for optical modules
	Temperature query and high temperature alarm
Reliability function	FEC
	Type B, Type C and Type C dual-homing protections
	Detection and isolation of rogue ONUs
Time and clock synchronization function	1588v2 clock

Working Principle

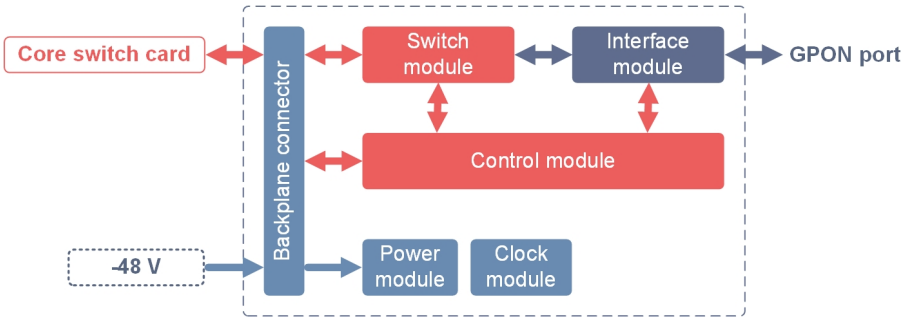


Figure 5-5 Working Principle of the GPOA Card

- The interface module provides GPON ports, and enables conversion between GPON packets and Ethernet packets.
- The switch module aggregates signals from 16 ports.
- The control module loads the card software, controls the card operation, and manages the card.
- The power module supplies power to each functional module of the card.
- The clock module provides working clock signals for each functional module of the card.

5.7 10G EPON Interface Card

The 10G EPON interface card provides service interfaces to access 10G EPON services by working together with ONUs.

5.7.1 Comparison Between 10G EPON Interface Cards

Table 5-10 and Table 5-11 describe the comparison between 10G EPON interface cards on technical specifications and functions respectively.

Table 5-10 Comparison Between 10G EPON Interface Cards on Technical Specifications

Item	EX8A	EXOA
Port quantity	8	16
Forwarding performance	80 Gbit/s	160 Gbit/s
Rate mode	◆ Asymmetric rate mode ◆ Symmetric rate mode	◆ Asymmetric rate mode ◆ Symmetric rate mode
Port rate	Asymmetric rate mode: ◆ Uplink: 1.25 Gbit/s ◆ Downlink: 10.313 Gbit/s, 1.25 Gbit/s Symmetric rate mode-10G channel: ◆ Uplink: 10.313 Gbit/s, 2.5 Gbit/s ◆ Downlink: 10.313 Gbit/s Symmetric rate mode-1G channel: ◆ Uplink: 1.25 Gbit/s ◆ Downlink: 1.25 Gbit/s	Asymmetric rate mode: ◆ Uplink: 1.25 Gbit/s ◆ Downlink: 10.313 Gbit/s, 1.25 Gbit/s Symmetric rate mode-10G channel: ◆ Uplink: 10.313 Gbit/s, 2.5 Gbit/s ◆ Downlink: 10.313 Gbit/s Symmetric rate mode-1G channel: ◆ Uplink: 1.25 Gbit/s ◆ Downlink: 1.25 Gbit/s
Maximum split ratio	1:128	1:128
Maximum number of LLIDs supported by each PON port	1024	2048
Maximum number of MAC addresses	65536	65536
Maximum differential fiber distance (maximum difference of ONU-to-PON port distance between two ONUs under the same PON port)	60 km	60 km

Table 5-10 Comparison Between 10G EPON Interface Cards on Technical Specifications (Continued)

Item	EX8A	EXOA
Supported ONU types	◆ 10G / 10G (downlink rate / uplink rate) ◆ 10G / 1G (downlink rate / uplink rate) ◆ 10G / 2G (downlink rate / uplink rate) ◆ 1G / 1G (downlink rate / uplink rate)	◆ 10G / 10G (downlink rate / uplink rate) ◆ 10G / 1G (downlink rate / uplink rate) ◆ 10G / 2G (downlink rate / uplink rate) ◆ 1G / 1G (downlink rate / uplink rate)
Maximum number of ONUs supported by each PON port	128	128
Bandwidth allocation granularity of DBA	640 kbit/s	640 kbit/s
Minimum bandwidth of each T-CONT	2560 kbit/s	2560 kbit/s
Switching mode	Store-and-forward	Store-and-forward
Network standards	IEEE 802.3, IEEE 802.3av, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z 1000BASE-SX/LX, IEEE 802.1d, IEEE 802.1p, IEEE 802.1q VLAN, etc.	IEEE 802.3, IEEE 802.3av, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z 1000BASE-SX/LX, IEEE 802.1d, IEEE 802.1p, IEEE 802.1q VLAN, etc.

