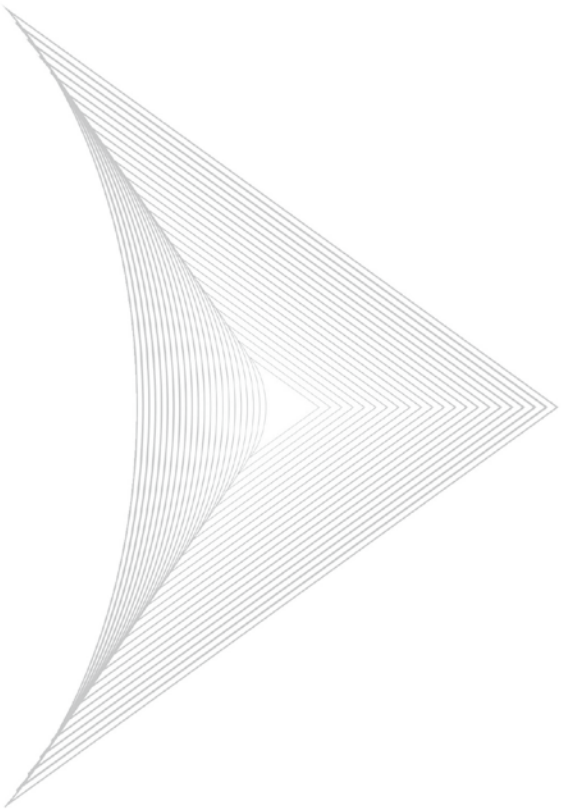
Huahuan

H0FL-EthMux.SA16/SAP16 Series

E1/T1 over Ethernet Converter

User's Manual



Beijing Huahuan Electronics Co.,Ltd.

H0FL-EthMux.SA16/SAP16 Series

E1/T1 over Ethernet Converter

User’s Manual

Beijing Huahuan Electronics Co., Ltd.

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E1/T1 over Ethernet Converter

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1 Overview

1.1 Introduction

Thank you for choosing H0FL-EthMux.SA16/SAP16 series E1/T1 over Ethernet Converters designed and made by Beijing Huahuan Electronics Co., Ltd. The converters encapsulate data of E1/T1 stream in the data packet and support SAToP protocol and UDP/IP packet mode; realizing transportation of 4~16 E1/T1 service over 1 FE port. In the same Ethernet segment, routers or layer-3 switch can be used to cross the Ethernet segment to realize interconnection within IP network, so as to build carrier-class E1/T1 channels. In addition, H0FL-EthMux.SA16/SAP16 series devices also support 2 local Ethernet data access; their internal QoS can set the priority of local Ethernet lower than that of E1/T1 data, so as to ensure the E1/T1 signal priority transmission. The uplink ports of H0FL-EthMux.SAP16 series devices support Power over Ethernet (PoE) function.

H0FL-EthMux.SA16/SAP16 series devices have many optional parameters, which can be modified by the user to suit different application requirements. Please read this manual carefully before using the product. Specific models of H0FL-EthMux.SA16/SAP16 series devices are listed in Table 1-1. According to different PoE modes, H0FL-EthMux.SAP16 series devices can be divided into two types: MS (Mid-span PSE) and ES (Endpoint PSE).

Table 1-1 H0FL-EthMux.SA16 series device models

Type	E1/T1 E1/T1 port number	100Base-Tx electrical port number	100Base-Fx optical port number	Remark
H0FL-EthMux.SA16	16	4	1	-
H0FL-EthMux.SA1608	8	4	1	-
H0FL-EthMux.SA1604	4	4	1	-
H0FL-EthMux.SAP16.MS	16	4	1	MS: 2 uplink ports support POE function
H0FL-EthMux.SAP1608.MS	8	4	1	
H0FL-EthMux.SAP1604.MS	4	4	1	
H0FL-EthMux.SAP1602.MS	2	4	1	
H0FL-EthMux.SAP1602.MS2410	2	4	1	
H0FL-EthMux.SAP1601.MS	1	4	1	
H0FL-EthMux.SAP16.ES	16	4	1	ES: 2 uplink ports support
H0FL-EthMux.SAP1608.ES	8	4	1	

Type	E1/T1 E1/T1 port number	100Base-Tx electrical port number	100Base-Fx optical port number	Remark
H0FL-EthMux. SAP1604.ES	4	4	1	POE function
H0FL-EthMux. SAP1602.ES	2	4	1	
H0FL-EthMux. SAP1601.ES	1	4	1	

1.2 Features

- 1/2/4/8/16 channels of E1/T1 over 1 Ethernet adaptation;
- 4 100Base-Tx electrical ports (2 for uplink, 2 for local data, 1 local data port used as monitoring port) and 1 100Base-Fx Ethernet optical port used for uplink or local data;
- E1 circuit emulation service on Ethernet links, SAToP protocol, IP/UDP Ethernet encapsulation, E1 QoS;
- 3 E1 clock modes: local clock, adaptive and loopback;
- 2 uplink Ethernet electrical ports, 1+1 hitless protection; for H0FL-EthMux. SAP16 series device, 2 uplink ports support Power Over Ethernet (POE) function and can provide the Ethernet client device with 24V/55 V DC, feeding power up to 24W/50W;
- Ethernet built-in layer 2 switch; VLAN (802.1Q based and QinQ based); QoS (port based, 802.1P based and ToS based); port speed limit, flow control, MAC address automatic learning and MAC address aging time setting;

- 120Ω_E1/100Ω_T1 interface, 75Ω unbalanced interface changeable, impedance matching realized through the dip settings of bottom and proprietary cable;
- High transmission efficiency, low transmission delay;
- Stable clock reconstruction frequency, low jitter and wander;
- High packet loss resistance, no frequency jump, frame synchronization protection;
- Buffer absorption function, resisting packet delay variation (PDV);
- Remote monitoring through Web server network management, easy operation and maintenance;
- SNMP network management protocol (V2);
- Online upgrade of software and hardware for local and remote devices;
- SNTP network time setting;
- Software test E1 error;
- H0FL-EthMux.SAP16 series devices: 100~240V AC and -48V DC dual power supply;
- H0FL-EthMux. SA16 series devices: AC + DC, dual AC or dual DC power supply, 1 + 1 backup.

1.3 Product Ordering Information

Product ordering information of H0FL-EthMux.SA16/SAP16 series products is shown in Table 1-2.

Table 1-2 Product ordering information

Product model	Description
H0FL-EthMux.SA16	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • Provides 16 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using dual-E1 socket; • Supports AC+DC, dual AC or dual DC power supply, realizing 1+1 backup
H0FL-EthMux.SA1608	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • Provides 8 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using RJ-48C socket; • Supports AC+DC, dual AC or dual DC power supply, realizing 1+1 backup

H0FL-EthMux.SA1604	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • Provides 4 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using RJ-48C socket; • Supports AC+DC, dual AC or dual DC power supply, realizing 1+1 backup
H0FL-EthMux.SAP16.MS	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • 2 uplink ports support Power over Ethernet (POE) function, can provide the Ethernet client device with 55V DC, feeding power can be up to 50W, which is MS (Mid-span PSE); • Provides 16 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using dual-E1 socket; • Supports AC 100~240V and DC -48V dual-power supply

H0FL-EthMux.SAP1608.MS	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • 2 uplink ports support Power over Ethernet (POE) function, can provide the Ethernet client device with 55V DC, feeding power can be up to 50W, which is MS (Mid-span PSE); • Provides 8 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using RJ-48C socket; • Supports AC 100~240V and DC -48V dual-power supply
H0FL-EthMux.SAP1604.MS	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • 2 uplink ports support Power over Ethernet (POE) function, can provide the Ethernet client device with 55V DC, feeding power can be up to 50W, which is MS (Mid-span PSE); • Provides 4 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using RJ-48C socket; • Supports AC 100~240V and DC -48V dual-power supply

H0FL-EthMux.SAP1602.MS	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx Ethernet electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • 2 uplink ports support Power over Ethernet (POE) function, can provide the Ethernet client device with 55V DC, feeding power can be up to 50W, which is MS (Mid-span PSE); • Provides 2 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using RJ-48C socket; • Supports AC 100~240V and DC -48V dual-power supply
H0FL-EthMux.SAP1602.MS 2410	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx Ethernet electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • 2 uplink ports support Power over Ethernet (POE) function, can provide the Ethernet client device with 24V DC, feeding power can be up to 24W, in order to ensure the steady operation of the device, feeding power should be not more than 18W (0.75A), which is MS (Mid-span PSE); • Provides 2 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using RJ-48C socket; • Supports AC 100~240V and DC -48V dual-power supply

H0FL-EthMux.SAP1601.MS	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • 2 uplink ports support Power over Ethernet (POE) function, can provide the Ethernet client device with 55V DC, feeding power can be up to 50W, which is MS (Mid-span PSE); • Provides 1 E1/T1 port, 120Ω-E1/100Ω-T1 balanced interface, using RJ-48C socket; • Supports AC 100~240V and DC -48V dual-power supply
H0FL-EthMux.SAP16.ES	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • 2 uplink ports support Power over Ethernet (POE) function, can provide the Ethernet client device with 55V DC, feeding power can be up to 50W, which is ES (Endpoint PSE); • Provides 16 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using dual-E1 socket; • Supports AC 100~240V and DC -48V dual-power supply

H0FL-EthMux.SAP1608.ES	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • 2 uplink ports support Power over Ethernet (POE) function, can provide the Ethernet client device with 55V DC, feeding power can be up to 50W, which is ES (Endpoint PSE); • Provides 8 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using RJ-48C socket; • Supports AC 100~240V and DC -48V dual-power supply
H0FL-EthMux.SAP1604.ES	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • 2 uplink ports support Power over Ethernet (POE) function, can provide the Ethernet client device with 55V DC, feeding power can be up to 50W, which is ES (Endpoint PSE); • Provides 4 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using RJ-48C socket; • Supports AC 100~240V and DC -48V dual-power supply

H0FL-EthMux.SAP1602.ES	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx Ethernet electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • 2 uplink ports support Power over Ethernet (POE) function, can provide the Ethernet client device with 55V DC, feeding power can be up to 50W, which is ES (Endpoint PSE); • Provides 2 E1/T1 ports, 120Ω-E1/100Ω-T1 balanced interface, using RJ-48C socket; • Supports AC 100~240V and DC -48V dual-power supply
H0FL-EthMux.SAP1601.ES	• Provides 1 100Base-Fx Ethernet optical port, also used as uplink port or local data port; • Provides 4 100Base-Tx Ethernet electrical ports, supporting VLAN/QinQ/QoS, port speed limit, bandwidth control, MAC address automatic learning and MAC address aging time setting; • 2 uplink ports support Power Over Ethernet (POE) function, can provide the Ethernet client device with 55V DC, feeding power can be up to 50W, which is ES (Endpoint PSE); • Provides 1 E1/T1 port, 120Ω-E1/100Ω-T1 balanced interface, using RJ-48C socket; • Supports AC 100~240V and DC -48V dual-power supply

2 Typical Applications

H0FL-EthMux.SA16/SAP16 series devices can be interconnected with CO aggregation E1 over Ethernet interface converter H0FL-EthMux.SA63, making point-to-multipoint application. And can also make point to point connection realize interconnections within the same Ethernet sub-network, such as used in wireless bridge interconnection, or using routers or layer-3 switch to across the Ethernet segment to realize interconnection within the IP network. Typical applications are shown in Figure 2-1~Figure 2-3.

Figure 2-1 Typical application of H0FL-EthMux SA16/SAP16 series devices

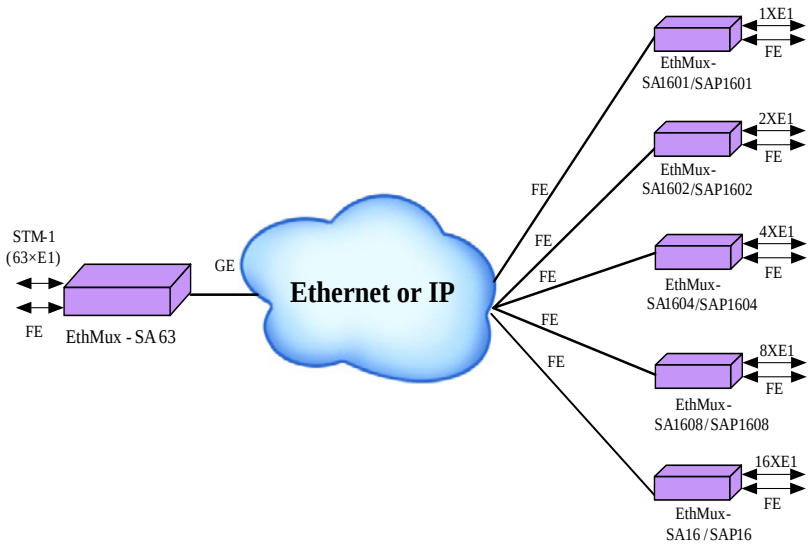


Figure 2-2 Typical application of H0FL-EthMux.SA16/SAP16 series devices in wireless network

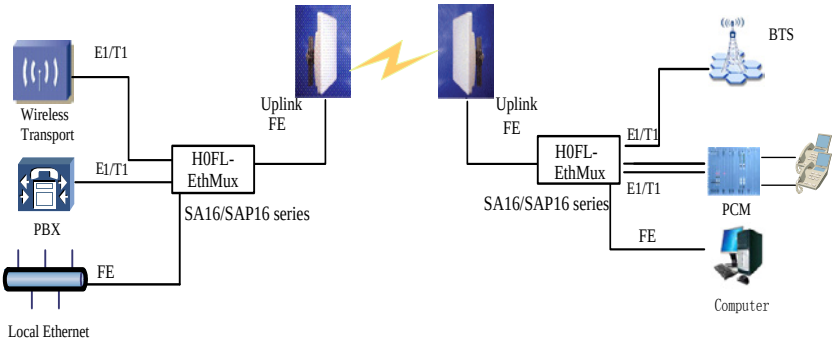
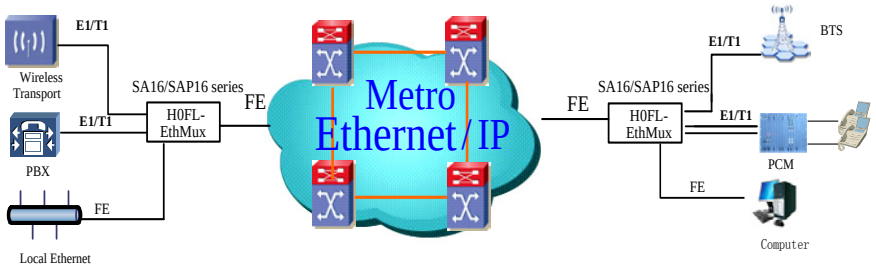


Figure 2-3 Typical application of H0FL-EthMux.SA16/SAP16 series device in cable network



In wireless network application, H0FL-EthMux.SA sereies devices can cooperate with wireless bridges from most manufacturers. At present, the transmission bandwidth of wireless bridge sold in the market is changing with the Ethernet packets; some bridges will introduce the packet delay jitter. When working with different wireless bridges, E1/T1 signal packet length and jitter absorption buffer size need to be adjusted to get the best transmission effect.

WARNING

When this device is working with the wireless bridges, it usually connects with outdoor wireless bridge antenna system through Ethernet cable, thus there is a risk of lightning strike. At this time, Ethernet lightning protection protector must be combined with the uplink network cable; otherwise, the lightning will seriously damage device and pose threat to the field staff!

3 System Architecture

3.1 Panel Arrangement

3.1.1 Panel Diagrams

All service interfaces, power ports, LEDs and DIPs of H0FL-EthMux.SA16/SAP16 series devices are located on the front panel. The front panels are shown in Figure 3-1 and Figure 3-19 (not in the exact proportion, some interfaces and LEDs are added or removed according to selection of actual devices).

