



BD-MSOT

Multi-service Optical Terminal

User Handbook

V1.11

2021.2

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1 Introduction

1.1 Overview

BD-MSOT is designed as a STM-1 level optical terminal with two 155.520Mb/s optical interfaces to provide an ultra-compact, cost-effective and flexible multi-service platform. It can realize the E1(up to 8E1), V.35, PCM traffic and 100Mbps Ethernet transmission over optical line.

BD-MSOT supports port-based VLAN and IEEE 802.1Q tag-based VLAN. By adopting ITU-T G.7041, G.7042 and G.707-compliant EOS (Ethernet Over SDH) technology and VLAN technology, each Ethernet port can employ 1~4 separate Virtual Concatenation Groups (VCG), and each VCG can be assigned to one or more Ethernet ports. The bandwidth of VCG can be flexibly configured for efficient transmission of Ethernet data over SDH network.

BD-MSOT supports NE management based on CLI command and RayView network management platform based on SNMP_V1 and SNMP_V2 protocol, to perform excellent management such as configurations, alarm monitoring and performance statistic.

BD-MSOT is suitable for data access network on the client side. With the technology compliant to ITU-T standards, it can communicate with products from other vendors adopting the same standards.

1.2 Features

- Standard rack with 1U height and 19 Inch width
- Optical Interface
 - Two STM-1 interfaces, LC type SFP module , hot pluggable
 - Complies with GB/T15941-1995 and ITU-T G.813 standards
 - Supports RPD (Remote Power down Detection) information sending function
 - Supports ALS (Automatic Laser Shutdown) to protect operators from hurt
- Ethernet Interface
 - Four LAN ports(physical port), each LAN port supports auto-negotiation, it can also be set to 10M full/half-duplex, 100M full/half-duplex mode by force
 - Four WAN ports (internal port and invisible), each WAN port employs a VCG; the total bandwidth of 4VCGs is 63 VC-12 and the bandwidth of optional one VCG is up to 48 VC-12(100Mbps)
 - The LAN and WAN ports are compatible with IEEE802.3/802.3u standard
 - Supports flow control and broadcast storm filtering control
 - Supports port-based VLAN and IEEE802.1Q tag-based VLAN
 - Supports GFP-F Encapsulation specification complying with ITU-T G.7041
 - Supports VCAT specification complying with ITU-T G.707
 - Supports LCAS specification complying with ITU-T G.7042

- Provides both LCAS and Non-LCAS modes
- The maximum tolerated differential delay between any two VC-12 channels is 112ms
- Three kinds of modules available for user service interfaces combination: 4E1/8E1, 2E1+V.35, 8E1+8PCM/16PCM/30PCM
- E1 Interface
 - Up to 8E1
 - Optional 120Ω balanced E1 interface / 75Ω unbalanced E1 interface
 - E1 interface complies with ITU-T G.703 standard
- V.35 Interface
 - DB25 connector, complies with ITU-T V.35 standard
 - V.35 interface supports non-framed and framed mode, the bit rate is $N \times 64\text{Kbps}$ ($N=1 \sim 31$) in framed mode and 2048Kbps in non-framed mode
 - In framed mode, the PCM30/PCM31/PCM30C/PCM31C mode is optional
 - Supports DCE and DTE mode, in DCE mode, the master timing and tracing timing is optional; while in DTE mode, it only supports tracing V.35 timing
 - Supports phase settings between V.35 output data and clock
 - Supports link fault pass through function, which can notify V.35 port that the E1 side is failed
- PCM interface
 - Up to 30 FXO / FXS interfaces
 - Up to 16 magneto interfaces
 - Up to 8 2/4-wire E&M audio interfaces
 - Up to 8 64K data/ RS232 /RS485 data
- Supports point-to-point, chain, ring and mixed networking with other STM-1
- Cross-connection with TU-12 granularity
- SDH equipment timing mode
 - ITU-T G.813 internal oscillator
 - STM-1 line timing (T11,T12)
 - The timing source can be automatically switched according to a programmed principle or forced switched by operator.
- Protection
 - Supports 1+1 path protection with switching time less than 50ms
 - Supports Automatic protection mode and manual protection mode
- Supports embedded BERT(Bit Error Rate Tester) and various loop back for troubleshooting
- Supports FTP protocol and firmware download online without disturbance of existing traffic
- NE Management
 - Provides serial management interface(CONSOLE) and Ethernet management

interface (EMU), both adopt RJ45 connector

- Supports network management based on SDH overhead or on internal E1 channel
- Supports NE management based on CLI command via RS232 interface or TELNET
- Supports RayView network management platform based on SNMP_V1 and SNMP_V2 protocol to perform excellent management
- Supports hot-spare power, the power consumption is less than 15W /25W
 - -48V DC single power access;
 - -48V DC double power access;
 - 220V AC single power access;
 - 220V AC double power access;
 - -48V DC+220V AC double power access;

2 System Architecture

2.1 Structure Diagram

BD-MSOT consists of chassis, system mainboard, E1 card and power module, as Figure.2-1 shows:

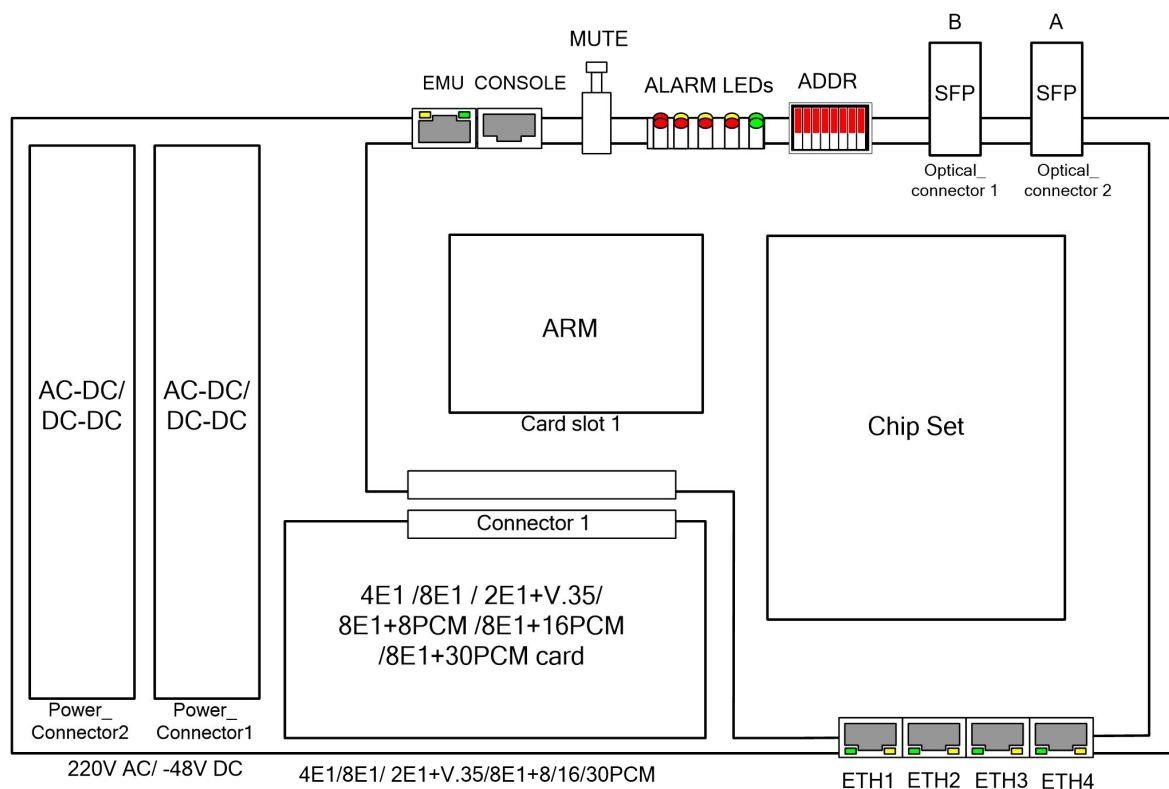


Figure. 2-1 Structure diagram

2.2 Components of BD-MSOT

Table 2-2 Components of BD-MSOT

Type	Specification		Description	Remarks
Chassis	BD-MSOT chassis		1U height, 482.6mm width and 195mm depth; The color of the chassis is black in default, it can be customized.	Required
Mainboard	BD-MSOT-12 mainboard		Multi-service platform mainboard with power supply of 12V	Optional
	BD-MSOT-5V5 mainboard		Multi-service platform mainboard with power supply of 5.5V	Optional
ARM card	CARM02J card		Realize card management and network-based management	Required
Tributary card	CLIU8 card	DB37F-BNC-8E1 cable adapter	8-unbalanced E1 card, provide BNC interface by the cable adapter	Optional 1. when CLIU4 / CLIU8 /CLIUB4-B/ CLIU8-B/ CLIU2V /CLIU4-BNC /CLIU8-BNC card is selected, the BD-MSOT-5V5 mainboard and the 15W power card are needed; 2. when CLIU8CH8/16/30 card is selected, the BD-MSOT-12 mainboard and the 25W power card are needed
	CLIU4 card	DB37F-BNC-4E1 cable adapter	4-unbalanced E1 card, provide BNC interface by the cable adapter	
	CLIU8-B NC card	-	8-unbalanced E1 card, provide BNC interface directly	
	CLIU4 -BNC card	-	4-unbalanced E1 card, provide BNC interface directly	
	CLIUB8-B card	-	8-balanced E1 card, RJ48C interface	
	CLIUB4-B card	-	4-balanced E1 card, RJ48C interface	
	CLIU2V Card	DCE cable (default) : DB25M-M34F DTE cable: DB25M-M34M	Provides two unbalanced E1 interface (BNC connector) and one V.35 interface (DB25 connector)	
	CLIU8CH8 Card		8 E1 +8 PCM interfaces In default, it adopts unbalanced E1 interface. For balanced E1 interface, Please declare when placing an order.	
	CLIU8CH16 card		8 E1 +16 PCM interfaces In default, it adopts unbalanced E1 interface. For balanced E1 interface, Please declare when placing an order.	