Table 5-11 Comparison Between 10G EPON Interface Cards on Functions

Classification	Function	EX8A	EXOA
Interface function	10G EPON service port	√	√
Access feature	Triple Play, including data, voice and IPTV	√	√
Multicast function	IGMP Proxy / Snooping multicast and controlled multicast	√	√
QoS function	Real-time DBA	√	√
	Selective QoS and SLA	√	√
	Service rate control	√	√
	HQoS	√	√
	Queue shaping based on ONUs or queues	√	√
Maintenance and management function	Local and remote loopback tests	√	√
	Remote upgrade of the card software	√	√
	Automatic discovery and detection of ONUs	√	√
	Pre-authorization and pre-configuration of ONUs	√	√
	ONU configuration in a batch manner	√	√
	Automatic upgrade of the ONU software	√	√
	Variable-length OMCI	×	×

Table 5-11 Comparison Between 10G EPON Interface Cards on Functions (Continued)

Classification	Function	EX8A	EXOA
	Light emission control for optical modules	√	√
	Temperature query and high temperature alarm	√	√
Reliability function	FEC	√	√
	Type B, Type C and Type C dual-homing protections	√	√
	Detection and isolation of rogue ONUs	√	√
	9K Jumbo frames	√	√
Time and clock synchronization function	1588v2 clock	√	√
Note 1: √ indicates "supported"; × indicates "not supported".			

5.7.2 EX8A

Basic Information

Refer to Card Overview for the number, power consumptions, maximum frame length and weight of the card.

Panel Description

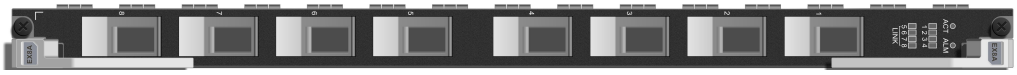


Table 5-12 Interfaces

Identifier	Meaning	Description
1 to 8	10G EPON ports	Connect to ONUs via an ODN.

Table 5-13 Indicator LEDs

Identifier	Meaning	Color	Status	Description
ACT	Working indicator LED	Green	ON	The card is working normally.
			Blinking slowly	The card is being initialized.

Table 5-13 Indicator LEDs (Continued)

Identifier	Meaning	Color	Status	Description
			Blinking quickly	The card is receiving a configuration command from the core switch card or the communication between the active and standby cards is being set up.
			OFF	The card is not powered on normally or is reset abnormally.
ALM	Alarm indicator LED	Red	ON	The card has an urgent alarm.
			OFF	The card has no urgent alarms.
LINK 1 to 8	Port status indicator LED	Green	ON	The ONU under the PON port is registered and authorized.
			OFF	No ONU under the PON port is registered or authorized.

Technical Specifications

See Comparison Between 10G EPON Interface Cards for the technical specifications.

Matching Module

Module Type	Module Code
10G EPON optical module	10/1.25G-20km-10G EPON OLT asymmetric-XFP (10G/1G BASE-PRX30)
	10/1.25G-20km-10G EPON OLT symmetric-XFP (10G BASE-PR30)
Note 1: 10G EPON Optical Module describes the module specifications.	

Function

Comparison Between 10G EPON Interface Cards describes the functions.

