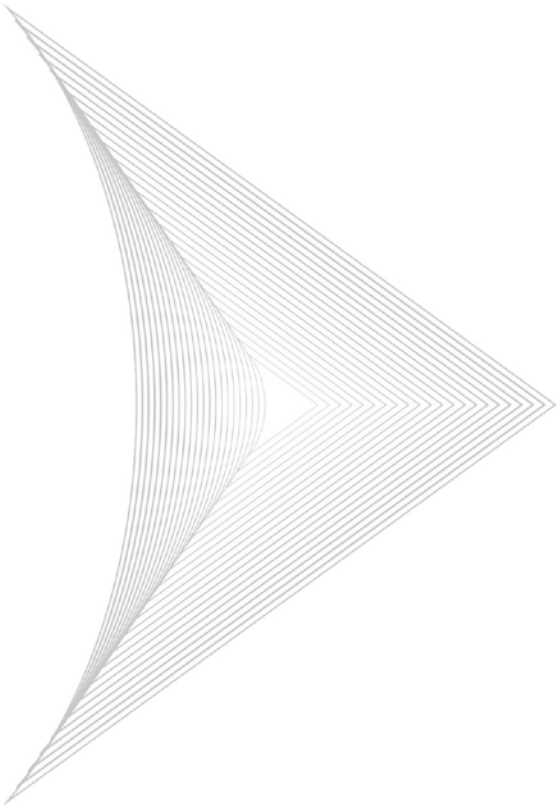
Huahuan

H5600.V5

Integrated Service Access Device

User's Manual



Beijing Huahuan Electronics Co.,Ltd.

H5600.V5

Integrated Service Access Device

User’s Manual

Beijing Huahuan Electronics Co., Ltd.

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1 Overview

Thank you for choosing H5600.V5 device oriented for integrated service access. For the best service from this product, please read this manual carefully.

H5600.V5 integrated service access device is the upgraded product of traditional PCM devices, which is deployed between the backbone network and access network, providing various service ports and larger-capacity transmission capabilities. With the small size, low power consumption and high reliability, H5600.V5 device is easy to maintain and manage which saves space in the equipment room and minimizes the CAPEX and OPEX. H5600.V5 device is widely used in power, oil, transportation industries, municipal NM and water resources monitoring. It transmits special data signals (monitoring or alarm), internal telephone (dispatch or administration) and other traditional services in a private network

H5600.V5 integrated service access device uses plug-in design. With 3U tall chassis, it contains 16 unit cards which include two hot backup power cards, two master-control cross-connection cards (EXM01/OXM04/ OXM16) and 12 service interface cards. Power cards and two master-control cross-connection cards (EXM01/OXM04/OXM16) are put into fixed slots. The other 12 slots are universal slots for service interface cards, the universal slot3 and slot10 are also Ethernet aggregation slots, in which we can configure aggregation cards to realize the aggregation of Ethernet service. The last two universal slots can also be used for ring

generator cards. E1 transmission cross-connection clock card (EXM01) supports 8E1 transmission interfaces, STM-1/4 master-control cross-connection card (OXM04) supports 2 STM-1/STM-4 universal ports, which can connect to various remote devices with standard E1 ports or STM-1/STM-4 optical ports and directly transmit services. Service interface cards support E1, V.35, X.21, C37.94, voice, RS-232 asynchronous/synchronous data, RS-422/RS-485 asynchronous data, G.703 64K co-directional data, STM-1 optical port, STM-4 optical port, Ethernet access, overhead/clock and other functions. The device can be used to construct star network, ring network, tangent rings network. STM-1/STM-4 optical card can also construct rings downward, forming various complex network topologies.

E1 transmission cross-connection clock card (EXM01)/STM-1/4 master-control cross-connection card (OXM04)/STM-16 cross-connection aggregation master-control card (OXM16) contains an NM unit, which can be used to monitor and manage the device

EXM01/OXM04/OXM16 has built-in TUPP and cross connection functions, providing channel cross connection and cascading of VC-12, VC-3, and VC-4 between service interface cards, between service interface cards and transmission cross clock cards (EMX01, OXM04 or OXM16), and between master-control cross-connection cards (EMX01, OXM04 or OXM16). The cross connection capacity of EXM01 is the full cross connections of 12 VC-4 and its sub-containers, in addition, providing the cross connection of 30 (excluding timeslot 16) or 31 (including timeslot 16) 64kbps timeslots of each E1 among 62 E1s simultaneously. The cross connection capacity of OXM04 card is the full cross connections of 32 VC-4 and its sub-containers. The cross connection capacity of OXM16 is the full cross connections of 96 VC-4 and full cross connections of 32 VC3/VC12 of VC-4 capacity.

EXM01, OXM04 and OXM16 are built in with SDH device clock unit which complies with ITU-T G.813 standard and has one channel of clock input and one channel of clock output. According to the configured priority, the device clock can be locked with STM-1 interface clock, external input

clock, E1 interface clock, or internal oscillator source, and maintain high-precision clock frequency when the reference clock is lost (holdover).

Dual-STM-1/STM-4 tributary optical interface card is mainly used to interconnect with terminal SDH device, or any device which features standard STM-1/STM-4 optical interfaces, so as to provide point-to-multipoint star access of optical fibers. Dual-STM-1 optical interface card can also be used to construct ring network or more complex network with ADM device. Each H5600.V5 device obtains 24 channels of STM-1 services when configured to the full capacity with STM-1 optical interface cards. To facilitate commissioning and maintenance, when the device is configured with EXM01, OXM04 or OXM16; it features two built-in E1 BER testers, which can test the optical transmission channel and E1 transmission channel simultaneously.

For maintenance, all optical interface cards of the device support LOS alarm reversion function, which can be enabled through NMS and restored automatically or manually.

Optical interface cards and various service interface cards can be configured, including 8E1 and 12E1 PDH interface cards, dual-V.35 interface card, dual-X.21 interface card, C37.94 interface card, overhead/clock interface card, 4Tx interface EoS card, 4Tx interface EoE card , 4Fx interface EoS card, 4Fx interface EoE card, 1-Port 4-channel Nx64K Ethernet interface card, dual-GE interface 16-channel aggregation EoS card, 16-channel EoS aggregation card, layer 3 switching card (ETR01), multi-functional voice card, multi-interface card, FXO voice card, FXS voice card, 2/4-wire voice voice card, EM signaling & 4-wire voice card, OW/overhead/clock interface card, asynchronous data card, asynchronous serial interface conference card, 64K co-directional data interface card, EM signaling interface card, relay signaling interface card, I/O interface card, ring generator card and etc., supporting the local access of E1, V.35, X.21, C37.94, 100M Ethernet, voice, RS-232 asynchronous/synchronous data, RS-422/RS-485 asynchronous data, G.703 64K co-directional data and etc. Besides, other overhead channel units and external clock interface unit can also be configured.

H5600.V5 device supports remote management. The NMS has the following features:

- Popular “C/S+ database” structure, which supports multi-client management and can conduct synchronization, update, backup, and restoration of data and specify different authorities and management ranges for different clients.
- “System–area–network–device” four-layer view, through which the browsing and searching of device can be conducted rapidly.
- Complete alarm management. Rich alarm query conditions are provided, and real-time output and print of alarm can be customized. Individual screening (suppression) and classified screening can be conducted, LOS alarm reversion of optical interface cards can be supported and the level of an alarm can be established.
- Client resource management. The link between device and client can be achieved conveniently. Especially when fault occurs, the influenced clients can be quickly ascertained, and corresponding measures can be taken.

NM network can be formed by using external Ethernet interface of E1 transmission cross-connection clock card (EXM01) or STM-1/4 master-control cross-connection card (OXM04), or internal management channel. For the management requirements of scattered connection nodes when interconnected with core network, the internal NMS network has three selections: assignable SDH overhead data channel D1~D12; a VC-12 channel is dedicated to NM, or 64Kbps monitoring channel. The NM network built in the transmission network can use star or ring topology. This device uses automatic gateway searching. When fault occurs to network, the backup gateway can be searched automatically without special settings.

To enhance reliability, H5600.V5 device uses multiple redundancy protection measures, including two independent power cards, NM unit, cross connection unit and clock unit consist of 1+1 backup protection. All the cards support hot plugging.

H5600.V5 device supports various loopback methods, which are convenient for commissioning, maintenance, and troubleshooting. The supported loopback methods include optical interface line-side loopback, E1 interface line-side and device-side loopback, interface line-side loopback, and cross connection ingress/egress VC loopback (including high-order VC, low-order VC, and VCG).

H5600.V5 device supports online upgrade of software and firmware of E1 transmission cross-connection clock card (EXM01), STM-1/4 master-control cross-connection card (OXM04) and other unit cards. E1 transmission cross-connection clock card (EXM01) and STM-1/4 master-control cross-connection card (OXM04) also support upgrade of itself and other unit cards' program version and network element service configuration through SD card.

2 System Structure and Typical Applications

2.1 System Structure

Figure 2-1 H5600.V5 device system structure diagram

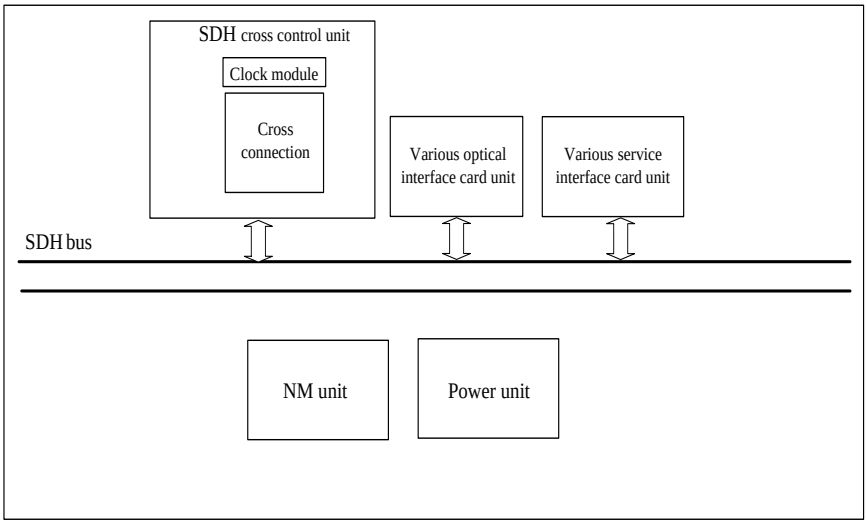


Figure 2-1 shows the block diagram of H5600.V5. The 12 service interface cards connect to 2 E1 transmission cross-connection clock cards (EXM01) or STM-1/4 master-control cross-connection card (OXM04) through back panel SDH bus. E1 transmission cross-connection clock card conducts full cross connections of 12 VC-4s and 756 VC-12s, STM-1/4 master-control cross-connection card (OXM04) conducts full cross connections of 32

VC-4 and its sub-containers. These cross matrixes provide powerful service configuration and protection capacity. When the device is configured with E1 transmission cross-connection clock card (EXM01) or STM-1/4 master-control cross-connection card (OXM04), it has two BERT testers which can be used to test E1 transmission errors.

The network management card manages all cards. The two power cards provide backup for each other.

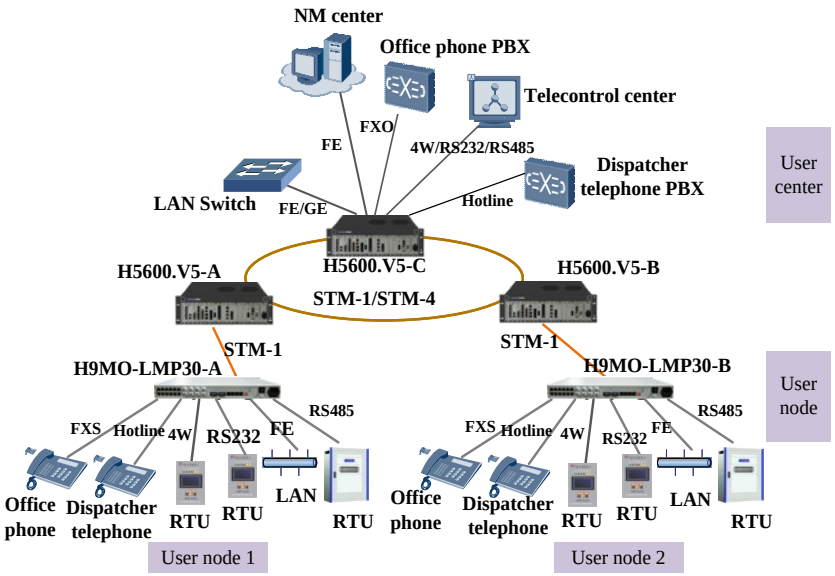
2.2 Networking Process

2.2.1 Establishing a Network Independently

H5600.V5 can be used to construct a network independently. When it is used to construct an optical fiber transport network independently, the chain, ring, star, and mixed network topologies are supported. The constructed network can implement SDH-class protection switching within 50ms.

This networking scheme applies to the following scenarios: town areas with densely distributed users and rich optical fiber resources, industrial areas with densely distributed enterprises, and office buildings with intensive commercial users. The independent optical fiber network allows monitoring information transfer in multiple easy-to-implement ways.

Figure 2-2 Establishing an optical fiber network independently



2.2.2 Establishing a Network by Connecting to a Transport Network

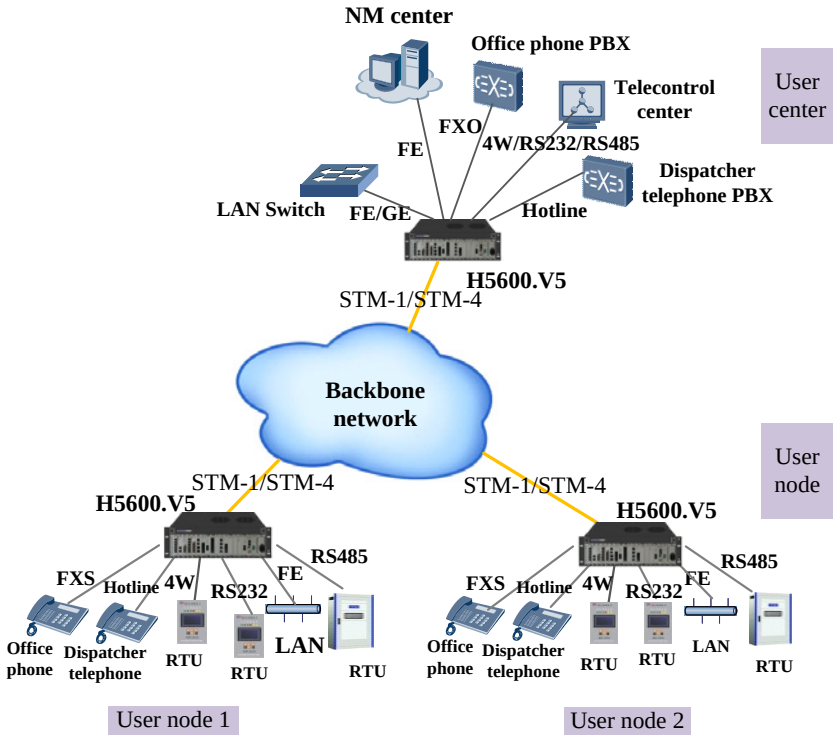
H5600.V5 also can construct a network by connecting to a transport network. When it constructs a network by connecting to a transport network, it uses SDH optical ports or E1 ports as transmission ports.

Connecting to a Transport Network Through Optical Fibers

When H5600.V5 connects to an SDH/MSTP optical network from other vendors for networking, it uses self-healing capabilities of the transport network to protect services. Two routes work in 1+1 backup mode between H5600.V5 and transport network to ensure high reliability. This networking scheme can be used for multiple service access of VIP customers, mobile station networking, and communication infrastructure construction for industries such as power, oil, and army.

H5600.V5 can be deployed in the command center of a dedicated network and connect to the monitoring devices and PBX on the transport network or in the dispatching center.

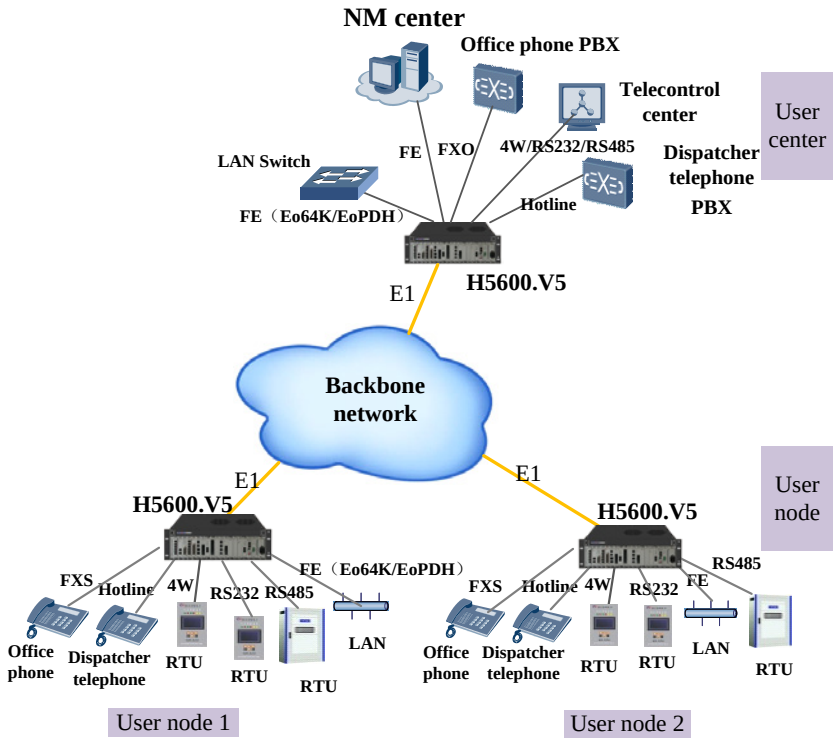
Figure 2-3 Establishing a network by connecting to a transport network



Connecting to a Transport Network Through E1 Ports

H5600.V5 can construct a network as an ordinary PCM device does by connecting to a transport network through E1 ports. Based on the existing E1 resources provided by carriers, H5600.V5 implements centralized access and management of various services such as voice, low-speed data, and Ethernet (EoPDH/Eo64K) services.

Figure 2-4 E1 Connecting to a transport network through E1 ports



2.3 Protection

2.3.1 SNCP and MSP 1+1 MSP

H5600.V5 device provides two service protection mechanisms: sub-network connection protection (SNCP) and multiplex section protection (MSP).

Figure 2-5 and Figure 2-6 shows SNCP and MSP 1+1 on the network.

Figure 2-5 SNCP

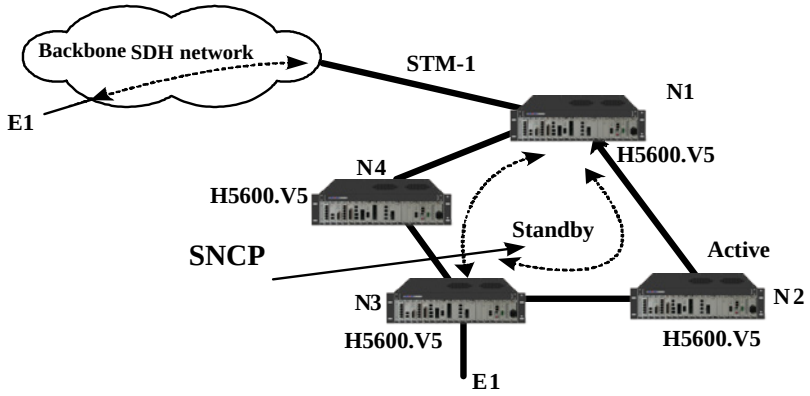
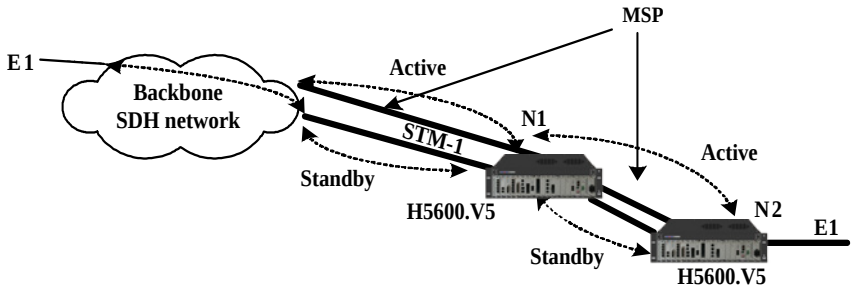


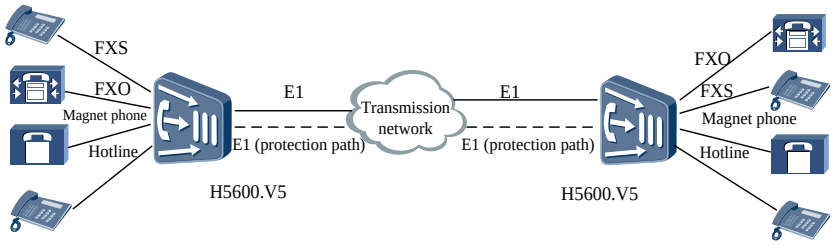
Figure 2-6 MSP 1+1



2.3.2 E1 1+1 Protection

E1 1+1 protection is enabled, the sender sends the same information on the primary and protection E1 channels simultaneously, the receiver receives the information from the primary channel under normal circumstance, when the primary channel fails, the service traffic is switched to the protection channel to protect PCM services.

Figure 2-7 PCM service protection through E1 ports



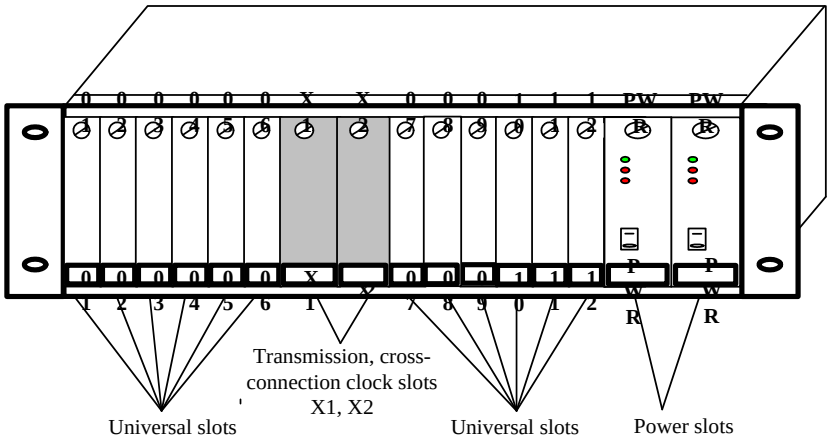
3 Usage Instruction

3.1 Hardware Arrangement

H5600.V5 integrated service access device uses plug-in design, containing 16 unit cards, they are 2 hot backup power cards (PWR01A//PWR01C/PWR02A/PWR02C), 2 master-control cross-connection cards (EXM01/OXM04/OXM16), and 12 service interface cards, the universal slot3 and slot10 are also Ethernet aggregation slots, and we can configure aggregation cards in them to realize the aggregation of Ethernet service. Power cards and 2 master-control cross-connection cards (EXM01 or OXM04) are put in fixed slots. The other 12 slots are universal slots for service interface cards. There are many types of service interface cards: dual-STM-1 optical interface card (OS01A/OS01S), dual-STM-4 optical interface card (OS04A), 4xVC4 channel 4 STM-1 interface tributary card (OS01QE), 12-E1 PDH interface card (EP03), OW/overhead/clock interface card (LA01), 4Tx interface EoS card (FE01), 4Fx interface EoS card (FE02), 4Tx interface EoE card (FE04), 4Fx interface EoE card (FE05), 1-Port 4-channel Nx64K Ethernet interface card (FE64), dual-GE interface 16-channel aggregation EoS card (GX05), 16-channel EoS aggregation card (GX05C), 4FX interface transceiver aggregation card (FX01), 3-layer switching card (ETR01), dual-V.35 interface card (ED01), dual-X.21 interface card (ED02), multi-functional voice interface card (CHU01/CHU02), multi-functional interface card (CHM01), FXO voice interface card (CHL01), FXS voice

interface card (CHR01), 2/4-wire voice interface card (CH4W01), EM signaling & 4-wire voice card (CH4W02), 2W/4W voice &EM interface card with digital gain adjustment (CH4W03), OW/overhead/clock interface card (LA01), audio conference card (VCF01), C37.94 interface card (C37D), low-speed interface card (SD01/SD02/SD03), asynchronous serial interface conference card (SD04), 64K co-directional data interface card (CHD01), 10-channel full modes EM signaling card (EM10), 20-channel EM signaling card (EM20), relay signaling interface card (DIO04), I/O interface card (DIO20), ring generator card (RING48V) and layer-3 switching card (ETR01). All the cards support hot plugging. The slot allocation is shown in Figure 3-1.

Figure 3-1 Slot allocation diagram



3.2 Card Introduction

This section introduces some of the cards available on H5600.V5 device. Some ports and LEDs may be removed or added according to selection.

3.2.1 DC Power Card (PWR01A/PWR01C) and AC Power Card (PWR02A/PWR02C)

Power cards are used to supply power for the operation of each card in the H5600.V5 device. One power card is sufficient to provide power for the entire fully loaded system. To enhance the device's reliability, users can select 2 power cards, which provide 1+1 hot backup. Each end of H5600.V5 device can be configured with two power cards (slots marked with PWR): DC+DC, AC+AC, or DC+AC. Power card supports protections of output overvoltage, output overflow and output short circuit. The chassis of is configured with the fan to lower the working temperature of power card, so as to extend its working life.

DC power cards (PWR01A/PWR01C) require -48V input, but the output power of PWR01A is 75W, the output power of PWR01C is 150W. AC power cards (PWR02A/PWR02C) require ~220V input, but the output power of PWR02A is 75W, the output power of PWR02C is 150W**. When the device is configured with GX05 card, it needs to work with PWR01C/PWR02C.**

DC power card (PWR01A/PWR01C) has one 3pin DC socket and two LEDs on the panel. AC power card (PWR02A/PWR02C) has one standard AC socket and two LEDs, as shown in Figure 3-2. The functional descriptions of the LEDs are given in Table 3-1.

Figure 3-2 Panel diagrams of power cards (PWR01A/PWR02A/PWR01C/PWR02C)

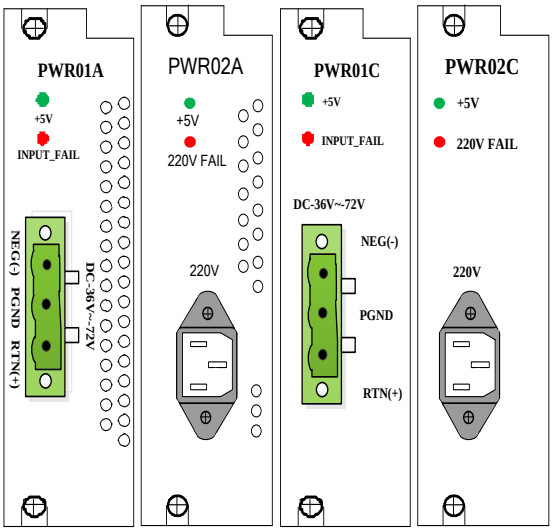


Table 3-1 LED functional description of (PWR01A/PWR01C/PWR02A/PWR02C)

Mark	Color	Functional description
+5V	Green	5V power indication: On: the card is running normally; Off: the card is running abnormally or not working
INPUT_FAIL	Red	DC power status indication: On: the card is running abnormally or unconnected; Off: the card is working normally

Mark	Color	Functional description
220VFAIL	Red	220V AC power status indication: On: the card is running abnormally or unconnected; Off: the card is working normally

CAUTION

For device security and safety of users, you must connect the grounding terminal on the chassis (on the backboard) to the protection ground of the machine room when using the device.

3.2.2 E1 Transmission Cross-connection Clock Card (EXM01)

E1 transmission cross-connection clock card (EXM01) has many functions such as network supervision, cross connection, PCM transmission, clock input/output and alarm output, which is fixed into slot X1 and X2. In two E1 transmission cross-connection clock cards, network monitoring, cross connection and the clock units compose 1 + 1 backup protection.

E1 transmission cross-connection clock card (EXM01) provides 2 Ethernet NM interfaces: the one marked with “NM/ALM” is also an alarm output interface, while the other marked with “EXT/CLK” is also a clock input/output interface. Through Ethernet NM interfaces, a device and its downlink device can be monitored and configured by displaying the operation status of the whole device (including the power status) and cards, and also configuration, management, status, performance, and power failure of the link partner device. EXM01 supports restoring the factory configuration of network element, i.e. removing all the services except for current IP address.

E1 transmission cross-connection clock card (EXM01) has cross connection unit and SDH device clock unit, fulfilling the full cross connections of 12 VC-4s and 756 VC-12s; providing channel cross connection and cascading of VC-12, VC-3, and VC-4 between all the service interface cards and E1 transmission cross-connection clock cards; and between E1 transmission cross-connection clock cards; supporting the cross connection of 30 (excluding timeslot 16) or 31 (including timeslot 16) 64kbps timeslots of each E1 among 62 E1s and providing 62 monitoring channels (64K). The card is built in with SDH device clock unit which complies with ITU-T G.813 standard and has one channel of clock input and one channel of clock output. The clock interface can be accessed from "EXT/CLK" Ethernet RJ45 port of the card. It supports two kinds of clock modes: 2Mbit and 2MHz.

When the device is configured with E1 transmission cross-connection clock card (EXM01); it features two built-in E1 BER testers, which can test the optical transmission channel and E1 transmission channel simultaneously. When the device is configured with E1 transmission cross-connection clock card (EXM01), it can also be built in 2 E1 monitoring channels to transmit management information. E1 BER testers and E1 monitoring channels can be inserted by cross matrix.