	CLIU8CH30 card	8 E1 +30 PCM interfaces In default, it adopts unbalanced E1 interface. For balanced E1 interface, Please declare when placing an order.	
SFP module	☐ Dual fiber,1310nm, 40Km ☐ Dual fiber, 1550nm, 80Km ☐ Dual fiber, 1550nm, 120Km ☐ Single fiber, 1550/1310nm, 20Km	155M SFP module with DDM function*	Optional
15W power module	☐ -48V DC single power ☐ 220V AC single power ☐ -48V DC +220V AC double power ☐ -48V DC +-48V DC double power ☐ 220V AC +220V AC double power	RPW15DC-K5V5, -48V to +5.5V (DC/DC) ; RPW25AC-K5V5, ~220V to +5.5V (AC/DC);	One is required, the other is optional
25W power module	☐ -48V DC single power ☐ 220V AC single power ☐ -48V DC +220V AC double power ☐ -48V DC +-48V DC double power ☐ 220V AC +220V AC double power	PW25DC-K12, -48V to +12V (DC/DC) ; PW25AC-K12, ~220V to +12V (AC/DC);	One is required, the other is optional

Note 1: Items designated with '□' means optional.

*Note2: It is suggested to use the SFP module with DDM function, otherwise, some information may not be uploaded and shown correctly.

2.3 Card slot of BD-MSOT

Table 2-3 card slot of BD-MSOT

Name	Description
Card_slot1	CARM02J card slot
Connector 1	Tributary card slot
Optical_connector 1	SFP optical module
Optical_connector 2	SFP optical module
Power_connector	Power module, if the selected power module is DC-DC module, the corresponding panel is -48VDC panel, if the selected power module is AC-DC module, the corresponding panel is 220VAC panel.

Note1: For the tributary card, Hot plug is not supported!

Note2: Before hot plugging the SFP optical module, both the operator and the device must be connected to the same earth in a reliable way! Otherwise, the device may be damaged!

2.4 Introduction to Tributary Card

BD-MSOT can provides four kinds of E1 card to provide E1 interface: CLIU4, CLIU8, CLIUB4-B and CLIUB8-B E1 card, or provides CLIU2V card, to provide 2E1 and 1 V.35 interface.

2.4.1 CLIU4/8 E1 Card

CLIU4/8 is the unbalanced E1 card providing 4/8 E1 unbalanced interfaces with a bit rate of 2.048 Mb/s, which is compliant to ITU-T G.703 standard. It adopts DB37 connector as its physical interface, provides BNC interfaces by DB37F-BNC-4/8E1 cable adapter. Refer to Appendix 2 for E1 adapter.

2.4.2 CLIUB4/8-B Card

CLIUB4/8-B is the balanced E1 card providing 4/8 E1 balanced interfaces with a bit rate of 2.048 Mb/s, which is compliant to ITU-T G.703 standard. It adopts RJ45 connector as its physical interface. Refer to Appendix 2 for more.

2.4.3 CLIU2V Card

CLIU2V card provides two unbalanced E1 interface and one V.35 interface. The bit rate of E1 interface is 2.048Mb/s, which is compliant to ITU-T G.703 standard. V.35 interface adopts DB25 connector, which is compliant to ITU-T V.35 standard.

V.35 interface supports multiple loop operation, refer to 5.11“loop control” for more.

Note: The tributary card do not support hot-pluggable, before installing tributary cards, make sure the equipment is power off.

2.4.4 PCM Card

PCM card includes CLIU8CH8, CLIU8CH16, and CLIU8CH30. CLIU8CH8 provides 2 PCM sub-module slots +8E1; CLIU8CH16 provides 4 PCM sub-module slots+8E1; CLIU8CH30 provides 4 PCM sub-module slots +8E1 +14 FXO/FXS.

With optional kinds of sub-modules as Table 2-4-4-1 shows, it is easy to meet user's various requirements.

Note:1. For any kind of sub-module, the PCM interface adopts RJ48C connector.

2. The PCM card also supports up to 8E1, In default, it adopts unbalanced E1 interface. combined with DB37F-BNC-8E1 cable adapter. As Appendix 2 shows;

For balanced E1 interface, it combined with DB37F-RJ48C-8E1 cable adapter, as Appendix 2 shows. Please declare when placing an order.

Table 2-4-4-1 PCM sub-module list

Model	Name	Description
PCM-4FXS	Foreign exchange station module	Provides a 4ch FXS interface, connects to user phone directly. Works with PCM-4FXO module to achieve extension of PBX user line
PCM-4FXO	Foreign exchange office module	Provides a 4ch FXO interface, connects to PBX user interface. Works with PCM-4FXS module to achieve extension of PBX user line.
PCM-4MAG	magneto telephone module	Provides a 4ch magneto telephone interface, adopts 2100Hz in-band signaling with signaling transmission and detection function, mainly apply to order wire, private line etc,...
PCM-2EM-2/4	2/4 wire E&M audio module	Provides 2ch 2/4 wire E&M audio without signaling, supports 2/4 Wire mode online switch.
PCM-2RS232	RS232 Interface module	Provides a 2ch RS232 asynchronous interface, each channel occupies one 64K time slot. Supports rate from 0Kbps~19.2Kbps.
PCM-2RS485	RS485 interface moudle	Provides a 2ch RS485 asynchronous interface, each channel occupies one 64K time slot. Supports rate from 0Kbps~19.2Kbps, half-duplex mode.
PCM-2CD64K	64K data module	Provides a 2ch 64K data interface, complies with ITU-T G.703

2.4.4.1 Foreign exchange station module - PCM-4FXS

Each PCM-4FXS module provides a 4ch FXS interface, achieve A/D and D/A conversion, ring current detection, hook status detection, battery feed to subscriber, ringing generation, hybrid, over-voltage and over-current protection, polarity reversal etc.

It supports caller display function, EOW mode setting, gain adjustment function and signaling mode * configuration for easy communication with other manufacturers.

*Note: FXS interface adopts G.704 standard, using TS16 of PCM30 to transmit CAS, the default value of a, b, c, d is shown in Figure 2-4-4-1. The signaling mode of FXS interface can be configured by Rayview. Refer to “RAYVIEW Management software user guide for RS7000 and RS3000” for more.

	a	b	c	d
On-hook:	1	0	1	0
Off-hook:	0	1	1	0
Ring:	0	1	0	0
Forward ...	0	0	0	1
Backfeed:	1	0	0	0
EM Set:	0	0	1	0
EM Reset:	1	1	1	0

Figure 2-4-4-1 Signaling mode

PCM-4FXS connects to user phone directly, and works with PCM-4FXO module to achieve extension of PBX user line, refer to Figure 2-4-4-1-1, 2-4-4-1-2, 2-4-4-1-3, 2-4-4-1-4, 2-4-4-1-5, 2-4-4-1-6 for its application.