Figure 3-1 The front panel diagram of H0FL-EthMux.SA1604 (-48V DC/100~240V AC)

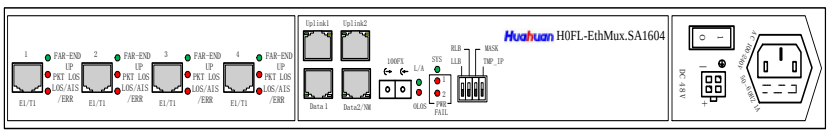


Figure 3-2 The front panel diagram of H0FL-EthMux.SA1604 (dual-48V DC)

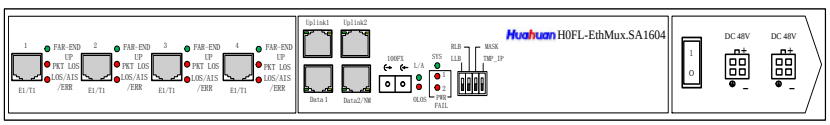


Figure 3-3 The front panel diagram of H0FL-EthMux.SA1604 (dual 100~240V AC)

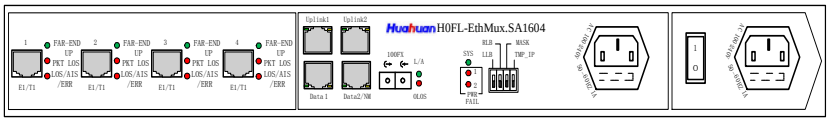


Figure 3-4 The front panel diagram of H0FL-EthMux.SAP1601.MS (-48V DC/100~240V AC)

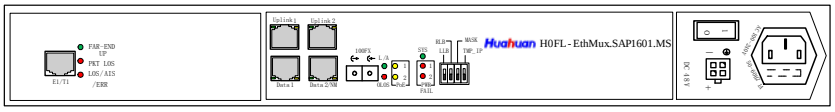


Figure 3-5 The front panel diagram of H0FL-EthMux.SAP1601.ES (-48V DC/100~240V AC)

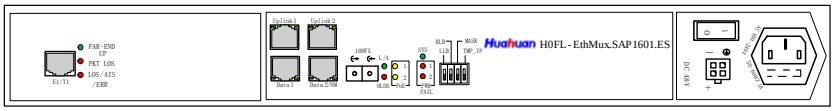
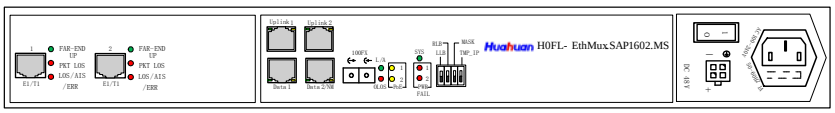


Figure 3-6 The front panel diagram of H0FL-EthMux.SAP1602.MS/ SAP1602.MS2410 (-48V DC/100~240V AC)



NOTE

The front and rear panels of H0FL-EthMux.SAP1602.MS and H0FL-EthMux.SAP1602.MS2410 are the same, we can distinguish these two types through the labels on their baseplates.

Figure 3-7 The front panel diagram of H0FL-EthMux.SAP1602.ES (-48V DC/100~240V AC)

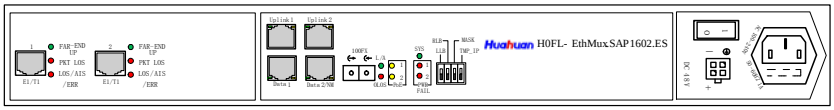


Figure 3-8 The front panel diagram of H0FL-EthMux.SAP1604.MS (-48V DC/100~240V AC)

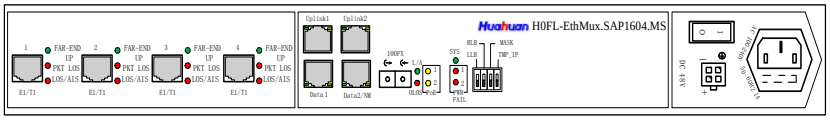


Figure 3-9 The front panel diagram of H0FL-EthMux.SAP1604.ES (-48V DC/100~240V AC)

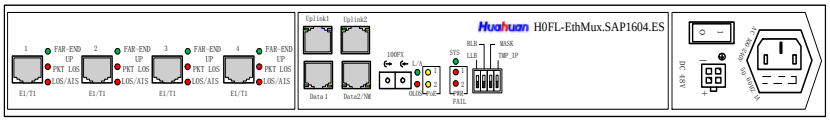


Figure 3-10 The front panel diagram of H0FL-EthMux.SA1608 (-48V DC/100~240V AC)

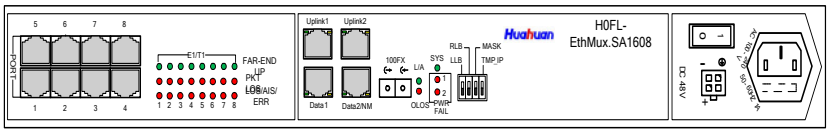


Figure 3-11 The front panel diagram of H0FL-EthMux.SA1608 (dual -48V DC)

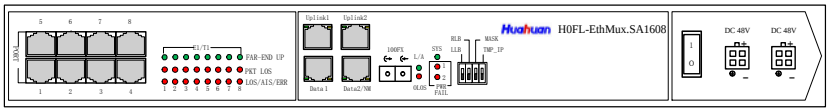


Figure 3-12 The front panel diagram of H0FL-EthMux.SA1608 (dual 100~240V AC)

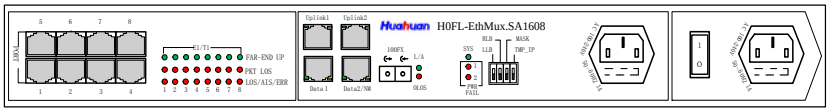


Figure 3-13 The front panel diagram of H0FL-EthMux.SAP1608.MS (-48V DC/100~240V AC)

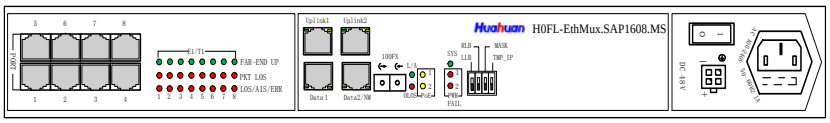


Figure 3-14 The front panel diagram of H0FL-EthMux.SAP1608.ES (-48V DC/100~240V AC)

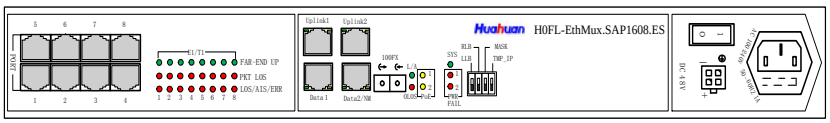


Figure 3-15 The front panel diagram of H0FL-EthMux.SA16 (-48V DC/100~240V AC)

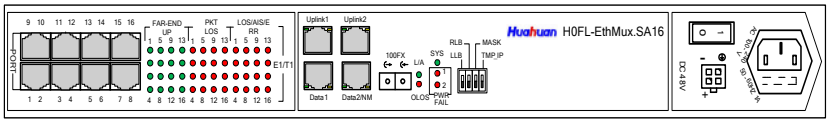


Figure 3-16 The front panel diagram of H0FL-EthMux.SA16 (dual -48V DC)

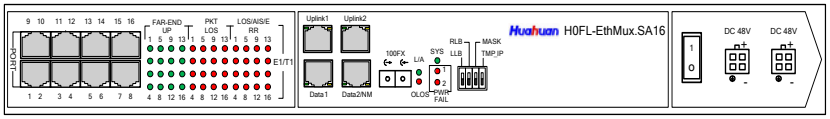


Figure 3-17 The front panel diagram of H0FL-EthMux.SA16 (dual 100~240V AC)

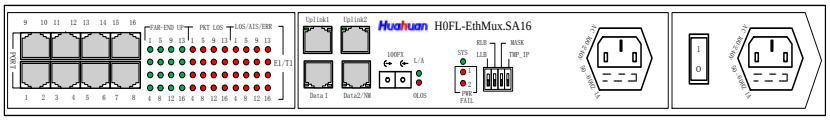


Figure 3-18 The front panel diagram of H0FL-EthMux.SAP16.MS (-48V DC/100~240V AC)

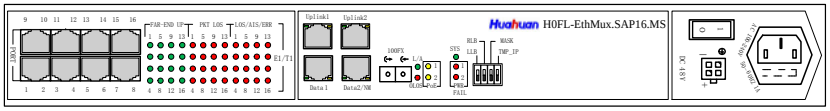
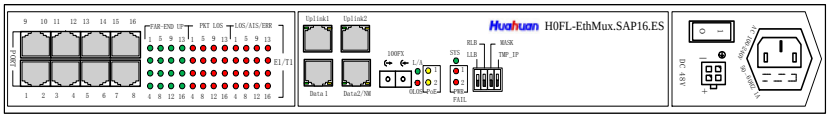


Figure 3-19 The front panel diagram of H0FL-EthMux.SAP16.ES (-48V DC/100~240V AC)



3.1.2 LED Functional Descriptions

Front panel LED functional descriptions of H0FL-EthMux.SA16/SAP16 series devices are shown in Table 3-1.

Table 3-1 LED functional descriptions of H0FL-EthMux.SA16/SAP16 series devices

Label	Color	Num	Definition	Remark
SYS	Green	1	System working state instructions: Blink: running normal On: system is in configuration or running abnormally Off: system does not work or works abnormally	-
PWR FAIL	Red	2	The power failure alarm instructions: On: power supply board is not plugged in or the power supply hasn't been accessed Off: normal	Indicators 1, 2 are corresponding to the left and right power supply

Label	Color	Num	Definition	Remark
L/A	Green	1	Ethernet optical port connection state instructions: On: connected with remote Ethernet optical port Off: not connected with Ethernet optical port	Ethernet optical port indicators
OLOS	Red	1	Ethernet optical port receiving no light instructions: On: no light receiving Off: receiving normally	-
(Ethernet electrical port LINK)	Green	4	Ethernet electrical port state instructions: On: Link normally Blink: data transmitting/receiving Off: Link abnormally	One link indicator on the left of each Ethernet electrical port socket
(Ethernet electrical port FDX)	Yellow	4	Ethernet electrical port rate instructions: On : rate is HULL Off : rate is HALF	One FDX indicator on the right of Ethernet electrical port socket

Label	Color	Num	Definition	Remark
POE	Yellow	2	Uplinked POE state instructions: On : power supply Off : no power supply	Only H0FL-EthMux.SAP16 series, indicators 1, 2 are separately corresponding to the unlinked ports 1, 2
FAR-END UP 1~16	Green	16	E1/T1 addressing the remote device link state instructions: On: addressing the remote MAC address Off: unaddressing the remote MAC address	-
PKT LOS 1~16	Red	16	E1/T1 service lost package instructions in Ethernet link: On: cannot receive the E1/T1 remote package Blink: remote E1/T1 lost package or disorderly sequence Off: remote E1/T1 no lost package and disorderly sequence	-

Label	Color	Num	Definition	Remark
LOS/ AIS 1~16	Red	16	E1/T1 port alarm status instructions: On: LOS alarm Regular slow blink: AIS alarm Irregular fast blink: receive E1/T1 signal with wrong code Off: no alarm	-

3.1.3 DIP Switch

There is a 4-position DIP switch on the front panel of H0FL-EthMux.SA16 /SAP16 series device; the definition is show in Table 3-2.

Table 3-2 DIP switches definition on the front panel of H0FL-EthMux.SA16/ SAP16 series device

Dip	Label	Definition
DIP-1	LLB	E1/T1 port Tx to Rx loop back: ON: set local E1/T1 port Tx to Rx loop back OFF: cancel local E1/T1 port Tx to Rx loop back
DIP-2	RLB	E1/T1 port Rx to Tx loop back: ON: set local E1/T1 port Rx to Tx loop back OFF: cancel local E1/T1 port Rx to Tx loop back

Dip	Label	Definition
DIP-3	MASK	Alarm mask setting: ON: set local alarm mask Off: cancel local alarm mask
DIP-4	TMP_IP	IP setting: ON: restore default IP address 192.192.192.192 OFF: use the IP address set by user
Note: **1) Dial down TMP_IP dip, 5 minutes later, no matter whether the user dials it up, it will return to the original user setting IP** **2) Dial down all the 4 dips, power failure will recover the default setting of the factory, but keep the current IP address, MAC address**		

There is a group of 8-position DIP switch--DIP 1 on the bottom of H0FL-EthMux.SAP1601.MS/SAP1601.ES/SAP1602.MS/SAP1602.ES/ SA1604/SAP1604.MS/SAP1604.ES; two groups of 8-position DIP switches--DIP1~DIP2 on the bottom of H0FL-EthMux.SA1608/ SAP1608.MS/SAP1608.ES; four groups of 8-position DIP switches--DIP1 ~DIP4 on the bottom of H0FL-EthMux.SA16/SAP16.MS/SAP16.ES, used to control the E1/T1 interface impedance and 75 Ω unbalanced interface shell grounding, every 8 dips control 4 channels E1/T1 interface, DIP1 definiation is shown in Table 3-3, DIP2-DIP4 definition is on the analogy of this.

Table 3-3 DIP switches definition on bottom panel of H0FL-EthMux.SA16/SAP16 series device

Dip	Definition	Remark
1st	ON: the 1st E1/T1 Interface impedance is 75 Ω OFF: the 1st E1/T1 Interface impedance is 120Ω-E1/100Ω-T1	Shared by all the types
2nd	ON: the 1st E1/T1 Interface shell grounding OFF: the 1st E1/T1 Interface shell suspended	
3rd	ON: the 2nd E1/T1 Interface impedance is 75 Ω OFF: the 2nd E1/T1 Interface impedance is 120Ω-E1/100Ω-T1	Shared by all the types except H0FL-EthMux.SAP1601
4th	ON: the 2nd E1/T1 interface shell grounding OFF: the 2nd E1/T1 interface shell suspended	
5th	On: the 3rd E1/T1 Interface impedance is 75 Ω OFF: the 3rd E1/T1 Interface impedance is 120Ω-E1/100Ω-T1	Shared by all the types except H0FL-EthMux.SAP1601/ SAP1602
6th	ON: the 3rd E1/T1 interface shell grounding OFF: the 3rd E1/T1 interface shell suspended	

Dip	Definition	Remark
7th	On: the 4th E1/T1 Interface impedance is 75 Ω OFF: the 4th E1/T1 Interface impedance is 120Ω-E1/100Ω-T1	
8th	ON: the 4th E1/T1 interface shell grounding OFF: the 4th E1/T1 interface shell suspended	

NOTE

The 3rd~8th DIPs of 8-position DIP switch--DIP 1 on the bottom of H0FL-EthMux.SAP1601.MS/SAP1601.ES are not defined; the 5th~8th DIPs of 8-position DIP switch--DIP 1 on the bottom of H0FL-EthMux.SAP1602.MS /SAP1602.MS2410/SAP1601.ES are not defined.

3.1.4 E1/T1 Interface

H0FL-EthMux.SAP1601.MS/SAP1601.ES/SAP1602.MS/SAP1602.MS2410/SAP1602.ES/SA1604/SAP1604.MS/SAP1604.ES/SA1608/SAP1608.MS/SAP1608.ES uses RJ-48C socket, and H0FL-EthMux.SA16/SAP16.MS /SAP16.ES uses dual-E1 socket. RJ-48C and dual-E1 connectors, line orders and signals are defined in Table 3-4 and Table 3-5.

H0FL-EthMux.SA16/SAP16 series can implement 75Ω/120Ω unbalanced interface through DIP switches on the bottom plate and external impedance conversion cable, and for this function, the user should provide interface impedance when making orders.

Figure 3-20 Pin order of RJ48-C and dual-E1 connectors

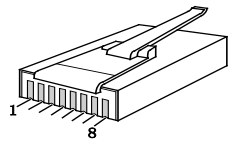


Table 3-4 RJ-48C socket signal definition (120Ω impedance)

Pin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Signal	IN+	IN-	GND	OUT+	OUT-	GND	Unused	Unused
	E1-IN			E1-OUT				

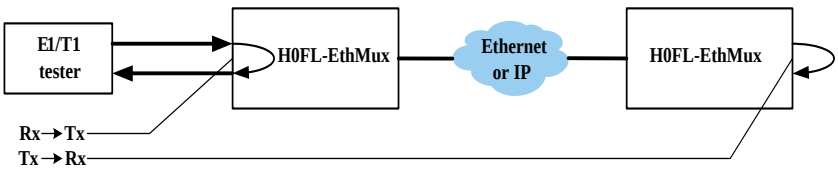
Table 3-5 Dual-E1 socket signal definition (120Ω impedance)

Pin	**E1connecting**	**Twisted pair**	**Using 5 cables to make pairs colors of the recommended**
1	E1_IN(1)-	paired	Blue
2	E1_IN(1)+		Blue white
3	E1_OUT(1)+	paired	Orange
4	E1_OUT(1)-		Orange white
5	E1_IN(2)-	paired	Green
6	E1_IN(2)+		Green white
7	E1_OUT(2)+	paired	Brown
8	E1_OUT(2)-		Brown and white

On the bottom of H0FL-EthMux.SA16/SAP16 series device, there are 1~4 groups of 2/4/8-position DIP switches, used to control the impedance of the E1/T1 interface and 75 Ω unbalanced interface shell grounded. When the interface selects 75Ω impedance, H0FL-EthMux.SAP1601.MS/ SAP1601.ES/SAP1602.MS/SAP1602.MS2410/SAP1602.ES/SA1604/ SAP1604.MS/SAP1604.ES/SA1608/SAP1608.MS/SAP1608.ES device can use BH4.815.122 cable which converts 120Ω-E1/100Ω-T1 balanced interface (RJ-48C) to 75Ω unbalanced interface (BNC). The "+" connects core, and "-" connects sheath. H0FL-EthMux.SA16/SAP16 series device uses the BH4.815.123 cable which converts 120Ω-E1/100Ω-T1 balanced interface (dual E1 socket) to 75Ω unbalanced interface (BNC). The "+" connects core, "-" connects sheath.

E1/T1 interface of H0FL-EthMux.SA16/SAP16 series device provides Rx→Tx, Tx→Rx loop back operation through NMS which is convenient for opening and maintain test. Rx→Tx, Tx→Rx loop back definition is shown in Figure 3-21.

Figure 3-21 E1/T1 loop back



Rx→Tx can test E1/T1 connection cable, and Tx→Rx is used to test the whole circuit including H0FL-EthMux.SA16/SAP16 series devices at both ends and the Ethernet link between them.