Working Principle

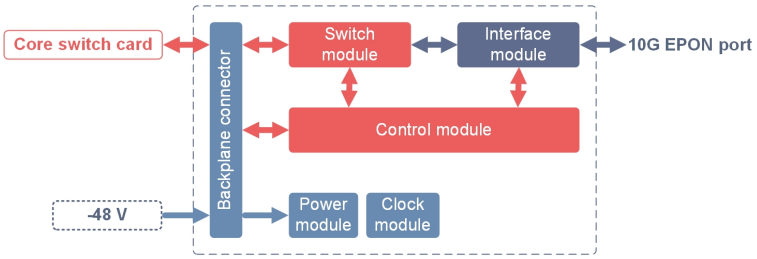


Figure 5-6 Working Principle of the EX8A Card

- The interface module provides 10G EPON ports, and enables conversion between 10G EPON packets and Ethernet packets.
- The switch module aggregates signals from eight ports.
- The control module loads the card software, controls the card operation, and manages the card.
- The power module supplies power to each functional module of the card.
- The clock module provides working clock signals for each functional module of the card.

5.7.3 EXOA

Basic Information

Refer to Card Overview for the number, power consumptions, maximum frame length and weight of the card.

Panel Description

Table 5-14 Interfaces

Identifier	Meaning	Description
1 to 16	10G EPON ports	Connect to ONUs via an ODN.

Table 5-15 Indicator LEDs

Identifier	Meaning	Color	Status	Description
ACT	Working indicator LED	Green	ON	The card is working normally.
			Blinking slowly	The card is being initialized.
			Blinking quickly	The card is receiving a configuration command from the core switch card or the communication between the active and standby cards is being set up.
			OFF	The card is not powered on normally or is reset abnormally.
ALM	Alarm indicator LED	Red	ON	The card has an urgent alarm.
			OFF	The card has no urgent alarms.
1 to 16	Port status indicator LED	Green	ON	The ONU under the PON port is registered and authorized.
			OFF	No ONU under the PON port is registered or authorized.

Technical Specifications

See Comparison Between 10G EPON Interface Cards for the technical specifications.

Matching Module

Module Type	Module Code
10G EPON optical module	10/1.25G-20km-10G EPON OLT asymmetric-SFP+ (10G/1G BASE-PRX30)
	10/1.25G-20km-10G EPON OLT symmetric-SFP+ (10G BASE-PR30)
Note 1: 10G EPON Optical Module describes the module specifications.	

Function

Comparison Between 10G EPON Interface Cards describes the functions.

Working Principle

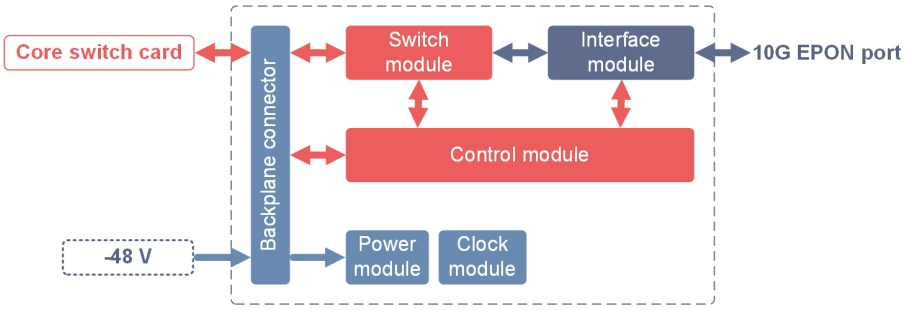


Figure 5-7 Working Principle of the EXOA Card

- The interface module provides 10G EPON ports, and enables conversion between 10G EPON packets and Ethernet packets.
- The switch module aggregates signals from 16 ports.
- The control module loads the card software, controls the card operation, and manages the card.
- The power module supplies power to each functional module of the card.
- The clock module provides working clock signals for each functional module of the card.

5.8 XG-PON Interface Card

The XG-PON interface cards provide service interfaces to access XG-PON services by working together with ONUs.

5.8.1 GX8A

Basic Information

Refer to Card Overview for the number, power consumptions, maximum frame length and weight of the card.

Panel Description

Table 5-16 Interfaces

Identifier	Meaning	Description
1 to 8	XG-PON ports	Connect to ONUs via an ODN.

Table 5-17 Indicator LEDs

Identifier	Meaning	Color	Status	Description
ACT	Working indicator LED	Green	ON	The card is working normally.
			Blinking slowly	The card is being initialized.
			Blinking quickly	The card is receiving a configuration command from the core switch card or the communication between the active and standby cards is being set up.
			OFF	The card is not powered on normally or is reset abnormally.
ALM	Alarm indicator LED	Red	ON	The card has an urgent alarm.
			OFF	The card has no urgent alarms.
LINK 1 to 8	Port status indicator LED	Green	ON	The ONU under the PON port is registered and authorized.
			OFF	No ONU under the PON port is registered or authorized.