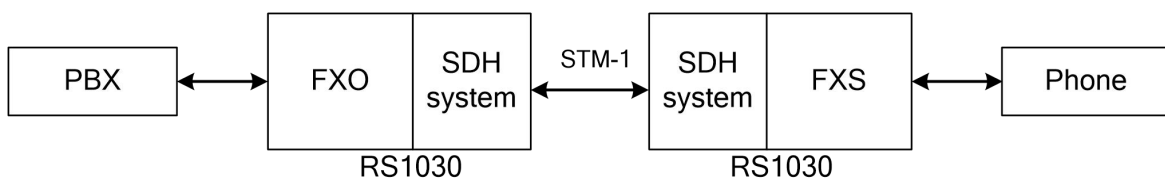


Figure 2-4-4-1-1 FXS and FXO Application 1

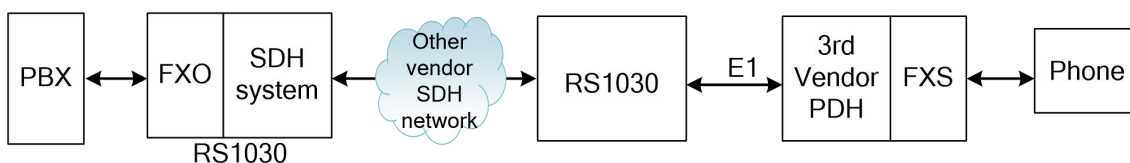


Figure 2-4-4-1-2 FXS and FXO Application 2

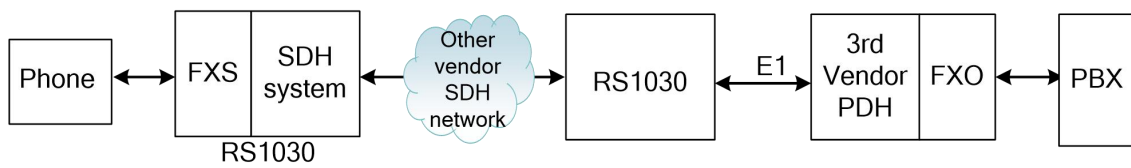


Figure 2-4-4-1-3 FXS and FXO Application 3

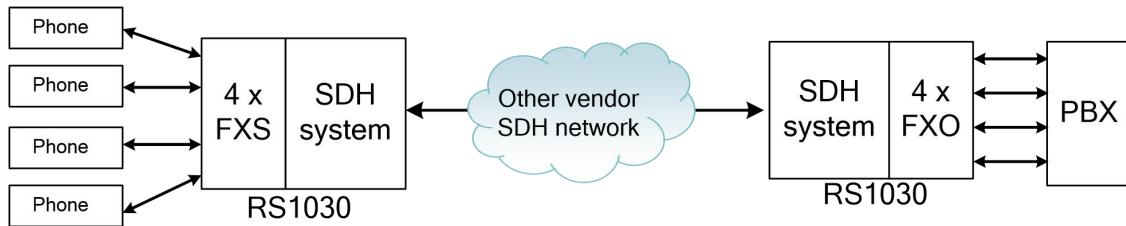


Figure 2-4-4-1-4 FXS and FXO Application 4



Figure 2-4-4-1-5 FXS and FXO Application 5

Note: Both ends use FXS phones or hotlines.

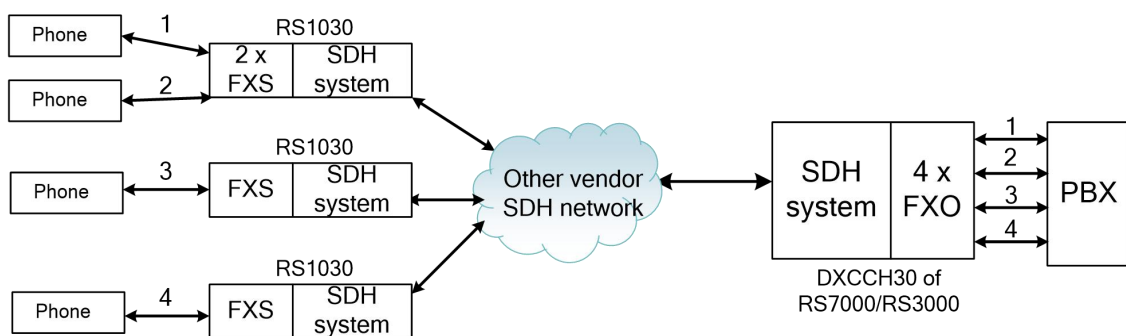


Figure 2-4-4-1-6 FXS and FXO Application 6

Each PCM-4FXS module adopts one RJ48C connector which provides 4 subscriber line interfaces, the interface definition and CH ACT indicators are as Table 2-4-4-1-1 shows:

Table 2-4-4-1-1 PCM-4FXS interface definition and CH ACT Indicators

Interface Definition		
No.	Name	Definition
PIN1	T1	T pin of telephone channel 1
PIN2	R1	R pin of telephone channel 1
PIN3	T2	T pin of telephone channel 2
PIN4	R2	R pin of telephone channel 2
PIN5	T3	T pin of telephone channel 3
PIN6	R3	R pin of telephone channel 3
PIN7	T4	T pin of telephone channel 4
PIN8	R4	R pin of telephone channel 4
CH ACT Indicators		
User Phone channel indicator, green	ON	User "off- hook"
	OFF	User "on- hook"

2.4.4.2 Foreign exchange Office Module - PCM-4FXO

Each PCM-4FXO module provides a 4ch FXO interface, achieve A/D and D/A conversion, ring current detection, polarity reversal detection, etc. It connects to PBX user line interface, works with PCM-4FXS module to achieve extension of PBX user line, refer to Figure 2-4-4-1-1 shows for its application.

Each PCM-4FXO module adopts one RJ48C connector which provides 4 exchange line interfaces, the interface definition and CH ACT indicators are as Table 2-4-4-2-1 shows:

Table 2-4-4-2-1 PCM-4FXO interface definition and CH ACT Indicators

Interface Definition		
No.	Name	Definition
PIN1	T1	T pin of telephone channel 1
PIN2	R1	R pin of telephone channel 1
PIN3	T2	T pin of telephone channel 2
PIN4	R2	R pin of telephone channel 2
PIN5	T3	T pin of telephone channel 3
PIN6	R3	R pin of telephone channel 3
PIN7	T4	T pin of telephone channel 4
PIN8	R4	R pin of telephone channel 4
CH ACT Indicators		
FXO indicator	OFF all the time	

2.4.4.3 Magneto telephone module - PCM-4MAG

Each PCM-4MAG module provides a 4ch magneto telephone interface, achieve A/D and D/A

conversion, hand-cranked signal detection and sends ringing power to magneto telephone when the remote is making the call. It adopts 2100Hz in-band signaling with signaling transmission and detection function, mainly apply to order wire, private line etc., occasions. Refer to Figure 2-4-4-3-1 shows for its application.

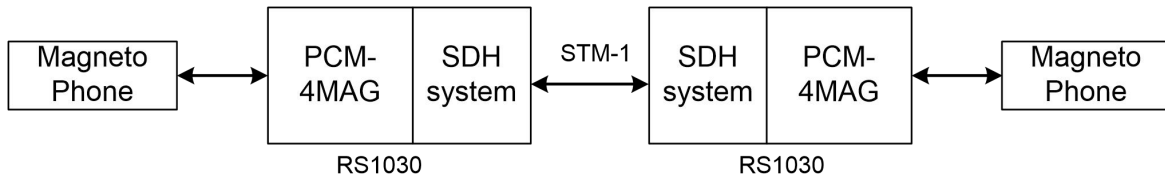


Figure 2-4-4-3-1 PCM-4MAG Application

Each PCM-4MAG module adopts one RJ48C connector which provides 4 telephone channels, the interface definition and CH ACT indicators are as Table 2-4-4-3-1 shows:

Table 2-4-4-3-1 PCM-4MAG interface definition and CH ACT Indicators

Interface Definition		
No.	Name	Definition
PIN1	T1	T pin of telephone channel 1
PIN2	R1	R pin of telephone channel 1
PIN3	T2	T pin of telephone channel 2
PIN4	R2	R pin of telephone channel 2
PIN5	T3	T pin of telephone channel 3
PIN6	R3	R pin of telephone channel 3
PIN7	T4	T pin of telephone channel 4
PIN8	R4	R pin of telephone channel 4
CH ACT Indicators		
Magneto Phone channel indicator, green	ON	Local hand-cranked or receive ringing
	OFF	No hand-cranked or receive ringing

2.4.4.4 2/4 wire E&M audio module - PCM-2EM-2/4

Each PCM-2EM-2/4 module provides a 2ch 2/4 wire E&M audio without signaling, supports 2/4 Wire mode online switch. It can achieve A/D and D/A conversion, audio interface level adjustment, etc. Refer to Figure 2-4-4-4-1, 2-4-4-4-2 shows for its application.

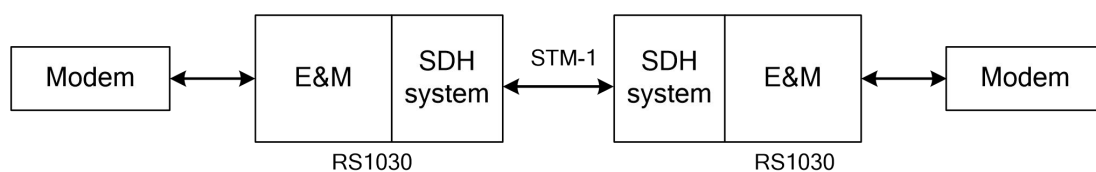


Figure 2-4-4-4-1 PCM-2EM-2/4 Application 1

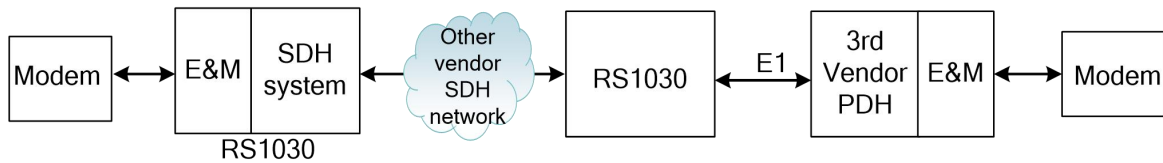


Figure 2-4-4-2 PCM-2EM-2/4 Application 2

Each PCM-2EM-2/4 module adopts one RJ48C connector, the interface definition and CH ACT indicators are as Table 2-4-4-4-1 shows:

Table 2-4-4-4-1 PCM-2EM-2/4 interface definition and CH ACT Indicators

Interface Definition		
No.	Name	Definition
PIN1	T1	Audio channel 1, input/output(2 wire) or output (4 wire)
PIN2	R1	Audio channel 1, input/output(2 wire) or output (4 wire)
PIN3	T2	Audio channel 2, input/output(2 wire) or output (4 wire)
PIN4	R2	Audio channel 2, input/output(2 wire) or output (4 wire)
PIN5	T1a	Audio channel 1, output (4 wire)
PIN6	R1a	Audio channel 1, output (4 wire)
PIN7	T2a	Audio channel 2, output (4 wire)
PIN8	R2a	Audio channel 2, output (4 wire)
CH ACT Indicators		
E&M audio indicator		OFF all the time

2.4.4.5 RS232 interface module - PC-2RS232

Each PCM-2RS232 provides a 2ch RS232 asynchronous interface, each channel occupies one 64K time slot, supports rate from 0Kbps~19.2Kbps. Refer to Figure 2-4-4-5-1 shows for its application.