CAUTION

- E1/T1 interface card doesn't support hot plug. If it needs to be replaced, please shut off the power first.
- E1/T1 interface of H0FL-EthMux.SA16/SAP16 device uses dual E1 socket, that is one socket corresponds two channels of E1/T1, belonging to proprietary definition, don't make the interface with the H0FL-EthMux.SA1604/SAP1604.MS/SAP1604.ES/SA1608/SAP1608.MS/SAP16.ES device standard RJ-48C socket confusion, or it will damage the interface.
- E1/T1 interface options are set by NMS.

3.1.5 Ethernet Port

There are four 100Base-Tx Ethernet electrical ports and one 100Base-Fx optical port provided by H0FL-EthMux.SA16/SAP16 series device. Two Ethernet electrical ports (marked with Uplink1 and Uplink2) are isolated uplink ports used to connect with transmission network and the other two are local data ports (marked with Data1 and Data2/NM) used to connect with local Ethernet, such as switches; and one optical port (marked with 100Fx) used as either uplink port or local data port. Ethernet electrical port (marked with Data2/NM) can use Web Server to monitor two devices connected at both ends; or online upgrade software and hardware. When the uplink port is accessed to the upper switch, it also can be used for monitoring.

Ethernet electrical port of H0FL-EthMux.SA16/SAP16 series device supports auto-negotiation or forced 10M full duplex/half-duplex and 100M full-duplex/half-duplex. Ethernet optical port supports 100M full-duplex mode.

Ethernet of H0FL-EthMux.SA16/SAP16 series device built-in layer-2 switches function, supporting Ethernet packet size up to 2000 bytes. It

supports multiple functions, such as port speed limit, IEEE802.3 x flow control, the MAC address automatic learning and MAC address aging time function set etc. It supports VLAN division based on 802.1Q and QinQ; and QoS setting based on port, 8021.1P and TOS which can be divided into priorities. These three QoS are enabled by default and configured with the recommended priority to ensure the normal monitoring and E1/T1 signal transmission priority, i.e. monitoring uses the highest priority (7); UPLINK port and optical port use priority (4); layer-2 E1/T1 uses priority (6); layer-3 E1/T1 uses DSCP priority 184 (0xB8); Ethernet service uses the lowest priority (0). If priorities need to be modified, E1/T1 service and monitoring priorities are recommended to be set to 6, 7; common Ethernet service priority is set to 0-5.

Ethernet electrical port of H0FL-EthMux.SA16/SAP16 series device uses RJ45 socket. Pin definition of RJ45 Ethernet socket is shown in Table 3-6. Ethernet optical port can use dual-fiber SFP optical module and the port labeled (→ is for optical signal output, (← for input. Also Ethernet optical port can use single-fiber optical module which has only one optical interface. The wavelength of single-fiber module is its emission wavelength, which is 1310nm or 1550nm. **Note that single fiber device with the same emission wavelength cannot interwork. So when single-fiber devices are interworked, the devices with matched emission wavelengths should be used.** The user can choose different SFP optical module according to the different transmission distance.

Table 3-6 RJ45 Ethernet socket definition

Pin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Definition	TxD+	TxD-	RxD+	-	-	RxD-	-	-

Two uplinked Ethernet electrical ports of H0FL-EthMux.SAP16 series device can control (POE) function by Webserver network management, open after POE by Ethernet data pin provide 24V/55V DC (support output short circuit protection function) to net Bridges, feeding power can be up

to 24W/50W, in order to ensure the steady operation of the device, feeding power should be not more than 18W (0.75A). Two modes of POE (Power over Ethernet) are supported. At MS (Mid-span PSE) mode, pin 4 and 5 are positive, and pin 7 and 8 are negative; at ES (Endpoint PSE) mode, pin 1 and 2 are positive, and pin 3 and 6 are negative, as shown in Table 3-7.

Table 3-7 Support POE function RJ45 Ethernet socket definition

Pin	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
MS mode	TxD+	TxD-	RxD+	24 V+/ 55 V+	24 V+/ 55 V+	RxD-	24 V-/ 55 V-	24 V-/ 55 V-
ES mode	TxD+ (55V+)	TxD- (55V+)	RxD+ (55V-)	-	-	RxD- (55V-)	-	-

CAUTION

- When H0FL-EthMux.SAP16 series device enables Ethernet power supply function, the uplinked port in the transmission of data will provide 24V/55 V DC continuously, which needs to pay attention to safety, Ethernet cable don't be naked.
- When H0FL-EthMux.SAP16 series device enables Ethernet power supply function, the uplinked port must not connect with monitoring computer in order to avoid damage. Therefore, Data2/NM Ethernet electrical port is recommended to be sued as monitoring port.
- When H0FL-EthMux.SAP16 series device enables Ethernet power supply function, Ethernet loop back won’t be set (including software loop back and used Ethernet cable of hardware loop back).

NOTE

In auto-negotiation mode, H0FL-EthMux.SA16/SAP16 series device Ethernet electrical port supports HP auto-MDIX function, which can automatically detect the transceiver line order of the network cable connected and make adaptions. So the port can be used whether the Ethernet port is MDI or MDI-X and whether the network cable used is crossover or straight-through.

3.1.6 Power Switch and Power Socket

H0FL-EthMux.SA16/SAP16 series device supports -48V DC and ~220V AC power supplies. The ~220V AC power supply uses ~220V AC power socket which complies with national standard and is connected by standard three-core power cable. The -48V DC power is connected by 2x2 socket.

When connecting AC power cable, IEC standard power cable sent with device will be used. The middle electrode of AC power socket is protection ground electrode. When connecting DC power cable, DC power cable sent with device will be used. Note that the red wire of power cable is high potential, i.e. power ground of -48V power supply, and that the blue wire is low potential, i.e. -48V. When inserting the power plug, please note the direction of the locking lever. The yellow-green wire of DC power cable sent with device is ground line. Make sure that the device has connected to the ground when installing it.

CAUTION

For user's safety, when ~220V AC power supply is used, the AC power socket must have good protection ground connection! When DC power supply is used, the DC power socket must have good protection ground connection!

3.2 Function Introduction

H0FL-EthMux.SA16/SAP16 series device is built on TDM/Packet processing unit. It truncates E1/T1 data stream and encapsulates the data

into Ethernet packet; and then sends the packeted MAC frame to the Ethernet exchange unit via MII interface; finally, accesses to Ethernet network through uplink Ethernet ports.

The receiving end sends Ethernet data packets carried with E1/T1 data to the TDM/Packet processing unit via MII interface. The processing unit will reassemble the receiving packets to recover the original E1/T1 data stream and outputs it via E1/T1 interface unit. TDM/Packet processing unit needs to process the reassembled data regularly, so as to recover bit rate, jitter and wander index of E1/T1 stream to meet the requirements of TDM signals.

Users can set various operational parameters of H0FL-EthMux.SA16/ SAP16 series device through Network Management.

3.3 Timing Modes

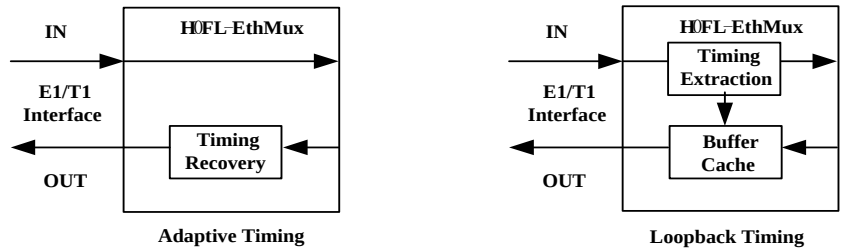
As an E1/T1 signal transparent transmission device, H0FL-EthMux.SA16/ SAP16 series device does not only transfer E1/T1 data stream correctly to the receiving end, but also recovers the E1/T1 data stream timing information of sending end at the receiving end (E1/T1 output end) accurately. Normally, bi-directional E1/T1 transmission signals are not necessary in the state of synchronization.In other words, although the signals coming in and going out of the same E1/T1 interface are nominal bit rate, there can be 100ppm frequency difference between them. In this case, the receiving end must reconstruct timing mode according to E1/T1 stream transferred from peer end, this process is **Adaptive Timing mode**. H0FL-EthMux.SA16/SAP16 series device uses timing recovery technique; the output E1/T1 has low jitter and high frequency stability; typical frequency offset is within 5ppm and clock jitter is below 0.1UI, which can meet most applications.

Because Ethernet or IP network transmission data packets have great randomness, although the adaptive timing can restore the clock with high stability and low jitter, the longtime wander is big. The wander does not affect the normal work of the reception device which uses the slave timing mode, but for some applications, such as switches using the internal clock,

may cause the overflow of the frame memory in input port, thus the slip frame will occur.

Therefore, H0FL-EthMux.SA16/SAP16 series device provides another timing mode, **loopback timing mode**. In this mode, H0FL-EthMux.SA16/SAP16 series device uses the clock extracted from E1/T1 input port signal to reconstruct E1/T1 output stream, the wander formed in network transmission can be absorbed completely by internal memory of H0FL-EthMux.SA16/SAP16 series device. Once the input signal loss fault, it will automatically switch to adaptive timing. H0FL-EthMux.SA16/SAP16 series device provides two kinds of timing modes, as shown in Figure 3-22.

Figure 3-22 Timing modes



Choosing proper timing mode is important for ensuring service quality. In most cases, setting both units to adaptive timing mode is sufficient. But sometimes, setting one unit to loop timing mode may work better. For example, setting the H0FL-EthMux.SA16/SAP16 series unit connected with the master clock (such as local switch) to loop back mode, and the other unit connected with the slave clock (such as remote module of switch or PCM terminal) to adaptive mode, is probably better than setting both to adaptive modes. If both sides of devices use master clocks in the state of the synchronization, such as, H0FL-EthMux.SA16/SAP16 series devices on both sides should work in the loopback timing mode when the switches with independent clock distribution network interconnect with each other. If both sides of devices use master clocks in the state of the asynchronous,

slips will occur, at this time, timing mode of H0FL-EthMuxSA16/SAP16 series devices on both sides must be adaptive timing.

CAUTION

One typical error in applications is to let both communication devices (such as PCM terminal) work at slave clocks. Neither transmission devices nor H0FL-EthMux.SA16/SAP16 series device will support such operation.

TIP At the beginning of startup, the clock usually takes several minutes to be locked. During that period, errors and slips are normal.

Various timing schemes are listed in Table 3-8, which can be selected according to the device interconnection shown inFigure 3-23.

Figure 3-23 Diagram for device interconnection

Table 3-8 Timing mode schemes

A side device clock mode	B side device clock mode	A side EthMux timing mode	B side EthMux timing mode	Remark
Master clock	Master clock	Loopback	Loopback	Device clocks at A and B sides are synchronous
		Adaptive	Adaptive	

A side device clock mode	B side device clock mode	A side EthMux timing mode	B side EthMux timing mode	Remark
Master clock	Master clock	Adaptive	Adaptive	Device clocks at A and B sides are respectively independent
Master clock	Slave clock	Loopback	Adaptive	-
		Adaptive	Adaptive	
Slave clock	Master clock	Adaptive	Loopback	-
		Adaptive	Adaptive	
Slave clock	Slave clock	-	-	Not allowed

3.4 System Structure

H0FL-EthMux.SA16/SAP16 series device uses standard 1U chassis, which is composed by E1/T1 interface board, system board and power module. System structures of H0FL-EthMux.SA16/SAP16 series device are shown in Figure 3-24 and Figure 3-25.

Figure 3-24 H0FL-EthMux.SA16 series device system structure

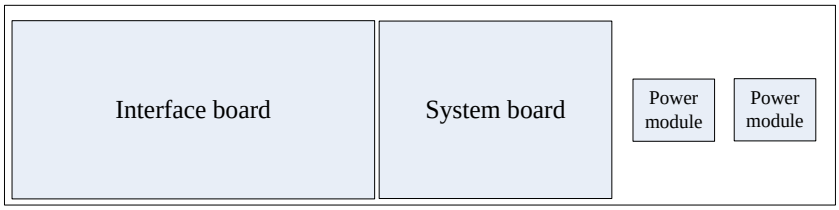
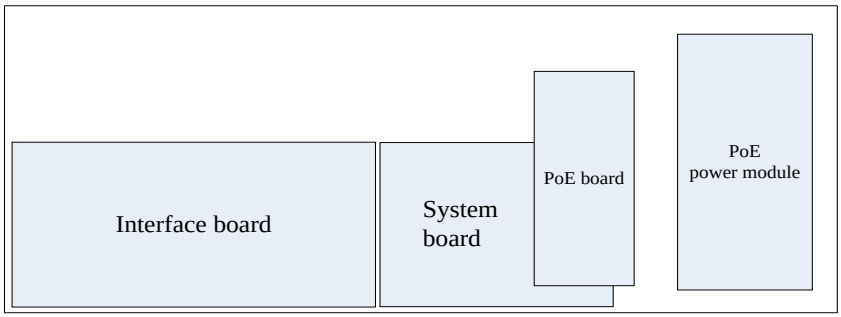


Figure 3-25 H0FL-EthMux.SAP16 series device system structure



4 Cable Introduction

4.1 AC Power Cable

Application

AC power cable transports AC power from power distribution equipment to AC power supply socket, and then transmits power to the entire device.

According to different devices, AC power cables ZJN.BH4.855.080 and ZJN.BH4.855.035 will be configured. See details in Table 4-1.

Table 4-1 AC power cable types

Cable types	Applicable devices
ZJN.BH4.855.080	H0FL-EthMux.SA16 series devices
ZJN.BH4.855.035	H0FL-EthMux.SAP16 series devices

4.1.1 AC Power Cable (ZJN.BH4.855.080)

Appearance

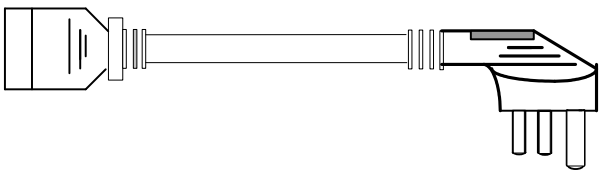
AC power supply cable (ZJN.BH4.855.080) used by device depends on local standards, while different regions have different standards, as shown in Table 4-2.

Table 4-2 AC power supply cable list

Regional standard	Cable type
Chinese standard	ZJN.BH4.855.080
German standard	ZJN.BH4.855.080-B
South Africa standard	ZJN.BH4.855.080-D
Japanese/American standard	ZJN.BH4.855.080-E
British standard	ZJN.BH4.855.080-F
North American standard	ZJN.BH4.855.080-G

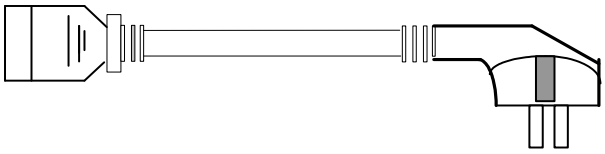
The AC power cable (ZJN.BH4.855.080) which meets Chinese standard is composed of Chinese standard three-plug connector and pins terminal, as shown in Figure 4-1.

Figure 4-1 Chinese standard AC power cable (ZJN.BH4.855.080)



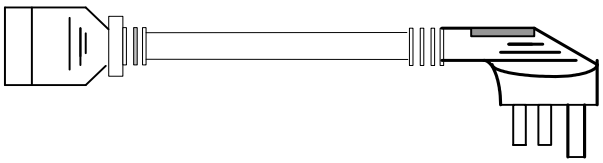
The AC power cable (ZJN.BH4.855.080-B) which meets German standard is composed of German standard French-mode two-plug connector and pins terminal, as shown in Figure 4-2.

Figure 4-2 German standard AC power cable (ZJN.BH4.855.080-B)



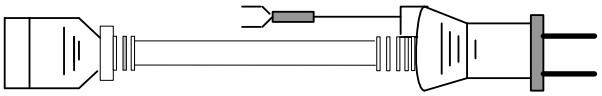
The AC power cable (ZJN.BH4.855.080-D) which meets South Africa standard is composed of South Africa standard three-plug connector and pins terminal, as shown in Figure 4-3.

Figure 4-3 South Africa standard AC power cable (ZJN.BH4.855.080-D)



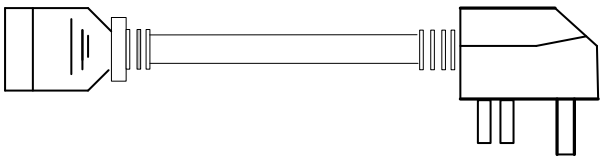
The AC power cable (ZJN.BH4.855.080-E) which meets Japanese/American standard is composed of Japanese/American standard two-plug connector and pins terminal, as shown in Figure 4-4.

Figure 4-4 Japanese/American standard AC power cable (ZJN.BH4.855.080-E)



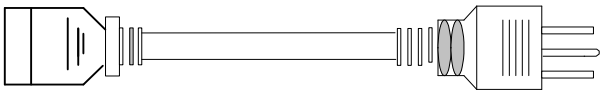
The AC power cable (ZJN.BH4.855.080-F) which meets British standard is composed of British standard three-plug connector and pins terminal, as shown in Figure 4-5.

Figure 4-5 British standard AC power cable (ZJN.BH4.855.080-F)



The AC power cable (ZJN.BH4.855.080-G) which meets North American standard is composed of North American standard three-plug connector and pins terminal, as shown in Figure 4-6.

Figure 4-6 North American AC power cable (ZJN.BH4.855.080-G)



Technical Specifications

Table 4-3 lists technical specifications of AC power cable.