EXM01 provides 8 E1 interfaces; PCM transmission function can be realized.

E1 transmission cross-connection clock card (EXM01) has SD card slots. It supports upgrade of EXM01 and other unit cards' program version and network element service configuration through SD card. Meanwhile, EXM01 supports remote online upgrade and CPU upgrade through NMS. DIP switch can be used to control NM card to make it in standby status.

EXM01 supports redundancy protection. When the device is configured with two EXM01 cards, non-recovery protection switching between the cards is supported. Switching by pulling the card out, artificially switching and automatically switching are supported.

EXM01 has 4 dual-E1 interfaces, 2 equivalent Ethernet monitoring interfaces (which can also serve as alarm output interface and external clock input/output interface), a button, 4 DIP switches and 6 LEDs. The panel diagram is shown in Figure 3-3. The functional descriptions of LEDs, button, and DIP switches are respectively shown in Table 3-2, Table 3-3 and Table 3-4.

Figure 3-3 Panel diagram of E1 transmission cross-connection clock card (EXM01)

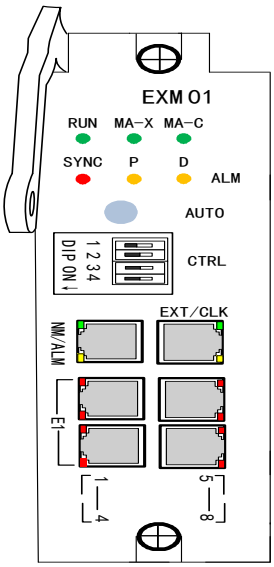


Table 3-2 E1 transmission cross-connection clock card (EXM01) LED functional descriptions

Mark	Color	Functional descriptions	Remark
RUN	Green	System running indication: Slow flashing (1s on, 1s off) indicates the single card is running normally; Quick flashing (500ms on, 500ms off) indicates the single card is online upgrading; Off and flashing (1s on, 500ms flashing) indicates the single card is starting; Breathing flashing (2s on, 2s off) indicates the single card is running in the standby status; Off indicates the single card is running abnormally or not working	Critical alarms and ordinary alarms are defined by monitoring software
MA-X	Green	Active/standby cross-connection/clock indication: On indicates the card is in active cross-connection/clock status; Off indicates the card is in standby cross-connection/clock status	
MA-C	Green	Active/standby monitoring indication: On indicates the card is in active monitoring status; Off indicates the card is in standby monitoring status	

Mark	Color	Functional descriptions	Remark
SYNC	Red	64K exchange slip indication: Flashing indicates slip occurs; Off indicates running normally	
ALM_D	Yellow	Deferred alarm indication: On indicates that deferred alarm occurs; Off indicates no deferred alarm	
ALM_P	Red	Prompt alarm indication: On indicates prompt alarm occurs; Off indicates no prompt alarm	
LED on the Ethernet port	Green	Ethernet electrical port status: On indicates Ethernet port is in Link status; Flashing indicates Ethernet port is transmitting data; Off indicates Ethernet port has no Link	
	Yellow	Ethernet electrical port status: On indicates Ethernet port works under full-duplex mode; Off indicates Ethernet port works under half-duplex mode	
LED on the E1 port	Red	E1 port signal receiving status: On indicates E1 LOS; Off indicates normal	

Table 3-3 E1 transmission cross-connection clock card (EXM01) button functional description

Mark	Description
AUTO	Non-self-locking button. Each time the button is pressed, the existing alarm is cleared. When a new alarm is generated, the alarm box sounds an alarm. The NMS still reports the alarm.
	SD card upgrade button. Pressing it for 5s can upgrade the SD card online. At this time, current alarm LED and rack alarm output will not be removed

Table 3-4 E1 transmission cross-connection clock card (EXM01) DIP switch functional description

Mark	Description	Remarks
1	ON (left): use IP address 192.192.192.192 OFF (right): use actual IP address **Note: if no actions has taken in 5 minutes after setting to the default IP (192.192.192.192), the device will be automatically back to the IP set by the user.**	The DIP switch 1 and 3 take effect only when they are switched, that is, the device performs corresponding functions when DIP switch 1 and 3 are switched. The function implementation is irrelevant to
2	ON (left): E1 transmission cross-connection clock card is in standby status; the device status can be enquired, but cannot set. OFF (right): E1 transmission cross-connection clock card is in normal state, and the device status can be enquired and set.	

Mark	Description	Remarks
3	ON (left): Dip switch confirms the device's configuration, when dip switch is turned left, embedded software can confirm the current configuration automatically, mount and delete cards. OFF (right): embedded software cannot recognize the new configuration when the settings are changed.	the DIP switch status. DIP switch 2 takes effect after it is switched ON or OFF. It is valid when the device is running or before the device is powered on.
4	Function is preserved	

Ethernet NM, Alarm Output, Clock Input/output Ports:

On the front panel of EXM01, there are 2 Ethernet NM ports, which are two switching ports and 100Base-Tx standard RJ45 ports, with HP auto-MDIX function, which can automatically detect the transceiver line order of the connected network cable. So it can be used whether the connected Ethernet interface is MDI or MDI-X, and whether the network cable used is crossover or straight-through. Among them, the one marked with "NM/ALM" is also an alarm output port, while the other one marked with "EXT/CLK" is also a clock input/output port.

ZJN.BH4.850.131 cable is used to convert into RJ45-A and RJ45-B ports, with the former used for network supervision and the latter used for alarm output or clock input/output. RJ45 socket signal definition is shown in Table 3-5, Table 3-6, and the wire table of the corresponding relationship between RJ45 port and RJ45-A, RJ45-B is shown in Table 3-7.

Table 3-5 NM/ALM port socket definition

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

TIP: The definitions of (RxD) and (TxD) are in relation to this port.

Table 3-6 EXT/CLK port socket definition

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

TIP: The definitions of (RxD) and (TxD) are in relation to this port.

Table 3-7 ZJN.BH4.850.131 interface conversion cable signal definition

RJ-45	Color	Signal name	RJ45-A	RJ45-B
1	Orange-white	TxD+	TxD+	NC
2	Orange	TxD-	TxD-	NC
3	Green-white	RxD+	RxD+	NC
4	Blue	OUT+/ALM_D	NC	OUT+/ALM_D
5	Blue-white	OUT-/ALM_P	NC	OUT-/ALM_P
6	Green	RxD-	RxD-	NC
7	Brown-white	IN+	NC	IN+
8	Brown	IN-	NC	IN-

The default IP address is 192.192.4.2. If the factory IP address is modified and the current address is forgotten, you can turn the DIP switch

position 1 to the left, making the device running at a fixed IP (192.192.192.192). In this way, the user can use this special IP address to visit Telnet and query the actual address after **modifying the host address mask to 255.255.0.0**, **see detailed methods in 4.1.1 Query and Configuration of IP Address, MAC, Subnet Mask, and Gateway.** Turn the DIP switch position 1 to the right after query. The IP addresses of nodes in the network must be unique.

E1 Port:

Each socket of E1 port corresponds to 2 E1 channels and the signal definition is shown in Table 3-8.

Table 3-8 E1 connector dual-E1 socket signal pin-out definition

Dual-E1 socket pin	E1 connection	Twisted-pair	Color
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-white

E1 port impedance of EXM01 card can be selected between 75Ω and 120Ω. 4 4-position DIP switches inside the card are used to set interface impedance, as shown in Table 3-9.

Table 3-9 Definition of 4 4-position DIP switches in EXM01 card

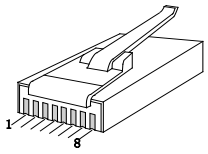
DIP	Definition	Remark
K1_1/K1_2	ON/ON: the 3rd E1 channel selects 75Ω OFF/OFF: the 3rd E1 channel selects 120Ω	4-position DIP switches of K1 control E1 impedance selections of the 3rd and 4th channels
K1_3/K1_4	ON/ON: the 4th E1 channel selects 75Ω OFF/OFF: the 4th E1 channel selects 120Ω	
K2_1/K2_2	ON/ON: the 7th E1 channel selects 75Ω OFF/OFF: the 7th E1 channel selects 120Ω	4-position DIP switches of K2 control E1 impedance selections of the 7th and 8th channels
K2_3/K2_4	ON/ON: the 8th E1 channel selects 75Ω OFF/OFF: the 8th E1 channel selects 120Ω	
K3_1/K3_2	ON/ON: the 5th E1 channel selects 75Ω OFF/OFF: the 5th E1 channel selects 120Ω	4-position DIP switches of K3 control E1 impedance selections of the 5th and 6th channels
K3_3/K3_4	ON/ON: the 6th E1 channel selects 75Ω OFF/OFF: the 6th E1 channel selects 120Ω	
K4_1/K4_2	ON/ON: the 1st E1 channel selects 75Ω OFF/OFF: the 1st E1 channel selects 120Ω	4-position DIP switches of K4 control E1 impedance selections of the 1st and 2nd channels
K4_3/K4_4	ON/ON: the 2nd E1 channel selects 75Ω OFF/OFF: the 2nd E1 channel selects 120Ω	

The requirements for the device's impedance are usually defined during purchasement. Changing settings should be avoided in usage. When 120Ω impedance is adopted, E1 ports of EXM01 can directly use dual-E1 connector crimped with 120Ω twisted pair, as shown in Figure 3-4. **When a cable is being made, please ensure the input and output line pairs respectively use a twisted pair, or interference would be introduced.** When 75Ω impedance is adopted, E1 ports of EXM01 card require the help of accessory cable ZJN. BH4.850.123 to realize the conversion from dual-E1 connector to BNC socket. **"+" connects to core and "-" connects to skin.**

CAUTION

Dual-E1 socket of E1 interface of EXM01 card are for two channels of E1. This is a private definition. Do not mix the interface with 120Ω standard RJ-48C socket, or the interface may be damaged.

Figure 3-4 Dual-E1 connector diagram



3.2.3 STM-1/4 Master-control Cross-connection Card (OXM04)

STM-1/4 master-control cross-connection card (OXM04) is the core aggregation network management card in H5600.V5 device, which is fixed into slot X1 or X2. It integrates many functions, such as Network supervision, STM-1/STM-4 optical transmission, cross-connection, clock input/output and alarm output. In two OXM04 cards, network monitoring, cross connection and the clock units compose 1 + 1 backup protection.

STM-1/4 master-control cross-connection card (OXM04) provides 2 Ethernet NM ports respectively marked with NM/ALM and EXT/CLK, in which, NM/ALM port is also used as alarm output port, while EXT/CLK port is used as clock input/output port. Through Ethernet NM ports of OXM04, you can use NMS to monitor and configure the device and its downstream device. The NMS can display the working states of the whole device (including power state) and all the service cards, meanwhile, the configuration, management, state and performance supervision and power failure supervision of the remote device also can be displayed on NMS. OXM04 supports restoring the factory configuration of network element, i.e. removing all the services except for current IP address of device.

STM-1/4 master-control cross-connection card (OXM04) has 2 universal fiber optic ports that can be configured to be either STM-1 or STM-4. These ports can be connected to form independent H5600 networks, with linear, star, ring, or other complex topologies such as multiple rings and mesh networks. Or they can connect to an existing SDH/MSTP core network to form access networks.

OXM04 has built-in TUPP and cross connection function. The cross connection capacity is the 48 VC-4 full cross connection and 32 VC-4 capacity's VC-3 and VC-12 full cross connection, providing channel cross connection and cascading of VC-12, VC-3, or VC-4 level between all tributary cards, tributary card and aggregation card, and aggregation cards. The cross connection directions can be from aggregation card to tributary card, tributary card to aggregation card, aggregation card to aggregation card, and tributary card to tributary card. The cross connection types are unidirectional, bidirectional, multicast/broadcast, and loopback.

Like EXM01 card, OXM04 also supports the cross connection of 30 (excluding timeslot 16) or 31 (including timeslot 16) 64kbps timeslots of each E1 among 62 E1s and providing 62 monitoring channels (64K).

When device is configured with OXM04, the SDH buses between STM-1 tributary card (OS01A/OS01S) and each OXM04 will be one group of VC-4. When the OS04A card is inserted into slot6 0r slot7, the SDH buses

between STM-4 tributary card and each OXM04 will be eight groups of VC-4. **Note that the OS04A cannot be inserted into any other slot except slot6 or slot7**.

Each OXM04 has two built-in E1 error testers, capable of testing optical transmission channel and E1 transmission channel. It also has two built-in E1 monitoring channels, dedicated to transmitting management information. Through cross matrix, E1 error tester and E1 monitoring channel can be inserted into OXM04.

On the OXM04, there is a built-in SDH device clock unit of ITU-T G.813 standard, providing a channel of clock input and a channel of clock output. The clock interface can be accessed from “EXT/CLK” Ethernet RJ45 port of the card. It supports two kinds of clock mode: 2Mbit and 2MHz.

Like EXM01 card, OXM04 also has SD card slots. It supports upgrade of OXM04 and other unit cards’ program version and network element service configuration through SD card. Meanwhile, OXM04 supports remote online upgrade and CPU upgrade through NMS. DIP switch can be used to control NM card to make it in standby state.

OXM04 supports revertive and non-revertive SNCP. When the device is configured with two OXM04 cards, redundancy protection and non-recovery protection switching between the cards are supported. Switching by pulling the card out, artificially switching and automatically switching are supported.

OXM04 optical port uses LC dual-fiber SFP optical module, and single-fiber SFP optical module is also selectable.

On the front panel of OXM04, there are 2 equivalent Ethernet monitoring ports (respectively used as alarm output port and external clock input/output port), 2 STM-1/STM-4 optical interface sockets, 1 button and 4 DIP switches and 6 LEDs. Front panel diagram is shown in Figure 3-5. The functional descriptions of LEDs, button, and DIP switches are respectively shown in Table 3-10, Table 3-11 and Table 3-12.

Figure 3-5 Front panel diagram of OXM04

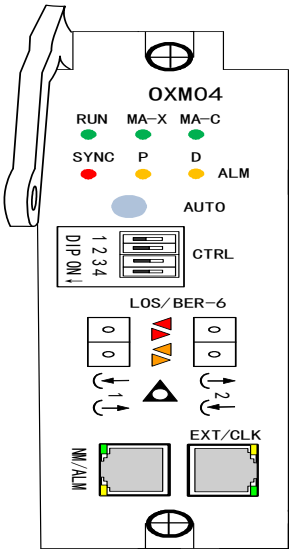


Table 3-10 LED functional descriptions of OXM04

Mark	Color	Functional description	Remark
RUN	Green	System running indication: Slow flashing (1s on, 1s off) indicates the single card is running normally; Quick flashing (500ms on, 500ms off) indicates the single card is online upgrading; Off and flashing (1s on, 500ms flashing) indicates the single card is starting; Breathing flashing (2s on, 2s off) indicates the single card is running in the standby state; Off indicates the single card is running abnormally or not working	Prompt alarms and deferred alarms are defined by monitoring software
MA-X	Green	Cross-connection/clock active/standby indication: On indicates the card is in active cross-connection/clock state Off indicates the card is in standby cross-connection/clock state	
MA-C	Green	Monitoring active/standby indication: On indicates the card is in active monitoring state Off indicates the card is in standby monitoring state	

Mark	Color	Functional description	Remark
SYNC	Red	64K exchange slip indication: Flashing indicates slip occurs Off indicates running normally	
ALM_D	Yellow	Deferred alarm indication: On indicates that deferred alarm occurs Off indicates no deferred alarm	
ALM_P	Red	Prompt alarm indication: On indicates prompt alarm occurs Off indicates no prompt alarm	
LOS	Red	Signal state indication of optical ports: On: signal loss Off: normal reception	
BER-6	Yellow	Bit error indication of optical line: On: bit error exceeds 10^{-6} Off: bit error within 10^{-6}	
LED on the Ethernet port	Green	Ethernet electrical port state: On indicates Ethernet port is in Link state Flashing indicates Ethernet port is transmitting data Off indicates Ethernet port has no Link	

Mark	Color	Functional description	Remark
	Yellow	Ethernet electrical port state: On indicates Ethernet port works under full-duplex mode; Off indicates Ethernet port works under half-duplex mode	

Table 3-11 Button definition of OXM04

Mark	Description
AUTO	Non-self-locking button. Each time the button is pressed, the existing alarm is cleared. When a new alarm is generated, the alarm box sounds an alarm. The NMS still reports the alarm.

Table 3-12 DIP switches definitions of OXM04

Mark	Description	Remarks
1	ON (switch left): use IP address 192.192.192.192 OFF (switch right): use actual IP address **Note: if no actions has taken in 5 minutes after setting to the default IP (192.192.192.192), the device will be automatically back to the IP set by the user.**	The DIP switch 1 and 3 take effect only when they are switched, that is, the device performs corresponding

Mark	Description	Remarks
2	ON (switch left): OXM04 card is in standby state; the device state can be queried, but cannot be set. OFF (switch right): OXM04 card is in normal monitoring state, and the device state can be queried and set.	functions when DIP switch 1 and 3 are switched. The function implementation is irrelevant to the DIP switch status. DIP switch 2 takes effect after it is switched ON or OFF. It is valid when the device is running or before the device is powered on.
3	ON (switch left): Dip switch confirms the device's configuration, when dip switch is switched left, embedded software can confirm the current configuration automatically, mount and delete cards. OFF (switch right): embedded software cannot recognize the new configuration when the settings are changed.	
4	Function is preserved	

Ethernet NM, Alarm Output, Clock Input/output Ports

The definitions of Ethernet NM, alarm output, clock input/output ports of OXM04 card are the same with those of EXM01 card, see details in 3.2.2.

The default IP address is 192.192.4.2. If the factory IP address is modified and the current address is forgotten, you can switch the DIP switch 1 to left, making the device run at a fixed IP (192.192.192.192). In this way, you can use this special IP address to visit Telnet and query the actual address after **modifying the host address mask to 255.255.0.0**, **see detailed methods in 4.1.1** Query and Configuration of IP Address, MAC,

Subnet Mask, and Gateway**.** Switch the DIP switch 1 to right after query. In actual networking, you need to assign an IP address for each device. The IP addresses of nodes in the network must be unique.

STM-1/STM-4 Fiber Optic Ports

Fiber optic ports of OXM04 card use LC/PC dual-fiber SFP optical module and single-fiber SFP optical module is also available. Optical signal output is marked with (→, while optical signal input is marked with (←. Optical cable is connected to the optical port through pigtail fiber. When using single-fiber transceiver module, only one optical port exists. The wavelength of single-fiber module is its emission wavelength. **Note that single-fiber devices with the same emission wavelength cannot interwork. So when single-fiber devices are interconnected, the devices with matched emission wavelengths should be used.** Customarily, single-fiber optical ports of H5600.V5 device use single-fiber module with 1310nm wavelength, while the remote device uses the one with 1550nm wavelength.

NOTE

- OXM04 has high power consumption. When using it, the fans must be running normally. If there are empty slots, blind cards should be equipped to ensure smooth airflow.
- When OXM04 is configured with ESFP optical module, it supports DDM (Digital Diagnostics Monitoring), for real-time monitoring of optical connection state and quality, as well as real-time monitoring of the intelligent optical module's emission optical power, reception optical power, temperature, working voltage, laser offset current, etc.

3.2.4 STM-16 Cross-connection Aggregation Master-control Card (OXM16)

STM-16 cross-connection aggregation master-control card (OXM16) is the core aggregation network management card in H5600.V5 device, which is fixed into slot X1 or X2. It integrates many functions, such as Network

supervision, STM-16 optical transmission, cross-connection, clock input/output and alarm output. In two OXM16 cards, network monitoring, cross connection and the clock units compose 1 + 1 backup protection.

STM-16 cross-connection aggregation master-control card (OXM16) provides 2 Ethernet NM ports respectively marked with NM/ALM and EXT/CLK, in which, NM/ALM port is also used as alarm output port, while EXT/CLK port is used as clock input/output port. Through Ethernet NM ports of OXM16, you can use NMS to monitor and configure the device and its downstream device. The NMS can display the working states of the whole device (including power state) and all the service cards, meanwhile, the configuration, management, state and performance supervision and power failure supervision of the remote device also can be displayed on NMS. OXM16 supports restoring the factory configuration of network element, i.e. removing all the services except for current IP address of device.

STM-16 cross-connection aggregation master-control card (OXM16) has 2 universal STM-16 ports which can be connected to form independent H5600.V5 networks, with linear, star, ring, or other complex topologies such as multiple rings and mesh networks. Or they can connect to an existing SDH/MSTP core network to form access networks.

The 4 STM-16 of 2 OXM16 cards can independently bear non-protective service whose total bandwidth is 4/8/16/64/256 VC-4, 12/24/48/192/768 VC-3, or 252/504/1008/4032/12168 VC-12, or carry Sub-Network Connection Protection (SNCP) of VC-12, VC-3, or VC-4 level to specified service. Protection between two interfaces in a card and between optical ports of different cards can be conducted.

OXM16 has built-in TUPP and cross connection function, providing channel cross connection and cascading of VC-12, VC-3, or VC-4 level between all tributary cards, tributary card and aggregation card, and aggregation cards. The cross connection directions can be from aggregation card to tributary card, tributary card to aggregation card, aggregation card to aggregation card, and tributary card to tributary card.

The cross connection types are unidirectional, bidirectional, multicast/broadcast, and loopback. The cross connection capacity of OXM16 is the full cross connections of 96 VC-4 and full cross connections of 32 VC3/VC12 of VC-4 capacity.

When device is configured with OXM16, and STM-1 tributary optical card in any tributary slot, the SDH buses between STM-1 tributary card (OS01S) and each aggregation card will be one group of VC-4.

Each OXM16 has two built-in E1 error testers, capable of testing optical transmission channel and E1 transmission channel. It also has two built-in E1 monitoring channels, dedicated to transmitting management information. Through cross matrix, E1 error tester and E1 monitoring channel can be inserted into OXM16.

On the OXM16, there is a built-in SDH device clock unit of ITU-T G.813 standard, providing a channel of clock input and a channel of clock output. The clock interface can be accessed from “EXT/CLK” Ethernet RJ45 port of the card. It supports two kinds of clock mode: 2Mbit and 2MHz.

Like EXM01 card, OXM16 also has SD card slots. It supports upgrade of OXM16 and other unit cards’ program version and network element service configuration through SD card. Meanwhile, OXM16 supports remote online upgrade and CPU upgrade through NMS. DIP switch can be used to control NM card to make it in standby state.

OXM16 supports revertive and non-revertive SNCP. When the device is configured with two OXM16 cards, redundancy protection and non-recovery protection switching between the cards are supported. Switching by pulling the card out, artificially switching and automatically switching are supported.

OXM16 optical port uses LC dual-fiber SFP optical module, and single-fiber SFP optical module is also selectable.

On the front panel of OXM16, there are 2 equivalent Ethernet monitoring ports (respectively used as alarm output port and external clock input/output port), 2 STM-16 optical interface sockets, 1 button and 4 DIP

switches and 6 LEDs. Front panel diagram is shown in Figure 3-6. The functional descriptions of LEDs, button, and DIP switches are respectively shown in Table 3-13, Table 3-14 and Table 3-15.

Figure 3-6 Front panel diagram of OXM16

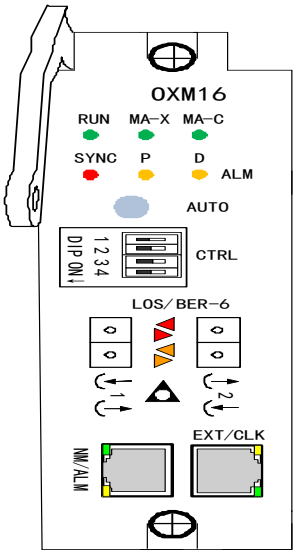


Table 3-13 LED functional descriptions of OXM16

Mark	Color	Functional description	Remark
RUN	Green	System running indication: Slow flashing (1s on, 1s off) indicates the single card is running normally; Quick flashing (500ms on, 500ms off) indicates the single card is online upgrading; Off and flashing (1s on, 500ms flashing) indicates the single card is starting; Breathing flashing (2s on, 2s off) indicates the single card is running in the standby state; Off indicates the single card is running abnormally or not working	Prompt alarms and deferred alarms are defined by monitoring software
MA-X	Green	Cross-connection/clock active/standby indication: On indicates the card is in active cross-connection/clock state Off indicates the card is in standby cross-connection/clock state	
MA-C	Green	Monitoring active/standby indication: On indicates the card is in active monitoring state Off indicates the card is in standby monitoring state	

Mark	Color	Functional description	Remark
SYNC	Red	64K exchange slip indication: Flashing indicates slip occurs Off indicates running normally	
ALM_D	Yellow	Deferred alarm indication: On indicates that deferred alarm occurs Off indicates no deferred alarm	
ALM_P	Red	Prompt alarm indication: On indicates prompt alarm occurs Off indicates no prompt alarm	
LOS	Red	Signal state indication of optical ports: On: signal loss Off: normal reception	
BER-6	Yellow	Bit error indication of optical line: On: bit error exceeds 10^{-6} Off: bit error within 10^{-6}	
LED on the Ethernet port	Green	Ethernet electrical port state: On indicates Ethernet port is in Link state Flashing indicates Ethernet port is transmitting data Off indicates Ethernet port has no Link	

Mark	Color	Functional description	Remark
	Yellow	Ethernet electrical port state: On indicates Ethernet port works under full-duplex mode; Off indicates Ethernet port works under half-duplex mode	

Table 3-14 Button definition of OXM16

Mark	Description
AUTO	Non-self-locking button. Each time the button is pressed, the existing alarm is cleared. When a new alarm is generated, the alarm box sounds an alarm. The NMS still reports the alarm.

Table 3-15 DIP switches definitions of OXM16

Mark	Description	Remarks
1	ON (switch left): use IP address 192.192.192.192 OFF (switch right): use actual IP address **Note: if no actions has taken in 5 minutes after setting to the default IP (192.192.192.192), the device will be automatically back to the IP set by the user.**	The DIP switch 1 and 3 take effect only when they are switched, that is, the device performs corresponding

Mark	Description	Remarks
2	ON (switch left): OXM16 card is in standby state; the device state can be queried, but cannot be set. OFF (switch right): OXM16 card is in normal monitoring state, and the device state can be queried and set.	functions when DIP switch 1 and 3 are switched. The function implementation is irrelevant to the DIP switch status. DIP switch 2 takes effect after it is switched ON or OFF. It is valid when the device is running or before the device is powered on.
3	ON (switch left): Dip switch confirms the device's configuration, when dip switch is switched left, embedded software can confirm the current configuration automatically, mount and delete cards. OFF (switch right): embedded software cannot recognize the new configuration when the settings are changed.	
4	Function is preserved	

Ethernet NM, Alarm Output, Clock Input/output Ports

The definitions of Ethernet NM, alarm output, clock input/output ports of OXM16 card are the same with those of EXM01 card, see details in 3.2.2.

The default IP address is 192.192.4.2. If the factory IP address is modified and the current address is forgotten, you can switch the DIP switch 1 to left, making the device run at a fixed IP (192.192.192.192). In this way, you can use this special IP address to visit Telnet and query the actual address after **modifying the host address mask to 255.255.0.0**, **see detailed methods in 4.1.1** Query and Configuration of IP Address, MAC,

Subnet Mask, and Gateway**.** Switch the DIP switch 1 to right after query. In actual networking, you need to assign an IP address for each device. The IP addresses of nodes in the network must be unique.

STM-1/STM-16 Fiber Optic Ports

Fiber optic ports of OXM16 card use LC/PC dual-fiber SFP optical module and single-fiber SFP optical module is also available. Optical signal output is marked with (→, while optical signal input is marked with (←. Optical cable is connected to the optical port through pigtail fiber. When using single-fiber transceiver module, only one optical port exists. The wavelength of single-fiber module is its emission wavelength. **Note that single-fiber devices with the same emission wavelength cannot interwork. So when single-fiber devices are interconnected, the devices with matched emission wavelengths should be used.** Customarily, single-fiber optical ports of H5600.V5 device use single-fiber module with 1310nm wavelength, while the remote device uses the one with 1550nm wavelength.

NOTE

- OXM16 has high power consumption. When using it, the fans must be running normally. If there are empty slots, blind cards should be equipped to ensure smooth airflow.

3.2.5 Dual STM-1/STM-4 Optical Interface Cards (OS01A/OS01S/OS04A) and 4xVC4 Channel 4 STM-1 Interface Tributary Card (OS01QE)

Dual-STM-1 optical interface cards (OS01A/OS01S), dual-STM-4 optical interface card (OS04A) and 4xVC4 channel 4 STM-1 interface tributary card (OS01QE) are mainly used to interconnect with our company's LM series terminal SDH devices, or any SDH device with standard STM-1/STM-4 optical ports from other companies, so as to provide point-to-multipoint star access of optical fibers, or construct hanging ring network or other more complex networks with ADM devices. Dual-STM-1

optical interface cards (OS01A/OS01S) can be inserted into any universal slot (1~12). 4 STM-4 optical interface card (OS01QE) and dual-STM-4 optical interface card (OS04A) can be inserted into slot6 or slot7.

The SDH bus between STM-1 optical interface card (OS01A/OS01S) and each E1 transmission cross-connection clock card is a group of VC-4. The SDH bus between OS01QE/OS04A and each E1 transmission cross-connection clock card is eight groups of VC-4. Non-blocking cross connections between two optical ports inside a STM-1 optical interface card (OS01A/OS01S/OS01QE/OS04A) are supported, which is used for 1+1 MSP and SNCP of optical ports. Uni-direction, bi-direction, multicast/broadcast and loopback cross connections are supported. 2 E1 BER testers and 2 E1 monitoring channels can be inserted by cross matrix.

Optical interface card (OS01A/OS01S/OS01QE/OS04A) supports timing extraction of two SDH ports.