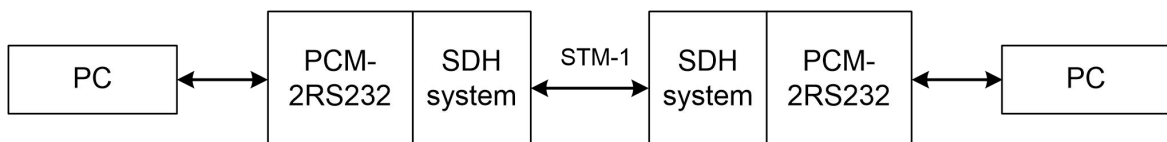


Figure 2-4-4-5-1 PCM-2RS232 Application

Each PCM-2RS232 module adopts one RJ48C connector with 2 RS232 channels, the interface definition and CH ACT indicators are as Table 2-4-4-5-1 shows:

Table 2-4-4-5-1 PCM-2RS232 interface definition and CH ACT Indicators

Interface Definition		
No.	Name	Definition
PIN1	T1	Serial data output of channel 1 (RS232 level)
PIN2	R1	Serial data input of channel 1 (RS232 level)
PIN3	GND	Ground of channel 1
PIN4	NC	-
PIN5	T1	Serial data output of channel 2 (RS232 level)
PIN6	R1	Serial data input of channel 2 (RS232 level)
PIN7	GND	Ground of channel 2
PIN8	NC	-
CH ACT Indicators		
RS232 channel indicator, green	Blink	Normal link and there are data transmitting and receiving.
	OFF	No link or the interface is damaged.

2.4.4.6 RS485 interface module - PCM-2RS485

Each PCM-2RS485 provides a 2ch RS485 asynchronous interface, each channel occupies one 64K time slot, supports rate from 0Kbps ~ 19.2Kbps, half-duplex mode. Refer to Figure 2-4-4-6-1 shows for its application.

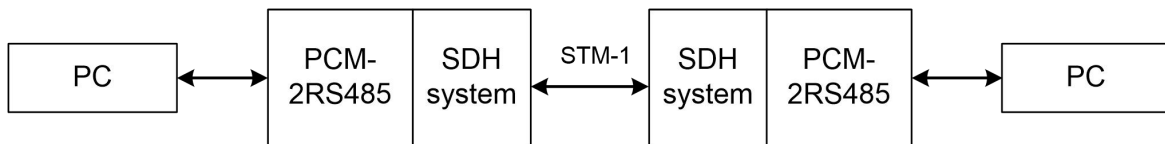


Figure 2-4-4-6-1 PCM-2RS485 Application

Each PCM-2RS485 module adopts one RJ48C connector with 2 RS485 channels, the interface definition and CH ACT indicators are as Table 2-4-4-6-1 shows:

Table 2-4-4-6-1 PCM-2RS485 interface definition and CH ACT Indicators

Interface Definition		
No.	Name	Definition
PIN1	T1	Serial data output of channel 1 (RS485 level)
PIN2	R1	Serial data input of channel 1 (RS485 level)
PIN3	GND	Ground of channel 1
PIN4	NC	-
PIN5	T1	Serial data output of channel 2 (RS485 level)

PIN6	R1	Serial data input of channel 2 (RS485 level)
PIN7	GND	Ground of channel 2
PIN8	NC	-
CH ACT Indicators		
RS485 channel indicator, green	Blink	Normal link and there are data transmitting and receiving.
	OFF	No link or the interface is damaged.

2.4.4.7 64K data module - PCM-2CD64K

Each PCM-2CD64K provides a 2ch 64K data interface, complies with ITU-T G.703, each channel occupies one 64K time slot.

Each PCM-2CD64K module adopts one RJ48C connector with two 64K data channels, the interface definition and CH ACT indicators are as Table 2-4-4-7-1 shows:

Table 2-4-4-7-1 PCM-2CD64K interface definition and CH ACT Indicators

Interface Definition		
No.	Name	Definition
PIN1	TP1	Balanced 64K data interface output P of channel 1
PIN2	TN1	Balanced 64K data interface output N of channel 1
PIN3	TP2	Balanced 64K data interface output P of channel 2
PIN4	TN2	Balanced 64K data interface output N of channel 2
PIN5	RP1	Balanced 64K data interface input P of channel 1
PIN6	RN1	Balanced 64K data interface input N of channel 1
PIN7	RP2	Balanced 64K data interface input P of channel 2
PIN8	RN2	Balanced 64K data interface input N of channel 2
CH ACT Indicators		
64Kdata channel indicator, green	ON	No loss of signal alarm
	OFF	Loss of signal

2.4.5 CLIUB4/8-BNC Card

CLIUB4/8-BNC is the unbalanced E1 card providing 4/8 E1 balanced interfaces with a bit rate of 2.048 Mb/s, which is compliant to ITU-T G.703 standard. It adopts BNC connector as its physical interface.

3 Typical Application

BD-MSOT can be used as Terminal Multiplexer (TM) or an Add-Drop-Multiplexer (ADM) to build a point-to-point, ring or chain transmission network. As following figure shows:

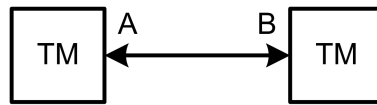


Fig. 3-1 Point to point network

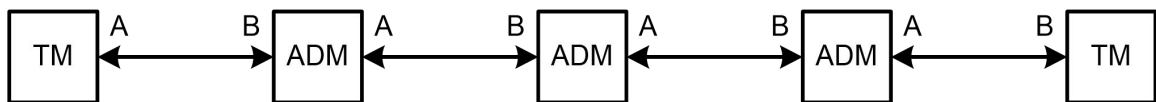


Fig. 3-2 Chain network

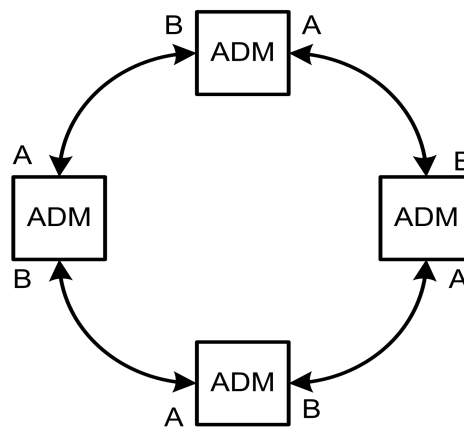


Figure 3-3 Ring network

Note: Make sure optical A of one NE must be connected with optical B of its neighboring NE.

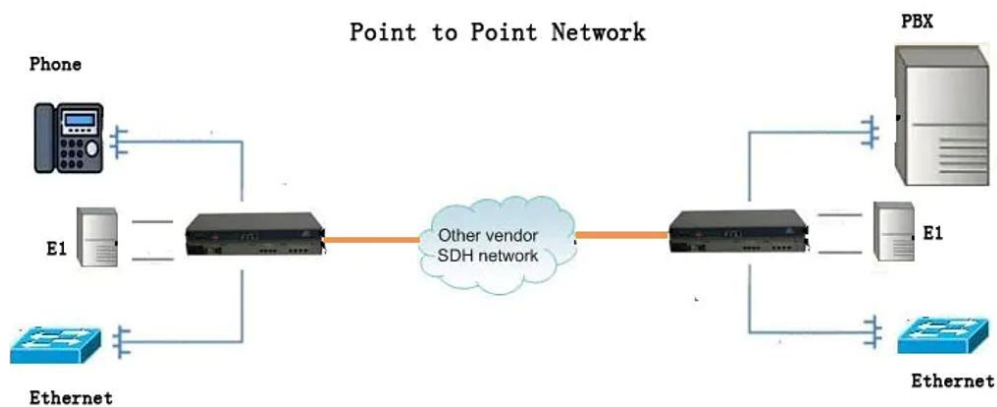


Figure 3-4 PCM+Ethernet+E1 application

Note: About the other application diagram of PCM, please refer to section 2.4.4 for more.