Table 4-3 Technical specifications of AC power cable

Item	Description
Cable type	Electronic and electrical cable
Color	Black
Diameter	≥0.5mm^2
Length	1.5m

4.1.2 AC Power Cable (ZJN.BH4.855.035)

Appearance

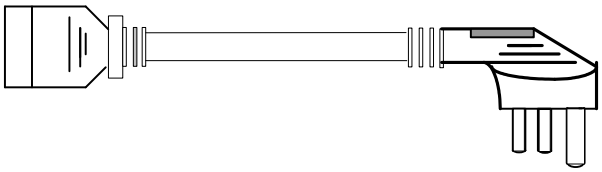
AC power supply cable (ZJN.BH4.855.035) used by device depends on local standards, while different regions have different standards, as shown in Table 4-4.

Table 4-4 AC power supply cable list

Regional standard	Cable type
Chinese standard	ZJN.BH4.855.035
German standard	ZJN.BH4.855.035-B
South Africa standard	ZJN.BH4.855.035-D
Japanese/ American standard	ZJN.BH4.855.035-E
British standard	ZJN.BH4.855.035-F
North American standard	ZJN.BH4.855.035-G

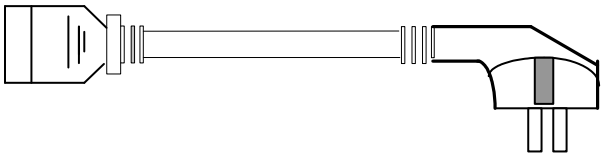
The AC power cable which meets Chinese standard (ZJN.BH4.855.035) is composed of Chinese standard three-plug connector and pins terminal, as shown in Figure 4-7.

Figure 4-7 Chinese standard AC power cable



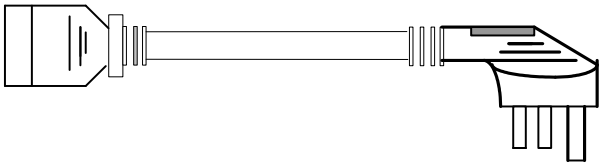
The AC power cable which meets German standard (ZJN.BH4.855.035-B) is composed of German standard French-mode two-plug connector and pins terminal, as shown in Figure 4-8.

Figure 4-8 German standard AC power cable



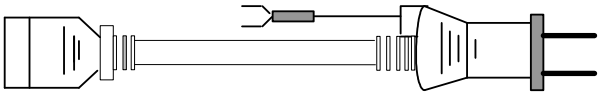
The AC power cable which meets South Africa standard (ZJN.BH4.855.035-D) is composed of South Africa standard three-plug connector and pins terminal, as shown in Figure 4-9.

Figure 4-9 South Africa AC power cable



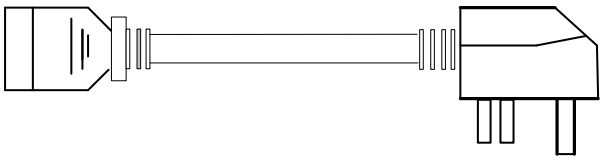
The AC power cable which meets Japanese/American standard (ZJN.BH4.855.035-E) is composed of Japanese standard two-plug connector and pins terminal, as shown in Figure 4-10.

Figure 4-10 Japanese /American standard AC power cable



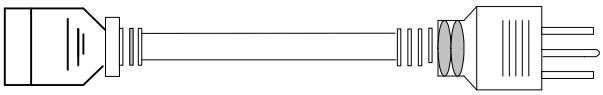
The AC power cable which meets British standard (ZJN.BH4.855.035-F) is composed of British standard three-plug connector and pins terminal, as shown in Figure 4-11.

Figure 4-11 British standard AC power cable



The AC power cable which meets North American standard (ZJN.BH4.855.035-G) is composed of North American standard three-plug connector and pins terminal, as shown in Figure 4-12.

Figure 4-12 North American AC power cable



Technical Parameters

Table 4-5 lists technical parameters of AC power cable.

Table 4-5 Technical parameters of AC power cable

Item	Description
Cable type	Electronic and electrical cable
Color	Black
Diameter	≥0.5mm^2
Length	1.7m, 1.8m

4.2 DC Power Cable

Application

DC power cable transports DC power from power distribution equipment to DC power supply socket, and then transmits power to the entire device.

According to different devices, DC power cables ZJN.BH4.855.079 and ZJN.BH4.855.050 will be configured. See details in Table 4-6.

Table 4-6 DC power cable types

Cable types	**Applicable devices**
ZJN.BH4.855.079	H0FL-EthMux.SA16 series devices

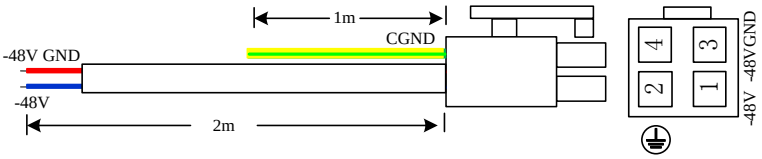
Cable types	Applicable devices
ZJN.BH4.855.050	H0FL-EthMux.SAP16 series devices

4.2.1 DC Power Cable (ZJN.BH4.855.079)

Appearance

Figure 4-13 shows appearance of DC power cable (ZJN.BH4.855.079) which is composed of 2x2 connector and power cable.

Figure 4-13 -48V DC power cable appearance



Pin Assignments

Table 4-7 lists DC power pin assignments.

Table 4-7 DC power pin assignments

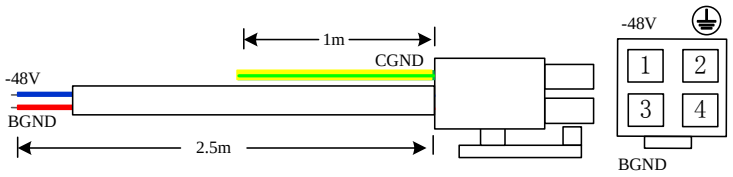
PIN	Color	Signal definition
1	Blue	-48V
2	Yellow green	CGND
3	Red	BGND
4	-	-

4.2.2 DC Power Cable (ZJN.BH4.855.050)

Appearance

Figure 4-14 shows appearance of DC power cable (ZJN.BH4.855.050) which is composed of 2x2 connector and power cable.

Figure 4-14 DC power cable appearance



Pin Assignments

Table 4-8 lists DC power pin assignments.

Table 4-8 DC power pin assignments

PIN	Color	Signal definition
1	Blue	-48V
2	Yellow green	CGND
3	Red	BGND
4	-	-

4.3 Fiber

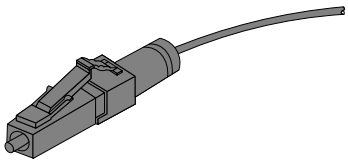
Application

Fiber is used to connect optical port with uplink devices or optical network terminals.

Appearance and Operation

Figure 4-15 shows the LC/PC fiber connector.

Figure 4-15 LC/PC fiber connector



When connecting or removing the LC/PC optical connector, align the connector with the optical interface, and do not rotate the fiber. Note the following points:

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

4.4 Ethernet Cable

Introduction

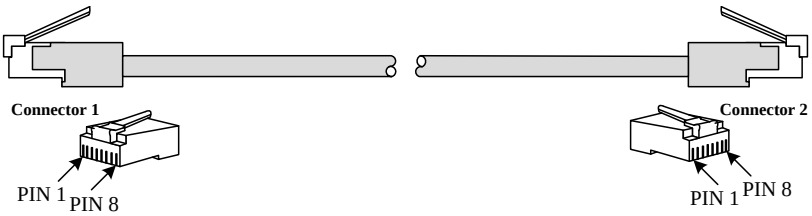
- Used to connect the Ethernet electrical interface with other devices.
- Used to connect the Ethernet monitoring interface on NM card with network interface on NM PC machine.

The Ethernet port of device is self-adaptive to straight-through cable mode and crossover cable mode. Both of them can be used to connect Ethernet electrical port.

Appearance

Figure 4-16 shows Ethernet cable appearance.

Figure 4-16 Ethernet cable



Pin Assignments

Ethernet cables are classified into straight-through cables and crossover cables:

- Straight through cable: the line orders of twisted pair crimped by both ends RJ45 connectors are the same, used to connect devices of different types.
- Crossover cable: the line orders of twisted pair crimped by both ends RJ45 connectors are different, used to connect devices of the same types.

Table 4-9 lists the line orders of EIA/TIA 568A and EIA/TIA 568B standards.

Table 4-9 Line orders of EIA/TIA 568A and EIA/TIA 568B standards

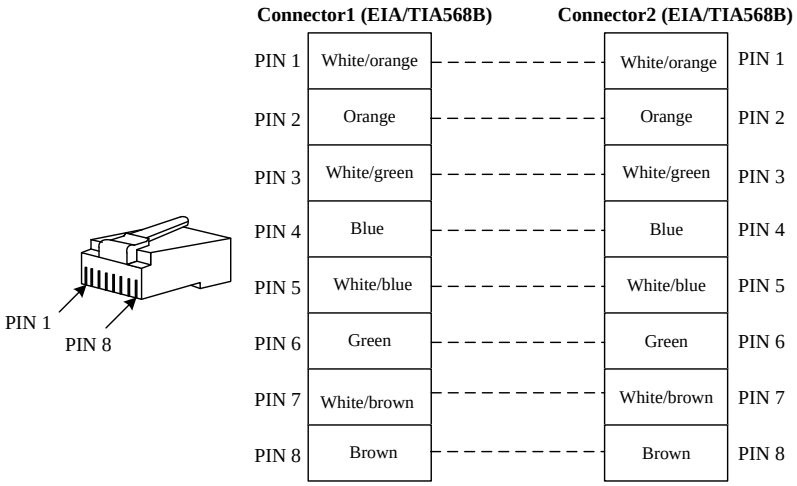
Connector (RJ45)	EIA/TIA568A	EIA/TIA568B
PIN 1	White/Green	White/Orange

PIN 2	Green	Orange
PIN 3	White/Orange	White/Green
PIN 4	Blue	Blue
PIN 5	White/Blue	White/Blue
PIN 6	Orange	Green
PIN 7	White/Brown	White/Brown
PIN 8	Brown	Brown

Both two RJ45 connectors of the straight-through cable follow EIA/TIA568B standard line order.

Figure 4-17 shows the line order of the straight-through cable.

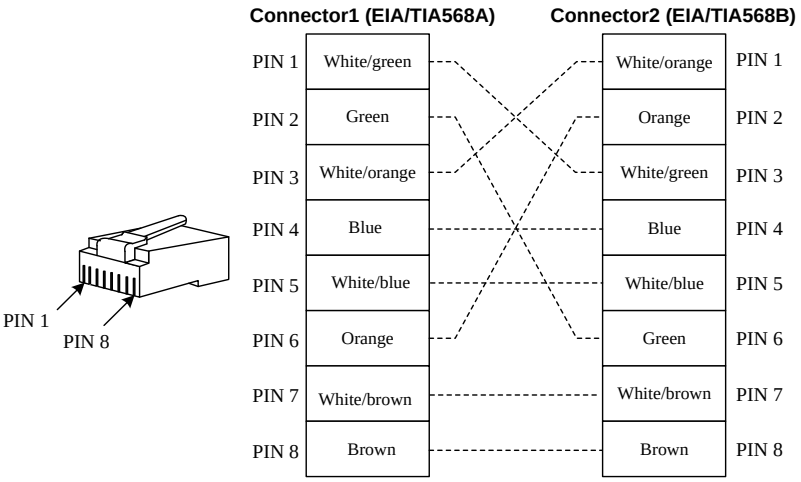
Figure 4-17 Line order of the straight-through cable



RJ45 connectors on both ends of crossover cable need to use different standard line orders, usually one RJ45 connector follows EIA/TIA568A standard; the other RJ45 connector follows EIA/TIA568B standard.

The line order of the 100 Mbit/s crossover cable is shown in Figure 4-18.

Figure 4-18 Line order of the 100 Mbit/s crossover cable



Technical Specifications

Table 4-10 lists technical specifications of the Ethernet cable.

Table 4-10 Technical specifications of the Ethernet cable

Item	Description
Connector type	RJ45 connector (crystal head)
Cable type	Category 5 unshielded twisted pair (UTP-5) or shielded twisted pair (STP)
Color	Dark grey
Characteristic impedance	100.0Ω
Inner conductor wire diameter	0.510mm
Breakdown voltage	500.0V

Item	Description
Inner conductor DC impedance	93.8Ω/km
Quantity of cores	8
Frequency range	0~100MHz
Frequency attenuation	22dB/100m@100MHz

4.5 E1 Cable

Application

E1 cable is used to connect E1 interface of equipment card, realizing the transmission of E1 signal. E1 cable type depends on different forms of interfaces. See E1 cable types in Table 4-11.

Table 4-11 E1 cable types

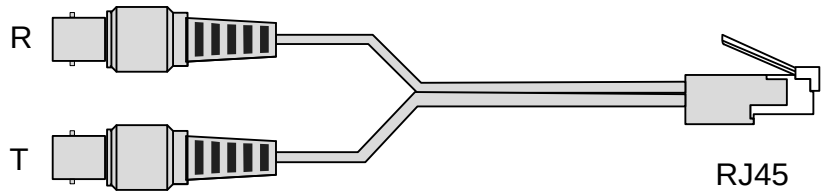
Cable type	Cable model	Applicable devices
RJ48-C socket cable	BH4.850.122	H0FL-EthMux.SAP1601.MS/SAP1601.ES/SAP1602.MS/SAP1602.MS2410/SAP1602.ES/SA1604/SAP1604.MS/SAP1604.ES/SA1608/SAP1608.MS/SAP1608.ES
Dual E1 socket cable	BH4.850.123	H0FL-EthMux.SA16/SAP16.MS/SAP16.ES

4.5.1 RJ48-C Socket Cable (BH4.850.122)

Appearance

RJ48-C socket cable (BH4.850.122) is composed of 1 RJ45 crystal head and 2 BNC heads, whose appearance diagram is shown in Figure 4-19.

Figure 4-19 RJ48-C socket cable (BH4.850.122) diagram



Pin Assignments

Table 4-12 shows pin assignments of RJ48-C socket cable (BH4.850.122).

Table 4-12 pin assignments of RJ48-C socket cable (BH4.850.122)

Pin of RJ45 connector	BNC socket
1	BNC_R shell/ BNC_R skin
2	BNC_R core / BNC_R core
3	-
4	BNC_T shell/ BNC_T skin
5	BNC_T core /BNC_T core
6	-
7	-
8	-

Technical Specifications

Table 4-13 shows technical specifications of RJ48-C socket cable (BH4.850.122).

Table 4-13 Technical specifications of RJ48-C socket cable (BH4.850.122)

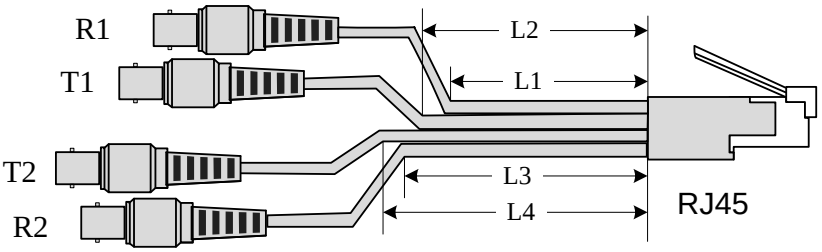
Item	Description
Cable name	RJ45 head/BNC adapter cable
Cable type	SYV75-2-1 (diameter: 2mm, coaxial cable)
Connector	RJ45 crystal head, BNC head
Cable length	L=20cm

4.5.2 Dual E1 Socket Cable (BH4.850.123)

Appearance

Dual E1 socket cable (BH4.850.123) is composed of 1 RJ45 crystal head and 4 BNC heads, whose appearance diagram is shown in Figure 4-20.

Figure 4-20 E1 cable (BH4.850.123) diagram



Pin Assignments

Table 3-5 shows pin assignments of dual E1 socket cable (BH4.850.123).

Technical Specifications

Table 4-14 shows technical specifications of dual E1 socket cable (BH4.850.123).

Table 4-14 Technical specifications of dual E1 socket cable (BH4.850.123)

Item	Description
Cable name	RJ45/BNC connector adapter cable
Cable type	SYV75-2-1 (diameter: 2mm, coaxial cable)
Connector	RJ45 crystal head, BNC head
Cable length	L1=20cm; L2=25cm; L3=30cm; L4=35cm

5 Device Installation

5.1 Installation

H0FL-EthMux.SA16/SAP16 series devices are installed in the same way; here we use H0FL-EthMux.SA16 as an example to introduce detailed installation methods.

5.1.1 Install the Chassis

Step 1 Mark the position with a marking pen.

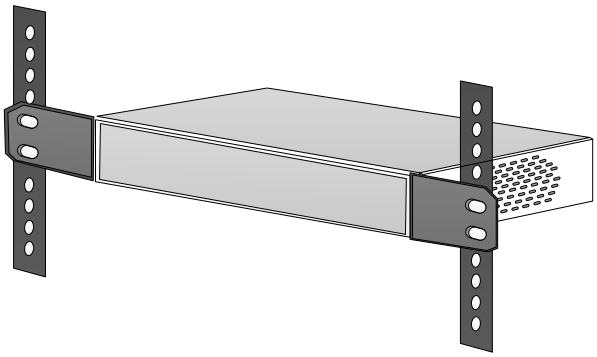
a) H0FL-EthMux.SA16 chassis is 1U high; the fixed holes in the mounting ears correspond to the two adjacent mounting holes in the mounting bracket.

b) Install captive nuts.