Optical port of STM-1 optical interface card (OS01A) adopts SC/PC dual-fiber optical module, and single fiber or FC/PC optical module is also available. Optical ports of STM-1 optical interface card (OS01S/OS01QE) and STM-4 optical interface card (OS04A) adopt LC/PC dual-fiber SFP optical module, and single-fiber SFP optical module is also available. Optical signal output is marked with (→, and optical signal input is marked with (←. Optical cable is connected to the optical port through pigtail fiber. When single-fiber transceiver module is adopted, only one optical port exists. The wavelength of single-fiber module is its emission wavelength. **Note that single-fiber devices with the same emission wavelength cannot interwork. So when single-fiber devices are interconnected, the devices with matched emission wavelengths should be used.** Customarily, single-fiber optical port of H5600.V5 device uses single-fiber module with 1310nm wavelength, while the link partner device adopts one with 1550nm wavelength.

The panels of OS01A/OS01S/OS01QE/OS04A are shown in Figure 3-7. Table 3-16 describes the LEDs on the panels. There are no user-adjustable components inside the cards. The internal jumpers are for the purposes of

production testing and firmware updating only, and should not be altered in any way. Improper settings will render the card non-operational.

Figure 3-7 Optical interface card (OS01A/OS01S/OS01QE/OS04A) panel diagram

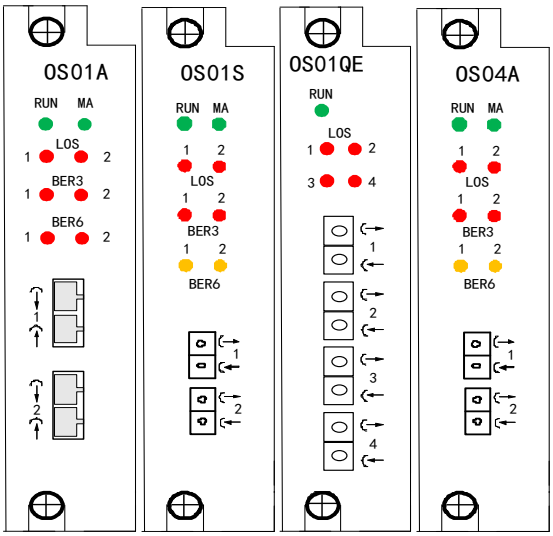


Table 3-16 LED description for optical interface card (OS01A/OS01S /OS01QE/OS04A)

Label	Color	Description	Note
RUN	Green	Running indication: Blinking indicates running normally; Off indicates running abnormally or not working	-

Label	Color	Description	Note
MA	Green	Clock status indication: On: the card drives the system clock Off: the card synchronizes with the system clock	
LOS-(1~4)	Red	Optical port signal status indication: On: signal loss Off: normal	Respectively indicate LOS status of each optical port
BER3-1 BER3-2	Red	Bit error indication of optical line: On: bit error exceeds 10^{-3} Off: bit error within 10^{-3}	BER3-1 and BER3-2 indicate port1 and port2 respectively
BER6-1 BER6-2	Yellow	Bit error indication of optical line: On: bit error exceeds 10^{-6} Off: bit error within 10^{-6}	BER6-1 and BER6-2 indicate port1 and port2 respectively

NOTE

- When OS01S/OS04A/OS01QE is configured with ESFP optical module, it supports DDM (Digital Diagnostics Monitoring), for real-time monitoring of optical connection status and quality and real-time monitoring of the intelligent optical module's emission optical power, reception optical power, temperature, working voltage, laser offset current, etc.
- Optical interface card (OS01A/OS01S) supports sharing of configuration data, i.e. if one card of these two types is replaced, its configuration can be ascertained by NMS and resetting service is not required.

CAUTION

STM-4 optical interface card (OS04A) and STM-1 optical interface card (OS01QE) have high power consumption. When using it, the fans must be running normally. If there are empty slots, blind cards should be equipped to ensure smooth airflow.

3.2.6 Multichannel High Capacity Fiber-Optic Transmission Card (OT01)

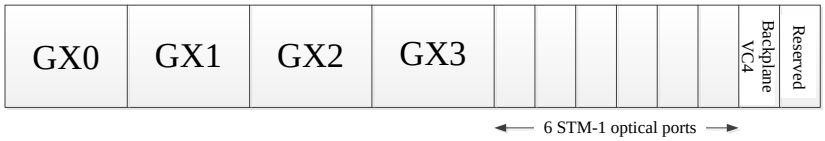
Multichannel high capacity fiber-optic transmission card (OT01) is a tributary card used in H5600.V5 device. It supports point-to-point application and realizes fiber-optic aggregation and transmission with high capacity and in different service types. OT01 implements multiplexing from 6 STM-1 standard interfaces and 4 GX standard interfaces to 2 UPLINK interfaces. OT01 occupies 2 slots, is inserted into any tributary slot except slot12.

OT01 provides 2 UPLINK interfaces, uses SFP+ optical module and supports 1+1 protection. When 1+1 protection is enabled, service will run in the interface 1, but if the interface 1 fails, service will be switched to the interface 2. When 1+1 protection is disabled, the interface 2 will be in down state, non-luminance. OT01 provides 4 GE interfaces, uses SFP optical module and supports DDM function, auto-negotiation, and forced 1000M full-duplex mode. OT01 provides 6 STM-1 interfaces, uses SFP optical module and supports DDM function.

OT01 provides 4 GE interfaces and the Ethernet maximum frame length is 16000Bytes. OT01 provides 6 STM-1 interfaces, realizes transparently transmitting path overhead D1-D12 bytes in VC4 level and supports error detection of B1 regenerative section and B2 multiplexing segment. 1 VC4 channel is accessed through the backplane of OT01 card, through which,

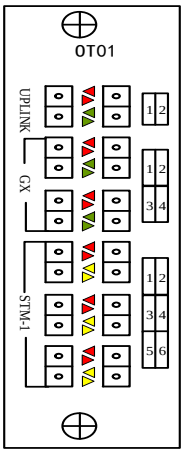
the service from other slot can be accessed into Uplink interface. The interface speed VC4, Ethernet and STM-1 are located in Uplink interface, see the UPLINK frame format diagram in Figure 3-8.

Figure 3-8 UPLINK frame format diagram



The panel diagram of OT01 is shown in Figure 3-9, and the LED functional descriptions are shown in Table 3-17.

Figure 3-9 The panel diagram of OT01



NOTE

When OT01 card is configured with ESFP optical module, it supports DDM (Digital Diagnostics Monitoring), for real-time monitoring of optical connection status, quality and real-time monitoring of the intelligent optical module's emission optical power, reception optical power, temperature, working voltage, laser offset current, etc.

Table 3-17 The LED functional descriptions

Label	Name	Color	Functional descriptions
UPLINK	LOS	Red	Signal state indication at Uplink port: On: optical signal loss Off: normal reception
	SYNC	Green	Frame synchronization state indication at Uplink port: On: frame synchronization Off: frame loss
GX	LOS	Red	optical signal loss indication at GX port: On: optical signal loss Off: normal reception
	LINK	Green	Link indication at GX port: On: link up Off: link down
STM-1	LOS	Red	Signal state indication at STM-1 port: On: optical signal loss Off: normal reception
	ERR	Yellow	Line error indication at STM-1 port: On: BER6 bit error exists Off: no bit error

3.2.7 12×E1 PDH Interface Card (EP03)

H5600.V5 device can directly realize the access of 12 E1 ports when configured with 12E1 PDH interface card, which can be inserted into any

universal slot (1~12). PDH interface card (EP03) can choose any two E1 ports as the clock reference source.

The front panel of (EP03) is shown in Figure 3-10. E1 port of EP03 uses dual-E1 connector. The signal definition is shown in Table 3-18.

Figure 3-10 Front panel of EP03

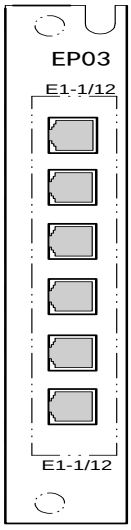


Table 3-18 EP03 dual-E1 socket's signal pin-out definition

Dual-E1 socket Pin	E1 connection	Twisted-pair	Recommended twisted-pair color
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

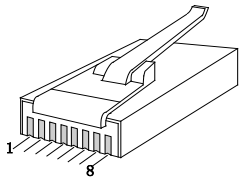
Dual-E1 socket Pin	E1 connection	Twisted-pair	Recommended twisted-pair color
7	E1_OUT (2)+	Paired	Brown
8	E1_OUT (2)-		Brown-white

E1 port impedance of EP03 card can be selected between 75Ω and 120Ω. On EP03 card, three 4-position DIP switches K4~K6 are used to set interface impedance: ON is 75Ω; OFF is 120Ω. **The requirements for the device's impedance are usually defined during purchasement. Changing settings should be avoided in usage**. When 120Ω impedance is adopted, E1 ports of EP03 can directly use RJ-48C connector which is crimped with 120Ω twisted pair, as shown in Figure 3-11. **When cable is being made, please ensure the input and output line pairs respectively use a twisted pair, or interference would be introduced.** When 75Ω impedance is adopted, E1 ports of EP03 card require accessory cable ZJN. BH4.850.123, to realize the conversion from RJ-48C to BNC socket. **"+" connects to core and "-" connects to skin**.

CAUTION

Each socket of E1 interface of EP03 card is for two channels of E1. This is a private definition. Do not mix the interface with 120Ω standard RJ-48C socket, or the interface may be damaged.

Figure 3-11 Dual-E1 connector diagram



3.2.8 Dual-V.35 Interface Card (ED01)

ED01 card provides dual V.35 ports, which can be inserted in any universal slot（1~12）.

V.35 interface adopts DB25 pins, providing two channels of V.35 data. The signal definition is shown in Table 3-19. V.35 interface offers DCE/DTE working mode, and supports unframed or framed structures and software/hardware time slot setting under framed mode. ITU-T V.35 interface can be converted through BH4.BH4.851.103 (DCE) or BH4.BH4.851.104 (DTE) cable (the connector is 34-pin ISO2593).

Table 3-19 V.35 signal DB25 definition

Signal	ISO-2593 DCE pin	DB25-DCE pin	DB25-DTE pin	Source
CGND	A	1	1	-
1-103 (A)	P	3	2	DTE
1-103(B)	S	16	14	
1-104(A)	R	2	3	DCE
1-104(B)	T	14	16	
RTS	C	-	4	DTE
CTS	D	4	-	DCE
DSR	E	20	-	DCE
DTR	H	-	20	DTE
SGND	B	7	7	-
DCD	F	8	-	DCE
1-113(A)	U	17	24	DTE

Signal	ISO-2593 DCE pin	DB25-DCE pin	DB25-DTE pin	Source
1-113(B)	W	9	11	
1-114(A)	Y	15	15	DCE
1-114(B)	AA	12	12	
1-115(A)	V	24	17	DCE
1-115(B)	X	11	9	
2-103(A)	P	5	6	DTE
2-103(B)	S	18	19	
2-104(A)	R	6	5	DCE
2-104(B)	T	19	8	
2-113(A)	U	10	13	DTE
2-113(B)	W	23	25	
2-114(A)	Y	21	21	DCE
2-114(B)	AA	22	22	
2-115(A)	V	13	10	DCE
2-115(B)	X	25	23	

Front panel of Dual-V.35 interface card (ED01) is shown in Figure 3-12. The LEDs are defined in Table 3-20.

Figure 3-12 Dual-V.35 interface card (ED01)

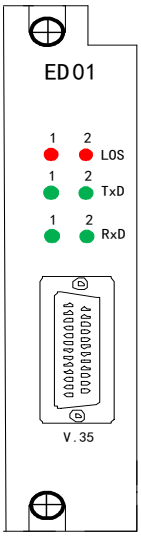


Table 3-20 LED definition of ED01

Label	Color	Definition	Note
LOS1~2	Red	Signal status indication: On: signal loss Off: receiving normal	Respectively indicating the signal status of two ports
TxD 1~2	Green	Data sending indication: On: data sending Off: no data sending	Respectively indicating the data sending status of two ports
RxD 1~2	Green	Data receiving indication: On: data receiving Off: no data receiving	Respectively indicating data receiving status of two ports

The work mode and bandwidth of V.35 port can be set by NMS or hardware DIP switches as shown in Table 3-21. There are four groups of DIP switches in each Dual V.35 card (K1 and K2, K3 and K4), which can set the work mode and bandwidth of 2 V.35 channels respectively. Take the first V.35 channel for example: 4-position DIP switch K1 is used to set the work mode, frame state and the 16th time slot, as shown in Table 3-21. 10-position DIP switch K2 is used to set head and tail time slots for the 1st V.35, it will be valid under framed mode. DIPs from K2_1 (high position) to K2_5 (low position) are DIPs for head slot setting, corresponding to Head Slot Set [4 to 0], denoted by binary code, for example, 00111 stands for the 7th time slot. DIPs from K2_6 (high position) to K2_10 (low position) are for tail slot setting, corresponding to Tail Slot Set [4 to 0], denoted by binary code, for example, 11111 stands for the 31th time slot.

Table 3-21 Description of the working mode, framing and 16 time slot setting by DIP switch K1 (4-position) of the first V35

DIP switch Number	Function	Description		
K1_4 (S16_en) K1_3 (FR_en)	K1_4: TS-16 mode K1_3: framed mode	K1_3: ON	K1_4: ON	Multi-frame
		K1_3: ON	K1_4: OFF	Framed
		K1_3: OFF	K1_4: OFF	Unframed
		K1_3: OFF	K1_4: ON	N/A
K1_2 (Mod0) K1_1 (Mod1)	Setting working mode of the V.35 port	K1_1: ON	K1_2: ON	Set by the software
		K1_1: ON	K1_2: OFF	DTE (optional)
		K1_1: OFF	K1_2: ON	DCE_E1 line clock
		K1_1: OFF	K1_2: OFF	DCE master clock

DIP switch Number	Function	Description
Remarks: • When K1_1 and K1_2 are switched ON simultaneously, the working mode and bandwidth of V.35 port are controlled by the NM software. When K1_1 and K1_2 are switched to the other statuses, the working mode and bandwidth of V.35 port are controlled by the DIP switch. The NM software does not control the working mode and bandwidth of the card but can query the device's alarms and status. • In unframed mode, the bandwidth is 32x64kbps. In framed mode, the bandwidth is Nx64kbps (N≤31). In multi-frame mode, the bandwidth is Nx64kbps (N≤30). The TS-16 mode is used for multi-frames and signals. • If services are forwarded through the 64kbps cross-connection card, the card must be set to DCE_E1 line clock but not the DCE master clock. And at this time, E1 clock is synchronizing with the timeslot cross-connection unit.		

3.2.9 Dual-X.21 Interface Card (ED02)

ED02 card provides dual X.21 ports, and can be inserted in any universal slot (1~12).

ED02 adopts DB15 (male) interface, providing two channels of X.21 data. The signal definitions are shown in Table 3-22 and Table 3-23. X.21 interface offers DCE/DTE working mode, supporting non-framing or framing structures and software/hardware time slot setting under framing mode. ITU-T X.21 interface can be converted through BH4.851.172 (DCE) or BH4.851.173 (DTE) cable.

Table 3-22 X.21 interface signal definition (DCE)

DB15 (MALE)	Name	Abbreviation	ITU-T Line	Signal From DTE to DCE	Signal From CTE to DTE
1	PGND cable	CG	-	-	-
2	Sending data A	T	103	→	←
3	Request for sending data A	C	105	→	←
4	Receiving data A	R	104	←	→
5	Sending data READY A	I	106	←	→
6	Receiving clock signal A	S	115	←	→
7	Sending clock signal (DCE) A	B	114	←	→
8	Signal ground	SG	102	-	-
9	Sending data B	T	103	→	←

DB15 (MALE)	Name	Abbreviation	ITU-T Line	Signal From DTE to DCE	Signal From CTE to DTE
10	Request for sending data B	C	105	→	←
11	Receiving data B	R	104	←	→
12	Sending data READY B	I	106	←	→
13	Receiving clock signal B	S	115	←	→
14	Sending clock signal (DCE) B	-	-	-	-

Table 3-23 X.21 interface signal definition (DTE)

DB15 (Female)	Name	Abbreviation	ITU-T Line	Signal From DTE to DCE
1	-	-	-	-
2	Sending data A	T	103	→

DB15 (Female)	Name	Abbreviation	ITU-T Line	Signal From DTE to DCE
3	Request for sending data A	C	105	→
4	Receiving data A	R	104	←
5	Sending data READY A	I	106	←
6	-	-	-	-
7	Receiving clock signal A	S	115	←
8	Signal ground	SG	102	
9	Sending data B	T	103	→
10	Request for sending data B	C	105	→
11	Receiving data B	R	104	←
12	Sending data READY B	I	106	←
13	-	-	-	-
14	Receiving clock signal B	S	115	←
15	-	-	-	-

Dual- X.21 interface card (ED02) is shown in Figure 3-13. The LEDs are defined in Table 3-24.

Figure 3-13 Front panel of ED02 card

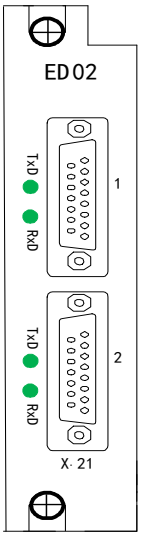


Table 3-24 LED definition of ED02 card

Label	Color	Definition	Note
TxD	Green	Data sending indication: Blink: data is sent through the port. Off: no data is sent through the port.	Respectively indicating data sending status of two ports
RxD	Green	Data receiving indication: Blink: data is received through the port. Off: no data is received through the port.	Respectively indicating data receiving status of two ports

The work mode and bandwidth of X.21 port can be set by the software or DIP switch as shown in Table 3-25. The card provides four groups of DIP switches: K1, K2, K3, and K4. K1 and K2 are used to configure the first

channel, while K3 and K4 are used to configure the second channel. Take the DIP switch configuration of the first X.21 channel as an example: Four-position DIP switch K3 is used to configure the working mode, framed mode, and TS-16 mode of the first V.35 channel as shown in Table 3-25. 10-position DIP switch K1 is used to configure the head and tail timeslots of the first V.35 channel, which is valid only in framed mode. DIP switch K1_10 (high position) to K1_6 (low position) configure the head timeslots, corresponding to Head Slot Set [4 to 0]. It uses binary encoding, for example, 00111 represents for timeslot 7. DIP switch K1_5 (high position) to K1_1 (low position) configure the tail timeslots, corresponding to Tail Slot Set [4 to 0]. It uses binary encoding, for example, 11111 represents for timeslot 31.

Table 3-25 Configuration of K3 (4-position DIP switch)

DIP Switch NO.	**Function**	**Description**		
K3_4 (S16_en) K3_3 (FR_en)	K3_4: TS-16 mode; K3_3: framed mode	K3_3: ON	K3_4: ON	Multiframe
		K3_3: ON	K3_4: OFF	Framed
		K3_3: OFF	K3_4: OFF	Unframed
		K3_3: OFF	K3_4: ON	N/A
K3_2 (Mod0) K3_1 (Mod1)	Setting working mode of the X.21 port	K3_1: ON	K3_2: ON	Set by the software
		K3_1: ON	K3_2: OFF	DTE (Optional)
		K3_1: OFF	K3_2: ON	DCE_E1 line clock
		K3_1: OFF	K3_2: OFF	DCE master clock

DIP Switch NO.	Function	Description
Remarks: • When K3_1 and K3_2 are switched ON, the working mode and bandwidth of X.21 port are controlled by the NM software. When K3_1 and K3_2 are switched to other status, the working mode and bandwidth of X.21 port are controlled by the DIP switch. The NM software does not control the working mode and bandwidth of the card but can query the device's alarms and status. • In unframed mode, the bandwidth is 32x64kbps. In framed mode, the bandwidth is Nx64kbps (N≤31). In multi-frame mode, the bandwidth is Nx64kbps (N≤30). The TS-16 mode is used for multi-frames and signals. • If services are forwarded through the 64kbps cross-connection card, the card must be set to DCE_E1 line clock but not the DCE master clock. In DCE_E1 line clock mode, E1 clock synchronizes with timeslot cross-connection unit.		

3.2.10 Layer 3 Switching Card (ETR01)

ETR01 is a layer-3 switching card, providing 2 GE ports. These two GE ports are combo ports, that is, two electrical ports and two optical ports are provided, but electrical and optical ports with the same sequence number cannot be used simultaneously. SFP plug-in design is used for the optical GE ports. Ethernet electrical ports support auto-negotiation and can work in the following modes: 100M bit/s full-duplex, 100M bit/s half-duplex, 10M bit/s full-duplex, and 10M bit/s half-duplex. The optical ports support auto-negotiation and 1000M bit/s full-duplex mode.

ETR01 can be only inserted at slot 3 and slot 10 in H5600.V5 chassis. ETR01 card provides the H5600.V5 with the ability to aggregate Ethernet traffic, using layer3 functionality. ETR01 card should be work with other layer2 cards. It works as a gateway for other layer 2 Ethernet traffic to

network. Static routing and Open Shortest Path First (OSPF v2) are supported.

The panel diagram of ETR01 card is shown in Figure 3-14, and the LED functional descriptions are shown in Table 3-26. RJ45 socket diagram and definitions are shown in Figure 3-15 and Table 3-27.

Figure 3-14 The panel diagram of ETR01 card

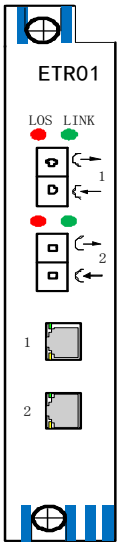


Table 3-26 LED functional descriptions of ETR01 card

Label	Color	LED functional descriptions
Green LED at Ethernet socket	Green	Link and Active indication: On: electrical port is effectively connected; Off: no network connection at electrical port; Blink: electrical port is in communication

Label	Color	LED functional descriptions
Yellow LED at Ethernet socket	Yellow	Ethernet port FDX indication: On: Ethernet ports (electrical&optical ports) are in full-duplex mode; Off: Ethernet ports (electrical&optical ports) are in half-duplex mode
LOS	Red	Signal state indication at the optical port: On: signal loss Off: normal reception
Link	Green	Link indication at the optical port: On: valid connection Off: no connection

Figure 3-15 RJ45 connector diagram

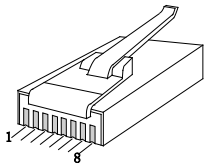


Table 3-27 RJ45 pin definition

Pin	1	2	3	4	5	6	7	8
Definition	BI_A+	BI_A-	BI_B+	BI_C+	BI_C-	BI_B-	BI_D+	BI_D-

3.2.11 OW/Overhead/Clock Card (LA01)

OW/overhead/clock interface card (LA01) is configured with order wire telephone, F1/E2 overhead channel and provides external clock interface. This card can be put into any universal slot of the device.

LA01 uses 64 kit/s PCM code, provides order wire telephone function, supports ordinary dial-up telephone calls, and provides phone power supply and ring generator. This card also provides user channel byte F1 or overhead byte E2 access, and uses RS-232 interface. This interface card also provides a channel of external clock input and output interface, the impedance can be selected between 75Ω and 120Ω.

Front panel diagram of OW/overhead/clock interface card (LA01) is shown in Figure 3-16, and LED definition is in Table 3-28.

Figure 3-16 OW/overhead/clock interface card (LA01) diagram

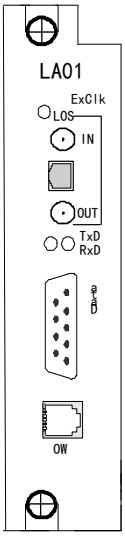


Table 3-28 OW/Overhead/Clock card (LA01) LED definition

Label	Color	LED definition
LOS	Red	Clock signal state indication: On: signal loss Off : receive normally
TxD	Green	Data transmitting indication: Blink: data is transmitted in the port Off: no data is transmitted in the port
RxD	Green	Data receiving indication: Blink: data is received in the port Off: no data is received in the port

Order Wire Port:

The RJ11 socket (labeled with OW) in the front panel is used for order wire telephones and connected to standard dual-tone multi-frequency telephone as an order wire telephone.

Order wire telephone provides communication between the nodes on ring topology network or chain topology network. Dial-up it will realize point to point selectable call. Dial key "#" before the call, and then dial 4-digit called number, namely #NNNN. The telephone number of a device can be set and query by network software.

Order wire communication can choose overhead E1 or E2, which is used in regenerator section and multiplex section respectively.

Clock Port:

In the front panel of LA01, there is one 75Ω or 120Ω clock port. Through network management software, the user can set 2MHz or 2Mbit/s clock mode. 75Ω port uses CC4 75Ω coaxial cable socket. IN and OUT

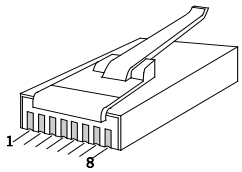
respectively denotes the input and output of clock signal. 120Ω port uses RJ-48C socket. The signal definition is shown in Table 3-29.

Table 3-29 Clock connector (RJ-48C) line definition

Pin	1	2	3	4	5	6	7	8
Definition	IN+	IN-	GND	OUT+	OUT-	GND	-	-

Use RJ-48C connector directly when 120Ω port is selected, which can be directly crimped with 120Ω twisted pair, as shown in Figure 3-17. When making cable, it must be ensured that input and output line pairs respectively use a twisted pair.

Figure 3-17 RJ-48C connector diagram



NOTE

- Clock 75Ω port and 120Ω port cannot be used at the same time.

RS-232/Overhead Port:

RS-232 port in the front panel of LA01 uses DB9 socket with rate≤19.2kbps, it can be used as asynchronous RS-232 port, and provides user channel byte F1 or E2 overhead access. DB9 socket line order is defined in Table 3-30. K1 definition is shown in Table 3-31.

Table 3-30 DB9 socket signal definition

Pin	Signal	Note
1	-	1. Asynchronous RS-232 port uses pin

Pin	Signal	Note
2	RxD	2, 3 and 5; 2. Asynchronous RS-232 port is controlled by in-card DIP switch K1. The DIP switch definition is shown in Table 3-31.
3	TxD	
4	-	
5	GND	
6	-	
7	-	
8	-	
9	-	

Table 3-31 DIP switch K1 definition

Dip switch number	Definition	Remark
K1[1]	RS-232 Mode selection: ON: USRT (synchronous); OFF: UART (asynchronous)	At present LA01 does not support synchronous data port, and K1[1] is OFF by default (asynchronous serial port)
K1[2]	75 Ω clock interface outside cover grounding selection: ON: grounding; OFF: not grounding	-

Dip switch number	Definition	Remark
K1[3]	Asynchronous RS-232 enable/disable selection: ON: enable UART; OFF: disable UART	-
K1[4]	Used for debugging, which should be set OFF during normal use	-

NOTE

- K2 is used for debugging; it should be set OFF during normal use.
- LA01 does not support synchronous data port at present.
- When overhead E2 is used by order wire and user channel at the same time, order wire first, then the user channel data will be interrupted. After the order wire hang-up, user channel data will resume again.

3.2.12 4Tx Channel EoS Card (FE01)

4Tx channel EoS card (FE01) is 100M Ethernet electrical port access card, which realizes Ethernet pass-through function. This card can be put into any universal slot (1~12).

This card supports VC-12 virtual concatenation, VCAT members can be selected from 1~63 VC-12. Four independent ports are adapted into independent virtual concatenation channels respectively. Each channel's bandwidth can be adjusted from 2M~100M by setting the number of VC-12 of VCAT, 46 VC-12 can reach 100M bandwidth.

FE01 card's Ethernet adopts GFP encapsulation and provides various GFP alarms. LCAS function is supported and ineffective members can be automatically deleted from VCAT group temporarily. After the fault is

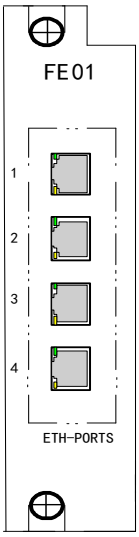
recovered, the members will be automatically added back to the VCAT group. Therefore, VCAT circuit capacity can be automatically adjusted to realize error-free bandwidth adjustment.

Ethernet supports flow control function. In 100M full-duplex mode, after flow control is enabled through NMS, when the reception cache occupation has surpassed the threshold value, pause frame will be automatically sent to the peer device's sending end, pausing its sending to avoid packet loss caused by cache overflow of the receiving device.

FE01 card's Ethernet supports LFP (Link Fault Pass-Through) function. When channel LFP function is enabled, status of any port connection in the link can be automatically detected. When port connection is broken, the other ports connected in the link will be forced to link down, so as to facilitate tracking network connection failure.

The front panel diagram of FE01 is shown by Figure 3-18.

Figure 3-18 Front panel of FE01 card



All the four Ethernet ports of FE01 card are standard RJ-45 interfaces and support auto-negotiation mode and forced 100M full-duplex mode. Of the

two LEDs at each socket of the Ethernet port, the green one indicates Link and Active: on indicates effective connection has been built; off indicates no network connection is built; flashing indicates there is communication at the port; the yellow one is Speed indication: on indicates 100M. RJ-45 socket definition is shown in Table 3-32.

Table 3-32 RJ-45 Ethernet socket definition

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

TIP: In the table above, Rx and Tx are defined based on this device.

NOTE

- The 100Base-Tx port of this device features HP auto-MDIX function under auto-negotiation mode and can automatically detect the transceiver line order of the connected network cable and make adaption. So it can be used whether the Ethernet port connected is MDI or MDI-X and whether the network cable used is crossover or straight-through.
- Different from optical interface card (OS01A/OS01S), FE01's cross capability is still 1 VC-4 even it is located in type A slots.