4 Panel Description

4.1 Front Panel

The front panel is arranged with optical interfaces, address switch, work status indicators, alarm indicators, management interfaces and alarm tone button, as Fig.4-1 shows:

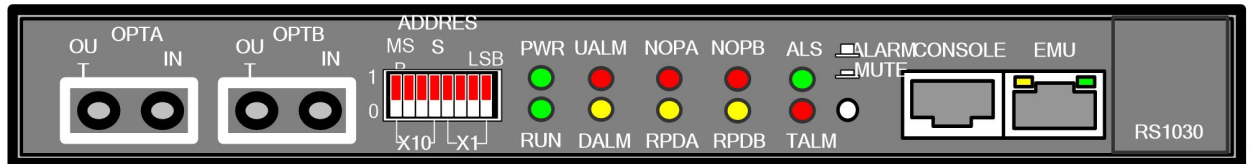


Fig. 4-1 Front Panel

Table 4-1-1 Switches on front panel

Name	Functional Description
MUTE	Alarm tone button; ON (the button is pressed): alarm tone is not allowed OFF (the button is released): alarm tone is allowed Note: If an alarm is shielded by software, this alarm cannot trigger the alarm tone.
ADDRESS	NE address switch The range of the device address is from 00 to 98, which is set by the address switch on the front panel. As Fig. 4-1 shows, the left 4-digit of the switch stands for tens of decimal figures, while the right 4-digit is 0--9. The code mode is 8421 BCD. ON means '0', OFF means '1'. For example, the address of '10011000' is '98' Note: the device address is unique mark used for network element management. Different devices in a network can't be set to the same address.

Table 4-1-2 Indicators on front panel

Name	Description
PWR	Power indicator, green ON: Power supply is normal OFF: Power down or something wrong with it.
RUN	Running indicator, green. BLINK: Device works normally (the blink cycle is 0.3s) Quickly blink: Device initializing (the quickly blink cycle is 0.1s)

	Slowly blink: Data transferring from ARM to FLASH (the slowly blink cycle is 1s) ON or OFF: Abnormal working status
UALM	Urgent alarm indicator, red ON: Urgent alarm present OFF: No urgent alarm Note1: Refer to Table 5-14-1 to see more about urgent alarm Note2: The alarm shielded by the management software cannot trigger the UALM indicator
DALM	Non-urgent alarm indicator, yellow. ON: Non-urgent alarm present OFF: No non-urgent alarm Note1: Refer to Table 5-14-1 to see more about Non-urgent alarm Note2: The alarm shielded by the management software cannot trigger the DALM indicator
NOPA/B	Optical signal loss alarm indicator ,red ON: Optical signal loss is detected at port A/B OFF: SFP works normally or no SFP module present in the socket, or optical interface is disabled by management software or NOP alarm is shielded by software. Note: When the fiber is broken, if ALS is enabled, the interface will start sending a laser pulse in a certain interval periodically. When the fiber is healed, the emitter will send laser after a while as ALS is enabled. Thus, if the fiber has already recovered, this indicator will still be ON for a short time, and then be OFF.(if ALS worked in short interval mode, the time delay is about 12.5s; while if ALS worked in long interval mode, this time delay is about 100s)
RPDA/B	Remote device power-down indicator, yellow ON: Remote power down Note1: RPDA/B must be used combined with NOP LED to indicate the remote power down or fiber break. Refer to 5.5 'RPD' for more. Note2: if RPD alarm is shielded by management software, or no SPF module present in the socket, the corresponding RPD alarm of the corresponding optical interface will be off.
TALM	TLOS of E1 port indicator, red. ON: TLOS alarm is detected on at least one E1 port OFF: TLOS alarm is detected on none of E1 ports or E1 card is not present on the socket or E1 interface is closed by management software(inactive) or no timeslot is assigned to the E1 interface

ALS	ALS indicator, green ON: ALS function of the two optical interfaces are configured as enabled simultaneously by management software; OFF: ALS function of the two optical interfaces are configured as disabled simultaneously by management software; Note: The ALS function of optical A and B must be configured as enable or disable simultaneously; only when the corresponding optical interface detects a Loss of signal and the ALS is enabled by the management software, that particular optical interface will enter into the ALS state.
-----	---

Table 4-1-3 EMU interface indicators

LINK/ACTIVE	Ethernet link indicator, green ON: Normal link but no data transmit or receive; Blink: Normal link and there are data transmitting and receiving; OFF: No link or the interface is damaged
SPEED	Ethernet speed indicator, yellow ON: operating with 100M; OFF: operating with 10M

Table 4-1-4 Interfaces on front panel

Name	Functional Description	Remark
OPTA/B	STM-1 optical port A and B, perform STM-1 signal transmitting and receiving; It is SFP optical interface, supports HOT-SWAP	Before using fiber to connect the two devices, the parameters of STM-1 optical interface (Mean launched power– maximum and Minimum overload) should be considered carefully, otherwise, the optical module may be damaged.
CONSOLE	Serial network management interface (RJ-45 interface), for CLI management	Refer to appendix 1 for the cable definition
EMU	Ethernet network management interface (RJ-45 interface), for SDH network management	crossover and straight through cable auto-adaptive

4.2 Rear Panel



Fig. 4-2-1 Rear panel 1

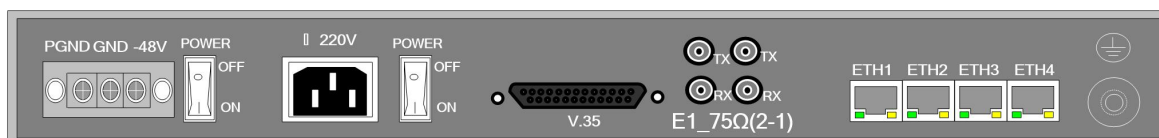


Fig. 4-2-2 Rear panel 2

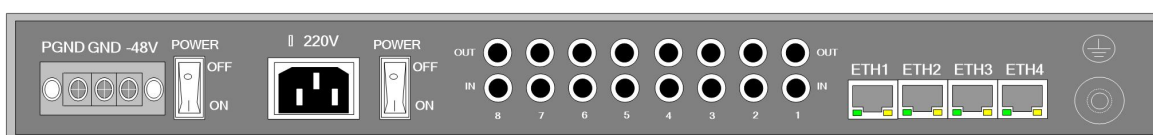


Fig. 4-2-3 Rear panel 3

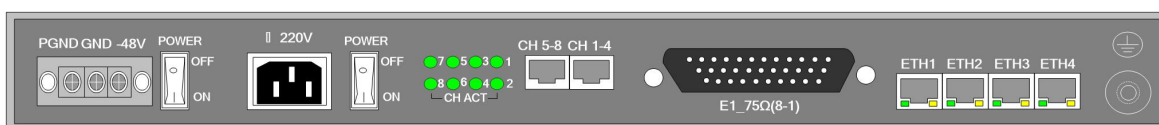


Fig. 4-2-4 Rear panel 4

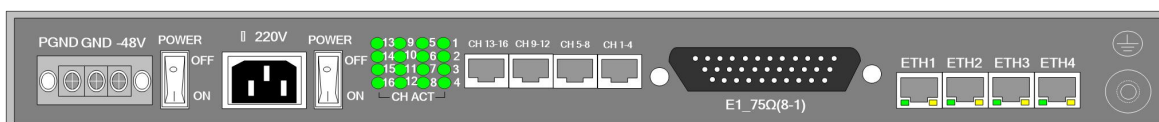


Fig. 4-2-5 Rear panel 5

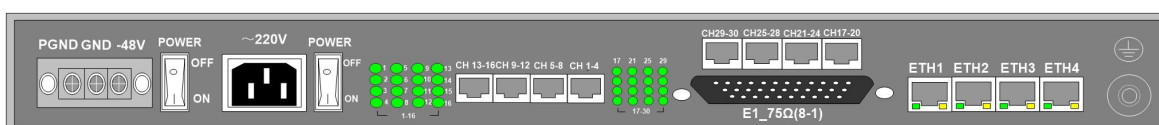


Fig. 4-2-6 Rear panel 6

Table 4-2 Rear panel description

Name	Functional description
-48VIN	-48V AC power interface, the accepted voltage ranges from -36 to -72V.
PGND	Protective ground, connected internally with the RS7000 rack.
BGND	-48V power ground
~220VIN	~220V AC power interface, the permitted voltage range is: 85~264V

Power	Power switch. 'I': Power on; 'O': Power off
E1/V.35 /PCM Interface	As Figure 4-2-1 shows, if CLIU8/4 E1 card is installed, there are 8/4 E1 unbalance interfaces(DB37) available, the DB37F-BNC-8E1/4E1 cable adapter is needed, refer to appendix 2; if CLIUB8/4-B E1 card is installed, there are 8/4 E1 balanced interfaces(RJ48C) available. As Figure 4-2-2 shows, If CLIU2V card is installed, there are two E1 unbalanced interface(BNC connector) and one V.35 interface(DB25 connector); For V.35 interface, if used as DCE(default), the DB25M-M34F cable is needed; if used as DTE, the DB25M-M34M cable is needed. As Figure 4-2-3 shows, if CLIU8/4-BNC card is installed, there will be 8/4 E1 unbalance interfaces(BNC) available. As Figure 4-2-4, Figure 4-2-5, Figure 4-2-6 shows, if CLIU8CH8 or CLIU8CH16 or CLIU8CH30 card is installed, there are 8 E1 interface (DB37, unbalanced in default, combined with DB37F-BNC-8E1 cable adapter. For balanced E1 interface, it combined with DB37F-RJ48C-8E1 cable adapter, as Appendix 2 shows. Please declare when placing an order.)+8/16/30 CH interface, PCM interface adopts RJ48C connector, refer to 2.4.4 “PCM card” for more If no card is installed, there are no E1 interfaces or V.35 or CH interface
Ethernet interface	4 electrical Ethernet interfaces (RJ45 connector), auto-detect the cross-over and straight-through cable. Refer to 5.6 “Ethernet function” for more.
	Protective ground (PGND) screw, connect with the chassis. The PGND screw should be connected to the equipment room ground by the external PGND cord.