Step 2 Install the chassis into a chassis cabinet or rack.

Installing the H0FL-EthMux.SA16 requires one person to hold the chassis and put it into cabinet/rack, as shown in Figure 5-1.

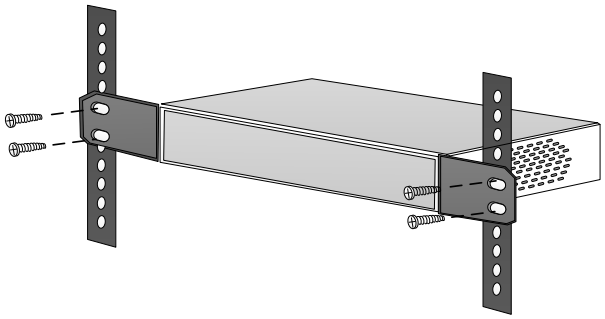
Figure 5-1 Put the chassis into a cabinet or a rack



Step 3 Fix the chassis.

Fixing H0FL-EthMux.SA16 requires a person to hold the chassis by one hand and fix the chassis to the mounting bracket with a screw driver by another hand, and then change the position and fix the other side to the mounting bracket too, as shown in Figure 5-2.

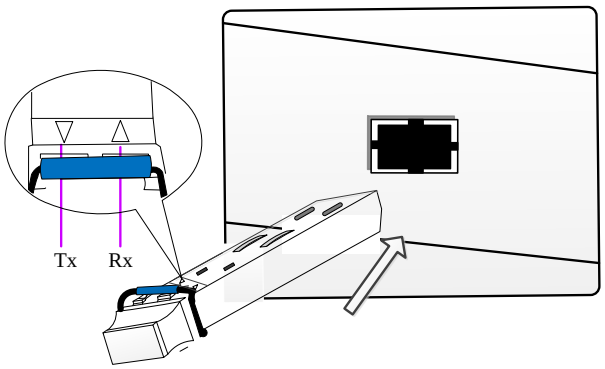
Figure 5-2 Fix the chassis



5.1.2 Connect the Fiber

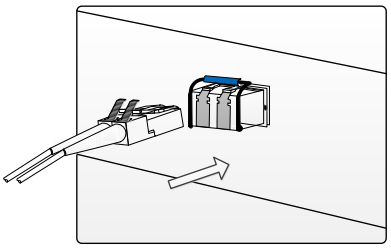
Step 1 Insert optical module to the device's optical port.

Figure 5-3 Insert the optical module



Step 2 Respectively remove the dust caps on the optical module and the optical fiber, aim the head of the fiber at the optical module port and insert it into the port with moderate force.

Figure 5-4 Connect the fiber



CAUTION

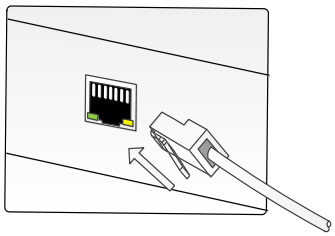
- Using dual fiber SFP optical module, the directions of input and output should be consistent with the triangular mark of SFP optical module, as shown in Figure 5-3. Be careful not to reverse Tx and Rx.
- When optical fiber connector is inserted or pulled, do not directly pull the optical fiber. When no optical fiber is connected, please ensure that the protection plug is inserted to prevent dust from entering.

5.1.3 Connect the Ethernet Cable

Step 1 Select proper cable length according to the cable path, and then select straight through cable or crossover cable according to the link partner device, finally, make an Ethernet cable according to 4.4.

Step 2 Aim one RJ45 connector of Ethernet cable at the Ethernet port of the card, and then insert it into the port with moderate force.

Figure 5-5 Connect Ethernet cable



Step 3 Aim another RJ45 connector of Ethernet cable at the Ethernet port of link partner device, and then insert it into the port with moderate force.

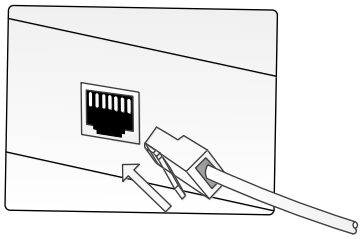
5.1.4 Connect the E1 Cable

Connect the RJ-48C socket cable

Step 1 If you select 120Ω impedance in E1 Port, please make E1 cables according to requirements.

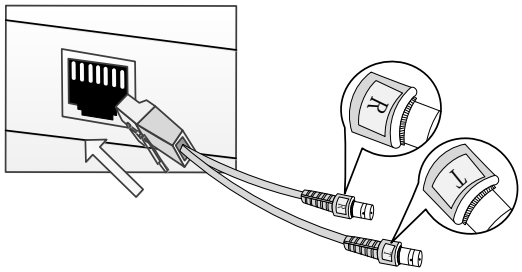
Step 2 Aim the crystal head of E1 cable at the device's E1 port; insert it into the port with moderate force, as shown in Figure 5-6.

Figure 5-6 Connect E1 cable (120Ω)



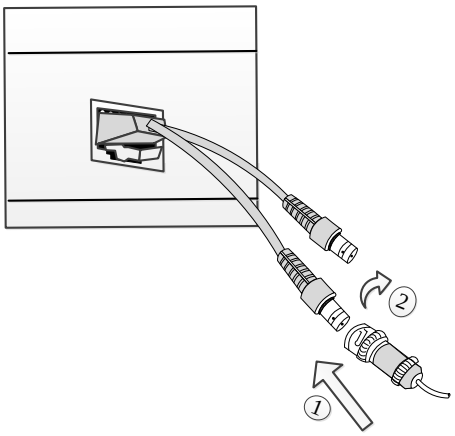
Step 3 If you select 75Ω impedance in E1 Port, you need to convert dual-E1 socket to BNC socket by interface conversion cable BH4.850.122 sent with the device, as shown in Figure 5-7.

Figure 5-7 Connect the interface conversion cable



Step 4 Aim the bayonet of BNC cable's male interface at the standoff of interface conversion cable BH4.850.122's BNC interface, then insert it into the standoff with moderate force and turn it right to the slot, as shown in Figure 5-8.

Figure 5-8 Connect E1 cable (75Ω)



CAUTION

- The BNC interface of the BH4.850.122 interface conversion cable marked with "T" is for E1 signal output and with "R" is for E1 signal input. Note that the input and output do not reverse.
- Users can choose the interface impedance based on the actual application of their own, but 75Ω and 120Ω cannot be used at the same time on the same E1 interface.

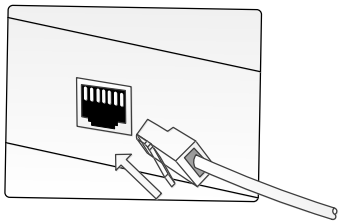
Connect Dual- E1 Socket Cable

120Ω Impedance Port

Step 1 Make E1 cables according to the pin definition in Table 3-5.

Step 2 Aim the crystal head of E1 cable at the device's E1 port; and then insert it into the socket with moderate force, as shown in Figure 5-9.

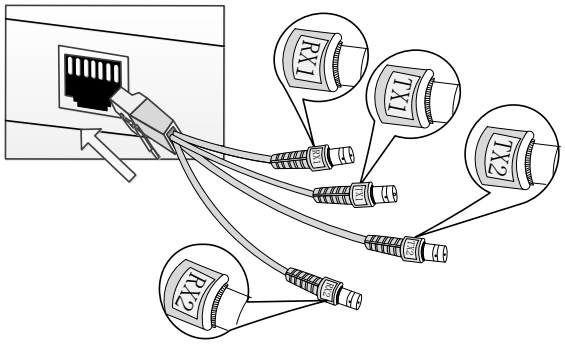
Figure 5-9 Connect E1 cable (120Ω)



75Ω Impedance Port (BH4.850.123)

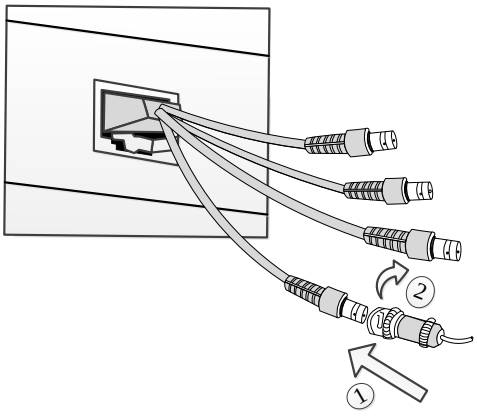
Step 1 Use BH4.850.123 interface conversion cable sent with the device to convert dual-E1 socket into BNC interface socket.

Figure 5-10 Connect interface conversion cable



Step 2 Aim the bayonet of BNC male interface at the standoff of interface conversion cable BH4.850.123's BNC interface, then insert it into the standoff with moderate force and turn it right to the slot.

Figure 5-11 Connect E1 cable (75Ω)



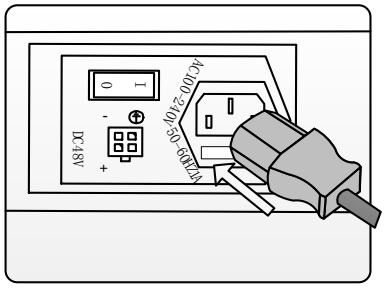
CAUTION

On interface conversion cable BH4.850.123, BNC interface marked with "**TX1**" is the 1st E1 signal output, the one marked with "**RX1**" is the 1st E1 signal input; while the one marked with "**TX2**" is the 2nd E1 signal output and the one marked with "**RX2**" is the 2nd E1 signal input. Be careful not to reverse input and output.

5.1.5 Connect the Power Cable

Step 1 When choosing AC power supply from -48V DC/~220V AC, please aim the AC power plug of the IEC standard power cable sent with the device at the device's ~220V standard AC power socket, and then insert it into the socket with moderate force.

Figure 5-12 Connect AC power cable of -48V DC/~220V AC

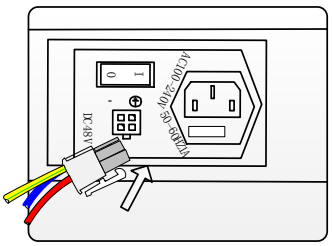


CAUTION

The middle electrode of the AC power socket is the protection ground electrode, which must be connected to protection ground.

Step 2 When choosing DC power supply from -48V DC/~220V AC, please aim the 2×2 power plug of the DC power cable sent with the device at the device's 2×2 power socket, and then insert it into the socket with moderate force.

Figure 5-13 Connect DC power cable of -48V DC/~220V AC

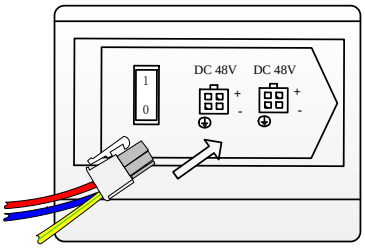


CAUTION

The red wire in the DC power cord is for high potential, i.e. GND for -48V; Blue is for low potential, i.e. -48V. When inserting power plug, pay attention to direction of locking lever, which should be at the bottom side. The electrode on the upper right of DC socket is protection ground connected to the yellow-green wire. Make sure the protection ground is rightly connected when installing the device.

Step 3 When choosing dual -48V DC power supply, please aim the 2×2 power plug of the DC power cable sent with the device at the device's 2×2 power socket, and then insert it into the socket with moderate force.

Figure 5-14 Connect dual -48V DC power cable

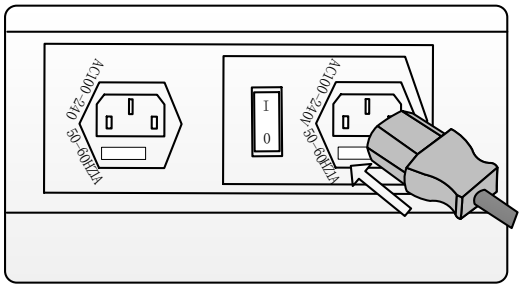


CAUTION

The red wire in the DC power cord is for high potential, i.e. GND for -48V; Blue is for low potential, i.e. -48V. When inserting power plug, pay attention to direction of locking lever, which should be on the upper side. The electrode on the bottom left of DC socket is protection ground connected to the yellow-green wire. Make sure the protection ground is rightly connected when installing the device.

Step 4 When choosing dual ~220V AC power supply, please tighten the fixed screws on ~220V AC power board clockwise first and then open the protective cap of the power socket, then aim the AC power plug of the IEC standard power cable sent with the device at the device's ~220V standard AC power socket and insert it into the socket with moderate force.

Figure 5-15 Connect dual ~220V AC power cable



CAUTION

The middle electrode of the AC power socket is the protection ground electrode, which must be connected to protection ground.

5.2 Post-installation Check

Table 5-1 Post-installation check items

Number	Descriptions	Method
1	There are no other things placed on the chassis	Check
2	The screws must be secured correctly	Check

Number	Descriptions	Method
3	All the cables are bound with proper tightness. The space between the cable ties is even, and the remaining parts of the cable ties are cut off neatly. All cable ties face the same direction, keeping the overall appearance nice	Check
4	Signal cables must be routed according to the engineering design	Check
5	Signal cables should not be damaged or broken, and there should not be any joints on the cable	Check
6	The connectors of the signal cable must be neat and intact. The connectors must be connected correctly and firmly. The tips of the connectors must be connected securely	Check
7	Signal cables must be laid horizontally or vertically without crossing, and must be bundled moderately at the turning (crossing is allowed for cables within 1m outside the cabinet)	Check
8	Labels at both ends of the signal cable must be marked correctly, clearly and neatly	Check
9	The routing of power cables and ground cables must comply with the engineering design. This helps maintenance and expansion	Check
10	The power cable and ground cable must adopt an entire segment of copper core. The cable should have no connection in the middle or scratch on the skin	Check
11	The power cables and ground cables must be corrected correctly and reliably	Check

Number	Descriptions	Method
12	The cross-sectional area of the power cable and ground cable must comply with the engineering design, meeting the requirements of running the equipment	Check
13	The power cables, ground cables and signal cables must be routed separately	Check
14	The power cables and ground cables must be routed horizontally and vertically without crossover. Proper margins must be reserved at the turning	Check
15	The identifiers on things like the power cable and ground cable must be correct, legible and neat	Check
16	The optical fibers routed outside the cabinet must be protected in a corrugated pipe and cabling trough, and must be protected from being extruded by other cables and goods	Check
17	The optical fibers must be protected in a corrugated pipe when being routed into the cabinet, and the corrugated pipe must be laid inside the cabinet. The length of the corrugated pipe inside the cabinet must not exceed 100mm, and the corrugated pipe must be fastened and bundled reliably	Check; measure
18	Curvature radius of the optical fiber must be 20 times larger than the diameter of the optical fiber. Generally, the curvature radius of the optical fiber must be greater than or equal to 40mm. There should be no sharp components on the routing path of the optical fibers	Check; measure

Number	Descriptions	Method
19	Place optical fiber pairs in order and bind them carefully with optical binders	Check

5.3 Power on

After powering on the H0FL-EthMux.SA16/SAP16 series device, the system should start after 90 seconds to work normally. When SYS LED blinks and other LEDs are randomly on, when the LEDs indicate state alarms normally, the device enters the working state.

Check alarm LEDs; preliminarily check if the device works normally. The L/A and LOS LEDs of Ethernet optical port indicate the working state of Ethernet optical port. LINK and FDX LEDs of Ethernet electrical port indicate the working state of the corresponding Ethernet port. LOS/AIS (ERR) LEDs of E1/T1 port indicate the alarm state of the corresponding E1/T1 port.

6 Usage and Maintenance

After powering on the H0FL-EthMux.SA16/SAP16 series device, the system should start after 90 seconds to work normally. The system completion startup SYS indicator changes from long on to flashing. You can observe each interface indicator to preliminarily judge working status of each port.

6.1 Troubleshooting

This paragraph describes common faults that may occur during installation and maintenance. Please seek technical support from Beijing Huahuan Electronics Co., Ltd for other problems.

6.1.1 PWR FAIL LED on

PWR FAIL LED is on, indicating the corresponding power supply board is not complete plugged in or not connected with, please check the following subjects: whether the power supply meets the requirements; the power cable is connected; or the switch is open.

6.1.2 SYS LED Doesn't Blink

After starting up 90 seconds or during working status, the SYS LED doesn't blink, indicating system hasn't powered on or program runs abnormally, you can turn off the power and reboot the device, if the system still does not start up, you need to find provider for technical support.

6.1.3 Ethernet Electrical Port LINK LED off

When Ethernet electrical port LINK LED is off, indicating the corresponding Ethernet port does not connect properly. You can check the following subjects: whether cable connection is normal or circuit is broken; cable line order is right, straight-through cable is used under manual mode (crossover cable should be used); the electrical interface connection does not match the client configuration, and network device connected with it is working properly.

6.1.4 Ethernet Optical Port L/A LED off or OLOS LED on

Ethernet optical port L/A LED is off, indicating the corresponding Ethernet port does not establish connection properly. The OLOS LED is on, indicating no optical signal is received. You can check the following subjects: the corresponding fiber is connected or not; sending and receiving pins are reversed or not; the emission wavelength of single-fiber module and the device connected are the same (optical modules with matched emission wavelengths should be used), and the remote device is working normally or not.