Technical Specifications

Item	Specification
Port quantity	8
Forwarding performance	80 Gbit/s
Rate mode	Asymmetric rate mode
Port rate	◆ Uplink: 2.488 Gbit/s ◆ Downlink: 9.953 Gbit/s
Maximum split ratio	1:256
Maximum number of T-CONTs supported by each PON port	2048
Maximum number of MAC addresses	65536

Item	Specification
Maximum differential fiber distance (maximum difference of ONU-to-PON port distance between two ONUs under the same PON port)	40 km
Supported ONU types	10G / 2.5G (downlink rate / uplink rate)
Maximum number of ONUs supported by each PON port	256
Bandwidth allocation granularity of DBA	256 kbit/s
Minimum bandwidth of each T-CONT	1024 kbit/s
Number of GEM ports supported by each card	32768
Switching mode	Store-and-forward
Network standards	IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z, IEEE 802.1d, IEEE 802.1p, IEEE 802.1q, etc.

Matching Module

Module Type	Module Code
XG-PON optical module	10/2.5G-20km-XG-PON OLT-SFP+ (N1 ODN CLASS)
Note 1: XG-PON Optical Module describes the module specifications.	

Function

Classification	Function
Interface function	XG-PON service port
Access feature	Triple Play, including data, voice and IPTV
Multicast function	IGMP Proxy / Snooping multicast and controlled multicast
QoS function	Real-time DBA
	Selective QoS and SLA
	Service rate control
	HQoS
	Queue shaping based on ONUs or queues
Maintenance and management function	Local and remote loopback tests
	Remote upgrade of the card software
	Automatic discovery and detection of ONUs
	Pre-authorization and pre-configuration of ONUs
	ONU configuration in a batch manner

Classification	Function
	Automatic upgrade of the ONU software
	Variable-length OMCI
	Light emission control for optical modules
	Temperature query and high temperature alarm
Reliability function	FEC
	Type B, Type C and Type C dual-homing protections
	Detection and isolation of rogue ONUs
	9K Jumbo frames
Time and clock synchronization function	1588v2 clock

Working Principle

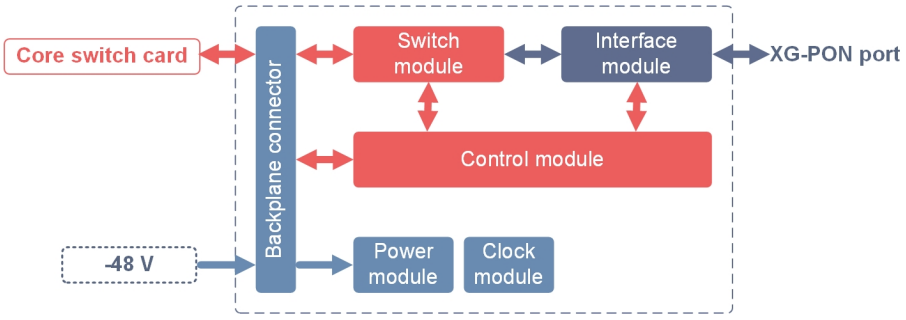


Figure 5-8 Working Principle of the GX8A Card

- The interface module provides XG-PON ports, and enables conversion between XG-PON packets and Ethernet packets.
- The switch module aggregates signals from eight ports.
- The control module loads the card software, controls the card operation, and manages the card.
- The power module supplies power to each functional module of the card.
- The clock module provides working clock signals for each functional module of the card.

5.9 PON Combo Interface Card

The PON Combo interface cards provide service interfaces to access GPON, XG-PON and XGS-PON services by working together with ONUs.

5.9.1 Comparison Between PON Combo Interface Cards

Table 5-18 and Table 5-19 describe the comparison between PON Combo interface cards on technical specifications and functions respectively.