5 Functional Description

5.1 Cross-Connection

BD-MSOT supports cross-connection with TU-12 granularity, by which, the E1 and EOS traffic can be assigned to any timeslot of OPTA/B, thus, it is easy to implement E1 and Ethernet transmission over SDH.

The creation and deletion of cross-connection can be implemented by management software or CLI command:

- ✧ Create connection: Create one or more VC-12 connection between the service interface and optical interface. Notice: for EOS service, the total bandwidth of 4VCGs is 63 VC-12 and the maximum bandwidth of each VCG is 48 VC-12 (100Mbps);
- ✧ Delete connection: Delete one or more VC-12 connection to release the timeslot resource occupied, the resource can be employed by other VC-12 cross-connection.

Note:

The TU-AIS alarm can be inserted into uplink timeslots. There is no connection in factory default settings, all the timeslots are free, and at this time, the TU-AIS will be inserted into the uplink timeslot of OPTA and OPTB.

5.2 Protection Architecture

BD-MSOT supports 1+1 path protection mode (SNCP). When the connection is created, the operator can decide which connection needs protection. If the connection does not need protection (1+0), the optical line can carry more user traffics.

5.2.1 1+1 mode

As Fig.5-2-1 shows, it is a two fiber ring topology application. For 1+1 path protection mode, in NE1, the client traffic is always transmitted in two directions, taking the same time slot, over the both working and protection path (VC-12 or timeslot) simultaneously. At the sink end of NE2, the same traffic signals come from the two directions along with the fibers. When auto protection is enabled, the NE2 can select the better one from the two available traffic signals. If NE2 is receiving from the West currently, it will turn to receive from the East immediately when the signal from the West is failure due to fiber broken or any fault else. In this case this traffic occupies the same time slot of VC 12 of both the East and West directions fibers. Therefore, the transmission bandwidth available is only up to 63 VC-12.

Note: The '.....' in Figure 5-2-1 indicates the omitted SDH equipment; The NE1 and NE2 in Figure 5-2-1 indicates the BD-MSOT equipment respectively.

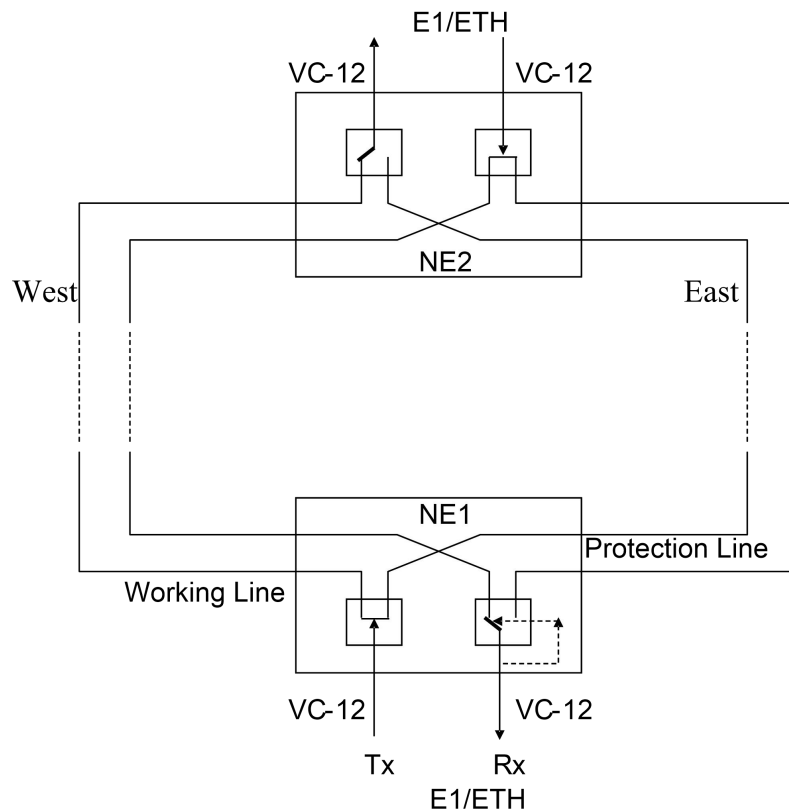


Fig. 5-2-1 1+1 mode

In 1+1 mode, each connection can be configured as “Enable Auto Protection” and “Disable Auto Protection”.

■ Enable Auto protection

When fiber break or the expected alarm occurring, the system will detect the fault and automatically switches to the protection path. By default, the trigger conditions are: TU-AIS, TU-LOP alarm. The other alarms, such as RS-TIM, MS-EXC, HP-EXC, HP-DEG, HP-TIM, HP-UNEQ, HP-PLM or HP-AIS can be added via management software.

When both working and protection path work normally, user can select “preferred A” or “preferred B” so that the traffic will be carried by the preferred path. If alarm occurs in the preferred path, the system will automatically switches to the protection path. After the fault disappears for a period of time (The length of time can be set by RAYVIEW), the system will switch back to the preferred path.

Note: The preferred switch command won't be lost after restarting device (the device is power off). E.g.: if it is preferred A status, after power on, the device will still work on preferred A status.

■ Disable Auto Protection

Whether the alarm presents on the corresponding timeslot or not, the system will not perform protection switch automatically.

- Forced to A/B: the switch protection can be performed regardless of the alarm present on the corresponding timeslot or not.

Note: the forced switch configuration will be lost after restarting device (the device is power off).
E.g.: if it is forced to A status, after power on, the device will still work on the initial state when auto protection is disabled.

The protection configuration can be implemented by management software or CLI command, refer to 'RayView management software user guide' and 'Guide to CLI command of BD-MSOT' for more.

5.2.2 1+0 mode

As Fig.5-2-2 shows: in 1+0 mode, the client traffic is transmitted over the dedicated working path without protection path standby. There is no protection path so the path of port A and port B with the same VC-12 No. can be transmitted to different client traffic, therefore, the transmission bandwidth available efficiency can increased double, that is the transmission bandwidth available can be up to (63×2) VC-12. Refer to 'RayView management software user guide' and 'Guide to CLI command of BD-MSOT' for more about the configuration.

Note: 1+0 mode is only available for E1 service, the Ethernet service cannot be configured for this mode!

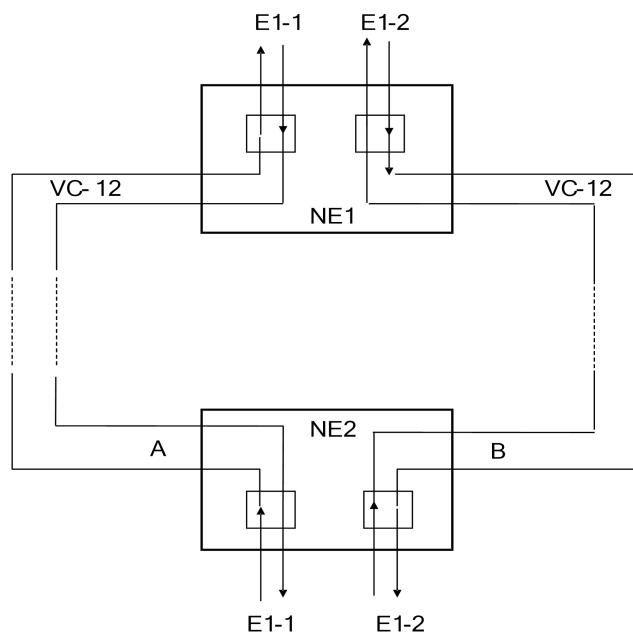


Fig. 5-2-2 1+0 mode

5.3 TU-12 Order

In order to be able to communicate with the equipment from other vendors, the two optical ports of BD-MSOT supports three different concatenation types simultaneously: logic order, path order and line order. The default type is path order; it can be changed by CLI command.

Note: Before changing the TU-12 order type of an optical interface, the corresponding optical interface and the related cross-connection should be deleted first.