3.2.13 4Fx Channel EoS Card (FE02)

When the Ethernet transmission distance is within 100m, electrical interface card 4Tx channel EoS card (FE01) can be used; but when the Ethernet transmission distance is beyond 100m, optical interface card 4Fx channel EoS card (FE02) should be used.

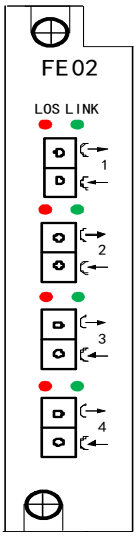
4Fx channel EoS card (FE02) is 100M Ethernet optical interface access card, which can be inserted into any universal slot (1~12) and connected to the link partner's standard optical transceiver or other Fx standard optical Ethernet port device. This card's four ports adopt LC optical ports. Different SFP optical modules should be selected according to the transmission distance. The other functions are the same with electrical

interface card 4Tx channel EoS card (FE01). For details please refer to 3.2.12.

4Fx channel EoS card (FE02) can be connected to optical transceiver H0FL-1101, and configure 802.1Q VLAN, TAG, and priority of H0FL-1101 through NMS (the VLAN ID is 1~4095); by factory default, configuration of VLAN of H0FL-1101 is disabled; the card's ports support LFP (Link Fault Pass-Through), i.e. when the channel LFP function is enabled, the card can automatically detect the connection status of any port and if one port connection is broken, the other ports connected by this link will be forced to link down, which facilitate tracking network connection failure. When 4Fx channel EoS card (FE02) is connected to optical transceiver H0FL-1101S1/1101S2 which supports standard protocols, the card supports network management for H0FL-1101S1/1101S2 NE; at this time LFP function of FE02 is disabled, i.e. not supporting LFP.

Figure 3-19 shows the front panel of 4Fx channel EoS card (FE02).

Figure 3-19 Front panels of FE02 card



The definition of the LEDs on FE02 card is shown below.

Table 3-33 FE02 LED definition

Label	Color	LED definition	Note
LOS	Red	Signal status indication: On: signal loss Off : receive normally	LEDs 1~4 indicate 4 Ethernet optical ports respectively.
LINK	Green	Link connection indication: On: interface link well Off: interface link wrong	

3.2.14 4Tx Channel EoE Card (FE04)

4Tx channel EoE card (FE04) is 100M Ethernet electrical interface card, providing Ethernet service transmission through multiple E1 channels. This card can be put into any universal slot (1~12).

FE04 provides four Ethernet ports via four independent transmission channels.

Ethernet adopts private protocol. Each channel transforms frame format of Ethernet to frame format of E1 for transmission. Ethernet packets are encapsulated into N×E1 (1≤N≤16) by order and switched to optical card by cross connection to transmit to the remote end. Ethernet packets can also be switched to E1 card and transmitted to the remote end through E1 interconnection, and then land in Ethernet, which is produced by a reversed process. This realizes transmission of Ethernet data based on E1. The bandwidth can be automatically adjusted according to the number of effective E1 channels. Even if fault or loopback occurs to some E1 channels, the data transmission will not be broken and only data throughput is lowered as those channels will be automatically deleted. After the channels are restored, the device will automatically raise the transmission bandwidth.

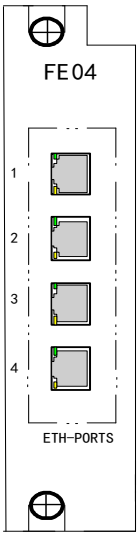
FE04 card's Ethernet supports LFP (Link Fault Pass-Through) function. When channel LFP function is enabled, connection status of each port can be automatically detected. When one port connection is broken, the other ports connected to the link will be forced to link down to facilitate tracking the network connection.

NOTE

- Bindings of four Ethernet channel 1~4 are respectively corresponding to 1~16, 17~32, 33~48, 49~63 VC12 time slots. (The 1st, 2nd, 3rd channels support up to 16 time slots, and the 4th channel supports up to 15 time slots).
- When two channels of EoE encapsulated Ethernet are interconnected, the service configurations and channel bindings should be corresponding with each other. E.g. when the 18th time slot of channel 2 of FE04 is interconnected with channel 3, it can only be interconnected with the corresponding time slot of channel 3, i.e. the 34th time slot. This must be noted when service configuration and channel binding is conducted. To avoid Ethernet blocking caused by configuration mistake, it is suggested that when conducting service configuration and channel binding, start consecutively from the first time slot.
- Every channel can transmit monitoring information along with service, i.e. supporting in-band monitoring, without taking extra resources.
- FE04 ports support auto-negotiation and manual 100M full-duplex modes.
- When FE04 is at type A slots, its cross connection capacity is one VC-4. This is the same with 4Tx channel EoS card (FE01).

4Tx channel EoE card FE04's front panel is shown below in Figure 3-20. The definitions of the LEDs at Ethernet socket and RJ-45 socket are the same with 4Tx channel EoS card (FE01), for details, please refer to 3.2.12.

Figure 3-20 Front panel of FE04 card



3.2.15 4Fx Channel EoE Card (FE05)

4Fx channel EoE card (FE05) is 100M Ethernet optical interface card, providing Ethernet service in multiple E1 channels, which can be inserted into any universal slot (1~12). The device can work with optical transceiver or other Fx standard optical Ethernet device at remote side to transmit data in EOE Ethernet. Four ports of FE05 use LC optical ports. You can select different SFP optical modules according to the transmission distance.

FE05 provides four Ethernet ports via four independent transmission channels. Ethernet adopts private protocol. Each channel transforms frame format of Ethernet to frame format of E1 for transmission. Ethernet packets are encapsulated to N×E1 (1≤N≤16) by order and switched to optical card by cross connection to transmit to the remote end. Ethernet packets can also be switched to E1 card and transmitted to the remote end through E1 interconnection, and then land in Ethernet, which is produced by a reversed process. This realizes transmission of Ethernet data based on E1. The bandwidth can be automatically adjusted according to the number of effective E1 channels. Even if fault or loopback occurs to some E1

channels, the data transmission will not be broken and only data throughput is lowered as those channels will be automatically deleted. After the channels are restored, the device will automatically raise the transmission bandwidth.

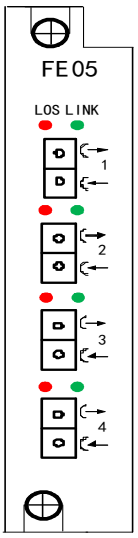
When 4Fx channel EoE card (FE05) is connected to remote optical transceiver H0FL-1101, the 802.1Q VLAN, TAG, and priority of H0FL-1101 can be configured through NMS (VLAN ID is 1~4095); by factory default, configuration of the VLAN of the link partner optical transceiver is disabled; and the card's ports support LFP (Link Fault Pass-Through). When 4Fx channel EoE card (FE05) is connected to H0FL-1101S1/1101S2 which support standard protocols, the card supports network management of H0FL-1101S1/1101S2 NE. At this time FE05's LFP function is disabled.

NOTE

- Bindings of four Ethernet channel 1~4 are respectively corresponding to 1~16, 17~32, 33~48, 49~63 VC12 time slots. (The 1st, 2nd, 3rd channels support up to 16 time slots, and the 4th channel supports up to 15 time slots).
- When two channels of EoE encapsulated Ethernet are interconnected, the service configurations and channel bindings should be corresponding with each other. E.g. when the 18th time slot of channel 2 of FE05 is interconnected with channel 3, it can only be interconnected with the corresponding time slot of channel 3, i.e. the 34th time slot. This must be noted when service configuration and channel binding is conducted. To avoid Ethernet blocking caused by configuration mistake, it is suggested that when conducting service configuration and channel binding, start consecutively from the first time slot.
- Each channel can transmit monitoring information along with service, i.e. supporting in-band monitoring, without taking extra resources.
- When 4Fx channel EoE card (FE05) is at type A slots, its cross connection capacity is one VC-4.

4Fx channel EoE card FE05's front panel is shown in Figure 3-21.

Figure 3-21 Front panel of FE05 card



The LED definition of 4Fx channel EoE card (FE05) is the same with 4Fx channel EoS card (FE02). Please see details in 3.2.13.

3.2.16 1-Port 4-Channel Nx64K Ethernet Interface Card (FE64)

1-port 4-channel Nx64K Ethernet interface card (FE64) is 10/100M adaptive Ethernet electrical interface card, which can access and switch Ethernet frames from four internal EoTDM channels (through SDH bus) and an external port. This card can be put into any universal slot (1~12).

The total available bandwidth of 4 internal channels of FE64 card is up to 63 E1s, channel 1 to 4 are respectively corresponds to 1~16, 17~32, 33~48, and 49~63 E1s (the first three channels support up to 16 E1s and the 4th channel supports up to 15 E1s).

4 internal channels of FE64 card are connected to the backplane SDH bus through the way of EoTDM. The encapsulation format of EoTDM is Eo64K or EoPDH. Eo64K format converts Ethernet frame into proprietary N×64K frame for transmission and Ethernet packets are encapsulated into

N×64K (1≤N≤496 or 465) in order. Channels 1 to 3 support up to 496×64K (16×31) timeslots, and channel 4 supports up to 465×64K (15×31) timeslots. Eo64K encapsulated Ethernet of FE64 card can cooperate with EXM01 card, realizing the access of N×64K Ethernet service; Each channel that adopts EoPDH standard-protocol encapsulation converts Ethernet frame into standard E1 frame into N×E1 (1≤N≤16 or 15) for transmission, realizing Ethernet data transmission based on E1. The first three channels support up to 16 E1s, while the 4th channel supports up to 15. It can interconnect with various EoPDH devices that conform to G.8040 standard.

Main functions:

- VLAN classification based on port, 802.1Q or Q in Q, VLAN supports up to 512 entries, and VLAN ID range is 1~4094;
- QoS management based on port, DS and 802.1P;
- STP/RSTP;
- Ethernet port loopback detection;

  Ethernet port loopback detection function and STP/RSTP are bound: the port will support loopback detection only when STP/RSTP is enabled. The device will automatically remove loopback ports (by default) which are determined by the principle that spanning tree only has backup ports and alternative ports. NMS supports loopback detection and query of removed ports but does not support disabling loopback detection and manual removal of loopback ports;
- Configuration of static MAC address list (64 entries);
- MAC address learning: query of the MAC address of user data packets, up to 2048 entries; the entry content includes MAC address, ports (external and internal ports) and VLAN ID; MAC address aging time can be set to 10~1048575s (the default is 300s);
- Ethernet internal channel Trunking (up to four channels and two groups of Trunking);

- LCAS protocol is supported, which can automatically adjust the bandwidth according to the number of effective E1 channels. Even if errors or loopbacks occur to some E1 channels, it will remove them automatically. This just decreases the data throughout but not breaks the transmission. And when the channels have recovered, the device will automatically restore the transmission bandwidth;
- Maximum packet length of 2032 bytes;
- Electrical ports support management of Ethernet input/out bandwidth (speed limit range can be set to 64Kbps~100Mbps: when the bandwidth is less than 2Mbps, the granule is 64Kbps; when the bandwidth is equal to or more than 2Mbps, the granule is 1Mbps);
- Storm repression for unknown unicast, multicast, and broadcast (the speed limit range and granule are the same with management of input/output bandwidth);
- RMON (Remote Network Monitoring). Query and configuration of relevant content of statistics group and history group;
- Single card resetting function.

NOTE

- The total available Ethernet bandwidth is up to 63 E1s, channels 1 to 4 respectively correspond to 1~16, 17~32, 33~48, and 49~63 E1s (the first three channels support up to 16 E1s and the 4th channel supports up to 15 E1s).
- When Eo64K encapsulation is adopted, timeslot 16 can be used to transmit Ethernet data or not to.
- When STP is enabled, the ports will be redetected and Ethernet will be broken.
- When LCAS function is disenabled, the Ethernet service configurations and channel bindings of both ends must be consistent.
- When VLAN is disenabled, one external port and four internal channels of FE64 card are switching ports.

Ethernet electrical ports of FE64 card support auto-negotiation mode and manual 10M/100M full/half-duplex mode.

The panel diagram of FE64 card is shown in Figure 3-22, and the LED definition is in Table 3-34. RJ45 socket definition of Ethernet electrical ports is the same with FE01 card, please see details in 3.2.12.

Figure 3-22 Panel diagram of FE64 card

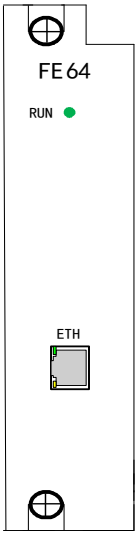


Table 3-34 LED definition of FE64 card

Label	Color	LED definition
RUN	Green	System running indication: Blink: the card is running normally; Off: the card is running abnormally
Green LED at Ethernet socket	Green	Link and Active indication: On: electrical port is effectively connected; Off: no network connection at electrical port; Blink: electrical port is in communication

Label	Color	LED definition
Yellow LED at Ethernet socket	Yellow	Ethernet port FDX indication: On: electrical port is in full-duplex mode; Off: electrical port is in half-duplex mode

3.2.17 Dual-GE Interface 16-channel Aggregation EoS Card (GX05)

Dual-GE interface 16-channel aggregation EoS card (GX05) is a 10/100/1000M adaptive Ethernet optical/electrical card, realizing access and switch of 1 or 5 Ethernet ports (at aggregation side) from back panel and 16 Ethernet ports from VCG channels (internal), aggregating to 2 GE optical/electrical ports (external). When GX05 is inserted to Ethernet aggregation slot (universal slot3 and slot10), it supports 5 aggregation ports to fulfill other slots' Ethernet service aggregation through backboard Ethernet bus to GE port (these slots need to be configured with cards with Ethernet aggregation function and enable aggregation side ports through NM software), aggregating Ethernet services of various tributaries to GE port and then uplink to the aggregation level switch or multi-service router of MAN. This helps to save service ports of aggregation node and realizes high-speed transmission. GX05 also can be inserted into other universal slot to provide one aggregation-side port. GX05 has 2 GE electrical ports and 2 GE optical ports. But the electrical and the optical ports with the same serial number cannot be used at the same time.

16 internal virtual concatenation channels support VC-12 VCAT, the total maximum bandwidth can get 1 STM-1. Each channel's bandwidth can be adjusted between 2M~100M by setting the number of VC12 of VCAT, 46 VC12 can get 100M bandwidth. Ethernet uses GFP encapsulation, and GFP alarm is supported.

GX05 card supports LCAS function, which can automatically delete failed members from VCAT for a while, when the malfunction is recovered, this

member will be backed to VCAT automatically. Accordingly, we can adjust VCAT capability, realizing zero BER bandwidth adjustment.

The 2 GE ports of GX05 are switching ports, and support VLAN (based on port, 802.1Q and QinQ). The Maximum VLAN number is 4094, and the range of VLAN ID is 1-4094. MAC address learning mode supports both Sharing VLAN Learning (SVL) and Independent VLAN Learning (IVL). They can be set through the NMS and SVL is used by default. 5 aggregation-side ports of slot3 respectively correspond to universal slots 1~2, 4~6, while 5 aggregation-side ports of slot10 respectively correspond to universal slot 7~9 and 11~12.

Besides, GX05 supports Ethernet port loop back detection function, STP function, RSTP function, static MAC table setting (64 table items), EFM function (802.3ah) and LACP function (manual and static). And Ethernet port loopback detection is bound with the RTP&RSTP function. Only when STP&RSTP function is enabled can the user use the Ethernet port loopback detection function (Ethernet port loopback detection function is enabled by default). According to STP, only backup ports and replacing ports are considered as loop back ports and will be deleted (automatically by default). NMS supports loop back monitoring and searching of deleted ports, but it cannot disable loop back monitoring function and delete loop back port manually. EFM function (802.3ah) support report of power failure and loopback test of the remote device. Remote loopback can be set to automatic test mode and user test mode.

LACP function supports 6 kinds of load sharing algorisms: S-MAC, D-MAC, S-MAC&D-MAC, S-IP, D-IP, and S-IP&D-IP. S-MAC&D-MAC is used by default. Under Manual LACP and Static LACP, aggregation group creation and member port adding need manual configuration. The difference is that in manual load sharing mode, all interfaces are under forwarding state, sharing the load, and no LACP (link Aggregation Control Protocol) message is involved. But the static LACP is a method that using LACP for aggregation parameter negotiation and LACP mode confirmation of active ports and passive ports. Ports' priority, synchronization mode, time-out mode and the Net-bridge's priority and

MAC address need to be configured manually. Besides, the priority range is 0~65535 (32768 by default), the synchronization mode should be active or passive (active by default), time-out mode should be short or long (long by default), the default Net-bridge MAC address is the MAC address of the NM card, and the Net-bridge priority range is 0-15 (slot -1 by default). The LACP function supports up to 12 aggregation groups, and each group can possess 8 ports with the same bit rate at most.

GX05 supports MAC address learning function, which can query MAC address of user data packets and supports up to 4095 entries including MAC addresses, source ports (internal, external and aggregation-side) and VLAN ID.

GX05 card's electrical port supports auto-negotiation mode and manual 10M/100M half/full duplex mode. Optical port supports auto-negotiation mode and manual 1000M full-duplex mode.

Ethernet's maximum frame length supported by GX05 is 2048Bytes.

The panel of GX05 is shown in Figure 3-23. Definition of LEDs is shown in Table 3-35. RJ45 connector diagram of Ethernet interface is shown in Figure 3-24, RJ45 socket line definition is shown in Table 3-36.

Figure 3-23 Panel of dual-GE interface 16-channel aggregation EoS card (GX05)

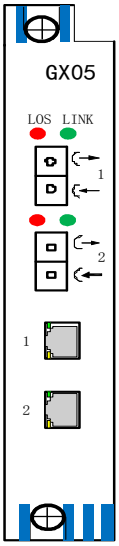


Table 3-35 LED functional descriptions of GX05 card

LED	Color	LED functional descriptions
Green LED on the Ethernet port	Green	Link/Active indication: On: valid connection Off: no connection Blink: data sent/received
Yellow LED on the Ethernet port	Yellow	Ethernet port FDX indication: On: Ethernet ports (electrical and optical) is in full-duplex mode Off: Ethernet ports (electrical and optical) is in half-duplex mode

LED	Color	LED functional descriptions
LOS	Red	Signal state indication of the optical port: On: signal loss Off: normal reception
Link	Green	Link indication of the optical port: On: valid connection Off: no connection

Figure 3-24 RJ45 connector diagram

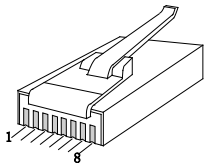


Table 3-36 RJ45 socket definition

Pin	1	2	3	4	5	6	7	8
Definition	BI_A+	BI_A-	BI_B+	BI_C+	BI_C-	BI_B-	BI_D+	BI_D-

NOTE

- The electrical port and optical port of GX05 support automatic adaption, but electrical and optical port with the same number cannot be used at the same time. When the card switches from optical port to electrical port, the interface work mode of ports should be reconfigured.
- When enabling STP function, the device will monitor all the ports and this will lead to interruption of Ethernet service for a while. Please set the ports which do not need to be monitored to edge port.
- Link aggregation function precautions:

- When the software is upgraded through a GE port on GX05 card, disable aggregation-side ports, STP and VLAN first. Link aggregation function and 802.3ah, STP/RSTP functions cannot be used at the same time.
- The ports added to the same aggregation should have the same work rate, duplex mode, and VLAN configuration.
- When the aggregation group is at activated state, its port attribute cannot be modified. Only when the aggregation group is at deactivated state, the port's priority, synchronization mode, and timeout mode can be modified.
- The load balancing algorithm of this device's aggregation group should be same with that of the link partner's aggregation group.
- The external port cannot be added to the same aggregation group with other ports.
- When setting the link aggregation module, after the aggregation group or port attributes are set, please query the result after three seconds.

3.2.18 16-channel EoS Aggregation Card (GX05C)

16-channel EoS aggregation card (GX05C) realizes the access and switch of 1 or 5 Ethernet (aggregation-side ports) from back panel and 16 Ethernet (internal ports) from VCG channels, and then aggregates to 2 GE optical ports and 2 FE electrical ports (external ports).

When GX05C is inserted to Ethernet aggregation slot (universal slot3 and slot10), it supports 5 aggregation ports (5 aggregation-side ports of slot3 respectively correspond to universal slots 1~2, 4~6, while 5 aggregation-side ports of slot10 respectively correspond to universal slot 7~9 and 11~12). These 5 aggregation ports fulfill other slots' Ethernet service aggregation through backboard Ethernet bus to GE port (these slots need to be configured with cards which support Ethernet aggregation function and enable aggregation side ports through NMS), aggregating Ethernet services of various tributaries to GE port and then uplink to the aggregation level switch or multi-service router of MAN. This helps to save service ports of aggregation node and realizes high-speed transmission. GX05C also can be inserted into other universal slot to provide one aggregation-side port.

16 internal virtual concatenation channels support VC-12 VCAT, the total maximum bandwidth can get 1 STM-1. Each channel's bandwidth can be adjusted between 2M~100M by setting the number of VC12 of VCAT, 46 VC12 can get 100M bandwidth. Ethernet uses GFP encapsulation, and GFP alarm is supported.

GX05C card supports LCAS function, which can automatically delete failed members from VCAT for a while, when the malfunction is recovered, the deleted members will be backed to VCAT automatically. Accordingly, VCAT capability can be adjusted automatically to realize zero BER bandwidth adjustment.

The 2 GE optical ports and 2 FE electrical ports of GX05C are switching ports, which support VLAN (based on 802.1Q and QinQ). The Maximum VLAN table entries are 4094, and the range of VLAN ID is 1-4094. MAC address learning mode supports both SVL (Sharing VLAN Learning) and IVL (Independent VLAN Learning). They can be set through the NMS and SVL is used by default. Besides, GX05C supports Ethernet port loop back detection function, STP function, RSTP function, static MAC table setting (64 table items), EFM function (802.3ah) and LACP function (manual and static). And Ethernet port loopback detection is bound with the RTP&RSTP function. Only when STP&RSTP function is enabled can the user use the Ethernet port loopback detection function (Ethernet port loopback detection function is enabled by default). According to STP, only backup ports and replacing ports are considered as loop back ports and will be deleted (automatically by default). NMS supports loop back monitoring and searching of deleted ports, but it cannot disable loop back monitoring function and delete loop back port manually. EFM function (802.3ah) support report of power failure and loopback test of the remote device.

LACP function supports 6 kinds of load sharing algorisms: S-MAC, D-MAC, S-MAC&D-MAC, S-IP, D-IP, and S-IP&D-IP. S-MAC&D-MAC is used by default. Under Manual LACP and Static LACP, aggregation group creation and member port adding need manual configuration. The difference is that in manual load sharing mode, all interfaces are under forwarding state, sharing the load, and no LACP (link Aggregation Control

Protocol) message is involved. But the static LACP is a method that using LACP for aggregation parameter negotiation and LACP mode confirmation of active ports and passive ports. Ports' priority, synchronization mode, time-out mode and the Net-bridge's priority and MAC address need to be configured manually. Besides, the priority range is 0~65535 (32768 by default), the synchronization mode should be active or passive (active by default), time-out mode should be short or long (long by default), the default Net-bridge MAC address is the MAC address of the NM card, and the Net-bridge priority range is 0-15 (slot-1 by default). The LACP function supports up to 12 aggregation groups, and each group can possess 8 ports with the same bit rate at most.

GX05C supports MAC address learning function, which supports up to 4095 VLAN table entries, including external ports, internal ports and aggregation-side ports.

GX05C has 2 100M Ethernet electrical ports and 2 1000M Ethernet optical ports. Ethernet electrical ports support auto-negotiation mode and manual 10M/100M full duplex modes. Optical ports support auto-negotiation mode and manual 100M/1000M full duplex modes.

Ethernet's maximum frame length supported by GX05C is 9712Bytes.

The panel of GX05C is shown in Figure 3-25. Definition of LEDs is shown in Table 3-37. RJ45 connector diagram of Ethernet interface is shown in Figure 3-26, RJ45 socket line definition is shown in Table 3-38.

Figure 3-25 Panel of 16-channel EoS aggregation card (GX05C)

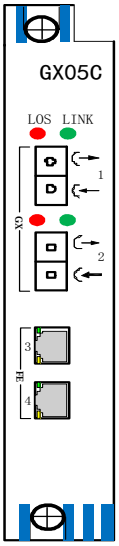


Table 3-37 LED functional descriptions of GX05C card

LED	Color	LED functional descriptions
Green LED on the Ethernet port	Green	Link/Active indication: On: valid connection Off: no connection Blink: data sent/received
Yellow LED on the Ethernet port	Yellow	Ethernet port FDX indication: On: Ethernet ports (electrical and optical) is in full-duplex mode Off: Ethernet ports (electrical and optical) is in half-duplex mode
LOS	Red	Signal state indication of the optical port: On: signal loss Off: normal reception

LED	Color	LED functional descriptions
LINK	Green	Link indication of the optical port: On: valid connection Off: no connection

Figure 3-26 RJ45 connector diagram

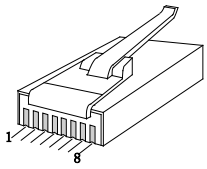


Table 3-38 RJ45 socket definition

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

Note: Rx and Tx in the table above are based on this device.

NOTE

- When enabling STP function, the device will monitor all the ports and this will lead to interruption of Ethernet service for a while. Please set the ports which do not need to be monitored to edge port.
- Link aggregation function precautions:
  - When the software is upgraded through an FE port on GX05C card, disable aggregation-side ports, STP and VLAN first. Link aggregation function and 802.3ah, STP/RSTP functions cannot be used at the same time.
  - The ports added to the same aggregation should have the same work rate, duplex mode, and VLAN configuration.
  - When the aggregation group is at activated state, its port attribute cannot be modified. Only when the aggregation group is at deactivated state, the port's priority, synchronization mode, and timeout mode can be modified.

- The load balancing algorithm of this device's aggregation group should be the same with that of the link partner's aggregation group.
- The external port cannot be added to the same aggregation group with other ports.
- When setting the link aggregation module, after the aggregation group or port attributes are set, please query the result after three seconds.
- PCB A01 version of GX05C does not support aggregating service in FX01 card.

3.2.19 4FX Interface Transceiver Aggregation Card (FX01)

4FX interface transceiver aggregation card (FX01) is an Ethernet aggregation access card facing carrier application. It provides four megabit Ethernet optical ports and the remote end can connect optical transceiver. This card can be inserted to any universal slot of the device except ethernet aggregation slot (slot3/slot10). FX01 card has a 100M Ethernet aggregation-side port, making it work with GX05 to realize access and aggregation of optical transceiver.

FX01 card provides four external Ethernet optical ports, and when the remote end is connected to our company's H0FL-1101, H0FL-1101S1, H0FL-1101S2 and other optical transceivers, the corresponding management functions are provided, such as port mode setting, speed limit setting, flow control setting, VLAN configuration, LFP setting and the query of remote device alarm information.

FX01 card supports setting static MAC address list (64 entries), MAC address aging, VLAN division, QoS function, STP, RSTP and other Ethernet L-2 protocol.

FX01 card static MAC address list supports setting static multicast MAC address and static unicast MAC address (64 entries). MAC address aging time range supports 10~524287s, the default being 300s.

The four Ethernet optical ports of FX01 card are switching ports, which can divide VLANs based on port, 802.1Q VLAN, and 802.1ad QinQ. The

VLAN group supports up to 4094 entries, and the VLAN ID range is 1~4094. VLAN based on port uses port pass-through mode, i.e. ports can receive frames with or without VLAN and do not filter frames sent and received based on VLAN. VLAN based on 802.1Q can identify and process 802.1Q tag, configure VLAN ID and 802.1p priority. VLAN based on QinQ can identify and deal with double tags. FX01 card can realize QoS management based on ports, 802.1p, and DS.

Ethernet can be configured with STP or RSTP. Switch devices running this protocol find loops in network through exchanging information and block some ports to remove loops. The RSTP of Ethernet ports of FX01 card is enabled by default.

NOTE

- When the STP function is enabled, the ports will be detected again and Ethernet will be broken. If some ports do not need detection, please set these ports to edge ports.

Ethernet's maximum frame length supported by FX01 card is 2000Bytes or 2046Bytes.

The Ethernet optical ports of 4FX interface transceiver aggregation card (FX01) use LC optical ports and support ESFP optical module DDM. Different SFP optical modules can be selected according to transmission distance. Optical ports support manual 100M full-duplex mode. Front panel diagram is shown by Figure 3-27, and LED functional descriptions are shown in Table 3-39.

Figure 3-27 4FX interface transceiver aggregation card (FX01) front panel diagram

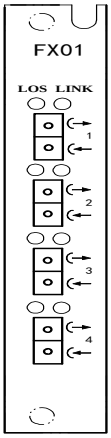


Table 3-39 4FX interface transceiver aggregation card (FX01) LED functional description

Mark	Color	Functional description	Remark
LOS	Red	Interface signal status indication: On: signal loss Off: normal reception	LED 1~4 marks are respectively corresponding with four Ethernet optical ports
LINK	Green	Interface Link indication: On: correct interface link Off: incorrect interface link	

3.2.20 Multi-functional Voice Interface Card (CHU01)

Multi-functional voice interface card (CHU01) provides 10-channel FXO, FXS, hotline, or magnet (common magnet and 2100 Hz signaling magnet) voice interfaces (timeslots 1 to 10). The interface mode of every two voice channels can be set to FXO, FXS, hotline, or magnet mode by the software

NMS or hardware DIP switch. The magnet port also supports out-of-band signaling, and can interconnect with common magnet port of H5 devices from our company.

When multi-functional voice interface card (CHU01) is configured to FXO voice interface, it can be installed in any universal slot (1~12) of the device; but when it is configured to FXS, hotline, or magnet voice interface, it can only be installed in slot (1~11), not in slot 12.