Table 5-18 Comparison Between PON Combo Interface Cards on Technical Specifications

Item	GM8A	GMOA	GNOA
Port quantity	8	16	16
Forwarding performance	80 Gbit/s	160 Gbit/s	160 Gbit/s
Rate mode	Asymmetric rate mode	Asymmetric rate mode	◆ Asymmetric rate mode ◆ Symmetric rate mode
Port rate	GPON channel: ◆ Uplink: 1.244 Gbit/s ◆ Downlink: 2.488 Gbit/s XG-PON channel: ◆ Uplink: 2.488 Gbit/s ◆ Downlink: 9.953 Gbit/s	GPON channel: ◆ Uplink: 1.244 Gbit/s ◆ Downlink: 2.488 Gbit/s XG-PON channel: ◆ Uplink: 2.488 Gbit/s ◆ Downlink: 9.953 Gbit/s	GPON channel: ◆ Uplink: 1.244 Gbit/s ◆ Downlink: 2.488 Gbit/s XGS-PON channel: ◆ Uplink: 9.953 Gbit/s, 2.488 Gbit/s ◆ Downlink: 9.953 Gbit/s
Maximum split ratio	◆ GPON channel: 1:128 ◆ XG-PON channel: 1:256	◆ GPON channel: 1:128 ◆ XG-PON channel: 1:256	◆ GPON channel: 1:128 ◆ XGS-PON channel: 1:256
Maximum number of T-CONTs supported by each PON port	2048	2048	2048
Maximum number of MAC addresses	65536	65536	65536
Maximum differential fiber distance (maximum difference of ONU-to-PON port distance between two ONUs under the same PON port)	40 km	40 km	40 km

Table 5-18 Comparison Between PON Combo Interface Cards on Technical Specifications (Continued)

Item	GM8A	GMOA	GNOA
Supported ONU types	◆ GPON channel: 2.5G / 1.25G (downlink rate / uplink rate) ◆ XG-PON channel: 10G / 2.5G (downlink rate / uplink rate)	◆ GPON channel: 2.5G / 1.25G (downlink rate / uplink rate) ◆ XG-PON channel: 10G / 2.5G (downlink rate / uplink rate)	◆ GPON channel: 2.5G / 1.25G (downlink rate / uplink rate) ◆ XG-PON channel: 10G / 2.5G (downlink rate / uplink rate) ◆ XGS-PON channel: 10G / 10G (downlink rate / uplink rate)
Maximum number of ONUs supported by each PON port	256	256	256
Bandwidth allocation granularity of DBA	◆ GPON channel: 64 kbit/s ◆ XG-PON channel: 256 kbit/s	◆ GPON channel: 64 kbit/s ◆ XG-PON channel: 256 kbit/s	◆ GPON channel: 64 kbit/s ◆ XGS-PON channel: 1024 kbit/s
Minimum bandwidth of each T-CONT	1024 kbit/s	1024 kbit/s	1024 kbit/s
Number of GEM ports supported by each card	32768	32768	32768
Switching mode	Store-and-forward	Store-and-forward	Store-and-forward
Network standards	IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z, IEEE 802.1d, IEEE 802.1p, IEEE 802.1q, etc.	IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z, IEEE 802.1d, IEEE 802.1p, IEEE 802.1q, etc.	IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z, IEEE 802.1d, IEEE 802.1p, IEEE 802.1q, ITU-T G.984.1, ITU-T G.984.2, ITU-T G.984.3, ITU- T G.984.4, ITU-T G.984.5, ITU-T G.984.6, ITU-T G.987, ITU-T G.987.1, ITU-T G.987.2, ITU-T G.987.3, ITU-T G.988 and ITU-T G.9807.1, etc.

Table 5-19 Comparison Between PON Combo Interface Cards on Functions

Classification	Function	GM8A	GMOA	GNOA
Interface function	GPON & XG-PON Combo service port	√	√	×
	GPON & XGS-PON Combo service port	×	×	√

Table 5-19 Comparison Between PON Combo Interface Cards on Functions (Continued)