Table 5-3-1 Three types of TU-12 order

TUG3	TUG2	TU-12	Logic Order	Path Order	Line Order
1	1	1	1	1	1
2	1	1	22	2	22
3	1	1	43	3	43
1	2	1	2	4	4
2	2	1	23	5	25
3	2	1	44	6	46
1	3	1	3	7	7
2	3	1	24	8	28
3	3	1	45	9	49
1	4	1	4	10	10
2	4	1	25	11	31
3	4	1	46	12	52
1	5	1	5	13	13
2	5	1	26	14	34
3	5	1	47	15	55
1	6	1	6	16	16
2	6	1	27	17	37
3	6	1	48	18	58
1	7	1	7	19	19
2	7	1	28	20	40
3	7	1	49	21	61
1	1	2	8	22	2
2	1	2	29	23	23
3	1	2	50	24	44
1	2	2	9	25	5
2	2	2	30	26	26
3	2	2	51	27	47
1	3	2	10	28	8
2	3	2	31	29	29

3	3	2	52	30	50
1	4	2	11	31	11
2	4	2	32	32	32
3	4	2	53	33	53
1	5	2	12	34	14
2	5	2	33	35	35
3	5	2	54	36	56
1	6	2	13	37	17
2	6	2	34	38	38
3	6	2	55	39	59
1	7	2	14	40	20
2	7	2	35	41	41
3	7	2	56	42	62
1	1	3	15	43	3
2	1	3	36	44	24
3	1	3	57	45	45
1	2	3	16	46	6
2	2	3	37	47	27
3	2	3	58	48	48
1	3	3	17	49	9
2	3	3	38	50	30
3	3	3	59	51	51
1	4	3	18	52	12
2	4	3	39	53	33
3	4	3	60	54	54
1	5	3	19	55	15
2	5	3	40	56	36
3	5	3	61	57	57
1	6	3	20	58	18
2	6	3	41	59	39
3	6	3	62	60	60
1	7	3	21	61	21
2	7	3	42	62	42
3	7	3	63	63	63

5.4 Automatic Laser Shutdown

In order to minimize or eliminate risk of exposure to laser radiation from fiber breaks, all optical

interfaces in the BD-MSOT support the Automatic Laser Shutdown (ALS) function.

When an optical interface detects a Loss of Signal (LOS) for 800ms, it will enter into an ALS state. The interface will then start sending a laser pulse in a certain interval periodically (10/100s cease and 2s transmit) in order to restore as the fiber is healed.

In default, ALS is enabled and it works in short interval mode. The ALS function of BD-MSOT can be disabled.

BD-MSOT also supports manually send a laser pulse when ALS is enabled, using manual function to send restart pulse to restore the laser within 2s when fiber is healed; if fiber is still broken, the laser only lasts for 2s, after that, it will automatically send pulse in a certain interval again.

BD-MSOT supports ALS configuration through RayView management software or CLI command, such as enable/ disable ALS, manual send pulse, long interval/short interval settings and so on, refer to 'RayView management software user guide' and 'Guide to CLI command of BD-MSOT' for more.

Note:

- (1) Enable or disable ALS is just means that the ALS function is effective configured by management software, only when the corresponding optical interface detects a Loss of signal and the ALS is enabled by the management software, that particular optical interface will enter into the ALS state.
- (2) ALS should be disabled when measuring Average Optical Transmit Power and Receiving Sensitivity.

5.5 Remote Power down Detection

During the equipment installation and daily maintenance, there will be defects such as the broken of optical fiber line or power-off of the remote equipment. RPD is used to distinguish these two defects. With the management software or the RPD alarm LED on the front of the device, the operator can view whether the RPD alarm presents.

Table 5-5 lists the corresponding alarm LED status in case of fiber broken or device power down.

Table 5-5 RPD and NOP case

Case Alarm	Both remote and optical fiber are normal	Power-off at remote and optical fiber is normal	Remote is normal, optical fiber is broken
RPD alarm	Off	Occur	Off
NOP alarm	Off	Off	Occur

5.6 Ethernet function

BD-MSOT provides four electrical fast Ethernet interfaces (LAN interface), compatible with IEEE802.3u 100Base-TX/ IEEE802.3 10Base-T standard. Each interface supports auto-negotiation, which can work in 100M full/half-duplex, 10M full/half-duplex mode; it can also be set to 100M full/half-duplex, 10M full/half-duplex mode by force. The default is auto-negotiation. Each LAN interface supports flow-control separately.

BD-MSOT provides four WAN interfaces (inside and invisible) compatible with IEEE802.3/802.3u standard, each WAN interface is fixed to 100M full-duplex mode, employed a VCG separately, each VCG can be assigned to 1~48 VC-12 and the total bandwidth of the 4 VCGs is 63 VC-12 at most.

BD-MSOT supports up to 1536/1552 bytes per Ethernet frame, it can be configured by management software to meet the user's needs. In default, the maximum packet length is 1552 bytes.

In order to meet the user's various requirements, BD-MSOT supports the following three MAC address table aging modes, which can be configured by management software:

- Quick aging: The MAC address learning is enabled and the aging time is 12s;
- Standard aging: The MAC address learning is enabled and the aging time is 300s;
- Close aging: The MAC address learning is disabled and the MAC address table is not affected by the aging time. (Suitable for fault testing).

Refer to 'Guide to CLI command of BD-MSOT' or 'RayView management software user guide' for more.

5.7 VLAN Function

5.7.1 Port-based VLAN

Port-based VLAN is used to assign each port of one switch to a separate VLAN, or multiple ports to the same VLAN. Port-based VLAN can't across different switches.

Port-based VLAN doesn't require its bridge to recognize the VLAN-tagged frames or to look up the VLAN table; Packets received from a port will only go forward to its associated ports - port members, so you must define the port member for each port, that is, to define the final destination ports allowed for each port, as Fig. 5-7-1-1 shows:

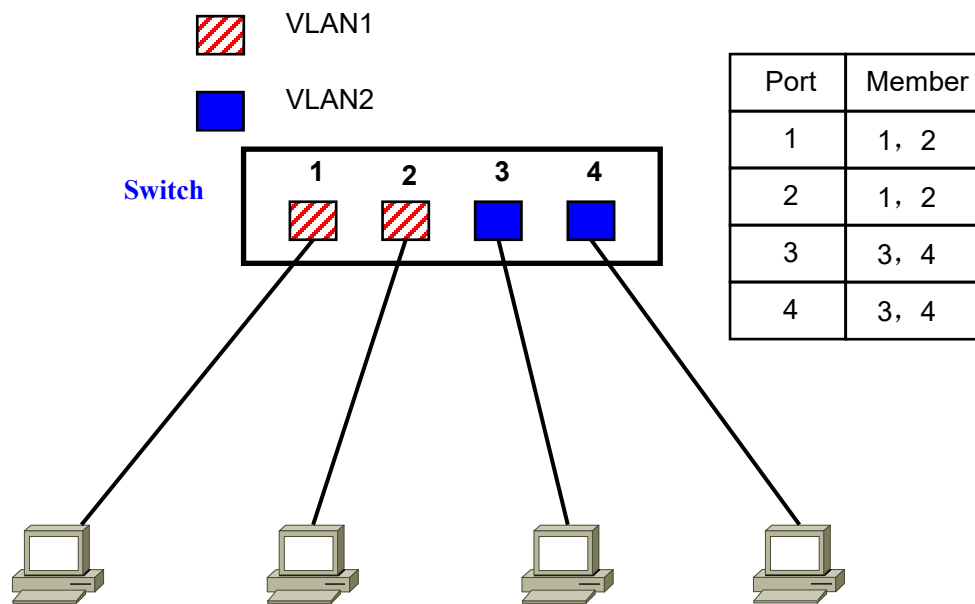


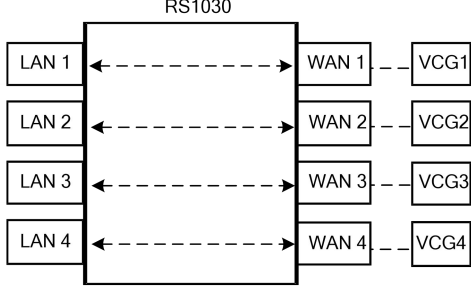
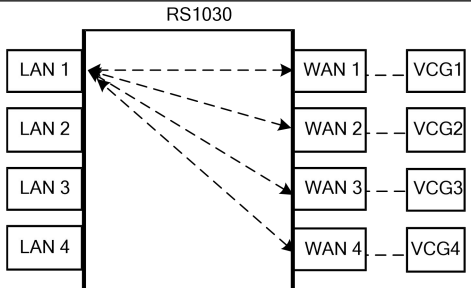
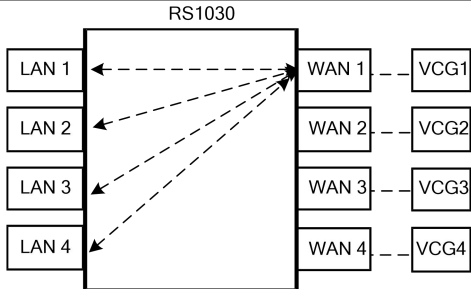
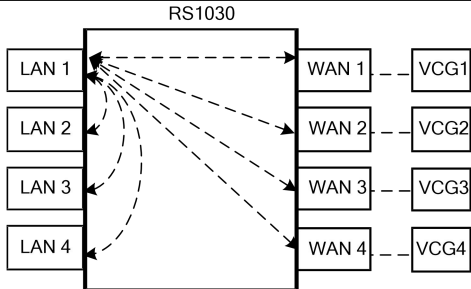
Fig. 5-7-1-1 Port-based VLAN