There is one voice interface (DB25 socket) and a total of ten LEDs in two left and right columns. See the panel diagram of CHU01 card in Figure 3-28. Each LED indicates the status of 2-channel voice services, with the left indicating the working mode (FXO, FXS, hotline, or magnet) and the right indicating whether the channel is occupied. DB25 socket is used to connect 2-wire voice cable ZJN.BH4.851.245. See LED definitions and pin assignments in Table 3-40 and Table 3-41.

Figure 3-28 Panel diagram of CHU01 card

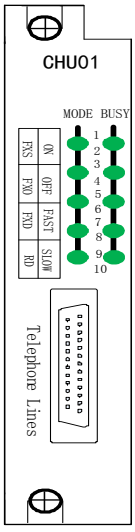


Table 3-40 LED definition of CHU01 card

Label	Color	LED definition	Remark
MODE	Green	On: FXS	Each LED indicates the status of 2-channel voice services, the left LEDs indicate the voice type (MODE) and the right LEDs indicate the voice occupied/idle status (BUSY)
		Off: FXO	
		Blink (once in 2 seconds: Magnet (RD)	
		Blink (twice every second): Hotline (FXD)	
BUSY	Green	On: calls occupy at least one channel; Off: the two channels are idle	

Table 3-41 Pin assignment of ZJN.BH4.851.245

DB25F Pin	Color	Signal	Combination	Remark
1	White	T1	Twisted pair	2-wire-1
14	Blue	R1		
2	White	T2	Twisted pair	2-wire-2
15	Orange	R2		
3	White	T3	Twisted pair	2-wire-3
16	Green	R3		
4	White	T4	Twisted pair	2-wire-4
17	Brown	R4		
6	White	T5	Twisted pair	2-wire-5

DB25F Pin	Color	Signal	Combination	Remark
19	Gray	R5		
7	Red	T6	Twisted pair	2-wire-6
20	Blue	R6		
8	Red	T7	Twisted pair	2-wire-7
21	Orange	R7		
9	Red	T8	Twisted pair	2-wire-8
22	Green	R8		
11	Red	T9	Twisted pair	2-wire-9
24	Brown	R9		
12	Red	T10	Twisted pair	2-wire-10
25	Gray	R10		

TIP: Ti, Ri (i = 1 to 10) indicates the input and output of the voice cable.

DIP Switch Description:

CHU01 card uses the NMS or a 10-position hardware DIP switch K1 to set the working mode of ports. The jumper J4 determines whether to use the hardware or the software. When pin 1 and 2 of J4 are connected, software control is used; and when pin 2 and 3 are connected, hardware control is used. Table 3-42 defines the 10-position DIP switch.

Table 3-42 Definition of the DIP switch of CHU01 card

Label		Definition	Remark
i (i=1,3,5,7,9)	i+1		

Label		Definition	Remark
OFF	OFF	The channels i~i+1 work in FXS mode	Channel i and i+1 work in the same mode.
OFF	ON	The channels i~i+1 work in FXO mode	
ON	OFF	The channels i~i+1 work in magnet mode	
ON	ON	The channels i~i+1 work in hotline mode	

3.2.21 Multi-functional Voice Interface Card (CHU02)

Multi-functional voice interface card (CHU02) provides 10-channel FXO, FXS, hotline, or magnet voice interfaces, whose interface type and quantity can be configured flexibly by plugging in voice sub-cards, each voice sub-card provides 1-channel voice and can be put into slot 1-10 of CHU02 card, occupying timeslots 1 to 10. Slot allocation is shown in Figure 3-29. FXO voice sub-card is mainly used to connect to the subscriber line interface of the switch card, whose functions are voice coding and decoding, ring detection, signaling decoding and etc.; FXS voice sub-card is mainly used to connect to the telephone, whose functions are voice coding and decoding, feeding and ringing to the subscriber line, overvoltage protection and etc.; The main functions of hotline voice sub-card are voice coding and decoding, on/off- hook detection, feeding and ringing to the phone and etc.; The main functions of magnetic voice sub-card are voice coding and decoding, detection of dialing signal, ringing to the phone and etc. This card uses 2100Hz in-band method with 2100Hz ring generator detection function.

When multi-functional voice interface card (CHU02) is configured to FXO voice interface, it can be installed in any universal slot (1~12) of the device;

but when it is configured to FXS, hotline, or magnet voice interface, it can only be installed in slot (1~11), not in slot 12.

NOTE

Voice level gain value of CHU02 card can be adjusted through NMS. Adjustment value of A/D direction is X (-18 dB≤X≤10dB); while adjustment value of D/A direction is Y (-18 dB≤Y≤8 dB).

There is one voice interface (DB25 socket) and a total of ten LEDs in two left and right columns. See the panel diagram of it in Figure 3-30. Each LED indicates the status of 1-channel voice services. See LED definition and pin assignment in Table 3-43. DB25 socket is used to connect 2-wire voice cable ZJN.BH4.851.245, whose pin assignment can be referred to the pin assignment Table 3-41 of 2-wire voice cable in 3.2.20.

Figure 3-29 Slot allocation of CHU02 voice sub-card

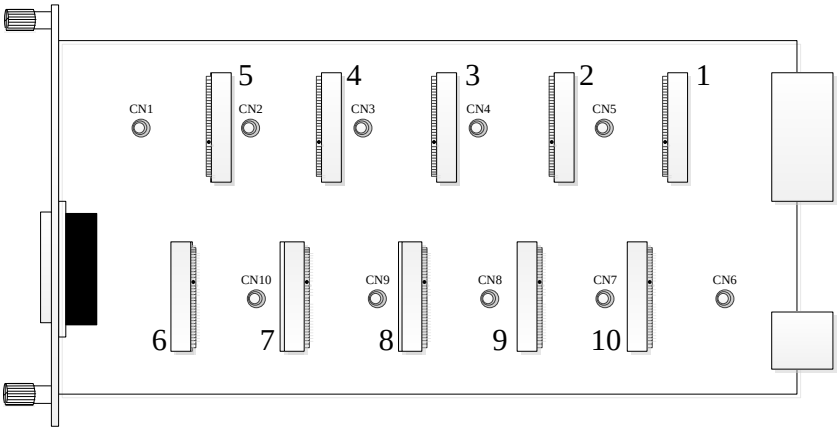


Figure 3-30 Panel diagram of CHU02 card

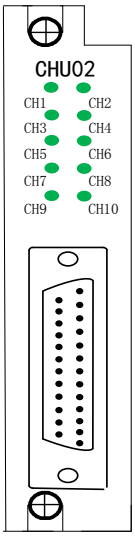


Table 3-43 LED definition of CHU02 card

LED status of voice channel occupancy status	Description
Solid on	In communication
Off	Not occupied
Blink	Sub-voice-card is unequipped

3.2.22 10 FXS Port card with Line Fault Detection (CHU03)

CHU03 is a PCM voice card that provides users with FXS telephone access ports and supports telephone line fault detection, such as open circuit and short circuit detection. We can enable/disable detection function, and set the automatic detection interval and manual detection on CHU03. It provides FXS interfaces, the number of which can be flexibly configured

through plugging in voice sub-cards. Each voice sub-card provides 1-channel voice and can be put into slot 1 to 10 in the CHU03, occupying timeslots 1 to 10. Slot allocation is shown in Figure 3-31. FXS voice sub-card is mainly used to connect to the telephone, whose functions are voice coding and decoding, feeding and ringing to the subscriber line, overvoltage protection and etc.

CHU03 can be installed in any universal slot (1~12) of the device. It comes with ring function, so only -48V power supply is enough.

NOTE

Voice level gain value of CHU03 card can be adjusted through NMS. Adjustment value of A/D direction is X (-18 dB≤X≤10dB); while adjustment value of D/A direction is Y (-18 dB≤Y≤8 dB).

There is one voice interface (DB25 socket) and ten LEDs on the front panel of CHU03. See the panel diagram in Figure 3-32. Each LED indicates the status of 1-channel voice services. See LED definition and pin assignment in Table 3-44. DB25 socket is used to connect 2-wire voice cable ZJN.BH4.851.245, whose pin assignment can be referred to the pin assignment Table 3-41 of 2-wire voice cable in 3.2.20.

Figure 3-31 Slot allocation of CHU03 voice sub-card

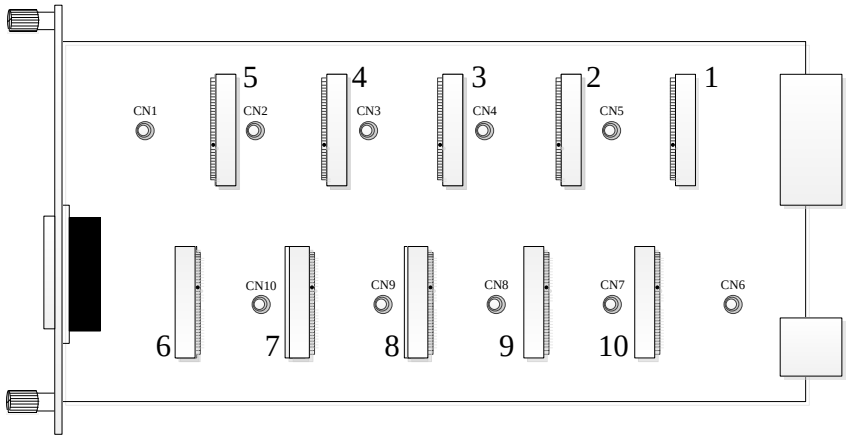


Figure 3-32 Panel diagram of CHU03 card

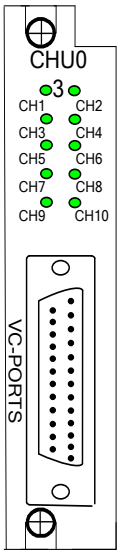


Table 3-44 LED definition of CHU03 card

LED status of voice channel occupancy status	**Description**
Solid on	In communication
Off	Not occupied
Blink	Sub-voice-card is unequipped

3.2.23 Multi-functional Interface Card (CHM01)

Multi-functional interface card (CHM01) provides 4-channel FXS ports (timeslot 1-4), 4-channel 4-wire voice ports (timeslot 5-8) (including the EM signaling transmission ports), and 4-channel RS232 asynchronous data ports (timeslot 9-12), with the highest rate of 19.2kbit/s. 4-channel EM ports correspond to the sequence of 4-channel 4-wire voice respectively.

Multi-functional interface card (CHM01) can be installed in slot (1~11), but not in slot 12.

There is one DB9 socket, one DB44 socket and one LED on the panel of CHM01 card, as shown in Figure 3-33. When any of the 4-channel FXS ports is off hook, the Green LED is on, otherwise off. DB9 socket is used to connect 2-wire voice cable ZJN.BH4.851.143 for 4-channel FXS ports, and DB44 socket is used to connect RS232 asynchronous data ports and 4-wire voice cable ZJN.BH4.851.144. Pin assignments of these two cables are shown in Table 3-45 and Table 3-46.

Figure 3-33 Panel diagram of CHM01 card

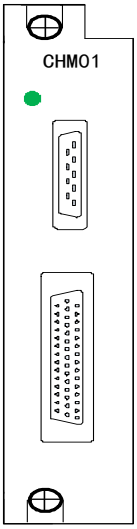


Table 3-45 Pin assignments of ZJN.BH4.851.143

DB9 Pin	Signal	Color	Combination	Remarks
7	T1	White	Twisted pair	2-wire-1
6	R1	Blue		
2	T2	White	Twisted pair	2-wire-2

DB9 Pin	Signal	Color	Combination	Remarks
3	R2	Orange		
4	T3	White	Twisted pair	2-wire-3
5	R3	Green		
9	T4	White	Twisted pair	2-wire-4
8	R4	Brown		

TIP: Ti, Ri (i = 1 to 4) indicates the input and output of the voice cable.

Table 3-46 Pin assignments ZJN.BH4.851.144

DB 44 Pin	Signal	Color	Combination	DB44 Pin	Signal	Color	Combination	DB 44 Pin	Signal	Color	Combination
1	T1a	White	Twisted pair	9	E1b	Red	Twisted pair	37	TxD1	Blue	Twisted pair
16	R1a	Blue		24	E1a	Blue		39	GND1	Purple	
3	T2a	White	Twisted pair	10	E2b	Red	Twisted pair		GND1	Gray	Twisted pair
18	R2a	Orange		25	E2a	Orange		38	RxD1	White	
5	T3a	White	Twisted pair	11	E3b	Red	Twisted pair	42	TxD2	Orange	Twisted pair
20	R3a	Green		26	E3a	Green		40	GND2	Purple	
7	T4a	White	Twisted pair	12	E4b	Red	Twisted pair		GND2	Gray	Twisted pair
22	R4a	Brown		27	E4a	Brown		41	RxD2	Black	
2	T1b	Black	Twisted pair	13	M1b	Yellow	Twisted pair	31	TxD3	Green	Twisted pair
17	R1b	Blue		28	M1a	Blue		33	GND3	Purple	
4	T2b	Black	Twisted pair	14	M2b	Yellow	Twisted pair		GND3	Gray	Twisted pair
19	R2b	Orange		29	M2a	Orange		32	RxD3	Red	
6	T3b	Black	Twisted pair	15	M3b	Yellow	Twisted pair	36	TxD4	Brown	Twisted pair
21	R3b	Green		30	M3a	Green		34	GND4	Purple	
8	T4b	Black	Twisted pair	43	M4b	Yellow	Twisted pair		GND4	Gray	Twisted pair
23	R4b	Brown		44	M4a	Brown		35	RxD4	Yellow	

4-wire	E/M	RS232

TIP: In Table 3-46, Tia and Ria (i = 1 to 4) indicate the output of 4-wire voice signals; Tib and Rib (i = 1 to 4) indicate the input of 4-wire voice signals. Eia and Eib (i = 1 to 4) indicate the input of M line signals; Mia and Mib (i = 1 to 4) indicate the output of E line signals. TxDi (i = 1 to 4) indicates the output line of RS232 signals and RxDi (i= 1 to 4) indicates the input line of RS232 signals.

NOTE

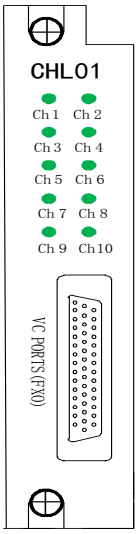
- EM signaling of CHM01 card supports 2E2M.
- GNDi (i=1～4) inside CHM01 card is disconnected from each other, so GND signal of each RS232 has to be grounded separately.
- When setting the electrical level value through NMS, you can adjust the 4-wire Tx and Rx level gain value in -14~+4 dBr.

3.2.24 FXO Voice Interface Card (CHL01)

The FXO voice interface card (CHL01) provides 10-channel FXO ports to connect to the subscriber line ports on a switch. This card can be installed in any universal slot (1~12) of the device.

There are 10 LEDs and one DB25 socket on the panel of CHL01 card, as shown in Figure 3-34. The green LEDs CH1~CH10 respectively correspond to 10-channel voice ports, on indicates the corresponding port is occupied, off indicates it is idle. DB25 socket is used to connect 2-wire voice cable ZJN.BH4.851.245, whose pin assignment can be referred to the pin assignment Table 3-41 of 2-wire voice cable in 3.2.20.

Figure 3-34 Panel diagram of CHL01 card



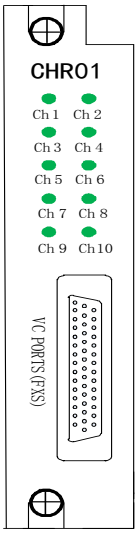
3.2.25 FXS Voice Interface Card (CHR01)

FXS voice interface card (CHR01) implements the encoding and decoding of 10-channel voice ports, 2-wire and 4-wire switch, DC feed to a subscriber line, signaling, overvoltage protection, test of the subscriber line and etc.

FXS voice interface card (CHR01) can be installed in slot (1~11), but not in slot 12.

The panel of CHR01 card is the same with CHL01 card, as shown in Figure 3-35. The green LEDs CH1~CH10 respectively correspond to 10-channel voice ports, on indicates the corresponding port is occupied, off indicates it is idle. DB25 socket is used to connect 2-wire voice cable ZJN.BH4.851.245, whose pin assignment can be referred to the pin assignment Table 3-41 of 2-wire voice cable in 3.2.20.

Figure 3-35 Panel of CHR01 card



3.2.26 2/4-Wire Voice Interface Card (CH4W01)

2/4-wire voice interface card (CH4W01) provides coding and decoding of 10-channel voice and power level adjustment of voice interface, and the transmitting and receiving level gain value of each voice channel can be set by software. Generally, this card is used for 2/4-wire voice conversion and there is no EM signaling interface conversion circuit inside it. It can be installed in any universal slot (1~12) of the device.

NOTE

When setting the electrical level value through NMS, you can adjust the 4-wire Tx and Rx level gain value in -14~+4 dBr; adjust 2-wire Tx level gain value in -7~0 dBr, 2-wire Rx level gain value in -7.5~+2 dBr.

There is one LED and one DB44 socket on the panel of CH4W01 card, as shown in Figure 3-36. When the green PWR LED is on, it indicates the power supply is normal, if off, it indicates the power supply is running abnormally or is not running. DB44 socket is used to connect 4-wire voice cable ZJN.BH4.851.085B, whose pin assignment is shown in Table 3-47.

Figure 3-36 Panel diagram of CH4W01 card

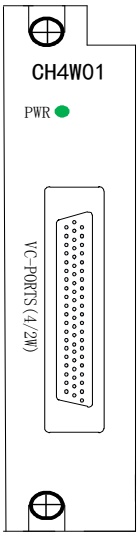


Table 3-47 Pin assignment of ZJN.BH4.851.085B

Pin	Signal	Definition	Pin	Signal	Definition	Pin	Signal	Definition
1	T1a	The 1st 4-wire Rx	28	T9a	The 9th 4-wire Rx	16	T1b	The 1st 4-wire Tx/ 2-wire
2	R1a		29	R9a		17	R1b	
3	T2a	The 2nd 4-wire Rx	24	T10a	The 10th 4-wire Rx	18	T2b	The 2nd 4-wire Tx/ 2-wire
4	R2a		25	R10a		19	R2b	
5	T3a	The 3rd 4-wire Rx	-	-	-	35	T3b	The 3rd 4-wire Tx/ 2-wire
6	R3a		-	-	-	36	R3b	
7	T4a	The 4th 4-wire Rx	-	-	-	37	T4b	The 4th 4-wire Tx/ 2-wire
8	R4a		-	-	-	38	R4b	
9	T5a	The 5th	15	GND	-	39	T5b	The 5th

Pin	Signal	Definition	Pin	Signal	Definition	Pin	Signal	Definition
10	R5a	4-wire Rx	30	GND	-	40	R5b	4-wire Tx/ 2-wire
11	T6a	The 6th 4-wire Rx	-	-	-	41	T6b	The 6th 4-wire Tx/ 2-wire
12	R6a		-	-	-	42	R6b	
13	T7a	The 7th 4-wire Rx	26	T9b	The 9th 4-wire Tx/ 2-wire	43	T7b	The 7th 4-wire Tx/ 2-wire
14	R7a		27	R9b		44	R7b	
31	T8a	The 8th 4-wire Rx	22	T10b	The 10th 4-wire Tx/ 2-wire	33	T8b	The 8th 4-wire Tx/ 2-wire
32	R8a		23	R10b		34	R8b	

TIP: Tia and Ria (i = 1 to 10) indicate the output of 4-wire voice; Tib and Rib (i = 1 to 10) indicate the input of 4-wire or 2-wire voice.

DIP Switch Description

CH4W01 provides 10 groups of jumpers (2 jumpers per group) and a group of 10-position DIP on the circuit board, used to select 2-wire or 4-wire at each interface, as shown in Figure 3-37. The i group of jumpers and the i DIP correspond to the i interface. See detailed setting methods in Table 3-48.

Figure 3-37 Jumpers and DIP diagram of CH4W01

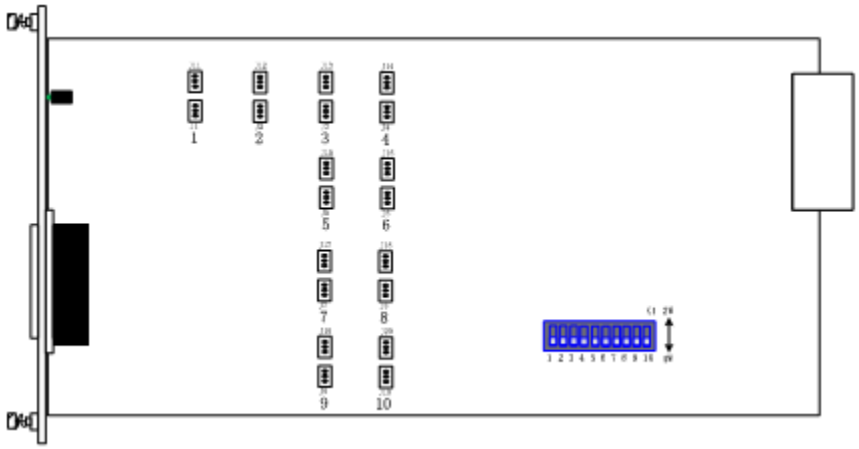


Table 3-48 Jumpers and DIP switch definitions of CH4W01 card

The i-channel port mode	**4-wire (factory default setting)**		**2-wire**	
-	The i group of jumpers location	The i group of DIP direction	The i group of jumpers location	The i group of DIP direction
Setting method				

Note: i=1, 2, 3, 4, 5, 6, 7, 8, 9, 10, which respectively corresponds to 10 channels of voice interfaces.

3.2.27 EM Signaling & 4-Wire Voice Card (CH4W02)

EM signaling & 4-wire voice card (CH4W02) provides 1~8 channels 2/4-wire voice and EM signaling, realizing the access of voice and signaling simultaneously. The number of interfaces can be flexibly configured by inserting the CH4WEM-ADP sub-card. Each CH4WEM-ADP card provides 1-channel 2/4-wire voice and EM signaling, which is inserted in the 1-8 slot of CH4W02 card and occupies 1-8 time slots. It can be installed in any universal slot (1~12) of the device.

There is one LED and eight RJ11 sockets on the panel of CH4W02 card, as shown in Figure 3-39. When the green RUN LED is on, indicating the power supply is normal, if off, indicating the power supply is running abnormally or is not running. Pin assignments of RJ11 socket is shown in Table 3-49.

Figure 3-38 CH4WEM-ADP slot layout

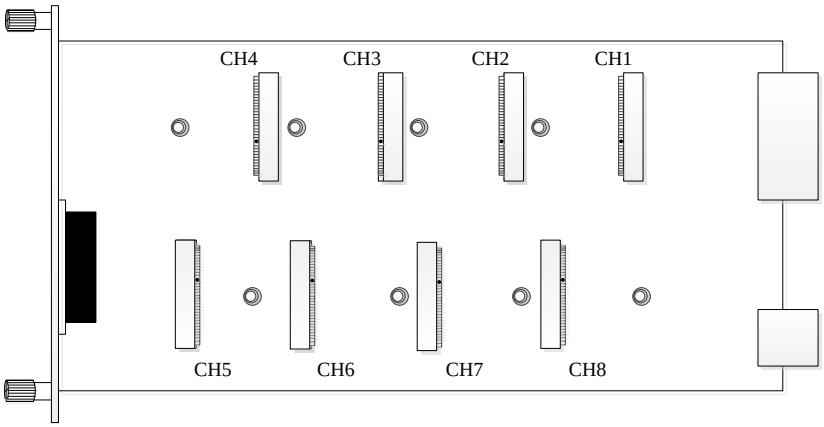


Figure 3-39 Panel diagram of CH4W02 card

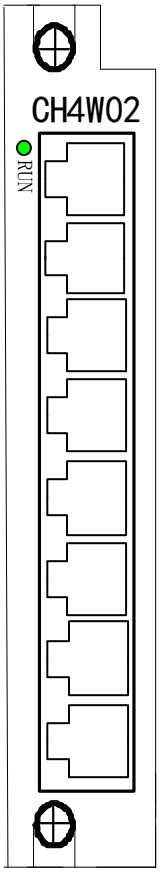


Table 3-49 Pin assignments of RJ11 socket

Pin	Signal	Definition
1	M_IN	EM signaling input
2	Tia	4-wire voice output positive pole
3	Tib	4-wire voice input positive pole
4	Rib	4-wire voice input negative pole
5	Ria	4-wire voice output negative pole

Pin	Signal	Definition
6	E_OUT	EM signaling output

NOTE

- EM signaling of CH4W02 supports 1E1M.
- When setting the electrical level value through NMS, you can adjust the 4-wire Tx and Rx level gain value in -14~+4 dBr.

3.2.28 2W/4W Voice &EM Interface Card with Digital Gain Adjustment (CH4W03)

2W/4W voice &EM interface card with digital gain adjustment (CH4W03) provides 1~8 channels 2/4-wire voice and EM signaling, realizing the access of 2/4-wire analog voice and TYPE V mode EM signaling. The number of interfaces can be flexibly configured by inserting the sub-card CH4WEM-ADP2. Each CH4WEM-ADP2 provides 1-channel 2/4-wire voice and EM signaling, which is inserted in the 1-8 slot of CH4W03 card and occupies 1-8 time slots. The slot layout is shown in Figure 4-31. CH4W03 can be installed in slot 1~12.

CH4W03 supports using NMS to switch 2/4-wire and 2/4-wire gain adjustment, which support single-level analog gain adjustment, 2-wire: A-D:0dB, D-A:0dB and A-D:0dB, D-A:5dB; 4-wire: A-D:0dB, D-A:0dB and A-D:+14dB, D-A:+4dB.

CH4W03 supports digital gain control: range from A-D:-18dB to +10dB, D-A: -18dB to +8dB, STEP can achieve 0.1dB.

There is one LED and eight RJ11 sockets on the panel of CH4W03 card, as shown in Figure 3-41. When the green RUN LED is on, indicating the power supply is normal, if off, indicating the power supply is running abnormally or is not running. Pin assignments of RJ11 socket is shown in Table 3-49.

Figure 3-40 CH4WEM-ADP2 slot layout

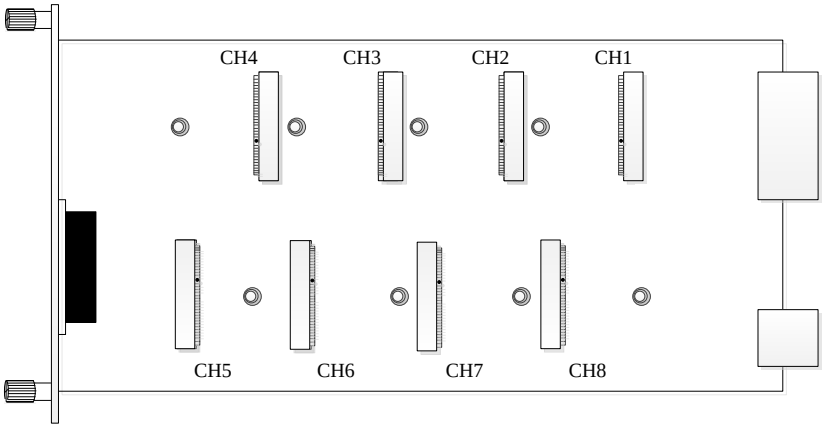
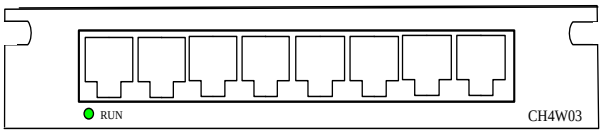


Figure 3-41 Panel diagram of CH4W03



3.2.29 Audio conference Card (VCF01)

Audio conference card (VCF01) supports 10-channel audio conference. VCF01 can work with 2/4-wire voice interface card (CH4W01), multi-functional interface card (CHM01), FXS voice interface card (CHR01), multi-functional voice interface card (CHU01/CHU02), 10-channel full modes EM signaling card (EM10) or 20-channel EM signaling interface card (EM20).

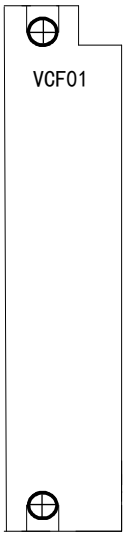
VCF01 supports three modes, including conference mode, phone conference mode and intercom mode setting through NMS. When VCF01 is set to conference mode, it can be inserted into any universal slot (1~12), with plug-and-play ability; When VCF01 is set to phone conference mode or intercom mode, it can be inserted into any universal slot (1~11) except slot 12, with plug-and-play ability.

When conference mode works with 2/4-wire voice interface card (CH4W01) or multi-functional interface card (CHM01), voice service can be mixed into VCF01 and then be broadcasted to each node to realize conference in real-time; phone conference mode needs to work with FXS voice interface card (CHR01) and multi-functional voice interface card (CHU01/CHU02); intercom mode supports PTT (Push To Talk) to make conversations, the PUSH signal is transferred to VCF01 through signaling. That is to say, in the conference, participants need to press the control button on EM signaling interface card (EM10/EM20） or I/O interface card to start talking. Intercom mode needs to work with multi-functional interface card (CHM01) or 2/4-wire voice interface card (CH4W01) and EM signaling interface card (EM10/EM20).

VCF01 supports up to a 10-channel audio conference, in which, each voice uses PCM A-law code and occupies 1 time slot. VCF01's bandwidth is 10×64kbit/s; it needs to occupy TS16 when using conference mode, phone conference mode and intercom mode. Data of member nodes is transferred to VCF01 through PCM voice time slot. After mixing, the PCM voice data can be broadcasted from VCF01 to all the members.

VCF01 complies with G.276 standard and supports online upgrade of software. It can be reset through software, i.e. reboot FPGA to reset VCF01. See panel diagram of VCF01 in Figure 3-42.