Classification	Function	GM8A	GMOA	GNOA
Access feature	Triple Play, including data, voice and IPTV	√	√	√
Multicast function	IGMP Proxy / Snooping multicast and controlled multicast	√	√	√
QoS function	Real-time DBA	√	√	√
	Selective QoS and SLA	√	√	√
	Service rate control	√	√	√
	HQoS	√	√	√
	Queue shaping based on ONUs or queues	√	√	√
Maintenance and management function	Local and remote loopback tests	√	√	√
	Remote upgrade of the card software	√	√	√
	Automatic discovery and detection of ONUs	√	√	√
	Pre-authorization and pre-configuration of ONUs	√	√	√
	ONU configuration in a batch manner	√	√	√
	Automatic upgrade of the ONU software	√	√	√
	Variable-length OMCI	√	√	√
	Light emission control for optical modules	√	√	√
	Temperature query and high temperature alarm	√	√	√
Reliability function	FEC	√	√	√
	Type B, Type C and Type C dual-homing protections	√	√	√
	Detection and isolation of rogue ONUs	√	√	√
	9K Jumbo frames	√	√	√
Time and clock synchronization function	1588v2 clock	√	√	√
Note 1: √ indicates "supported"; × indicates "not supported".				

5.9.2 GM8A

Basic Information

Refer to Card Overview for the number, power consumptions, maximum frame length and weight of the card.

Panel Description

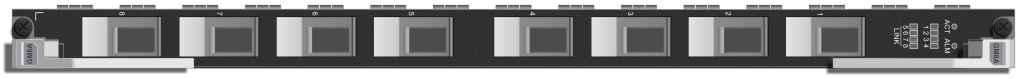


Table 5-20 Interfaces

Identifier	Meaning	Description
1 to 8	GPON & XG-PON Combo ports	Connect to ONUs via an ODN.

Table 5-21 Indicator LEDs

Identifier	Meaning	Color	Status	Description
ACT	Working indicator LED	Green	ON	The card is working normally.
			Blinking slowly	The card is being initialized.
			Blinking quickly	The card is receiving a configuration command from the core switch card or the communication between the active and standby cards is being set up.
			OFF	The card is not powered on normally or is reset abnormally.
ALM	Alarm indicator LED	Red	ON	The card has an urgent alarm.
			OFF	The card has no urgent alarms.
LINK 1 to 8	Port status indicator LED	Green	ON	The ONU under the PON port is registered and authorized.
			OFF	No ONU under the PON port is registered or authorized.

Technical Specifications

See Comparison Between PON Combo Interface Cards for the technical specifications.

Matching Module

Module Type	Module Code
GPON & XG-PON Combo optical module	10/2.5G: 2.5/1.25G-20km-XG-PON: GPON OLT-XFP (B+ ODN CLASS)

Module Type	Module Code
	10/2.5G: 2.5/1.25G-20km-XG-PON: GPON OLT-XFP (C+ ODN CLASS)
Note 1: Combo PON Optical Module describes the module specifications.	

Function

Comparison Between PON Combo Interface Cards describes the functions.

Working Principle

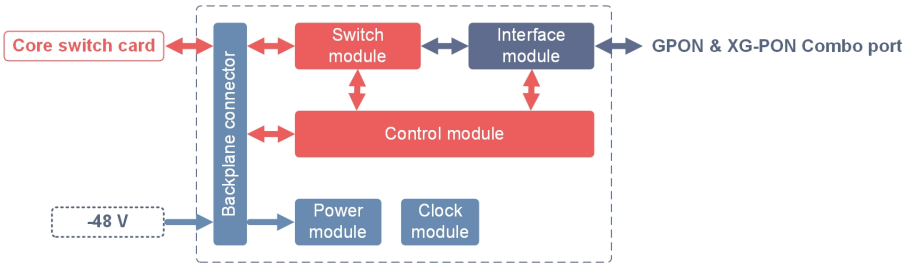


Figure 5-9 Working Principle of the GM8A Card

- The interface module provides GPON & XG-PON Combo ports, and enables conversion between GPON / XG-PON packets and Ethernet packets.
- The switch module aggregates signals from 8 ports.
- The control module loads the card software, controls the card operation, and manages the card.
- The power module supplies power to each functional module of the card.
- The clock module provides working clock signals for each functional module of the card.

5.9.3 GMOA

Basic Information

Refer to Card Overview for the number, power consumptions, maximum frame length and weight of the card.

Panel Description

Table 5-22 Interfaces

Identifier	Meaning	Description
1 to 16	GPON & XG-PON Combo ports	Connect to ONUs via an ODN.