6.1.5 E1/T1 Interface Alarm LED on

E1/T1 interface LOS/AIS LED is on, indicating loss of E1/T1 signal. Troubleshooting can be conducted as following steps: first, check the E1/T1 terminal connected with the other end of cable, such as whether PCM terminal is powered off; and then check whether the E1/T1 cable connections and connectors are reliable; finally, check whether the E1/T1 cable is broken, this will cause the loss of input signal.

LOS/AIS LED blinks slowly and regularly when E1/T1 interface AIS alarm is detected, i.e. the alarm signal is all 1. Such alarm doesn’t indicate fault conditions on the local device, but to detect the alarm information of E1/T1 terminal connected to the local device. The operation status of corresponding device should be checked.

PKT LOS LED is on, indicating the service packet in peer end E1/T1 port cannot be received in Ethernet links; blink indicates the service packet in peer end E1 / T1 port loss or out-of-order in Ethernet links; off indicates there is no service packet in peer end E1/T1 port loss or out-of-order in Ethernet links.

6.1.6 Two ends of Devices Cannot Connect

Both ends of devices are in the same Ethernet broadcast domain, please check both ends of devices IP address should on dual relationship; check MAC address is unique (including other devices on the same network); use Ping command to check network and check bandwidth is sufficient or not.

If both sides of devices are not in the same Ethernet segment, please check device IP default gateway setting, IP address, IP address mask, and check conflicts of MAC address or IP address; check bandwidth is sufficient. IP address and gateway address can be modified by NMS, MAC address is set by manufacture.

Check whether VLAN settings on both sides of the devices are in accordance with each other.

6.1.7 Both Sides Terminals of E1/T1 Have Slips

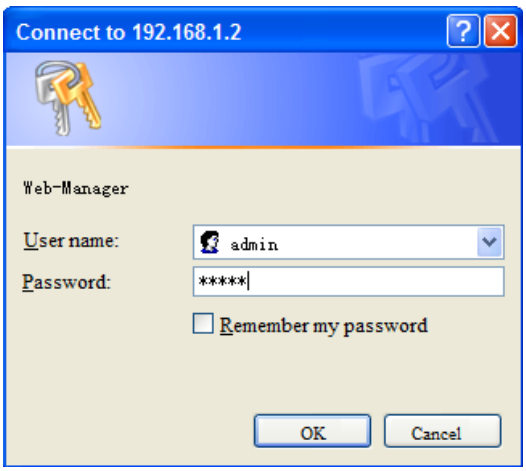
Check E1/T1 terminals connected on both sides of H0FL-EthMux.SA16/ SAP16 series devices, whether both of them use slave clock timing mode, at least one of terminals should use master clock.

Check time mode setting of H0FL-EthMux.SA16/SAP16 series device. If both sides of the E1/T1 devices are not in the state of the synchronization, timing mode of H0FL-EthMuxSA16/SAP16 series device must be adaptive timing, not loop timing.

At the beginning of startup, slip is normal.

7 Device Monitoring

H0FL-EthMux.SA16/SAP16 series device supports Web Server to monitor devices. Login Web Server needs Username and Password, the default Username and Password are lowercase “admin”, as shown in the following figure, you can change it at System setting.



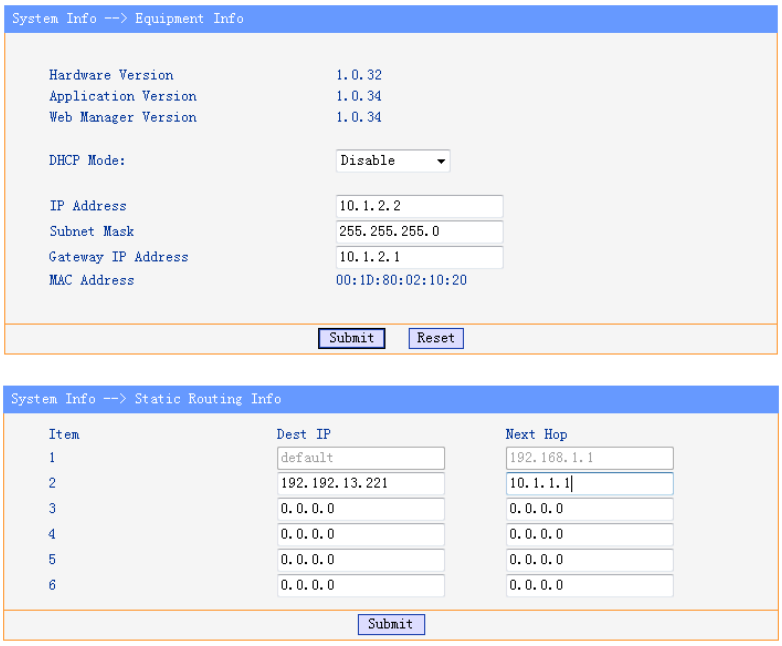
All Web Server includes 7 parts: System Info, Alarm Status, Alarm Management, ETH Management, E1 Management, Internal Management, SNMP Management, and System.

Web Server NM of H0FL-EthMux.SA16/SAP1602 will be introduced in the following part.

7.1 System Info

After login Web Server, Welcome page will be shown. This page includes Hardware version number, Software version number, Web manager version number, IP address, Subnet Mask, Gateway IP address and MAC address, Destination IP and Next Hop. IP address, Subnet address and Gateway address Destination IP and Next Hop can be modified by customer, while others are only for querying, as shown in Figure 7-1. The default setting IP address is 192.168.1.2.

Figure 7-1 System Info



7.2 Alarm Status

Alarm status includes E1 Channel, Ethernet Port, Power Supply and Alarm Log.

7.2.1 E1 Channel Status

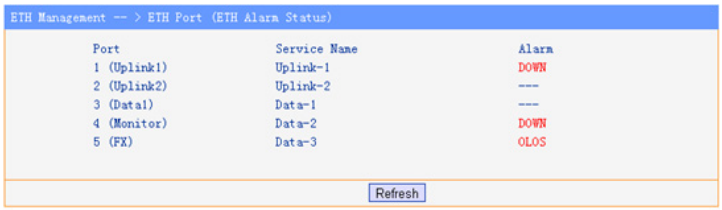
Click left side of Alarm Status-E1 Channel will show E1 channel Service Name, Loopback status, E1 Port LOS, AIS alarm, Packet loss alarm, Packet loss count and far-end connection status. E1 loopback is for testing connection, loopback is defined in 3.1.4 . E1 Loopback setting will become effective after submitting, but not saved, after rebooting the device, E1 in each channel will not be in Loop status. See details in Figure 7-2.

Figure 7-2 E1 channel Alarm Status

7.2.2 Ethernet Port Status

Click left side Alarm Status – ETH Port will show 4 Ethernet electrical ports and 1 optical port LINK UP/DOWN status, as shown in Figure 7-3.

Figure 7-3 ETH port Alarm Status



7.2.3 Power Status

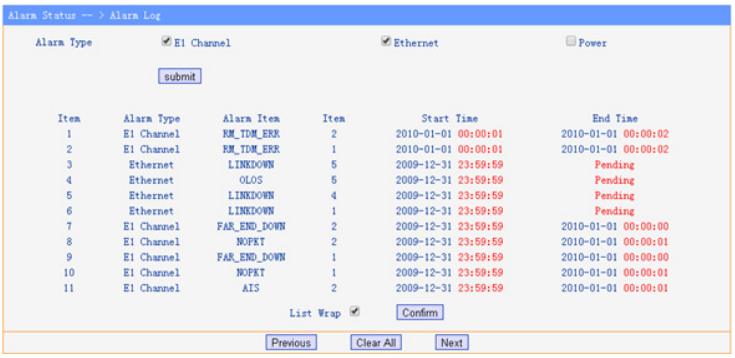
Click left side Alarm Status–Power Alarm will show Power Alarm Status, including 2 channels power-off alarm status information, as shown in Figure 7-4.

Figure 7-4 Power Status

7.2.4 Alarm Log

Click left side Alarm Status–Alarm Log will show Alarm Type, Alarm Item, Port number, Start Time and End Time, as shown in Figure 7-5.

Figure 7-5 Alarm Log



7.3 Alarm Management

Alarm Management includes E1 Channel, Ethernet Port and Power Alarm Shielding.

Alarm Shielding Management

If alarm mask is set, this alarm will be shielded at alarm log, alarm indicator on the front panel and it will not be displayed no matter what

situation is unless the mask is canceled. E1 channel supports not only shielding any alarm of any channel, but also batch shielding. But Ethernet port alarm and power alarm shielding can only be set one by one.

Figure 7-6 E1 channel alarm shielding management

Figure 7-7 ETH alarm shielding management

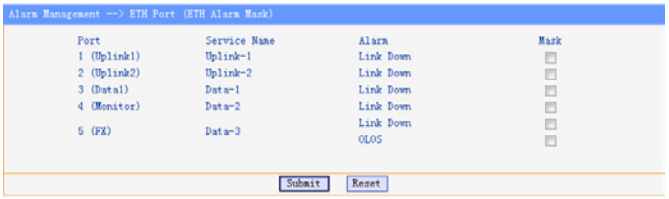
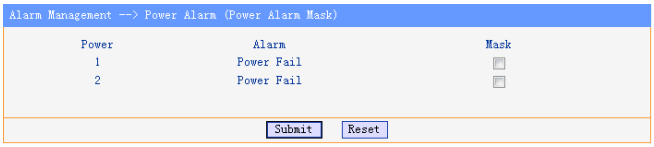


Figure 7-8 Power alarm shielding management



7.4 ETH Management

ETH Management includes Ethernet port management, Ethernet advance management (MAC address aging time, QoS management and port rate control) and VLAN management.

7.4.1 Ethernet Port Management

Figure 7-9 Ethernet port management of H0FL-EthMux.SA16

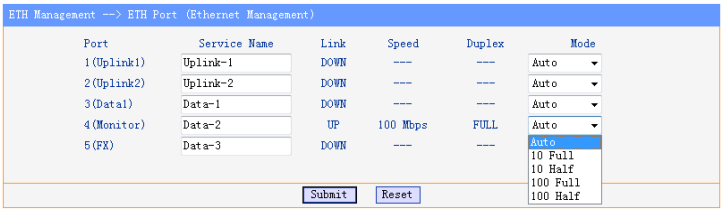


Figure 7-10 Ethernet port management of H0FL-EthMux.SAP1602

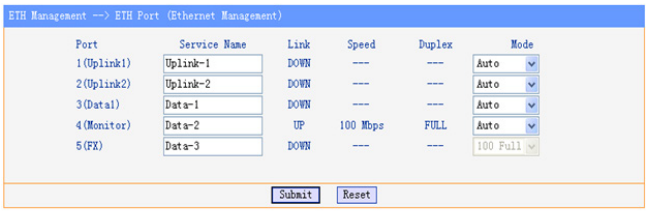


Table 7-1 Ethernet port management parameters

Parameters		Options	Instruction
Ethernet Management	Port	-	Numbers for 5 Ethernet ports
	Service Name	-	Ethernet service name: support up to 15 capital/small letters, digit and part special character input; support 7 Chinese characters (doesn't support any special characters, such as "/", "\" input)

Parameters		Options	Instruction
	Link	-	Indicate current Ethernet port link status (Up/Down)
	Speed	-	Indicate current Ethernet port working speed, such as 10/100Mbps
	Duplex	-	Indicate current Ethernet work mode (FULL/HALF)
	Mode	Auto, 100M full, 100M half, 10M full, 10M half	5 Ethernet ports work mode configuration: Auto- negotiation (default) 100M full 100M half 10M full 10M half Electrical interface work modes have Auto, 100M full, 100M half, 10M full and 10M half Optical interface work modes have 100M full
POE Management	Mode		indicate Ethernet POE mode hardware configuration, MS mode is supported by our products
	Enable		Enable and disable control of Ethernet uplink port POE function, disable is by default

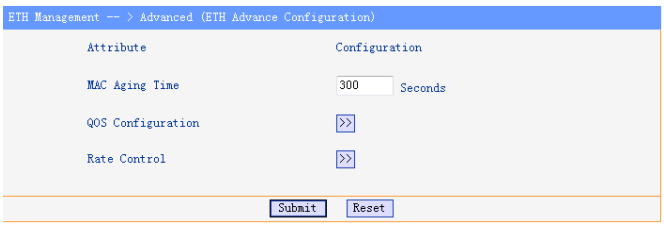
Parameters		Options	Instruction
	Mask		After enabling Ethernet POE function, if there is no 55V power output, POE FAIL alarm will occur,and this alarm can be set to shield

TIP: The sentence with underline is default setting.

7.4.2 Ethernet Advance Management

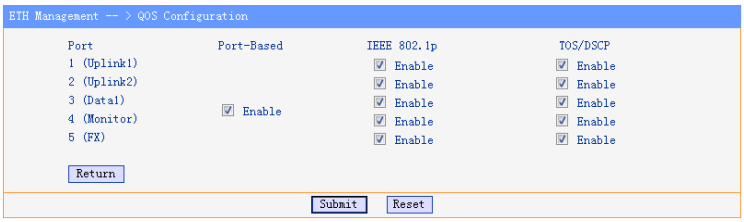
Ethernet advance management provides MAC address aging time, Ethernet port QoS management and port rate control setting. MAC address aging time range is 0~524287s (default: 300s), as shown in Figure 7-11.

Figure 7-11 Ethernet advance management



For Ethernet ports 1~5, we can enable QoS, QoS priority tags based on port, IEEE 802.1p and TOS are supported. QoS is enabled by default.

Figure 7-12 Ethernet port QoS configuration



Port rate control of Ethernet advance management includes enable Ethernet port throughput limiting and speed configuration (supporting entry speed limiting) and storm suppression, as shown in Figure 7-13. Speed class of Ethernet interface is shown in Table 7-2. When we configure the maximum port speed, if the value is not equal to any speed class in Table 7-2, it will select the lower speed class proximal to this value. For example, value is set to 70, after clicking Submit, the value will change to 64, means the maximum speed is 64KB. This series device supports suppression function of broadcast, multicast and unknown package, you can set rate limit according to your actual use.

Figure 7-13 Ethernet port rate control configuration and storm suppression

Table 7-2 Speed class of Ethernet interface

Speed limit range	Speed class interval	Minimum speed	Maximum speed
Lower than 2M	64KB	64KB	1.792MB
Higher than 2M, lower than 100M	1MB	2MB	100MB

7.4.3 VLAN Management

Two uplink Ethernet electrical interfaces support 1+1 hitless protection. After enabling 1+1 hitless protect, device can configure QinQ VLAN automatically and user only needs to configure VID of uplink Ethernet electrical interface and monitoring port, as shown in Figure 7-14 and Figure 7-15.

Figure 7-14 Uplink port 1+1 hitless configuration

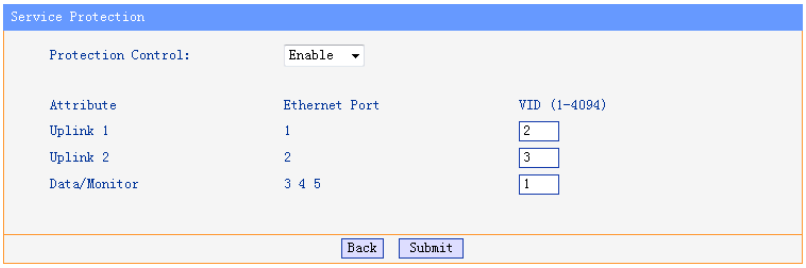
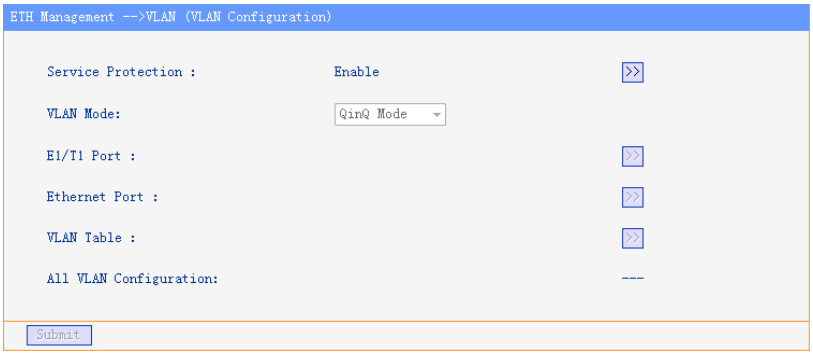


Figure 7-15 Configure QinQ VLAN automatically



Uplink 1 + 1 hitless protection function is forbidden, Ethernet of H0FL-EthMux.SA16 series device supports 802.1Q VLAN and QinQ VLAN. 802.1Q VLAN is that adding the VLAN tag in front of Ethernet frame type. QinQ VLAN is that nesting the VLAN (S-Tag) of operators in 802.1Q outer layer to enable the VLAN stacking. VLAN management parameters are shown in Table 7-3.