Figure 3-42 Panel diagram of VCF01



The conference mode, phone conference mode and intercom mode can be realized by following steps:

- Conference mode works with CH4W01 or CHM01 who has voice ports, it needs to configure member group instead of signaling through NMS;
- Phone conference mode only works with CHR01/CHU01/CHU02 who has FXS voice and 64K cross-connection function. The signaling of CHR01 FXS voice and off-hook and ringing of VCF01 must be the same, if ringing is needed, VCF01 must work with ring generator card;

  Specific process of audio conference is: the initiator picks up the phone and then the phones of other participants will ring, at this time, participants need to pick up the phones, or the phones won't stop ringing. Audio conference will start according to the participant's number. If some participants (except initiator) hang up, they will quit from the conference and their phones won't ring; but if the initiator hangs up, all the participants hang up.

- Intercom mode works with CH4W01/EM10/EM20 card. At first, configure 4-wire voice service to EM10/EM20 card and extract the signaling from it; EM10/EM20 cross-connects I/O signals to corresponding TS, and then the signal will reach VCF01 card. In EM10/EM20 card, there are 5 modes used to input I/O signals. The VCF01 card can judge the speaker according to the corresponding TS signaling. Under intercom mode, this card can realize multicasting of E/M signaling.

3.2.30 C37.94 Interface Card (C37D)

C37.94 interface card configured to H5600.V5 device, it provides 2-channel service inputs complying with the IEEE C37.94™-2002 standard, and can be installed in any universal slot (1~12).

There are 4 optical sockets and 6 LEDs on the panel of C37D card, as shown in Figure 3-43. And see the LED definition in Table 3-50.

Figure 3-43 Panel diagram of C37D card

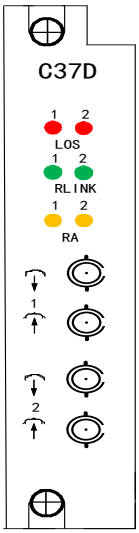


Table 3-50 LED definition of C37D card

Mark	Color	LED definition	Remark
LOS 1~2	Red	Signal status indication of optical ports: On: signal loss; Off: normal reception	Respectively indicates signal status of two optical ports
RLINK 1~2	Green	Connection status indication of a remote channel: On: the connection between the local and remote channels is established; Off: the connection between the local and remote channels is not established.	Respectively indicates connection status of 2 remote channels
RA 1~2	Yellow	Remote signal alarm indication: On: remote signal loss; Off: normal remote reception	Respectively indicates signal alarm of 2 remote channels

3.2.31 Low-speed Interface Card (SD01/SD02/SD03)

Low-speed interface card (SD01/SD02) implements asynchronous to synchronous conversion and interface adaptation, SD01 card provides 16-channel RS-232/V.24/V.28, occupying 16 voice channels with the highest rate of 19.2kbit/s; SD02 card provides 16-channel RS-232/V.24 and 2-channel RS-422/485/V.11, occupying 18 common channels with the highest rate of 19.2kbit/s.

SD03 card provides 6-channel RS232/V.24 low speed asynchronous data ports, or interface adaptation function for 2-channel synchronous data ports

and 4-channel asynchronous data ports, conforming to ITU-T X.50 Division 3 and ITU-T X.54 standards, with the highest synchronous rate of 64Kbps and the highest asynchronous rate of 48Kbps. Under multiplexed mode, each voice channel of SD03 card can multiplex 6-channel V.24, while under independent mode, SD03 card fixedly occupies 6 voice channels, which are ordered by interface.

Low-speed interface card (SD01/SD02/SD03) can be installed in any universal slot (1~12), with plug-and-play ability.

There are one LED and one DB62 socket on the panel of SD01/SD02 card, 6 LEDs and 6 RJ-48C sockets on the panel of SD03 card, as shown in Figure 3-44. When the green PWR LED on the panel of SD01/SD02 card is on, it indicates normal power supply; off indicates disconnected or abnormal power supply. When the green LED on the panel of SD03 card is on, it indicates link is synchronized, off indicates no link, or the link is not synchronized. DB62 socket on the panel of SD01 card is used to connect 16 RS232 cables ZJN.BH4.851.147; DB62 socket on the panel of SD02 card is used to connect 16 RS232 and dual RS422/485 cables ZJN.BH4.851.148. See pin assignments of SD01/SD02 in Table 3-51 and Table 3-52. See RJ-45 socket definition of SD03 in Table 3-53.

Figure 3-44 Panel diagram of SD01/SD02/SD03 card

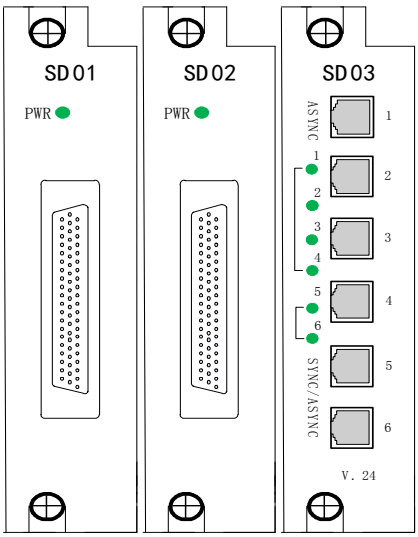


Table 3-51 Pin assignment of ZJN.BH4.851.147

DRAS62F Pin	Signal	Color	Combination	DRAS62F Pin	Signal	Color	Combination	DRAS62F pin	Signal	Color	Combination
22	TXD1	Blue	Twisted pair blue tie 1	28	TXD7	Green	Twisted pair blue tie 2	34	TXD13	Brown	Twisted pair Orange tie 2
43	GND	White		49	GND	Black		55	GND	Red	
43	GND	White	Twisted pair blue tie 1	49	GND	Black	Twisted pair blue tie 2	55	GND	Red	Twisted pair Orange tie 2
1	RXD1	Orange		7	RXD7	Brown		13	RXD13	Gray	
23	TXD2	Green	Twisted pair blue tie 1	29	TXD8	Gray	Twisted pair blue tie 2	35	TXD14	Blue	Twisted pair Orange tie 2
44	GND	White		50	GND	Black		56	GND	Black	
44	GND	White	Twisted pair blue tie 1	50	GND	Yellow	Twisted pair blue tie 2	56	GND	Black	Twisted pair Orange tie 2
2	RXD2	Brown		8	RXD8	Blue		14	RXD14	Orange	
24	TXD3	Gray	Twisted pair blue tie 1	30	TXD9	Blue	Twisted pair Orange tie 1	36	TXD15	Green	Twisted pair Orange tie 2
45	GND	White		51	GND	White		57	GND	Black	
45	GND	Red	Twisted pair blue tie 1	51	GND	White	Twisted pair Orange tie 1	57	GND	Black	Twisted pair Orange tie 2
3	RXD3	Blue		9	RXD9	Orange		15	RXD15	Brown	
25	TXD4	Orange	Twisted pair blue tie 1	31	TXD10	Green	Twisted pair Orange tie 1	37	TXD16	Gray	Twisted pair Orange tie 2
46	GND	Red		52	GND	White		58	GND	Black	
46	GND	Red	Twisted pair blue tie 1	52	GND	White	Twisted pair Orange tie 1	58	GND	Yellow	Twisted pair Orange tie 2
4	RXD4	Green		10	RXD10	Brown		16	RXD16	Blue	
26	TXD5	Brown	Twisted	32	TXD11	Gray	Twisted				

47	GND	Red	pair blue tie 2	53	GND	White	pair Orange tie 1				
47	GND	Red	Twisted pair blue tie 2	53	GND	Red	Twisted pair Orange tie 1				
5	RXD5	Gray		11	RXD11	Blue					
27	TXD6	Blue	Twisted pair blue tie 2	33	TXD12	Orange	Twisted pair Orange tie 1				
48	GND	Black		54	GND	Red					
48	GND	Black	Twisted pair blue tie 2	54	GND	Red	Twisted pair Orange tie 1				
6	RXD6	Orange		12	RXD12	Green					

TIP: In the table above, TxDi (i = 1 to 16) indicates the output line of RS232 signals and RxDi (i= 1 to 16) indicates the input line of RS232 signals.

Table 3-52 Pin assignment of ZJN.BH4.851.148

DRAS62F Pin		Signal	Color	Combination	DRAS62F Pin		Signal	Color	Combination	DRAS62F Pin		Signal	Color	Combination
232-1	22	TXD1	Blue	Twisted pair blue tie 1	232-7	28	TXD7	Green	Twisted pair blue tie 2	232-13	34	TXD13	Brown	Twisted pair Orange tie 2
	43	GND	White			49	GND	Black			55	GND	Red	
	43	GND	White	Twisted pair blue tie 1		49	GND	Black	Twisted pair blue tie 2		55	GND	Red	Twisted pair Orange tie 2
	1	RXD1	Orange			7	RXD7	Brown			13	RXD13	Gray	
232-2	23	TXD2	Green	Twisted pair blue tie 1	232-8	29	TXD8	Gray	Twisted pair blue tie 2	232-14	35	TXD14	Blue	Twisted pair Orange tie 2
	44	GND	White			50	GND	Black			56	GND	Black	
	44	GND	White	Twisted pair blue tie 1		50	GND	Yellow	Twisted pair blue tie 2		56	GND	Black	Twisted pair Orange tie 2
	2	RXD2	Brown			8	RXD8	Blue			14	RXD14	Orange	
232-3	24	TXD3	Gray	Twisted pair	23 2-9	30	TXD9	Blue	Twisted pair	2-1	36	TXD15	Green	Twisted pair

	45	GND	White	blue tie 1		51	GND	White	Orange tie 1		57	GND	Black	Orange tie 2
	45	GND	Red	Twisted pair blue tie 1		51	GND	White	Twisted pair Orange tie 1		57	GND	Black	Twisted pair Orange tie 2
	3	RXD 3	Blue			9	RXD 9	Orange			15	RXD 15	Brown	
232-4	25	TXD 4	Orange	Twisted pair blue tie 1	232-10	31	TXD 10	Green	Twisted pair Orange tie 1	232-16	37	TXD 16	Gray	Twisted pair Orange tie 2
	46	GND	Red			52	GND	White			58	GND	Black	
	46	GND	Red	Twisted pair blue tie 1		52	GND	White	Twisted pair Orange tie 1		58	GND	Yellow	Twisted pair Orange tie 2
	4	RXD 4	Green			10	RXD 10	Brown			16	RXD 16	Blue	
232-5	26	TXD 5	Brown	Twisted pair blue tie 2	232-11	32	TXD 11	Gray	Twisted pair Orange tie 1	422/485-1	18	TXD1 +	Orange	Twisted pair
	47	GND	Red			53	GND	White			39	TXD1 -	Orange-white	
	47	GND	Red	Twisted pair blue tie 2		53	GND	Red	Twisted pair Orange tie 1		19	RXD 1+	Green	Twisted pair
	5	RXD 5	Gray			11	RXD 11	Blue			40	RXD 1-	Green-white	
232-6	27	TXD 6	Blue	Twisted pair blue tie 2	232-12	33	TXD 12	Orange	Twisted pair Orange tie 1	422/485-2	20	TXD2 +	Brown	Twisted pair
	48	GND	Black			54	GND	Red			41	TXD2 -	Brown-white	
	48	GND	Black	Twisted pair blue tie 2		54	GND	Red	Twisted pair Orange tie 1		21	RXD 2+	Blue	Twisted pair
	6	RXD 6	Orange			12	RXD 12	Green			42	RXD 2-	Blue-white	

TIP: In the table above, TxDi (i = 1 to 16) indicates the output line of RS-232 signals and RxDi (i= 1 to 16) indicates the input line of RS-232 signals. When a port works in RS-422/485 (full duplex) mode, TxDi+/- (i = 1 to 2) indicates the output line of RS-422/485 (full duplex) signals and RxDi+/- (i= 1 to 2) indicates the input line of RS-422/485 (full duplex)

signals. When a port works in RS-485 (half duplex) mode, RxDi+/- (i = 1 to 2) indicates the input line of RS-485 signals.

Table 3-53 RJ-45 socket port definition

RJ-45	1	2	3	4	5	6	7	8
Signal name	RC	TC	DTR	S_GND	RXD	TXD	CTS_DSR_DCD	RTS

DIP Switch Description:

4-position DIP switch K1 and K2 on SD02 card respectively correspond to 2-channel RS-422/485 ports, position 1, 2, and 4 of K1 and K2 control RS-422/485 interface mode: when 1, 2 and 4 are switched to OFF (by default), the port can be set to work in RS-422 (full-duplex) or RS-485 (full-duplex) mode by the NMS; when 1, 2 and 4 are switched ON, the interface is working in RS-485 (half-duplex) mode. Position 3 determines whether 120Ω build-out resistors are connected: ON means to connect the resistor; OFF means to disconnect the resistor. You can determine whether to connect build-out resistors based on the onsite environment.

3.2.32 Asynchronous Serial Interface Conference Card (SD04)

Asynchronous serial interface conference card (SD04) provides 8-channel RS-232/V.24 ports, and 2-channel RS-422/V.11 ports, with the highest rate of 19.2kbit/s, occupying 10 voice channels. SD04 supports three modes: point to point (also called one-to-one), point to multi-point (also called one-to-many), and multi-point to multi-point (also called many-to-many). Point to multi-point mode uses OMNI BUS technology to realize the RS-232/V.24 conference. An OMNI BUS only occupies 1x64Kbps bandwidth. The single card supports up to 30 OMNI BUS. OMNI Bus allows only one master and limitless slaves to reduce the bandwidth of link transmission. As for point to point/multi-point to multi-point (conference), all the members are equal and all the members can receive the signal sent

by others (including itself). The conference of multi-point to multi-point can support 30 members at most and these 30 members can at random compose of different groups and the newly built group will not affect other ongoing groups.

Asynchronous serial interface conference card (SD04) can be installed in any universal slot (1~12), with plug-and-play ability.

There is a PWR LED and a DB62 socket on the panel of SD04, as shown in Figure 3-45. When the green PWR LED on the panel of SD04 card is on, it indicates normal power supply; off indicates disconnected or abnormal power supply. DB62 socket on the front panel of SD04 card is used to connect 8-channel RS-232/V.24 and 2-channel RS-422/V.11 cable ZJN.BH4.851.148. See pin assignments of SD04 in Table 3-54.

Figure 3-45 Panel diagram of asynchronous serial interface conference card (SD04)

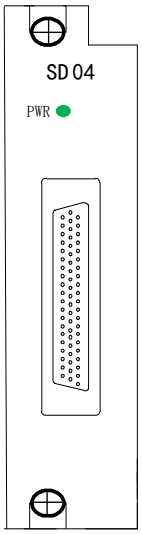


Table 3-54 Pin assignment of 8-channel RS-232/V.24 and 2-channel RS-422/V.11 cable (ZJN.BH4.851.148)

DRAS62F Pin		Signal	Color	Combination	DRAS62F Pin		Signal	Color	Combination	DRAS62F Pin		Signal	Color	Combination
232-1	22	TXD1	Blue	Twisted pair	232-5	26	TXD5	Brown	Twisted pair	422-1	18	TXD1+	Orange	Twisted pair
	43	GND	White			47	GND	Red			39	TXD1-	Orange white	
	43	GND	White	Twisted pair		47	GND	Red	Twisted pair		19	RXD1+	Green	Twisted pair
	1	RXD1	Orange			5	RXD5	Gray			40	RXD1-	Green white	
232-2	23	TXD2	Green	Twisted pair	232-6	27	TXD6	Blue	Twisted pair	422-2	20	TXD2+	Brown	Twisted pair
	44	GND	White			48	GND	Black			41	TXD2-	Brown white	
	44	GND	White	Twisted pair		48	GND	Black	Twisted pair		21	RXD2+	Blue	Twisted pair
	2	RXD2	Brown			6	RXD6	Orange			42	RXD2-	Blue white	
232-3	24	TXD3	Gray	Twisted pair	232-7	28	TXD7	Green	Twisted pair					
	45	GND	White			49	GND	Black						
	45	GND	Red	Twisted pair		49	GND	Black	Twisted pair					
	3	RXD3	Blue			7	RXD7	Brown						
232-4	25	TXD4	Orange	Twisted pair	232-8	29	TXD8	Gray	Twisted pair					
	46	GND	Red			50	GND	Black						
	46	GND	Red	Twisted pair		50	GND	Yellow	Twisted pair					
	4	RXD4	Green			8	RXD8	Blue						

TIP: In the table above, TxDi indicates the output line of RS-232 signals and RxDi indicates the input line of RS-232 signals. When a port works in RS-422 mode, TxDi+/- indicates the output line of RS-422 signals and RxDi+/- indicates the input line of RS-422 signals.

DIP Switch Description:

4-position DIP switch K1 and K2 on SD04 card respectively correspond to 2-channel RS-422 ports, position 1, 2, and 4 of K1 and K2 control RS-422 interface mode: when 1, 2 and 4 are switched to OFF (by default), the port can be set to work in RS-422 (full-duplex) mode by the NMS. Position 3 determines whether 120Ω build-out resistors are connected: ON means to connect the resistor; OFF means to disconnect the resistor. You can determine whether to connect build-out resistors based on the onsite environment.

3.2.33 64K Co-directional Interface Card (CHD01)

When H5600.V5 device is configured with 64K co-directional interface cards (CHD01), it can provide the access of 8-channel 64K co-directional data conforming to ITU-T G.703 standard. This card can be installed in any universal slot (1~12).

There are 9 LEDs and 4 sockets on the panel of CHD01 card, as shown in Figure 3-46. When the green LED RUN on the panel blinks, it indicates that this card is working normally, when it is off, it indicates that this card is not working or not powered on. The red LED 1~8 correspond to 8-channel 64K co-directional data, on indicates the loss of this channel of 64K co-directional data, blinking indicates AIS and off indicates normal data transmission. Each socket corresponds to 2-channel 64K co-directional data, and their pin assignment is shown in Table 3-55.

Figure 3-46 Panel of 64K co-directional interface card (CHD01)

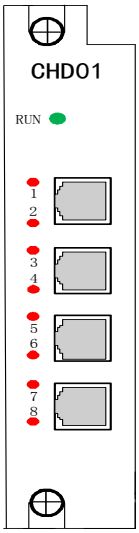


Table 3-55 Pin assignment of 64K co-directional interface card (CHD01)

Dual-E1 socket Pin	**64K co-directional data connection**	**Twisted pair**	**Recommended twisted pair color**
1	IN (1)-	Paired	Blue
2	IN (1)+		Blue-white
3	OUT (1)+	Paired	Orange
4	OUT (1)-		Orange-white
5	IN (2)-	Paired	Green
6	IN (2)+		Green-white
7	OUT (2)+	Paired	Brown
8	OUT (2)-		Brown-white

64K co-directional data interface cable can directly use dual-E1 connector (please refer to Figure 3-11 in 3.2.6), which can be directly crimpled with

120Ω twisted pair. **When cable is being made, please ensure the input and output line pairs respectively use a twisted pair, or interference would be introduced.**

CAUTION

Each socket of CHD01 card is for two channels of 64K co-directional data. This is a private definition. Do not mix the interface with 120Ω standard RJ-48C socket, or the interface may be damaged.

3.2.34 RING Generator Card (RING48V)

Ring generator card (RING48V) provides 75V/25Hz signaling for voice channel interfaces within the device. **RING48V card only occupies one slot, which can be universal slot 11 or 12. It also supports 1+1 protection.**

There are two LEDs on the panel of RING48V card, as shown in Figure 3-47, and defined in Table 3-56.

Figure 3-47 Panel diagram of RING48V card

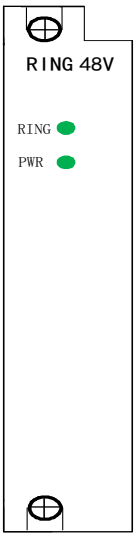


Table 3-56 LED functional description of RING48V card

Mark	Color	LED functional description
RING	Green	Working status indication: On: the card is working normally; Off: the card is working abnormally
PWR	Green	Power status indication: On: the power supply is normal; Off: the power supply is running abnormally or not running

3.2.35 10-channel Full Modes EM Signaling Interface Card (EM10)

10-channel full modes EM signaling interface card (EM10) provides 10-channel E lines and 10-channel M lines, realizing the transmissions of

10-channel 1E1M signaling or 5-channel 2E2M signaling. E/M signaling interface supports I, II, III, IV and V signaling modes based on RS-464 standard. Signaling mode cannot be set under 2E2M. 2E2M mode is “ab” code by default, the corresponding relations are: the first signaling corresponds to “a”, the second signaling corresponds to “b”, and so on. “cd” code is fixed to “01”.

EM10 card can cooperate with multi-functional voice interface card (CHU01/CHU02), FXO/FXS voice interface card (CHL01/CHR01), multi-functional interface card (CHM01) and 2/4-wire voice interface card (CH4W01), to implement 2/4-wire voice EM service transmission. At this time, you need to configure cross connection relationship between EM signaling and each single card through NMS. EM can also be used as separate data transmission, occupying a 64k timeslot (TS1 of PCM8).

10-channel full modes EM signaling card (EM10) can be installed in any universal slot (1~12).

EM signaling of (EM10) card can be set through jumpers on the card; mode state can be queried through NMS. Five EM signaling modes and jumpers are respectively defined in Table 3-57 and Table 3-58.

Table 3-57 Five EM signaling modes

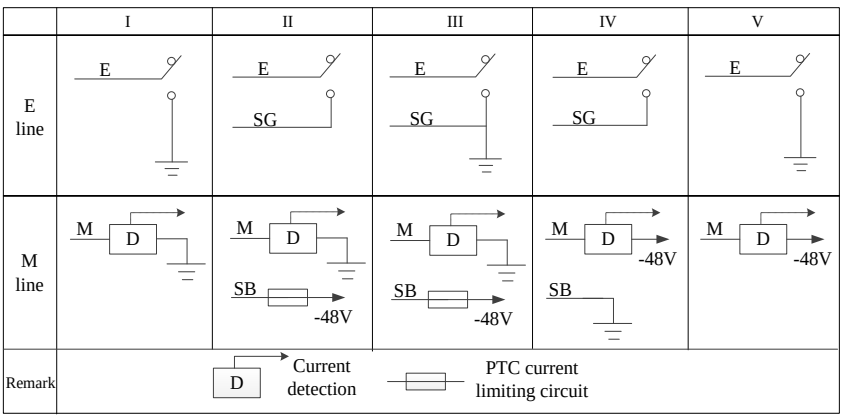


Table 3-58 Jumpers definitions

NET	M line mode		A	B	C	E line mode	
Jumpers	J1	J2	J3	J4	J5	J6	J7
Mode I	1\2	2\3	1\2	2\3	2\3	2\3	2\3
Mode II	2\3	2\3	2\3	1\2	2\3	1\2	1\2
Mode III	2\3	2\3	1\2	1\2	2\3	1\2	2\3
Mode IV	3\4	1\2	2\3	2\3	1\2	1\2	1\2
Mode V	1\2	1\2	1\2	2\3	1\2	2\3	2\3

NOTE

In Table 3-58, J1~J2, J6~J7 are used to set EM signaling mode of single card. The correct EM signaling mode can be queried by NMS only when you set J3~J5 correctly, otherwise, EM signaling mode you queried might be inconsistent with the actual working mode of single card.

On the front panel of EM10, there are 5 RJ45 sockets. Front panel diagram is shown in Figure 3-48. RJ45 socket is used to connect with EM cables; each RJ45 socket is for 2 channels of EM signals. Pin definitions of RJ45 socket is shown in Table 3-59.

Figure 3-48 Front panel diagram of EM10 card

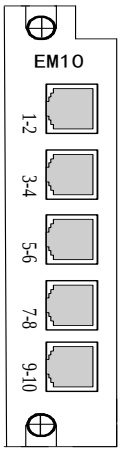


Table 3-59 Pin definitions of RJ45 socket

RJ45 pin	1	2	3	4	5	6	7	8
Signal definition	M1	SB1	E1	SG1	M2	SB2	E2	SG2

3.2.36 20-channel Signaling Interface Card (EM20)

20-channel EM signaling interface card (EM20) provides 20-channel E lines and 20-channel M lines and realizes the transmission of 20-channel 1E1M or 10-channel 2E2M signaling. When two adjacent EM_n and EM_{n+1} set different routers (E1 port numbers and 64K timeslot numbers of routers are not exactly the same), it is 1E1M; when they set the same router (E1 port numbers and 64K timeslot numbers of routers are exactly the same), the two front and back EM respectively correspond to the front and back EM in 2E2M, i.e. Eia, Eib/Mia, Mib; 1E1M and 2E2M are allowed to be mixed up (some channels set 1E1M, while some set 2E2M). EM20 card can cooperate with CH4W01 card, which requires configuring the cross-connection relationship between EM signaling and CH4W01 card through NMS. EM can also be used as separate data transmission, occupying a 64k timeslot (TS1 timeslot of PCM8). 20-channel EM

signaling card (EM20) can be installed in universal slot (7~12) and must cooperate with ring generator card.

There is one LED and one DB44 socket on the panel of EM20 card, as shown in Figure 3-49. When the green RUN LED blinks once every two seconds (0.5 Hz), it indicates the card is working normally; when it is off, it indicates it is not working. DB44 socket is used to connect EM cable, please see its pin assignment in Table 3-60.

Figure 3-49 Panel diagram of EM20 card

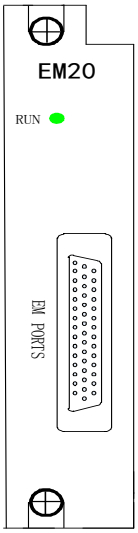


Table 3-60 Pin assignment of ZJN.BH4.851.144A

DB 44 Pin	Signal	Color	Combination	DB44 Pin	Signal	Color	Combination	DB 44 Pin	Signal	Color	Combination
1	M1a/M1	White	Twisted pair	9	M9a/M17	Red	Twisted pair	37	E7a/E13	Blue	Twisted pair
16	M1b/M2	Blue		24	M9b/M18	Blue		39	E7b/E14	Purple	
3	M2a/M3	White	Twisted pair	10	M10a/M19	Red	Twisted pair			Gray	Twisted pair
18	M2b/M4	Orange		25	M10b/M20	Orange		38		White	
5	M3a/M5	White	Twisted pair	11	E1a/E1	Red	Twisted pair	42	E8a/E15	Orange	Twisted pair
20	M3b/M6	Green		26	E1b/ E2	Green		40	E8b/E16	Purple	
7	M4a/M7	White	Twisted pair	12	E2a/E3	Red	Twisted pair			Gray	Twisted pair
22	M4b/M8	Brown		27	E2b/E4	Brown		41		Black	
2	M5a/M9	Black	Twisted pair	13	E3a/E5	Yellow	Twisted pair	31	M5b/M10	Green	Twisted pair
17	E9a/E17	Blue		28	E3b/E6	Blue		33	E9b/E18	Purple	
4	M6a/M11	Black	Twisted pair	14	E4a/E7	Yellow	Twisted pair			Gray	Twisted pair
19	M6b/M12	Orange		29	E4b/E8	Orange		32		Red	
6	M7a/M13	Black	Twisted pair	15	E5a/E9	Yellow	Twisted pair	36	E10a/E19	Brown	Twisted pair
21	M7b/M14	Green		30	E5b/E10	Green		34	E10b/E20	Purple	
8	M8a/M15	Black	Twisted pair	43	E6a/E11	Yellow	Twisted pair			Gray	Twisted pair
23	M8b/M16	Brown		44	E6b/E12	Brown		35		Yellow	
EM (2E2M/1E1M)											

3.2.37 Relay Signaling Interface Card (DIO04)

Relay signaling interface card (DIO04) is designed to provide communication links for protection commands between teleprotection relays. It can be inserted into any general slot (1~12) of the device.

Relay signaling interface card (DIO04) supports 4 DC signal input detections, and 4 solid-state relay I/O signal output for dry contacts. The input trip voltage level can be set from DC 24V to DC 250V through NMS, available in 7 configurations: DC 24V, DC 48V, DC 60V, DC 110V, DC 125V, DC 220V and DC 250V, which can be set according to 4 input service ports. The secure and dependable signal transmission of DIO04 is compliant with IEC60834-1 standards of teleprotection equipment of power systems.

Relay signaling interface card (DIO04) supports upgrading and resetting through software.

On the panel of relay signaling interface card (DIO04), there is a system state LED (RUN), four input port state LEDs (1~4) and two standard (5.04mm spacing) 8PIN green phoenix terminal interfaces (IN/OUT). The panel diagram is shown in Figure 3-50. The LED functional descriptions are shown in Table 3-61.

Figure 3-50 The panel diagram of relay signaling interface card (DIO04)

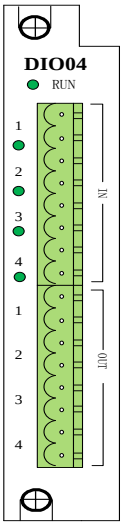


Table 3-61 The LED functional descriptions of relay signaling interface card (DIO04)

Mark	Color	Functional descriptions
RUN	Green	System running indication: Blink (1s interval): running normally On: running abnormally Off: not running or LED failure
1~4	Green	Input port state indication: On: voltage is inputted Off: no voltage is inputted

The input /output signaling ports of relay signaling interface card (DIO04) are respectively marked with IN and OUT, using 8PIN phoenix terminal, services can be transmitted in 4 directions. See input/output port definitions Table 3-62.

Table 3-62 Input/output port definitions of DIO04 card

IN	Signal	Definition	OUT	Signal	Definition
1	IN_1+	The 1st input	9	OUT_1+	The 1st output
2	IN_1-		10	OUT_1-	
3	IN_2+	The 2nd input	11	OUT_2+	The 2nd output
4	IN_2-		12	OUT_2-	
5	IN_3+	The 3rd input	13	OUT_3+	The 3rd output
6	IN_3-		14	OUT_3-	
7	IN_4+	The 4th input	15	OUT_4+	The 4th output
8	IN_4-		16	OUT_4-	

Input/output port parameters of relay signaling interface card (DIO04) are shown in Table 3-63.