Table 5-23 Indicator LEDs

Identifier	Meaning	Color	Status	Description
ACT	Working indicator LED	Green	ON	The card is working normally.
			Blinking slowly	The card is being initialized.
			Blinking quickly	The card is receiving a configuration command from the core switch card or the communication between the active and standby cards is being set up.
			OFF	The card is not powered on normally or is reset abnormally.
ALM	Alarm indicator LED	Red	ON	The card has an urgent alarm.
			OFF	The card has no urgent alarms.
1 to 16	Port status indicator LED	Green	ON	The ONU under the PON port is registered and authorized.
			OFF	No ONU under the PON port is registered or authorized.

Technical Specifications

See Comparison Between PON Combo Interface Cards for the technical specifications.

Matching Module

Module Type	Module Code
GPON & XG-PON Combo optical module	10/2.5G: 2.5/1.25G-20km-XG-PON: GPON OLT-SFP+ (B+ ODN CLASS)
	10/2.5G: 2.5/1.25G-20km-XG-PON: GPON OLT-SFP+ (C+ ODN CLASS)
Note 1: Combo PON Optical Module describes the module specifications.	

Function

Comparison Between PON Combo Interface Cards describes the functions.

Working Principle

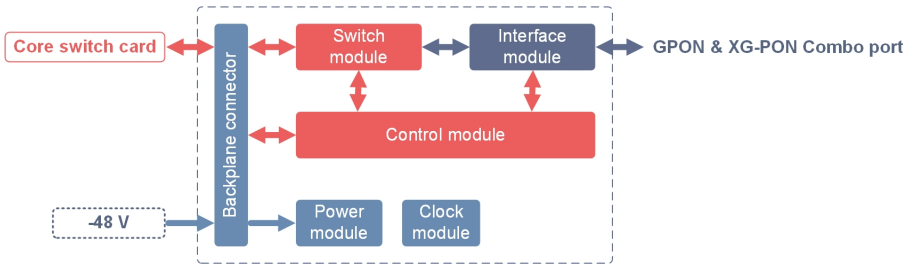


Figure 5-10 Working Principle of the GMOA Card

- The interface module provides GPON & XG-PON Combo ports, and enables conversion between GPON / XG-PON packets and Ethernet packets.
- The switch module aggregates signals from 16 ports.
- The control module loads the card software, controls the card operation, and manages the card.
- The power module supplies power to each functional module of the card.
- The clock module provides working clock signals for each functional module of the card.

5.9.4 GNOA

Basic Information

Refer to Card Overview for the number, power consumptions, maximum frame length and weight of the card.

Panel Description

Table 5-24 Interfaces

Identifier	Meaning	Description
1 to 16	GPON & XGS-PON Combo ports	Connect to ONUs via an ODN.

Table 5-25 Indicator LEDs

Identifier	Meaning	Color	Status	Description
ACT	Working indicator LED	Green	ON	The card is working normally.
			Blinking slowly	The card is being initialized.
			Blinking quickly	The card is receiving a configuration command from the core switch card or the communication between the active and standby cards is being set up.
			OFF	The card is not powered on normally or is reset abnormally.
ALM	Alarm indicator LED	Red	ON	The card has an urgent alarm.
			OFF	The card has no urgent alarms.
1 to 16	Port status indicator LED	Green	ON	The ONU under the PON port is registered and authorized.
			OFF	No ONU under the PON port is registered or authorized.

Technical Specifications

See Comparison Between PON Combo Interface Cards for the technical specifications.

Matching Module

Module Type	Module Code
GPON & XGS-PON Combo optical module	10/10G: 10/2.5G: 2.5/1.25G-20km-XGS-PON: XG-PON: GPON OLT-SFP+ (B+ ODN CLASS)
	10/10G: 10/2.5G: 2.5/1.25G-20km-XGS-PON: XG-PON: GPON OLT-SFP+ (C+ ODN CLASS)
Note 1: Combo PON Optical Module describes the module specifications.	

Function

Comparison Between PON Combo Interface Cards describes the functions.