Figure 7-16 VLAN management 1—VALN configuration

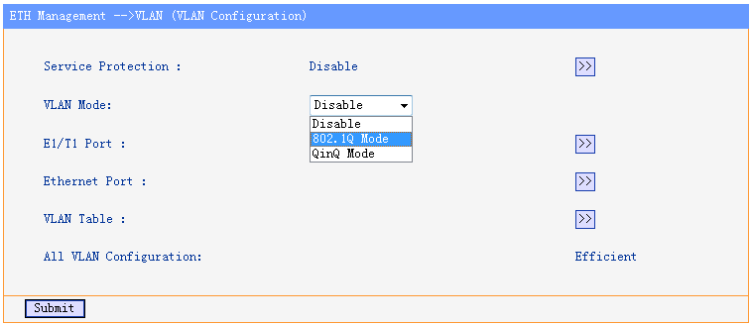


Figure 7-17 VLAN management 2—E1 port VLAN configuration

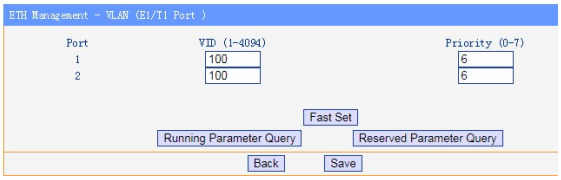


Figure 7-18 VLAN management 3—Ethernet port VLAN configuration

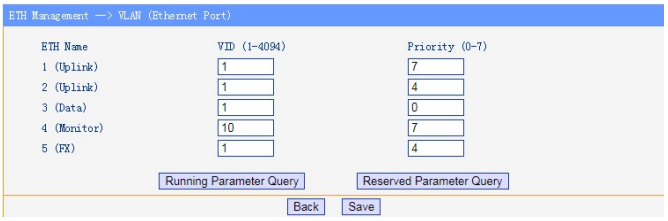


Figure 7-19 VLAN management 4—VLAN Table

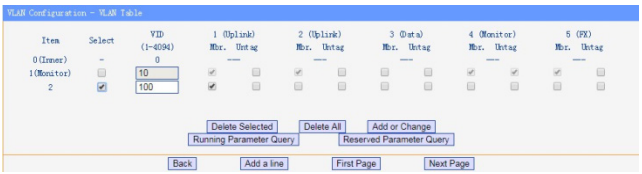


Figure 7-20 VLAN management 5—VLAN configuration confirmation

Table 7-3 VLAN management parameters

Parameters	Options	Instruction
VLAN Mode	Disable	During VLAN division, untagged VLAN is disabled, it is applicable to the network which doesn't support VLAN priority; When 802.1Q VLAN is enabled, add the VLAN tag in front of Ethernet frame type; when QinQ VLAN is enabled, nest the VLAN (S-Tag) of operators in 802.1Q outer layer to enable the dual-layer VLAN tag
	802.1Q	
	QinQ	
Service Protection	Protection Control	Disable: not supply slave transmission channel Enable: both master and slave transmission channels transport service and no data loss during protection switching
	Attribute	Attribute of 1~5 Ethernet port, including uplink port and data/monitoring port

	Ethernet Port	Ethernet port number 1~5
	VID	VLAN ID, support 4094 VLAN ID, range (1-4094)
E1 Channel VLAN Configuration	Port	E1 port number 1~16
	VID	VLAN ID, support 4094 VLAN ID, range (1-4094)
	Priority	Define customer priority, including 8 PRI degrees (0-7). The higher the value is, the greater the priority will be
Ethernet Port VLAN Configuration	Eth Name	Ethernet port number 1~5
	VID	VLAN ID, support 4094 VLAN ID, range (1-4094)
	Priority	Define customer priority, including 8 PRI degrees (0-7). The higher the value is, the greater the priority will be
VLAN Table	VLAN table configurations, inquiry, add and delete	
	Select	When adding VLAN groups or VLAN members, property are changed, this option must be tick off
	VID	VLAN group ID, support 1-4094
	Mbr.	VLAN group member, it will be a VLAN member when ticking off
	Untag	Tagged/untagged, ticking off means untag

NOTE

According to the PVID value of Data2/NM port, the device can automatically generate a default monitoring VLAN entry and it cannot be changed. If the monitoring VID value needs to be modified, the PVID of monitoring port needs to be modified firstly.

7.5 E1 Management

E1 management includes E1 service management, E1 advance management, and bit error test. Every section has many parameter settings as shown in Table 7-4.

7.5.1 E1 Service Management

Figure 7-21 E1 channel Management

7.5.2 E1 Advance Management

Figure 7-22 E1 channel advance Management

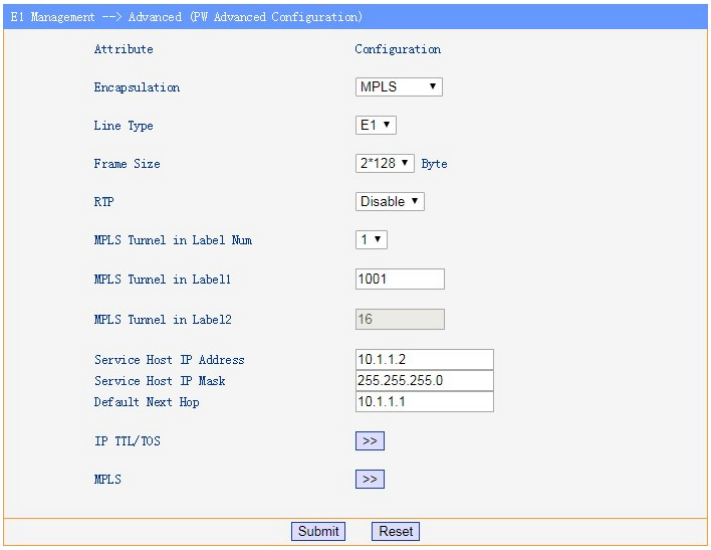


Figure 7-23 TTL/TOS configuration of E1 channel Management

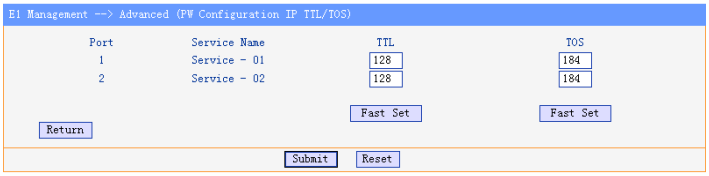


Figure 7-24 MPLS parameter settings page of E1 channel Management

E1 Management parameter settings are shown in Table 7-4.

Table 7-4 E1 Management parameters

Parameters		Options	Instruction
E1 Channel	Service Name		E1 service name: support up to 15 capital/small letters, digit and part special character input; support 7 Chinese characters (not support any special characters, such as "/", "\" input)
	Enable		Enable this E1 channel. Default: disable
	Timing Mode	Adaptive	Adaptive timing mode: E1 timing comes from remote E1 stream Loopback timing mode: E1 timing comes from local E1 stream Local clock mode: E1 timing comes from local device crystal oscillator
		Loopback	
		Local	
	Jitter Buffer	2~255ms	Jitter absorption buffer: worked with the link with bigger jitter, used to buffer the receiving packets; buffer coming packets to eliminate jitter. Range: 2~255ms Default: 16ms

Parameters		Options	Instruction
	Destination IP		Remote site IP address connected with each E1 can be set separately; Default 192.168.1.3
	UDP Port	Source	UDP source port number, effective port number range: 1024~65535
		Destination	UDP destination port number, effective port number range: 1024~65535
Advanced	Encapsulation	IPv4-_UDP	IP encapsulation
		MPLS	MPLS encapsulation
	Line Type	E1/T1	E1/T1 service can be selected Default: E1
	Frame Size	1×128 byte	Every Ethernet packet encapsulation length can select 1×128 bytes /2×128bytes/4×128 bytes. The longer the packet is, the more E1 data encapsulated in the packet is, the lower expense ratio is, the higher bandwidth efficiency is and the bigger time delay is. Vice versa. Default: 2
		2×128 byte	
		4×128 byte	
	RTP	Enable	Real-time Transport Protocol,

Parameters		Options	Instruction
		Disable	used to define E1 time stamp Default: Enable
	MPLS Tunnel in Label Num	0/1/2	Tunnel in Label Number
	MPLS Tunnel in Label1		Tunnel in Label1, default is 16, value range [16, 1048575]
	MPLS Tunnel in Label2		Tunnel in Label2, default is 16, value range [16, 1048575]
	Service Host IP Address		Service Host IP Address
	Service Host IP Mask		Service Host IP Mask
	Default Next Hop		Next Hop
	IP TTL/TOS		TTL: Time To Live, Default: 128 TOS: Type Of Service, Default: 184

Parameters		Options	Instruction
	MPLS		MPLS-EXP: Priority, default value 0, value≤7 MPLS-TTL Time To Live, default value 128 Out Lable Num: default value 1, value range[0, 2] Tunnle Out Label1: default value 16, value range [16, 1048575] Tunnle Out Label2: default value 16, value range [16, 1048575] PW Label Src: Source label for inner label, value range [0, 1048575] PW Label Dst: destination label for inner label, value range [0, 1048575]

Supplementary items:

1. Whether E1 bandwidth is adaptive depends on whether enabling this E1. Suggestion: If this E1 is not used, it is better to let this E1 channel disabled.

2. Each end of Ethernet devices has a unique and fixed with 12 a hexadecimal MAC address, such as 80-80-80-80-80-80, can make the communication with other device. H0FL-EthMux.SA63 device Ethernet MAC address has formed, you don’t need to set. H0FL-EthMux.SA16 series device supports ARP protocol addressing; the opposite device or default gateway device's MAC address can automatically get through Negotiation, you don’t need to set the opposite end MAC address, but need to set up its IP address.

CAUTION

In Ethernet broadcast domain, all of the device's MAC address must be unique, otherwise it will cause address conflict!

3. In order to improve the transmission service quality of E1 data, according to provide transmission Ethernet whether support IEEE 802.1 Q, 802.1 AD and 802.1 p standard, H0FL-EthMux.SA16/ SAP16 series device can set the standard is packed to join contain priority VLAN label (V-Tag) or QinQ label (S-Tag). According to 802.1 Q/QinQ/802.1 p standard packing, the encapsulation spending is slightly bigger, but can be transmitted by higher priority. But for the network that doesn’t support 802.1 p standard; there is no practical significance, but increases unnecessary transmission bandwidth costs, therefore, VLAN should be set to Disable.

4. The Settings of MPLS Tunnel in Label, Tunnle Out Label, PW Label Src and PW Label Dst must be consistent with the relative parameter Settings on the peer side. For example, if local MPLS Tunnel in Label is set to 1001; the out Label on the peer side must be set to 1001, and so on.

7.5.3 Error Test

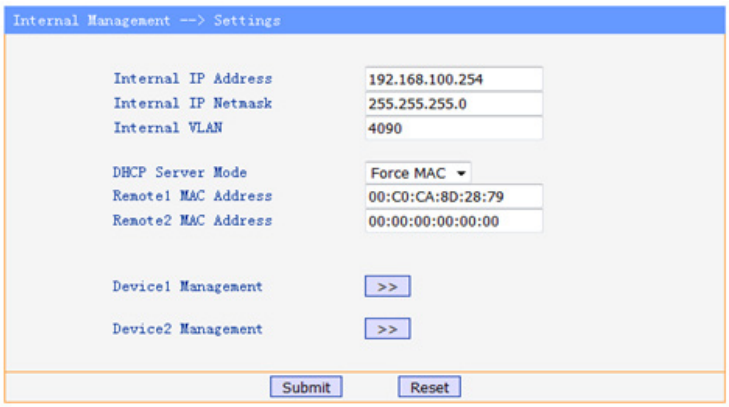
Click BER Test will display error test, including error test enables, the selection of test channels, the selection of test start and stop, port state (frame synchronization or out-of-frame), error count (Bit), error-rate and Test duration, as shown in Figure 7-25. If need to test error for channel, at first elected "enable" and "start", and second click "submit" button to begin testing. Stop testing can choose the channel "stop", and click "submit" button, at this time, test results will be displayed. Clicking on the "Refresh" button during test can inquire test error by the current time.

Figure 7-25 Error test

7.6 Internal Management

Internal Management interface is shown in Figure 7-26.

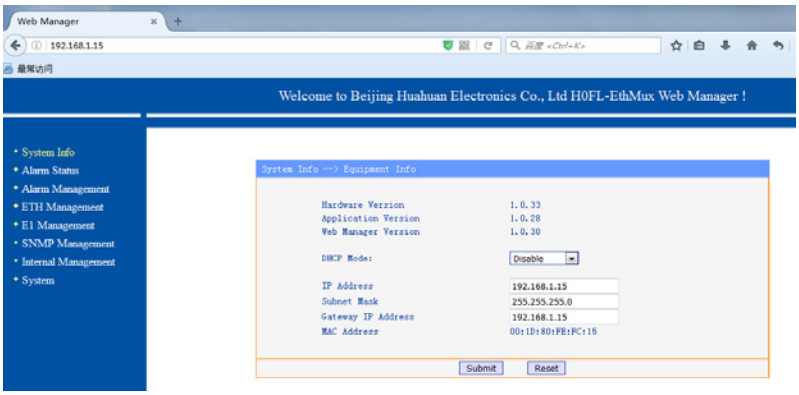
Figure 7-26 Internal Management interface



ConfigurationDescription

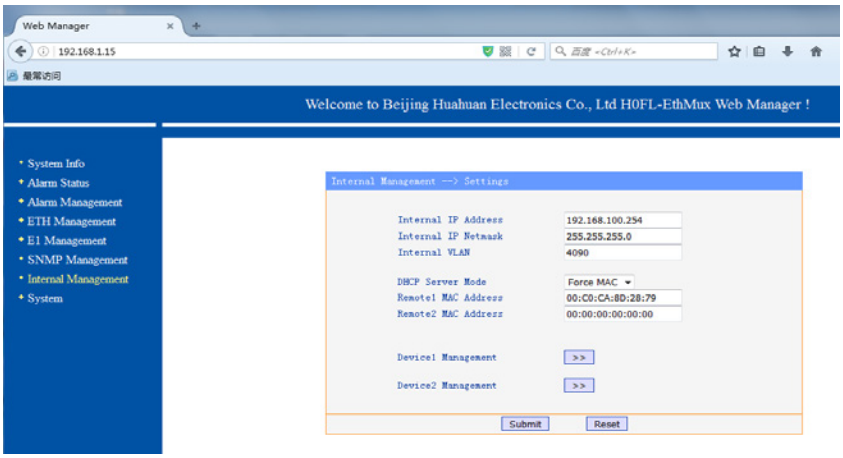
1. Configure EthMux IP.

Figure 7-27 Configure EthMux IP



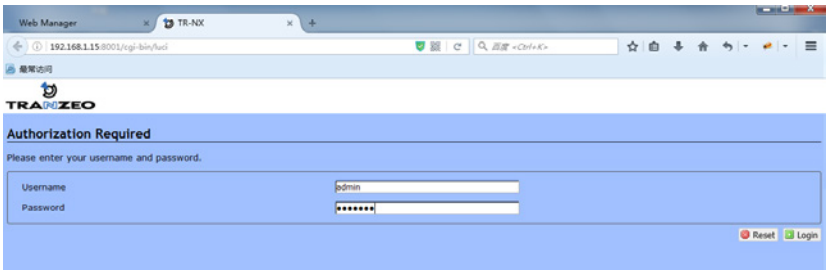
2. Configure internal management IP, VLAN and other information. By modifying DHCP Server Mode, CPE device static IP (configured Disable) or DHCP (configured Enable) can be supported. If two devices are managed simultaneously and DHCP is required, DHCP Server Mode must be configured as Force MAC Mode and the MAC address of CPE shall be specified.

Figure 7-28 Configure internal management



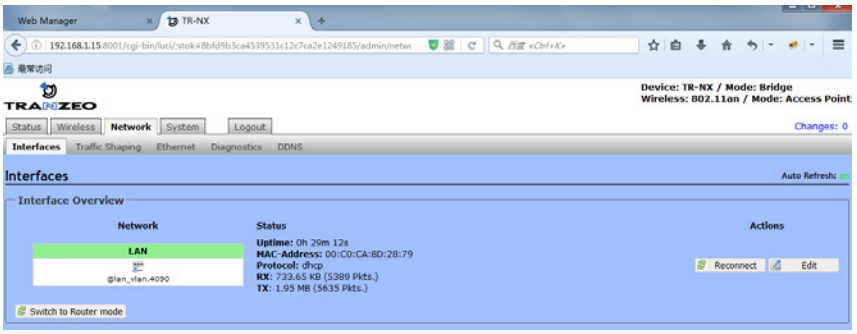
3. Click the button on the right of Device1 Management above to enter the CPE Management interface.

Figure 7-29 Enter the CPE Management interface



4. Manage CPE device.

Figure 7-30 Manage CPE device



7.7 SNMP Management

SMMP management is shown in Figure 7-31, SNMP management parameters are in Table 7-5.