Table 3-63 Input/output port parameters of DIO04 card

Parameter	Rating or standard
4 input voltage	
Operation threshold (trip detection)	DC 24V, DC 48V, DC 60V, DC 110V, DC 125V, DC 220V, DC 250V
4 output voltage	
Command outputs	Solid-state relay; normally open
Max. switching voltage/current	DC 250V/0.25A
Isolation value	2500Vrms

3.2.38 I/O Interface Card (DIO20)

The I/O interface card (DIO20) provides input and output ports for 20-channel single-end or 10-channel dual-end I/O signals at most. Three input modes and two output modes are available. In dual-end input mode, the card can have an internal power supply or connect to an external power supply. This card can be installed into any universal slot (1~12).

DIO20's input mode and output mode are respectively controlled by jumper J11~J20 and J1-J10, which are detailed defined in Table 3-64 and Table 3-65.

Table 3-64 Input mode configuration table (J11-J20)

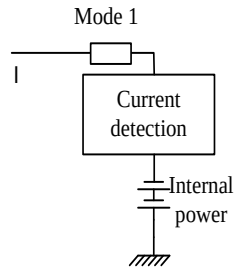
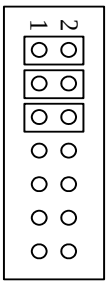
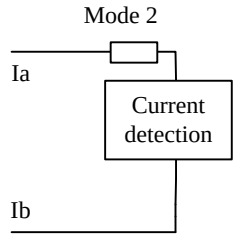
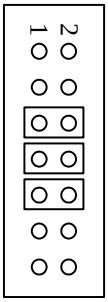
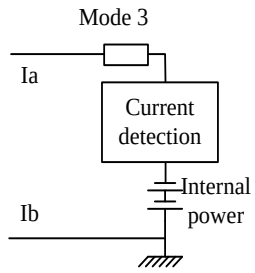
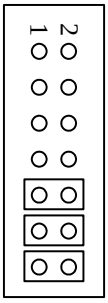
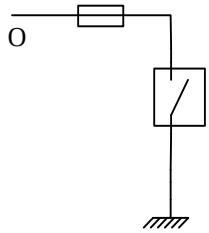
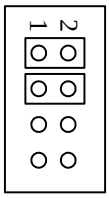
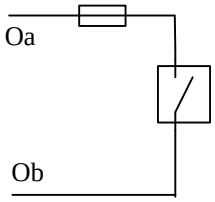
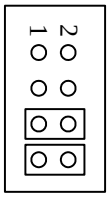
Input Mode	Jumper Settings	Mode Description	Port Description
		Single-end input	I = n[1:20]
		Dual-end input (dry contact)	I = n or (10 + n) n[1:10]
		Dual-end input (with internal power supply)	I = n or (10 + n) n[1:10]

Table 3-65 Output mode configuration table (J1-J10)

Output Mode	Jumper Settings	Mode Description	Port Description
Mode 1  	 	Single-end output	O = n[1:20]
Mode 2  	 	Dual-end output (dry contact)	O = n or (10 + n) n[1:10]

There are one LED and one DB44 socket on the front panel of DIO20 card, as shown in Figure 3-51. If the Green RUN LED on the card blinks once every two seconds, it indicates the card is running normally; if it is steady green, the card is running abnormally; and if off, the card is not running or the LED fails. DB44 socket is used to connect DIO cable BH4.851.144B, and the pin assignments of DIO20 are shown in Table 3-66.

Figure 3-51 Front panel of DIO20

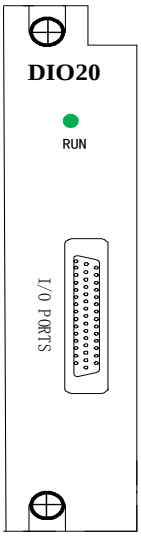


Table 3-66 Pin assignments of DIO20

DB44 Pin	Signal	DB44 Pin	Signal	DB44 Pin	Signal
1	I[1]/I_a[1]	9	I[9]/I_a[9]	37	O[7]/O_a[7]
16	I[11]/I_b[1]	24	I[19]/I_b[9]	39	O[17]/O_b[7]
3	I[2]/I_a[2]	10	I[10]/I_a[10]		-
18	I[12]/I_b[2]	25	I[20]/I_b[10]	38	-
5	I[3]/I_a[3]	11	O[1]/O_a[1]	42	O[8]/O_a[8]
20	I[13]/I_b[3]	26	O[11]/O_b[1]	40	O[18]/O_b[8]
7	I[4]/I_a[4]	12	O[2]/O_a[2]		-
22	I[14]/I_b[4]	27	O[12]/O_b[2]	41	-
2	I[5]/I_a[5]	13	O[3]/O_a[3]	31	O[9]/O_a[9]

DB44 Pin	Signal	DB44 Pin	Signal	DB44 Pin	Signal
17	I[15]/I_b[5]	28	O[13]/O_b[3]	33	O[19]/O_b[9]
4	I[6]/I_a[6]	14	O[4]/O_a[4]		-
19	I[16]/I_b[6]	29	O[14]/O_b[4]	32	-
6	I[7]/I_a[7]	15	O[5]/O_a[5]	36	O[10]/O_a[10]
21	I[17]/I_b[7]	30	O[15]/O_b[5]	34	O[20]/O_b[10]
8	I[8]/I_a[8]	43	O[6]/O_a[6]		-
23	I[18]/I_b[8]	44	O[16]/O_b[6]	35	-

3.2.39 Device Label

The label strip at the leftmost of H5600.V5 device indicates the device type, which is shown in Figure 3-52.

Figure 3-52 Device label

3.3 Installation

3.3.1 Chassis Installation

Step 1 Mark the position with a marking pen.

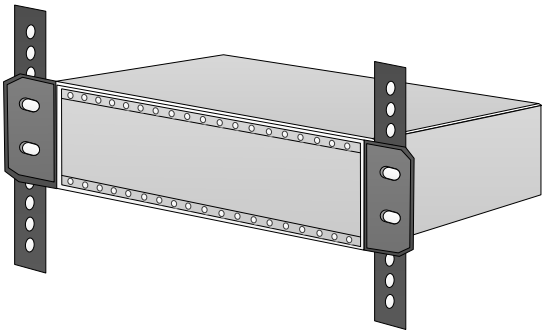
a) H5600.V5 chassis is 3U high; the fixed holes in the mounting ears correspond to the two mounting holes with a distance of 5 holes in between in the mounting bracket.

b) Install captive nuts.

Step 2 Install the chassis into chassis cabinet or rack.

Installing H5600.V5 requires one person to hold the chassis and put it into a cabinet/rack., as shown in Figure 3-53.

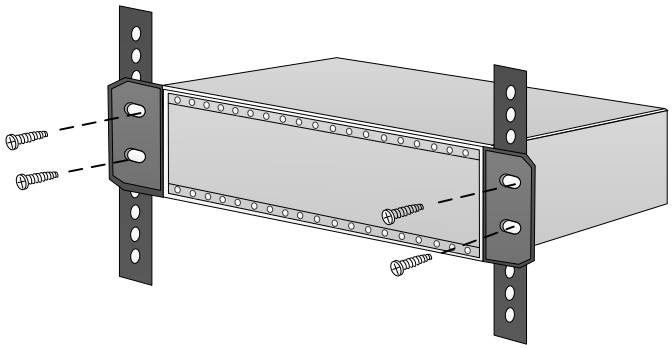
Figure 3-53 Put into a cabinet or rack



Step 3 Fix the chassis.

Fixing H5600.V5 requires a pe rson 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 3-54.

Figure 3-54 Fix the chassis

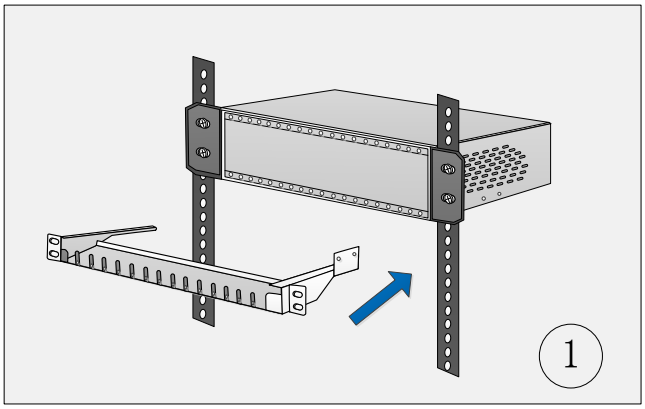


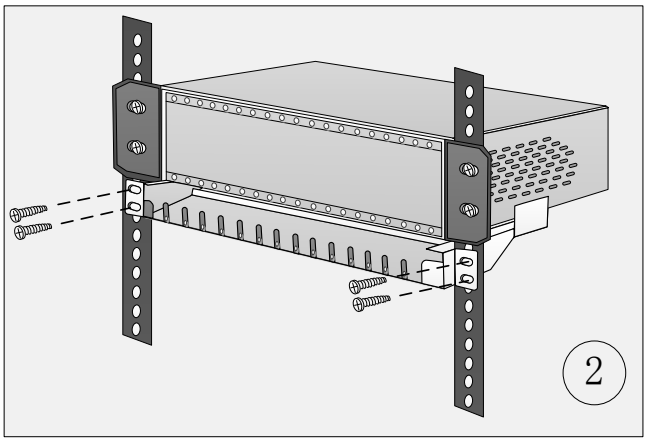
Step 4 Install the cabling channel.

a) Put the cabling channel under the chassis closely and push in with moderate force.

b) Install captive nuts and fix the cabling channel.

Figure 3-55 Install the cabling channel





3.3.2 Install Cards

Step 1 Install the cards in the universal slot.

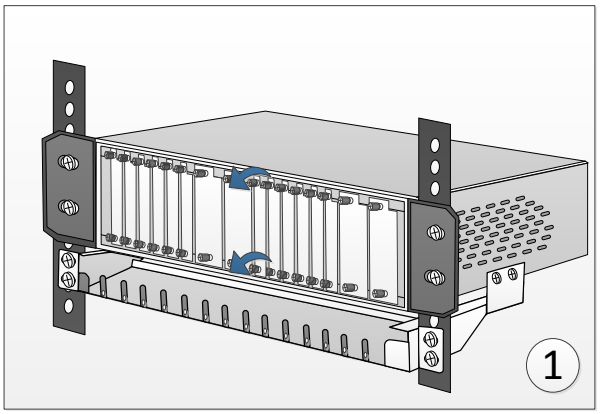
a) Twist down the locking screws on the blind card counterclockwise.

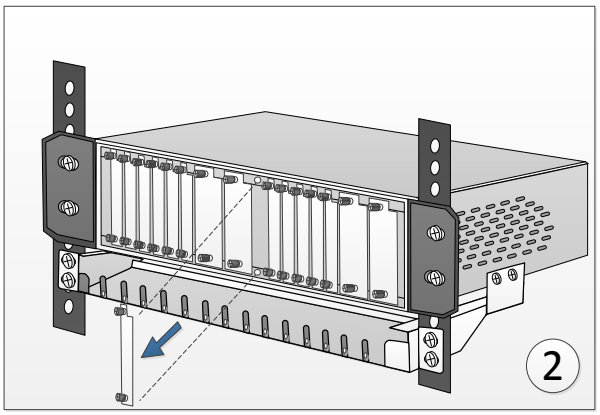
b) Take down the blind card.

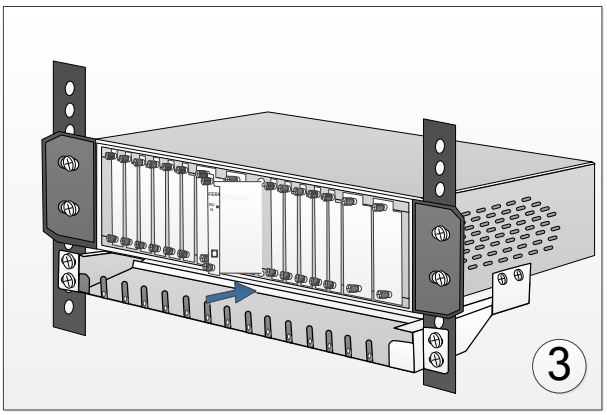
c) Aim the upper and lower edges of the card at the upper and lower guides of the chassis, and then push in slowly along the guide till to the back panel of the chassis exactly.

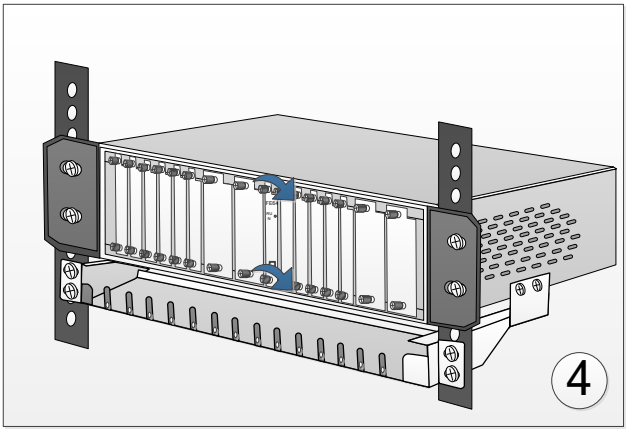
d) Tighten up the locking screws on the upper and lower ends of the card.

Figure 3-56 Install the card in the universal slot









Step 2 Install the card in slot X1, X2 (use EXM01 as an example).

a) Twist down the locking screws on the blind card counterclockwise.

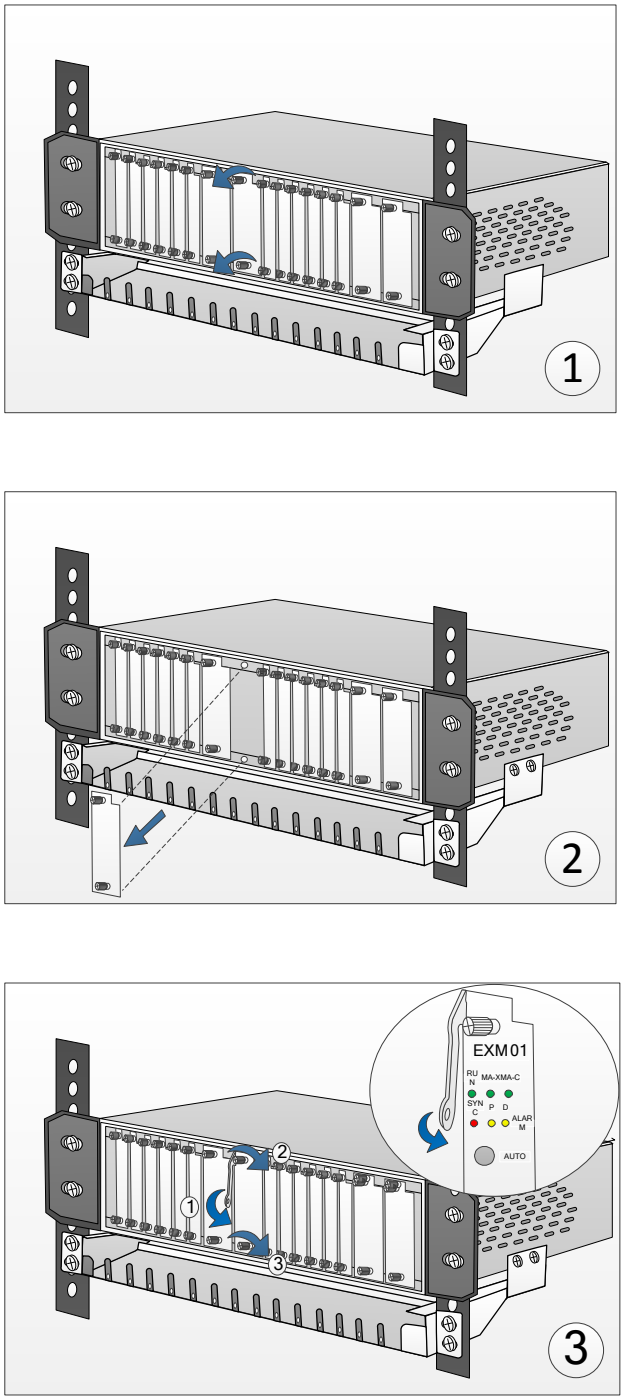
b) Take down the blind card.

c) Put up the self-contained handle of EXM01 card using for plugging in and pulling out the card.

d) Aim the upper and lower edges of the card at the upper and lower guides of the chassis, and then push in slowly along the guide till to the back panel of the chassis exactly.

e) Press down the handle.

Figure 3-57 Install the card in slot X1, X2



3.3.3 Connecting the Ground Wire

The ground wire sent with the device is as shown below:

Figure 3-58 The ground wire

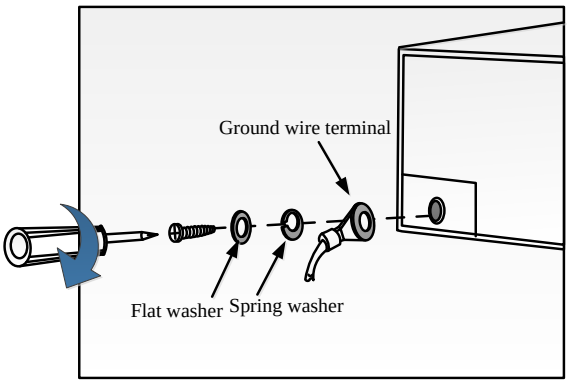
Specific connection steps are as follows:

Step 1 The screw exposed in the rectangular notch on the back panel of the device is the grounding terminal, which needs to be twisted down counterclockwise.

Step 2 Successively place the flat washer, the spring washer and the ground wire terminal around the grounding terminal according to the order shown in Figure 3-59, tighten up the grounding terminal to the ground interface of the device clockwise.

Step 3 Connect the other end of the ground wire to the grounding apparatus like the grounding terminal of the rack or the grounding bar of the machine room.

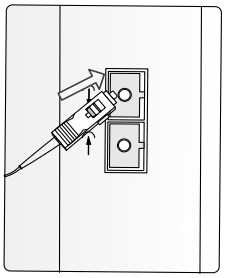
Figure 3-59 Connecting the ground wire



3.3.4 Connecting the Fiber

Step 1 If SC/PC dual-fiber optical module is adopted, 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, as shown in Figure 3-60.

Figure 3-60 Connecting the fiber



Step 2 If LC/PC dual-fiber SFP optical module is used; 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, as shown in Figure 3-61 and Figure 3-62.

Figure 3-61 Inserting the optical module

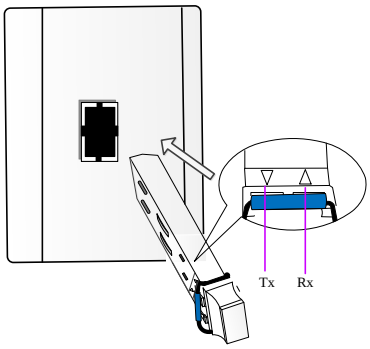
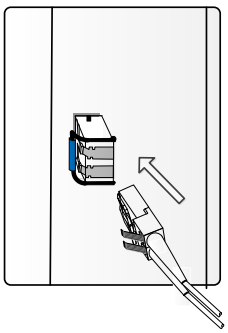


Figure 3-62 Connecting the fiber



CAUTION

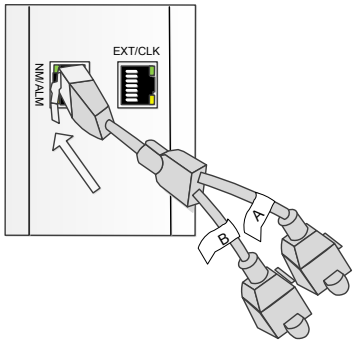
- SC/PC dual-fiber optical module socket marked with ⊂→ is optical signal output, while marked with ←⊃ is optical signal input;
- Using double fiber SFP optical module, the directions of input and output should be consistent with the triangular logo of SFP optical module, as shown in Figure 3-61. Be 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.

3.3.5 Connecting the Ethernet Monitoring Cable

Step 1 Make an Ethernet monitoring cable according to RJ45-A pin definition in Table 3-7.

Step 2 Aim RJ45 connector of interface conversion cable ZJN.BH4.850.131 at "NM/ALM" or "EXT/CLK" port of EXM01/OXM04/OXM16 card; insert it into the port with moderate force.

Figure 3-63 Connecting Ethernet monitoring cable

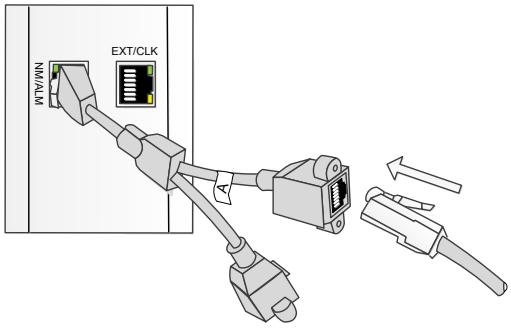


NOTE

NM ports "NM/ALM" and "EXT/CLK" are switching ports.

Step 3 Aim the crystal head of the monitoring cable at RJ45-A port of interface conversion cable ZJN.BH4.850.131; insert it into the port with moderate force.

Figure 3-64 Connecting the Ethernet monitoring cable

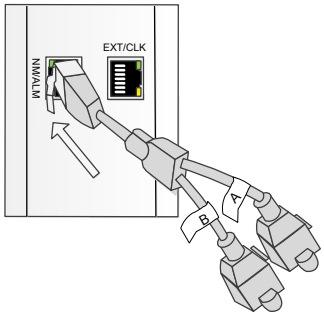


3.3.6 Connecting the Alarm Output Cable

Step 1 Make an alarm output cable according to the alarm output signal definition of RJ45-B in Table 3-7.

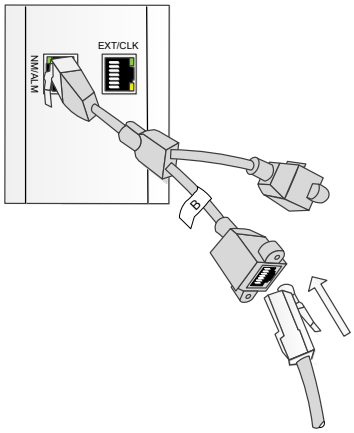
Step 2 Aim RJ45 connector of interface conversion cable ZJN.BH4.850.131 at "NM/ALM" port of EXM01/OXM04/OXM16 card; insert it into the port with moderate force.

Figure 3-65 Connecting alarm output cable



Step 3 Aim the crystal head of alarm output cable at RJ45-B port of interface conversion cable ZJN.BH4.850.131; insert it into the port with moderate force.

Figure 3-66 Connecting alarm output cable



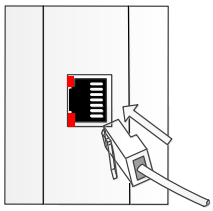
3.3.7 Connecting the E1 Cable

120Ω Impedance Port

Step 1 Make120Ω E1 cable according to the pin definition in Table 3-8.

Step 2 Aim the crystal head of E1 cable at the device's E port; insert it into the port with moderate force.

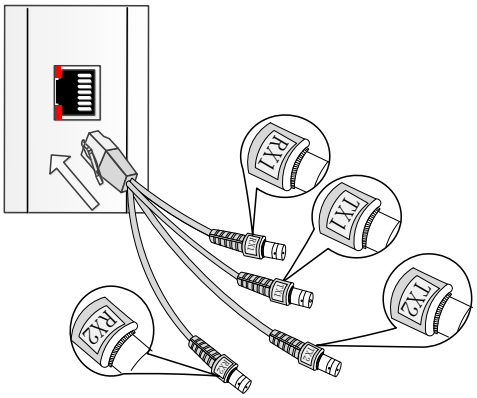
Figure 3-67 Connecting E1 cable (120Ω)



75Ω Impedance Port

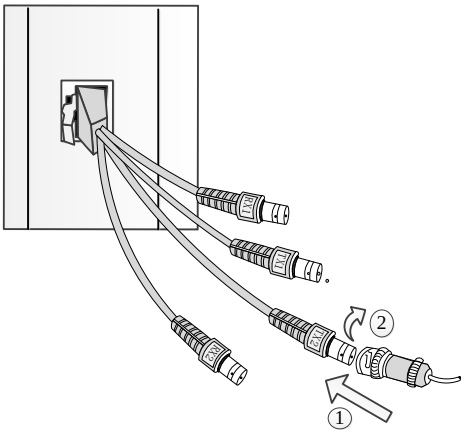
Step 1 Convert dual-E1 socket to BNC socket by interface conversion cable ZJN. BH4.850.123 sent with the device.

Figure 3-68 Connecting interface conversion cable



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

Figure 3-69 Connecting E1 cable (75Ω)



CAUTION

There are signal definition tags adhered on dual E1 cable ZJN. BH4.850.107. “TX1” is the 1st E1 signal output, “RX1” is the 1st E1 signal input; while “TX2” is the 2nd E1 signal output and “RX2” is the 2nd E1 signal input. Be careful not to reverse input and output.

3.3.8 Connecting the Low-speed Interface Cable

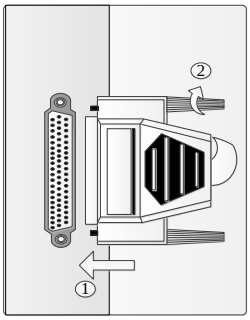
DB-62 Socket Cable Connection

Step 1 If SD01 card is configured, ZJN.BH4.851.147 cable sent with the device is used to make a cable required on site according to the pin assignment in Table 3-51.

Step 2 If SD02 card is configured, ZJN.BH4.851.148 cable sent with the device is used to make a cable required on site according to the pin assignment in Table 3-52.

Step 3 Aim DB-62 connector of the ready-made cable at the device’s DB-62 socket, then insert it into the socket with moderate force and tighten the screws at both ends of the cable clockwise, as shown in Figure 3-70.

Figure 3-70 DB-62 interface cable connection



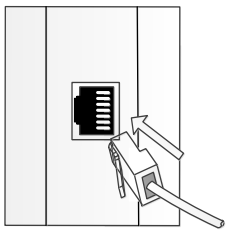
Step 4 Connect the other side of the cable to the corresponding port of the user device.

RJ-45 Socket Cable Connection

Step 1 If SD03 card is configured, make a cable according to the socket definition in Table 3-53.

Step 2 Aim the crystal head of the cable at the device's RJ45 low-speed port, and then insert it into the port with moderate force.

Figure 3-71 Connecting the RJ-45 port low-speed cable



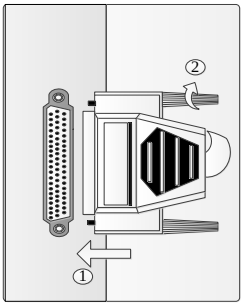
Step 3 Connect the other side of the cable to the corresponding port of the user device.

3.3.9 Connecting the Asynchronous Serial Interface Cable

Step 1 If SD04 card is configured, ZJN.BH4.851.148 cable sent with the device is used to make a cable required on site according to the pin assignment in Table 3-54.

Step 2 Aim DB-62 connector of the ready-made cable at the device's DB-62 socket, then insert it into the socket with moderate force and tighten the screws at both ends of the cable clockwise, as shown in Figure 3-72.

Figure 3-72 DB-62 interface cable connection

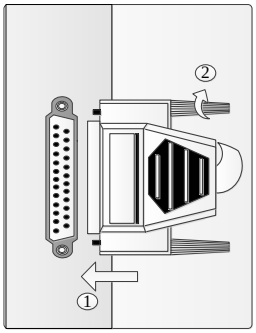


Step 3 Connect the other side of the cable to the corresponding port of the user device.

3.3.10 Connecting the Dual- V.35 Port Cable

Step 1 Aim DB-25 connector at the device's DB25 port, then insert it into the port with moderate force and tighten the screws at both ends of the cable clockwise, as shown in Figure 3-73.

Figure 3-73 DB-25 port cable connection



Step 2 Connect DTE or DCE connector at the other side of the cable to the corresponding port of the user device.

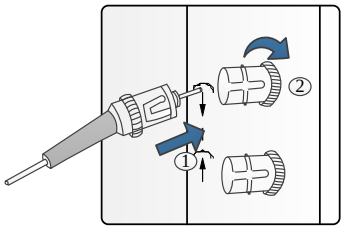
3.3.11 Connecting the Dual- X.21 Port Cable

Dual-X.21 cable connection method is the same as that of dual-V.35 port cable and will not be repeated here; please connect it with the reference of V.35 port.

3.3.12 Connecting the C37.94 Port Cable

Aim the bayonet of ST/FC male interface at the standoff of the device's BNC interface, then insert it into the standoff with moderate force and rotate it right to the slot clockwise, as shown in Figure 3-74.

Figure 3-74 C37.94 port cable connection



CAUTION

Optical interface socket marked with ⊂→ is optical signal output, while marked with ←⊂ is optical signal input.

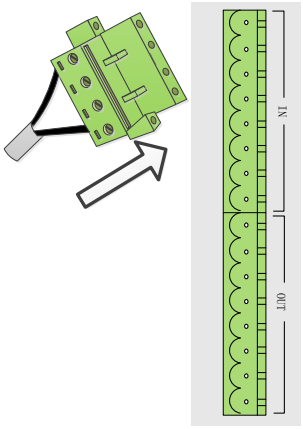
3.3.13 Connecting the Relay Signaling Interface Port Cable

The input/output ports on the panel of DIO04 card can be used.

Step 1 Make the cable according to the port signal definition in Table 3-62.

Step 2 Aim the 4PIN phoenix plug at the socket and insert it into the socket with moderate force.