Working Principle

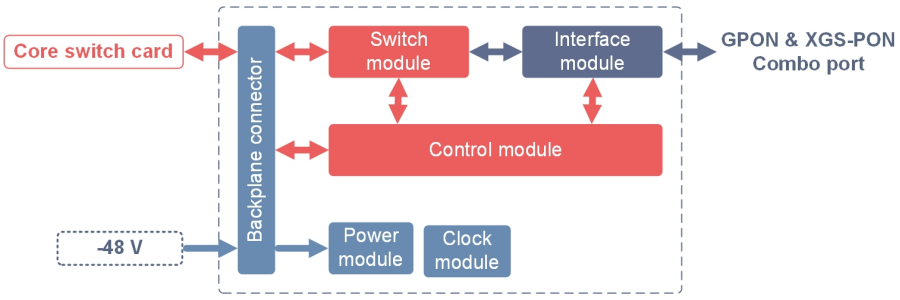


Figure 5-11 Working Principle of the GNOA Card

- The interface module provides GPON & XGS-PON Combo ports, and enables conversion between GPON / XGS-PON packets and Ethernet packets.
- The switch module aggregates signals from 16 ports.
- The control module loads the card software, controls the card operation, and manages the card.
- The power module supplies power to each functional module of the card.
- The clock module provides working clock signals for each functional module of the card.

5.10 Common Interface Card

The common interface card provides the out-of-band management network port, alarm interface, dry contact interface and external clock interface.

5.10.1 CIOA

Basic Information

Refer to Card Overview for the number, power consumptions and weight of the card.

Panel Description

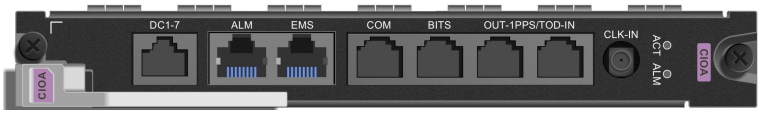


Table 5-26 Interfaces

Identifier	Meaning	Description
CLK-IN	Clock input port	Provides GPS clock input.
1PPS/TOD-IN	1PPS+TOD input port	Inducts high-precision clock and time information from GPS.
1PPS/TOD-OUT	1PPS+TOD output port	Connects to the time input port of a cascade device for time synchronization.
BITS	BITS clock input / output port	Inducts clock information from an E1 link.
COM	Reserved interface	Reserved functional interface
EMS	Out-of-band management network port	Connects to an out-of-band network management computer.
ALM	Alarm port	Outputs equipment alarms to the PDP, the top of the cabinet, or the head of row cabinet.
DC1-7	Dry contact interface	Connects to dry contact signals.

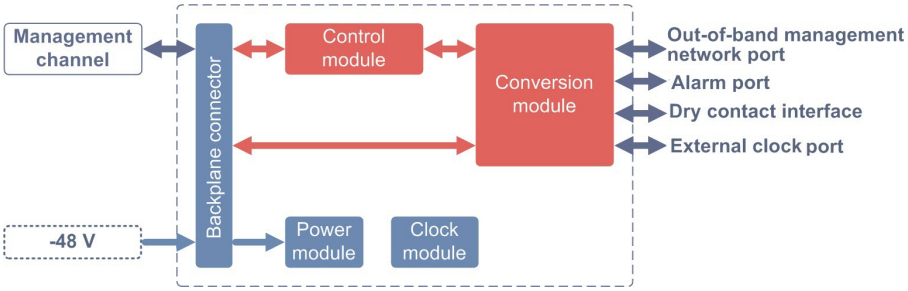
Table 5-27 Indicator LEDs

Identifier	Meaning	Color	Status	Description
ACT	Working indicator LED	Green	ON	The card is working normally.
			Blinking slowly	The card is being initialized.
			OFF	The card is not powered on normally.
ALM	Alarm indicator LED	Red	ON	The card is being reset or has an urgent alarm.
			OFF	The card has no urgent alarms.

Function

- Provides an EMS port for out-of-band network management of the system.
- Provides an alarm monitoring port (ALM).
- Provides a dry contact interface for 7 lines.
- Provides clock ports.

Working Principle



- The conversion module transmits data transparently, and provides an out-of-band management network port, an alarm port, a dry contact interface and clock ports.
- The control module loads the card software, controls the card operation, and manages the card.
- The power module supplies power to each functional module of the card.
- The clock module provides working clock signals for each functional module of the card.