Figure 7-31 SNMP management

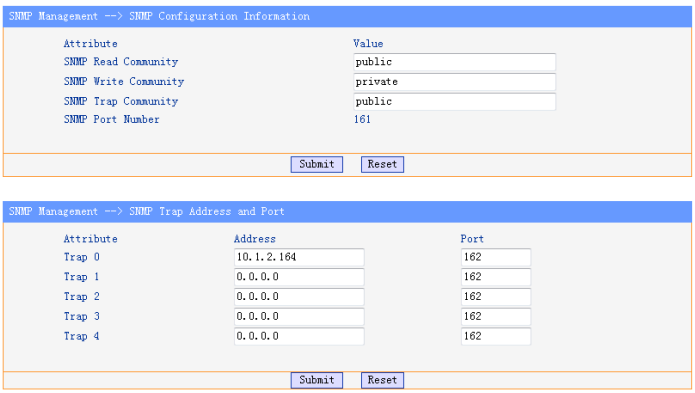


Table 7-5 SNMP management parameters

Parameters		**Instruction**
SNMP Configuration Information	SNMP Read Community	Read commands of device nodes (Read-only) Default: public
	SNMP Write Community	Configure commands of device nodes Default: proprietary
	SNMP Trap Community	Receive commands of Trap Default: public
	SNMP Port Number	The communication ports connecting the devices with SNMP NM is SNMP protocol default port: 161

Parameters		Instruction
SNMP Trap Address and Port	SNMP Trap Address	Address used to receive Trap information: the most addresses and ports can be set is up to 5. That means the managed device can sent Trap information to 5 network management devices at the same time. SNMP Trap Address needs to be configured at the first time (initial value: 0), but it can be saved and recovered
	SNMP Trap Port	Ports used to receive Trap information: it needs to be configured at the first time (initial value: 0), but it can be saved and recovered

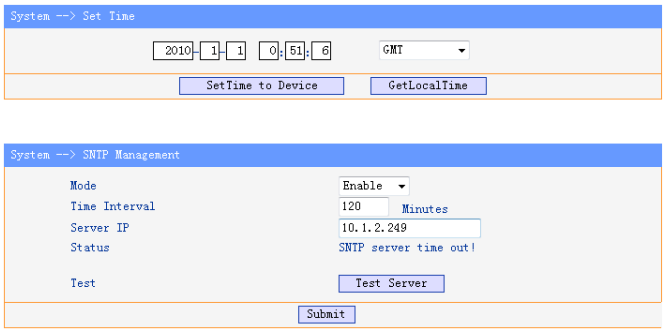
7.8 System Configuration

This section includes time configuration, password modification, default parameter recovery, upgrade online and reboot system.

7.8.1 System Time Management

System time can be modified in three ways: manually enter the time, use Local PC time or SNTP network time. System time setting divides into time setting and device SNTP management, as shown in Figure 7-32.

Figure 7-32 System time management



SNTP management includes SNTP server option (stop/start/test), time setting interval (10~60000 minutes), SNTP server IP address and SNTP server status display (disable/enable, connect successfully/fail).

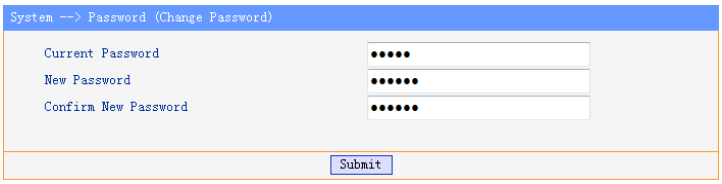
CAUTION

It needs to get the current time again when the power is off!

7.8.2 Password Management

Password Management is shown in Figure 7-33, the change will be valid after confirming the submitting.

Figure 7-33 Password Management

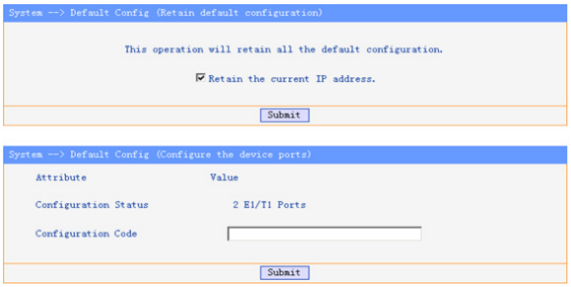


7.8.3 Default Parameter Recovery

Default parameter recovery can make all the parameters recover to factory default except the IP address of devices and the devices will reboot

automatically. If you don't select to remain current IP, IP address will also recover to factory default (192.168.1.2). At the same time, due to the change of IP, it will show Access failed. Then we need to restart Web Server.

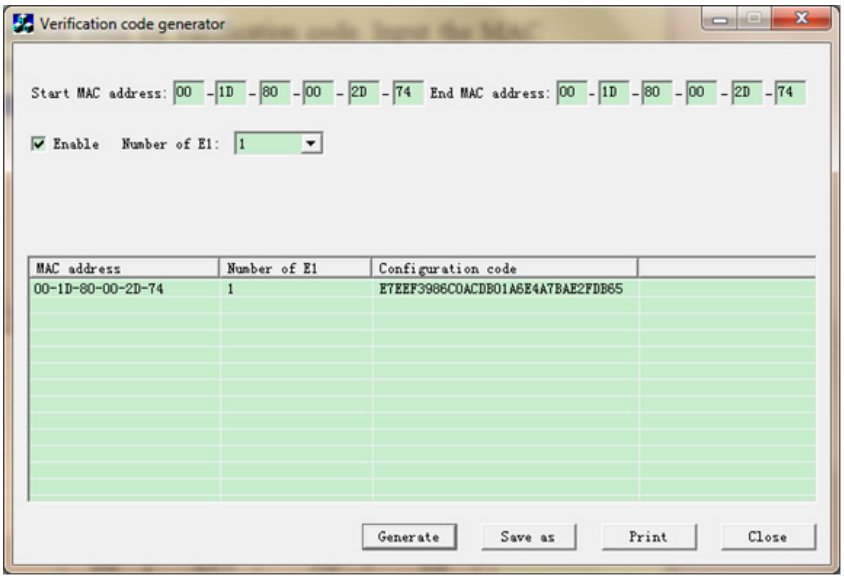
Figure 7-34 Default parameters recovery



H0FL-EthMux.SA16 series device supports changing E1/T1 port number. For example, change E1/T1 port number of H0FL-EthMux.SA16 to 1. It is shown as follows:

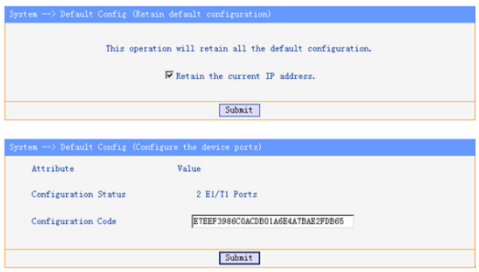
Step 1 Generate the configuration code by verification code. Type in the MAC address of H0FL-EthMux.SA16 and set E1 number as 1, and then click Generate, finally, the configuration code is generated.

Figure 7-35 Generate configuration code



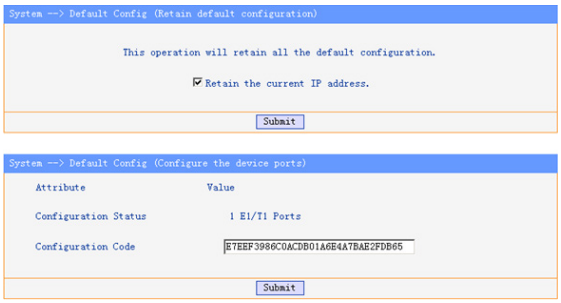
Step 2 Type in the configuration code and click Submit, E1/T1 port number will be changed.

Figure 7-36 Change E1/T1 port number



Step 3 Check E1/T1 port number in Configuration Status to confirm whether the change is successful.

Figure 7-37 Change E1/T1 port number successfully

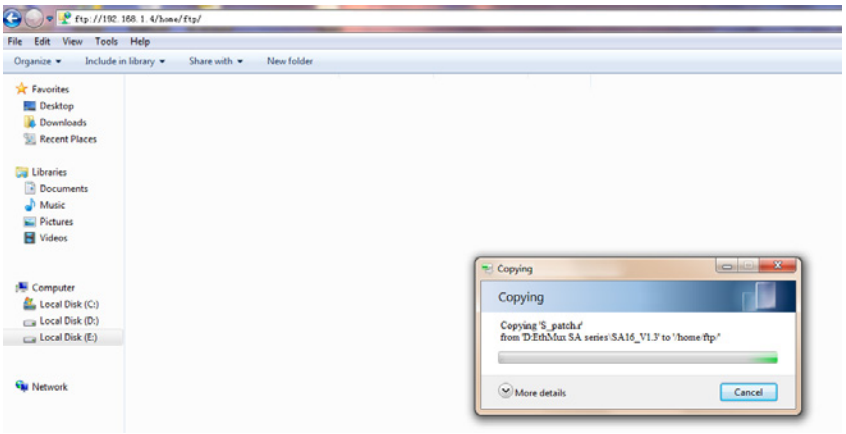


7.8.4 Upgrade Online

Both hardware and software programs of H0FL-EthMux.SA16/SAP16 series device can be upgraded through ftp. We will take software program as an example to introduce online upgrade method.

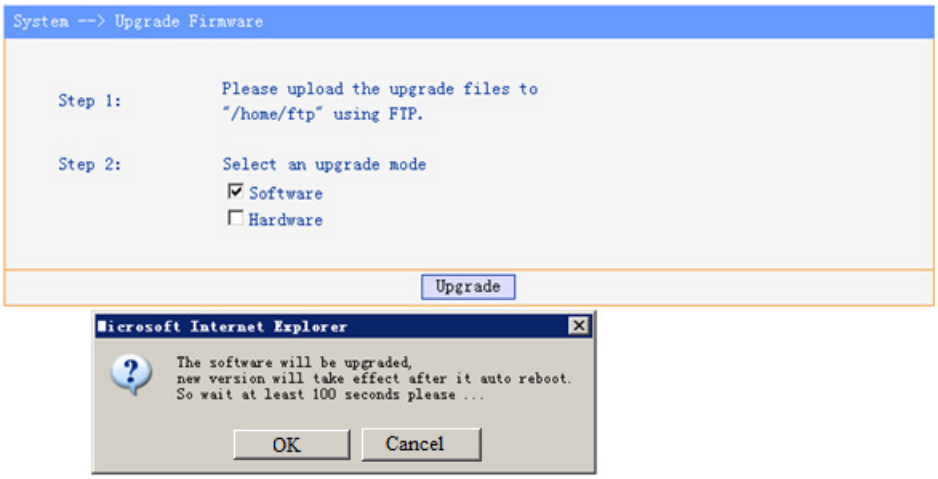
Step 1 Use any FTP tool or type in ftp://root:root@192.168.1.2/home/ftp directly in My Computer address bar to access the ftp server. And then copy the upgrade program to the server. Note that software program file name is S_patch.r, and the hardware program file name is H_patch.r. The file name cannot be changed.

Figure 7-38 Upgrade online 1—upload upgrade program



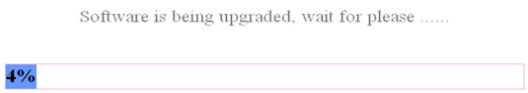
Step 2 Select an upgrade mode; it is available to select software and hardware at the same time. Note that the upgrade files must be uploaded at the first step, and then click “Upgrade” and confirm it, finally, it starts to upgrade.

Figure 7-39 Upgrade online 2—upgrade program



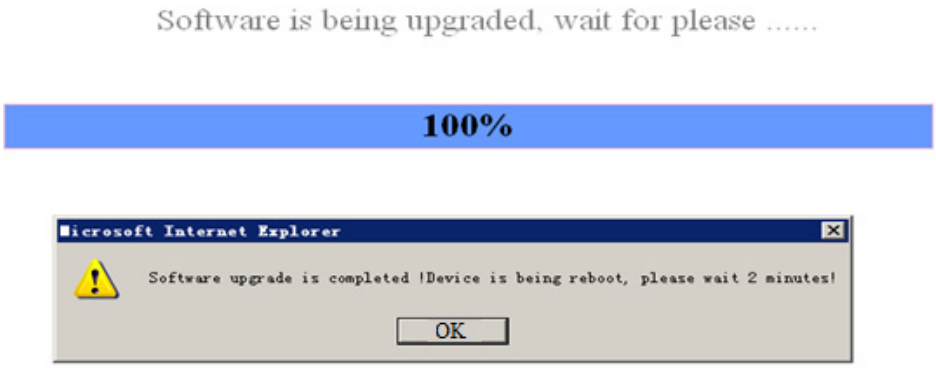
It may take several minutes to complete the upgrade (depends on what program you upgraded). During the upgrade, we can refresh to check upgrade progress.

Figure 7-40 Upgrade online 3—during the upgrade



When the upgrade is done, click Confirm to reboot the device. Login Web management again to check the version number and confirm the upgrade is successful.

Figure 7-41 Upgrade online 4—upgrade is completed



CAUTION

If the power is off during upgrade, it may make device not start and need to program with download line.

7.8.5 Load Configuration Profile

Download the configuration file:

Step 1 Click “Make config.tar.gz” and wait a few seconds.

Step 2 Click “Download config.tar.gz” and download the file.

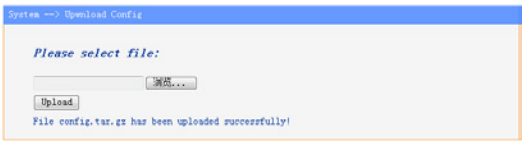
Figure 7-42 Download the configuration file

Upload the configuration file:

Step 1 Click “Browse…” and select the profile to upload.

Step 2 Click “Upload” to start uploading and finish when the upload is successful.

Figure 7-43 Upload the configuration file



7.8.6 Reboot Device

Figure 7-44 Reboot device

7.8.7 CLI Settings

CLI Settings interface is as follows, supporting Telnet or SSH mode.

Figure 7-45 CLI settings

8 Technical Specifications

8.1 System Parameters

Interface	Quantity
100Base-Fx Ethernet optical interface	1
100Base-Tx Ethernet electrical interface	4
E1/T1 interface	1, 2, 4, 8, 16

8.2 E1/T1 Interface Features

Specification	Instruction
E1/T1 interface	Complies with ITU-T G.703 recommendation
Point-to-point single way additional processing delay (minimum delay setting)	≤ 10ms

Specification	Instruction
Output frequency stability (adaptive timing, stable)	≤5ppm
Output jitter (adaptive timing)	≤0.1UI
Interface impedance: default configuration	E1-120Ω/T1-100Ω; 75Ω conversion can be achieved
Connector	RJ-48C or dual-E1
Interface number	H0FL-EthMux.SAP1601.MS/SAP1601.ES：1 E1/T1 interface
	H0FL-EthMux.SAP1602.MS/SAP1602.MS2410/SAP1602.ES：2 E1/T1 interfaces
	H0FL-EthMux.SA1604/SAP1604.MS/SAP1604.ES: 4 E1/T1 interfaces
	H0FL-EthMuxSA1608/SAP1608.MS/SAP1608.ES:8 E1/T1 interfaces
	H0FL-EthMuxSA16/SAP16.MS/SAP16.ES: 16 E1/T1 interfaces

8.3 Ethernet Port

Specification	Instruction
Related protocols	Complies with IEEE 802.3, 802.1Q, 802.1ad, 802.1P recommendation

Specification	Instruction
Working mode	Electrical ports support auto-negotiation, manual 10M/100M, half-duplex/ full-duplex Optical ports support manual 100M full-duplex
Maximum packet length	2000 bytes
Connector	100M electrical port: RJ45
	100M optical port: LC
Port number	100M electrical port: 4
	100M optical port: 1

8.4 POE

Specification	Instruction
PoE function	Provided by uplink ports of H0FL-EthMux. SAP16 series device
PoE mode	MS（Mid-span PSE); ES（Endpoint PSE)
Voltage	H0FL-EthMux.SAP1602.MS2410: 24V Other H0FL-EthMux.SAP16 series devices: 55V
Power	H0FL-EthMux.SAP1602.MS2410: 24W Other H0FL-EthMux.SAP16 series devices: 50W

8.5 Power Supply

Specification	Instruction
AC	100V~240V/50~60Hz (fuse: 3A)
DC	-36V~-72V
Power consumption	H0FL-EthMux.SA16/SAP16.MS/SAP16.ES: ≤7.7W
	H0FL-EthMux.SAP1601.MS/SAP1601.ES/ SAP1602.MS/SAP1602.MS2410/SAP1602. ES/SA1604/SA1608/SAP1604.MS/SAP160 4.ES/SAP1608.MS/SAP16.8.ES: ≤7W

8.6 Operating Environment

Specification	Instruction
Temperature	(-5~45)℃
Humidity	≤90% RH (non-condensing)

8.7 Dimensions

Specification	Instruction
SA16 series devices	H×D×W (mm): 44×136.5×440
SAP16 series devices (except H0FL-EthMux. SAP1602.MS2410)	H×D×W (mm): 44×255×440

Specification	Instruction
H0FL-EthMux.SAP1602.MS2410	H×D×W (mm): 44×175×440

8.8 Weight

Specification	Instruction
Weight	H0FL-EthMux.SA16 series device ≤2.0kg
	H0FL-EthMux.SAP16 series device (except H0FL-EthMux.SAP1602.MS2410) ≤2.7kg
	H0FL-EthMux.SAP1602.MS241 ≤2.2kg

Appendix Acronyms and Abbreviation

Word	Definition
TDM	Time Division Multiplex
SAToP	Structure-Agnostic TDM over Packet
DSCP	Differentiated Services Code point
UDP	User Datagram Protocol
QoS	Quality of Service
ToS	Terms of Service
TTL	Time To Live
VLAN	Virtual Local Area Network
RTP	Real-time Transport Protocol
SNTP	Simple Network Time Protocol
PoE	Power over Ethernet