Figure 3-75 Connecting 4PIN phoenix plug



NOTE

Input and output ports are 8PIN phoenix sockets, which needs to respectively connect 2 groups of 4PIN phoenix plugs.

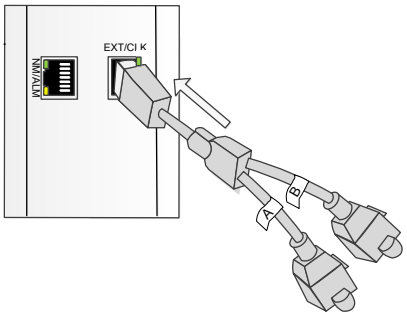
3.3.14 Connecting the Clock Signal Cable

When clock input/output port on the panel of E1 transmission cross-connection card (EXM01) is used:

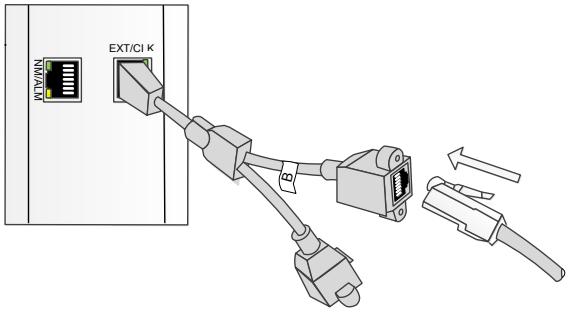
Step 1 Make a clock input/output cable according to the clock signal definition of RJ45-B in Table 3-7.

Step 2 Aim RJ45 connector of interface conversion cable ZJN.BH4.850.131 at “EXT/CLK” port of EXM01 card; insert it into the port with moderate force.

Figure 3-76 Connecting clock input/output cable



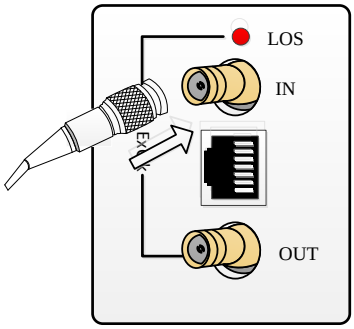
Step 3 Aim the crystal head of clock input/output cable at RJ45-B port of interface conversion cable ZJN.BH4.850.131; insert it into the port with moderate force.



When clock input/output port on the panel of OW/overhead/clock interface card (LA01) is used:

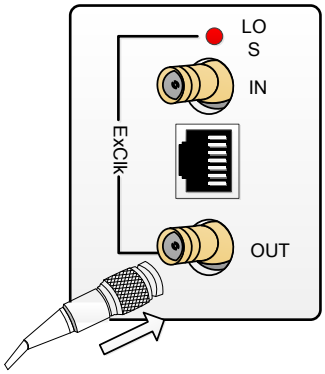
Step 1 If CC4 75Ω 2Mbit/s external clock input is needed, aim the male interface of CC4 75Ω coaxial cable at CC4 socket marked with “IN” on LA01 card, and then insert it into the socket with moderate force.

Figure 3-77 Connecting CC4 75Ω clock input signal cable



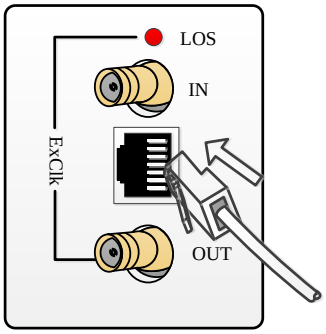
Step 2 If CC4 75Ω 2Mbit/s external clock output is needed, aim the male interface of CC4 75Ω coaxial cable at CC4 socket marked with "OUT" on LA01 card, and then insert it into the socket with moderate force.

Figure 3-78 Connecting CC4 75Ω clock output signal cable



Step 3 If RJ48-C 120Ω clock signal is needed, make a cable according to the line definition in Table 3-29. Aim the connector of the cable at RJ48C interface on LA01 card, and then insert it into the interface with moderate force.

Figure 3-79 Connecting RJ48-C 120Ω clock signal cable



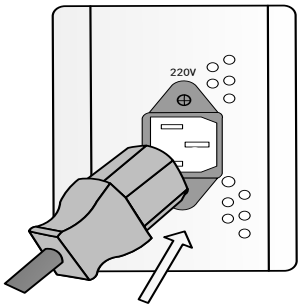
NOTE

75Ω and 120Ω clock ports cannot be used at the same time.

3.3.15 Connecting the Power Cord

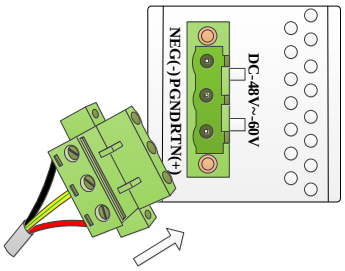
Step 1 When using AC power supply, aim AC power connector of IEC standard power cord sent with the device at ~220V standard AC power socket on the device, then insert it into the socket with moderate force.

Figure 3-80 Connecting AC power cord



Step 2 When using DC power supply, aim DC power connector of DC power cord sent with the device at the socket, then insert it into the socket with moderate force.

Figure 3-81 Connecting DC power cord



CAUTION

Note that the red wire of the power cord means high voltage level, connecting to "+", and the black wire means low voltage level, connecting to "-". The yellow-green wire of DC power cord sent with the device is the ground line. The electrode in the middle of the DC power socket is the protection grounding. Make sure the protection ground is rightly connected when installing the device.

3.4 Post-installation Check

Table 3-67 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

Number	Descriptions	Method
11	The power cables and ground cables must be corrected correctly and reliably	Check
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

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

3.5 Power on

After connecting the power cord, turn on the power switch and enter the configuration process (bootstrapping), power LED is on, indicating normal power supply, about 30 seconds later, RUN LED on E1 transmission cross-connection clock card blinks, indicating the device enters the working state.

Check alarm LEDs, preliminarily check if the device works normally. When ALM_P LED on E1 transmission cross-connection clock card is on, it indicates prompt alarm occurs to the device; when ALAM_D on the NM card is on, it indicates deferred alarm occurs to the device, a further check is needed. If the remote device has already working normally, for example, OLOS LED of optical interface card is on, it needs to check the device's optical ports to see whether they are firmly connected, whether optical line attenuations are excessive and whether optical modules are correctly selected. Status LEDs of E1 interface card indicate the working status of the corresponding E1interfaces.

4 Deployment and Maintenance

4.1 Device Monitoring

The deployment, running, and maintenance of H5600.V5 device reply on network element/subnet management system. This section gives a brief description of our company's EzView network element/subnet management software. For more details, please refer to *EzView User's Manual* and the online help.

EzView is a GUI based NE/SN management software. It is connected to the monitored NE through Ethernet. H5600.V5 device uses Ethernet to connect local network management computer. The other nodes in the network can realize remote management through DCC channel or dedicated E1 channel. Every device requires an IP address, but only the IP addresses of gateway nodes require occupation of external address space and the addresses of other nodes only have internal meaning.

The factory default IP address of the device is: 192.192.4.2. In actual networking, each end of device must be assigned an IP address first. The IP addresses of nodes in the network must be unique.

4.1.1 Query and Configuration of IP Address, MAC, Subnet Mask, and Gateway

In H5600.V5 device, the query and setting of IP address require logging in Telnet/SSH through Ethernet monitoring port. If the factory IP address is modified and the current address is forgotten, turn the DIP switch position 1 on E1 transmission cross-connection clock card (EXM01) or STM-1/4 master-control cross-connection card (OXM04) to the left and make the device run at a fixed IP (192.192.192.192). In this way, the user can use this special IP address to access Telnet/SSH to query or modify the real address of the device. **The host address mask should be modified to 255.255.0.0.** After query, turn the DIP switch position to the right.

NOTE

When logging in the system through Telnet or SSH (Secure Shell), Ethernet monitoring port has Telnet/SSH access authentication mechanism, requiring to inputting both the username and the password, which is enabled by default, and the default login user name and password is “root” and “root” respectively. Telnet is the standard protocol and the main way of Internet remote registry, since it transmits data in clear text, it is not safe and can be opened and closed by telnetd stop/start command; it is recommended to log in through SSH, which is a network security protocol realizing safe remote access service through encryption and authentication mechanisms with better safety performance.

Log in H5600.V5 device through Telnet/SSH. Use ipconfig under usr/app/tools to query the device’s IP address, subnet mask, MAC address and default gateway, or set the device’s new IP address, subnet mask, and gateway IP address. The operations are as follows:

Type in command ipconfig, to consult the current address information, including the device’s IP address, subnet mask, MAC address and default gateway;

Type in command ipconfig -v, to consult version information;

Type in command ipconfig -h, to consult parameter information and version information;

Type in command ipconfig -i: to set IP address;

Type in command ipconfig -n: to set subnet mask address;

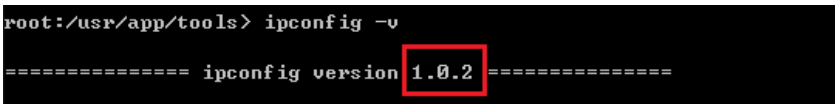
Type in command ipconfig -g: to set the device's gateway address.

It is allowed to set multiple parameters simultaneously, and the order is not definite. E.g. To set IP address and subnet mask simultaneously, you can type in command #./ipconfig –i new IP address –n new subnet mask address.

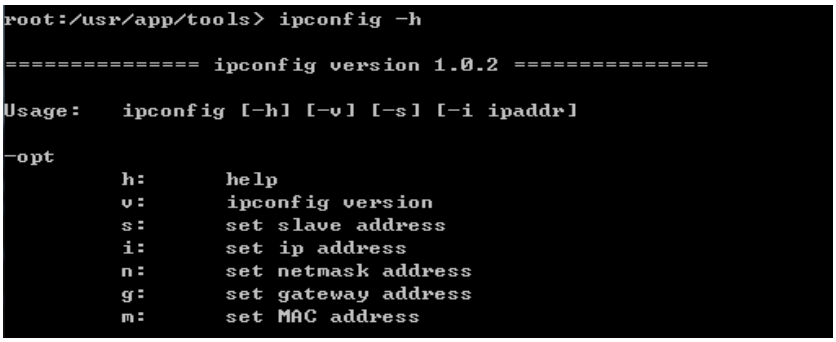
The detailed operation method is shown in Figure 4-1.

Figure 4-1 Method of using ipconfig to query and set addresses

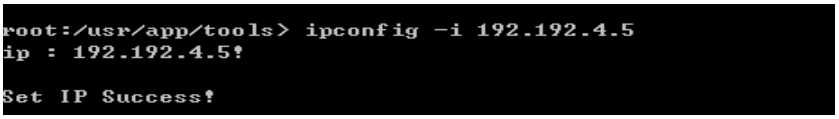
To query version number: parameter –v



To query help: parameter –h



To set IP address: parameter –i



To set subnet mask: parameter –n

```
root:/usr/app/tools> ipconfig -n 255.255.255.0
netmask : 255.255.255.0!

Set IP Success!
```

To set gateway: parameter –g

```
root:/usr/app/tools> ipconfig -g 192.192.4.1
gateway : 192.192.4.1!

Set IP Success!
root:/usr/app/tools>
```

Multiple parameters can be set simultaneously. E.g. setting IP address and mask

```
root:/usr/app/tools> ipconfig -i 192.192.4.5 -n 255.255.255.0
ip : 192.192.4.5!
netmask : 255.255.255.0!

Set IP Success!
```

NOTE

- After the setting is completed, you can type in ipconfig, to check the result. Note that the modified address is not effective yet and you can reboot E1 transmission cross-connection clock card by hot plugging or logging in Telnet to use reboot command.
- Before the device or E1 transmission cross-connection clock card is booted, if the DIP switch position 1 on E1 transmission cross-connection clock card's panel is OFF (right), the IP address used is the device's current IP address.
- The factory default MAC address of the device is unique. Please do not modify it.

4.1.2 Monitoring Software

For detailed usage instruction of the software, please refer to the online help.

5 Troubleshooting

When a fault occurs, first find out the position of alarm through the alarm indication on the device's front panel (whether it is device fault, or transmission line fault), and then deal with it accordingly. The following part is an instruction of judgments of common faults and solution measures.

Phenomenon	Possible causes	Solutions
5V LED is not on Power supply is abnormal	Power supply does not meet requirements	Check if the power input is normal, adjust the power voltage to the working range
	Power switch is not turned on	Turn on the power switch
	Power connection is loose	Tighten the power supply wiring
	Internal fuse is blown	Replace the fuse
E1 interface alarm	RJ-48C or dual-E1 connector fault	Adjust the connector
	E1 cable is not connected or reversed	Connect the cables correctly

Phenomenon	Possible causes	Solutions
	Loose connection of DDF	Check if the connection of DDF is firm
	E1 interface card fault	Replace E1 interface card
	E1 signal alarm of the link partner device	Replace the link partner device
OLOS LED is on, no optical reception alarm	Fiber cut	Check if the optical cable is intact
	Excessive line attenuation	Check optical joints to see if they are in good contact; clean the optical connector
	Optical power overload	If the optical power is overload, an attenuator is needed
	Optical card fault of the local end; sending part fault of the far end	If it is the single card fault, replace it
Ethernet LNK green LED is off	Network cable is low-qualified or line order is wrong	Replace network cable
	Using straight-through network cable in manual mode	Please use crossover network cable in manual mode

Phenomenon	Possible causes	Solutions
	Electrical port and link partner configurations are not matched	Please modify electrical port configuration of this device or the link partner device
Ethernet interface FDX LED is off	Perhaps half-duplex mode is set	Normal phenomenon
	The Ethernet interface of one end is set to auto-negotiation mode, and interface of the other end is manual full-duplex mode	Normal phenomenon, self-negotiation interface must work at half-duplex mode. Please configure the electrical ports of both ends to the same
Ethernet service is blocked	GFP loss of frame delineation alarm occurs, generally caused by wrong service setting	Check the low-order alarm first to see if the channel setting is normal
	Wrong VLAN configuration: perhaps Ethernet VLAN of one end is set, and Ethernet VLAN of the other end is not set	Both ends set VLAN or both disable VLAN

Phenomenon	Possible causes	Solutions
Packet loss of Ethernet service	Packet loss of ETH service due to different port modes is generally caused by different working modes of the interfaces	Check working modes of the interfaces of the interconnected Ethernets and keep consistent, the case that auto-negotiation on one side and forced 100M in full-duplex mode on the other side is forbidden
	Packet loss of ETH service due to the network cable is generally caused by using Cat 3 cable which is designed for 10M Ethernet as the transmission media of 100M Ethernet service. Currently most of the Ethernet interfaces are 100M, so a large number of CRC packet errors will occur if Cat 3 cable is used, which leads to packet loss. The problem of poor contact between connectors caused by crimping the crystal head of Cat 5 or Cat 5 e cable by Cat 6 cable also produces a number of packet losses	Check the network cable to ensure correct network cable production

Phenomenon	Possible causes	Solutions
	Packet loss of ETH service caused by channel errors, including the errors caused by optical fiber attenuation, which is a main reason of packet loss	Check if there are channel errors; Check if Optical fiber attenuation is excessive
	Packet loss caused by the device or the card	Confirm this by replacing it with other types of devices or cards
V.35 LOS	V.35 cable is not connected or in poor contact	Correctly connect the cable
	V.35 work mode is incorrectly set	To connect to router, this device should be set to DCE mode. Please set the work mode correctly
X.21 LOS	X.21 cable is not connected or in poor contact	Correctly connect the cable
	X.21 work mode is incorrectly set	To connect to router, this device should be set to DCE mode. Please set the work mode correctly
Low-speed data RS232/RS485/	The cable is not connected or in poor contact	Correctly connect the cable

Phenomenon	Possible causes	Solutions
RS422 is blocked	64K cross connection setting problem	Check 64K-level cross connection, ensure its setting is correct
	VC-12 service setting problem	Check VC-12-level service, ensure its setting is correct
	The card problem	Replace the card
C37.94 service is blocked	C37.94 cable is not connected or in poor contact	Correctly connect the cable
	VC-12 service setting problem	Check VC-12-level service, ensure its setting is correct
	Tx problem of C37.94 optical ports	If it is the card problem, replace it
	Rx problem of C37.94 optical ports	
PCM channel is blocked	The voice cable used is of the wrong type, not connected or in poor contact	Correctly connect the cable
	64K timeslot cross connection relationship is not set	Set 64K timeslot cross connection

Phenomenon	Possible causes	Solutions
The link partner device cannot be monitored	DCC channel is not corresponding with the link partner configuration	Please configure the DDC channel bytes used of both ends to the same
	E1 monitoring channel is not connected	Check if E1 monitoring channel settings of both ends are correct, make sure that the E1 channel is not set for transmission service

If problem occurs during installation or usage, please deal with it through the above measures. If problem persists, please contact Beijing Huahuan Electronics Co., Ltd. for technical support.

6 Technical Specifications

6.1 Device Performance Specifications

Performance parameter	Parameter description
Network topology	Star, chain and ring
Card number	12 service interface cards, 2 E1 transmission cross-connection clock cards (or 2 STM-1/4 master-control cross-connection cards), 2 power cards
Cross connection capacity	EXM01: 12×12 VC-4s, 756×756 VC-12s Full cross connection of all the 64kbps timeslots of 62×62 E1s OXM04: 48×48 VC-4s, 96×96 VC-3s, 2016×2016 VC-12s OXM16: 96×96VC-4s, 96×96 VC-3s, 2016×2016 VC-12s
Cross connection type	Unidirectional, bidirectional, multicast/broadcast, loopback

Performance parameter	Parameter description
Optical protection ability	VC-12, VC-3, and VC-4 levels support subnet connection protection, and the protection time is less than 50ms. Linear multiplex section 1+1 protection. STM-1/STM-4 level dual-fiber unidirectional multiplex section protection
Network management channel	External DCN DCC network management channel: DCC channels (D1~D3/D4~D6/D7~D9/D10~D12) can be freely assigned. E1 network management channel can be assigned to any VC-12 of the main processing switch card or STM card, or E1 interface of specified E1 interface card. EoE (Ethernet over E1) encapsulation Ethernet in-band network management channel. N*64K in-band monitoring Monitoring channels of PCM cards (Sa in-band monitoring)
Device clock	Built-in G.813 standard SDH device clock, supporting SSM. One channel of external clock input and one channel of output, 2Mbit/s or 2MHz

Performance parameter	Parameter description
Internal function	E1 trasnmission cross-connection clock card/ STM-1/4 master-control cross-connection card features built-in TUPP and cross connection function, and standard SDH device clock unit. E1 trasnmission cross-connection clock card and optical interface card feature built-in E1 BER tester
Service	Single card can realize 8/12 channels of E1 service, 100M Ethernet electrical port or optical port service, two channels of V.35/X.21/C37.94 service, 16 channels of asynchronous RS232, 16 channels of asynchronous RS232 + 2 channels of RS422/RS485, 6 channels of asynchronous RS232 or 2 channels of synchronous + 4 channels of asynchronous RS232

6.2 STM-1 Optical Port

STM-1 port specifications	
Transmission rate	155520kbit/s ±4.6ppm
Line code format	Scramble NRZ
Optical interface property	Determined by the optical module
Connector	OS01A card optical port:

STM-1 port specifications		
	Standard configuration	SC dual-fiber bidirectional transmission
	Selected configuration/S	SC single-fiber bidirectional transmission
	OS01S card optical port:	
	Standard configuration	LC dual-fiber bidirectional transmission (SFP socket)
	Selected configuration/S	LC single-fiber bidirectional transmission (SFP socket)

6.3 STM-4 Fiber Optic Port

STM-4 port specifications	
Transmission rate	622080kbit/s ± 4.6ppm
Line code format	Scramble NRZ
Optical interface property	Determined by the optical module
Connector	Standard configuration: LC dual-fiber bidirectional transmission (SFP socket)
	Selected configuration/S: LC single-fiber bidirectional transmission (SFP socket)

6.4 STM-16 Fiber Optic Port

STM-16 port specifications	
Transmission rate	2488320kbit/s ± 4.6ppm
Line code format	Scramble NRZ
Optical interface property	Determined by the optical module
Connector	Standard configuration: LC dual-fiber bidirectional transmission (SFP socket)
	Selected configuration/S: LC single-fiber bidirectional transmission (SFP socket)

6.5 C37.94 Optical Port

Parameter	Specifications
Transmission rate	2048kbit/s ±100ppm
Service data rate	N×64kbit/sN (1-12)
Work wavelength of optical port	830nm±40nm
Average output optical power	50um fiber: minimum -23 dBm, maximum -11 dBm; 62.5um fiber: minimum -19 dBm, maximum -11 dBm
Reception sensitivity	-32dBm~-11dBm
Connector	ST/PC

Parameter	Specifications
Standards	IEEE C37.94TM-2002 standard

6.6 E1 Port

Parameter	Specifications
Bit rate	2.048 Mbps ± 50ppm
Line code format	HDB3
Impedance	75Ω unbalanced interface/120Ω balanced interface
Connector	Dual-E1
E1 channel number	8, 12

6.7 Ethernet Port

Parameter	Specifications
Speed	64K, 2M, 100M
Work mode	Electrical port: auto-negotiation, manual 100M full-duplex, 100M half-duplex, 10M full-duplex, 10M half-duplex; Optical port: auto-negotiation

Parameter	Specifications
Connector	Electrical port: RJ-45 Optical port: LC
Supported functions	VCAT, GFP, LCAS or automatic bandwidth adjustment, LFP, VLAN, Ethernet loopback detection and deletion, flow control, E1 loopback detection and deletion, broadcast packet suppression, STP, RSTP, static MAC address list setting, LACP/TRUNKING and etc.
Frame length	Minimum frame length: 64 bytes; Maximum frame length: 2048 bytes
Transmission method	EoS, EoE, EoPDH, Eo64K (private protocol, private protocol, standard protocol, private protocol)
Channel number	4, 16
Interface number	1, 2, 4
Standards	IEEE 802 relevant recommendation G.7041/G.704 2/G.7043 and G.8040

6.8 V.35 Port

Parameter	Specifications
Bit rate	Nx64kbps ± 50ppm (N≤31) or 2048 kbps
Frame structure	Framed E1 or unframed

Parameter	Specifications
Port mode	DCE/DTE
Port number	2
Connector	DB25

6.9 Clock Port

Parameter	Specifications
Clock source	Internal clock, STM-1 interface clock, external input clock, E1 interface clock
External clock input	2048kbit/s or 2048kHz external clock, 75Ω unbalanced coaxial socket or 120Ω balanced RJ-48C socket
Clock output	2048kbit/s or 2048kHz clock, 75Ω unbalanced coaxial socket or 120Ω balanced RJ-48C socket
Connector	EXM01/OXM04/OXM16 card: 1 external clock RJ-45 socket LA01 card: 1 external clock CC4 or RJ-48C socket
Standards	G.823

6.10 Monitoring Port

Parameter	Specifications
Ethernet monitoring port	10/100Base-T Ethernet MDI port
Supported protocol	SNMP protocol (TRAP, GET function)
Port number	2
Connector	RJ45

6.11 Voice and Asynchronous Data Port

6.11.1 Traditional Phone Port and Signaling

Interface Parameters

Parameter	Specifications	
Switching-side	Off-hook impedance	<500Ω
	On-hook impedance	>10KΩ
User-side	Loop impedance	≤2000Ω (including the phone)
	Free circuit voltage	≤50V

Parameter	Specifications	
	Loop current	25mA
	Off-hook threshold	8mA
	Polarity reversion delay	<50msec
	Dialing	Pulse dialing monpulse distortion < 5msec The total distortion of in-band tone dialing meets the requirements of voice ports
	Off-hook delay	<100msec

Ringing Current

Parameter	Specifications	
FXS ringing current generator	Frequency	25Hz ± 3Hz
	Amplitude	75V ± 5Vrms
	Ringing current delay	<50ms
	Total output power	≤5 W (per chassis)

Parameter	Specifications	
FXO ringing current detection	Amplitude range	38Vrms (Minimum)

Voice Specifications

Parameter	Specifications
Impedance	600Ω or ternary impedance, as shown in Figure 6-1
Voice range	300 Hz~3400 Hz
Encoding law	G.711A law of ITU-T recommendation
2-wire interface level	2-wire Tx: 0dBr ± 0.5dBr 2-wire Rx: -3.5dBr ±0.5dBr
Return loss	300-600Hz >12dB 600-3400Hz >15dB
Frequency response	300-3400Hz complying with ITU G.712
Air Noise	≤-65dBm0p
Gain	-45dB~+3dB (Error less than ±0.5dB)
Total SNR	Comply with ITU G.712 sample as shown in Figure 6-2
Standards	G.711, G.712

Figure 6-1 Ternary impedance

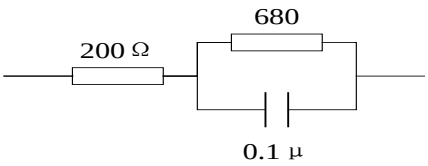
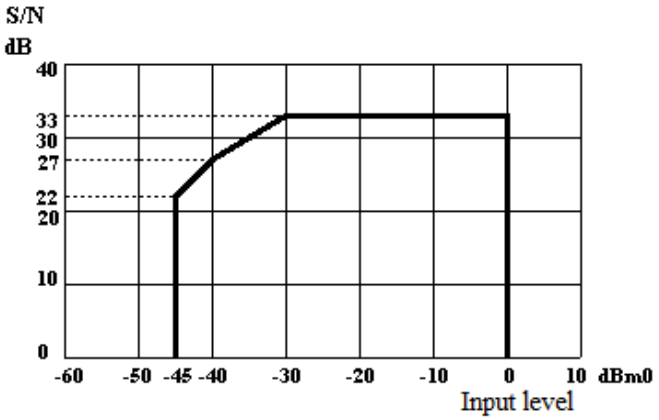


Figure 6-2 Total SNR sample of 2W interface



6.11.2 Special Interfaces

2/4-wire Voice

Parameter	Specifications
Impedance	600Ω
Encoding law	G.711 A law of ITU-T recommendation
Return loss	300-3400Hz >20dB
Frequency response	300-3400Hz complying with ITU G.712
Air noise	≤-65dBm0p

Parameter	Specifications
Total SNR	Complies with ITU G.712 sample, as shown in Figure 6-2
Interface level	4-wire Tx: 0dBr ± 0.5dBr (default) 4-wire Rx: 0dBr ± 0.5dBr (default)
Adjustment accuracy	0.1 dB
standards	G.711, G.712

Magnet Port

Parameter	Specifications		
Common magnet port	Voice index		The same as common 2-wire voice
	Signal detection		A minimum of 20Vrms with a detection time of 0.5s
	Signaling mode		Digital (PCM 16-timeslot code a)
Carrier magnet port	Voice	2-wire port level	2-wireTx: 0dBr±0.5dBr 2-wire Rx: -3.5dBr±0.5dBr
		Other voice index	The same as common 2-wire voice
	Signaling	Signal detection	A minimum of 20Vrms

Parameter	Specifications		
		Signaling mode	Analog 2100Hz single-tone
		2100 Hz signal generator amplitude	-6dBm ±1dBm
		2100 Hz signal generator frequency	2100Hz±5Hz
		Signaling detection amplitude	No less than -17dBm
		Signaling detection frequency	2100Hz±50Hz
Standards	G.711, G.712		

Hotline Phone

Parameter	Specifications
Loop impedance	≤2000Ω (including the phone)
Idle circuit voltage	≤50V
Loop current	25mA

Parameter	Specifications
Off-hook threshold	8mA
Voice port index	See details in 6.11.1

Asynchronous Data Port

Parameter	Specifications
Port level	Complies with RS-232/V.24 or RS-422/RS-485/V.11
Port rate	≤19.2kbit/s asynchronous data
Standards	V.24, V.11

Synchronous/Asynchronous Data Port

Parameter	Specifications
Port level	Complies with ITUT-T X.50 Division 3, ITUT-T X.54
Port rate	Synchronous rate: at most 64kb/s Asynchronous rate: at most 48Kb/s
Standards	V.24, V.11

64 K Co-directional Data Port

Parameter	Specifications
Port type	64Kbps co-directional data port

Parameter	Specifications
Port rate	64kbit/s±100ppm
Impedance	120Ω (balanced)
Line encoding	Co-directional encoding
Line waveform	Complies with 64K co-directional port pulse sample in G.703
Port number	8
Connector	RJ-48C

6.12 Physical/Electrical Attributes

Parameter	Specifications
Chassis size	130mm x 270mm x 435mm (H×D×W)
Weight	≤12kg (fully configured)
DC power supply	PWR01A (-36V~-72V), output 75W PWR01C (-36V~-72V), output 150W
AC power supply	PWR02A (140V~265V), output 75W PWR02C (140V~265V), output 150W
Power consumption	Maximum power consumption (related to configurations): Ordinary application≤85W Special application (use many GE switch cards, e.g. more than 10)≤160W

Parameter	Specifications
Operation temperature	-10°C~+50°C
Operation humidity	0-95%RH (non-condensing)

6.13 Standards

Items	Standards
STM-1, STM-4, SDH optical ports	G.957, frame structure G.707
E1 port	G.703, G.704
Ethernet port	IEEE 802.3 recommendations
2Mbit/s, 2MHz clock port	G.823
Port	G.991.2
Voice and asynchronous/synchronous data port	G.711, G.712, V.24, V.11, G.703
SDH clock	G.813, G.825, YDN121-1999, YDN123-1999
Network structure	G.783, G.798, G.803, G.805

Items	Standards
Monitoring management	G.784,G.831, Q.811, Q.812, M.3100, M.3000, YDN037-1997, YDN045-1997, YD5080-99
Service protection	G.841, G.842, YDN028-1997
Built-in E1 error test	O.150