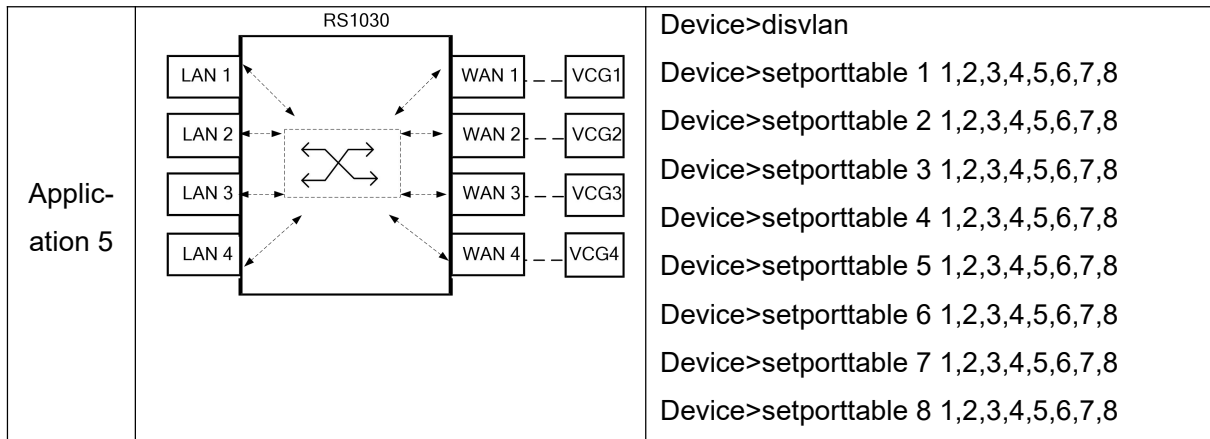
Fig. 5-7-1-1 is the diagram for a switch with 4 ports, while BD-MSOT provides 8 ports at most (4 LAN ports and 4 WAN ports). BD-MSOT can also support Port-based VLAN function, which can be configured by both RayView management software and CLI command. As WAN interfaces are the internal ports, and each WAN port corresponds a VCG, some VLAN configurations (such as: isolate the 8 ports from each other) is unnecessary. To facilitate the operation for users, RayView management software provides 5 fixed applications to do VLAN configuration, as Table 5-7-1 shows; All the users have to do is to select the associated application for each port, the default application is application1, refer to 'RayView management software user guide' for more.

For CLI command, there is no application selection of VLAN, users have to do VLAN configuration one command by one command, here will give several CLI commands for the corresponding VLAN applications in Table 5-7-1, refer to 'Guide to CLI command OF BD-MSOT ' for more.

Table 5-7-1 Port-based VLAN Application illustration

Applic- ation	Diagram	CLI Command
------------------	---------	-------------

Application 1		<pre>Device>disvlan Device>setporttable 1 1,5 Device>setporttable 2 2,6 Device>setporttable 3 3,7 Device>setporttable 4 4,8 Device>setporttable 5 1,5 Device>setporttable 6 2,6 Device>setporttable 7 3,7 Device>setporttable 8 4,8</pre> Note: 1: LAN1; 2: LAN2; 3: LAN3; 4: LAN4 5: WAN1; 6: WAN2; 7: WAN3 8: WAN4
Application 2		<pre>Device>disvlan Device>setporttable 1 1,5,6,7,8 Device>setporttable 5 1,5 Device>setporttable 6 1,6 Device>setporttable 7 1,7 Device>setporttable 8 1,8</pre>
Application 3		<pre>Device>disvlan Device>setporttable 5 1,2,3,4,5 Device>setporttable 1 1,5 Device>setporttable 2 2,5 Device>setporttable 3 3,5 Device>setporttable 4 4,5</pre>
Application 4		<pre>Device>disvlan Device>setporttable 1 1,2,3,4,5,6,7,8 Device>setporttable 5 1,5 Device>setporttable 6 1,6 Device>setporttable 7 1,7 Device>setporttable 8 1,8 Device>setporttable 2 1,2 Device>setporttable 3 1,3 Device>setporttable 4 1,4</pre> Note: Currently, only RayView management software support application 4, CLI do not support the application 4, that is, the CLI commands for application 4 above is invalid.



5.7.1.1 Typical Application for port-based VLAN

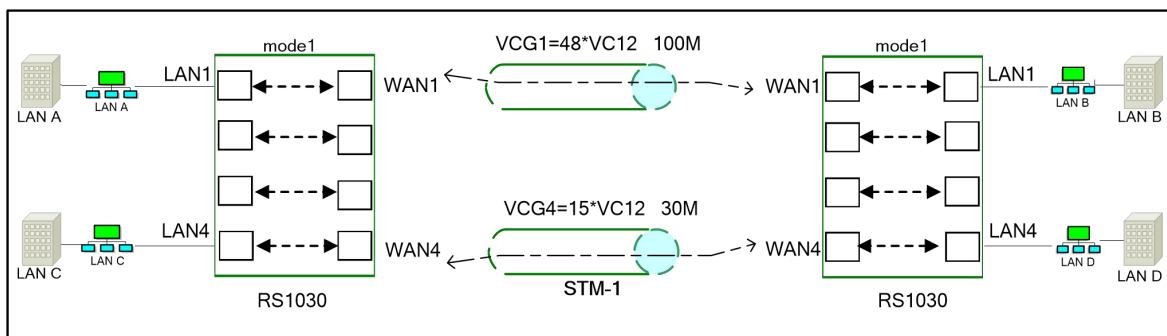


Fig. 5-7-1-1-1 Application I for port-based VLAN

Note: BD-MSOT can communicate with any equipment complying with ITU-T G.7041, G.7042 and G.707 standard from other vendors. In the application, BD-MSOT in the right side can also be the equipment from other vendors complying with the same standard, the below is the same.

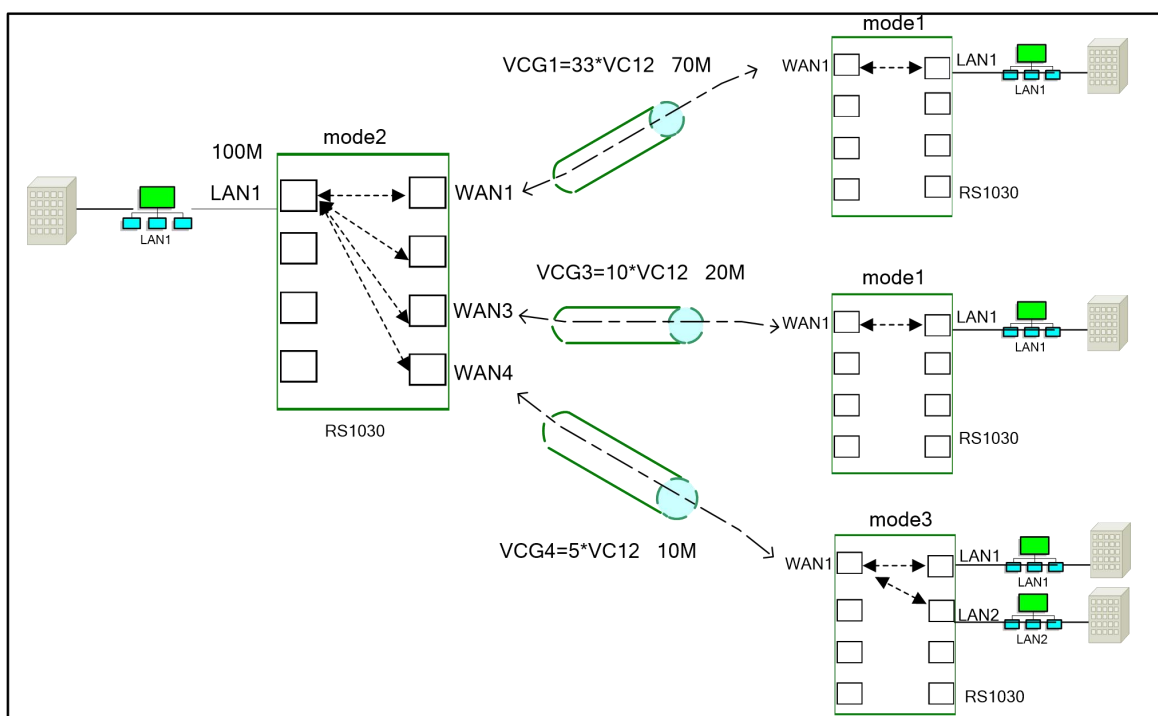


Fig. 5-7-1-1-2 Application II for port-based VLAN

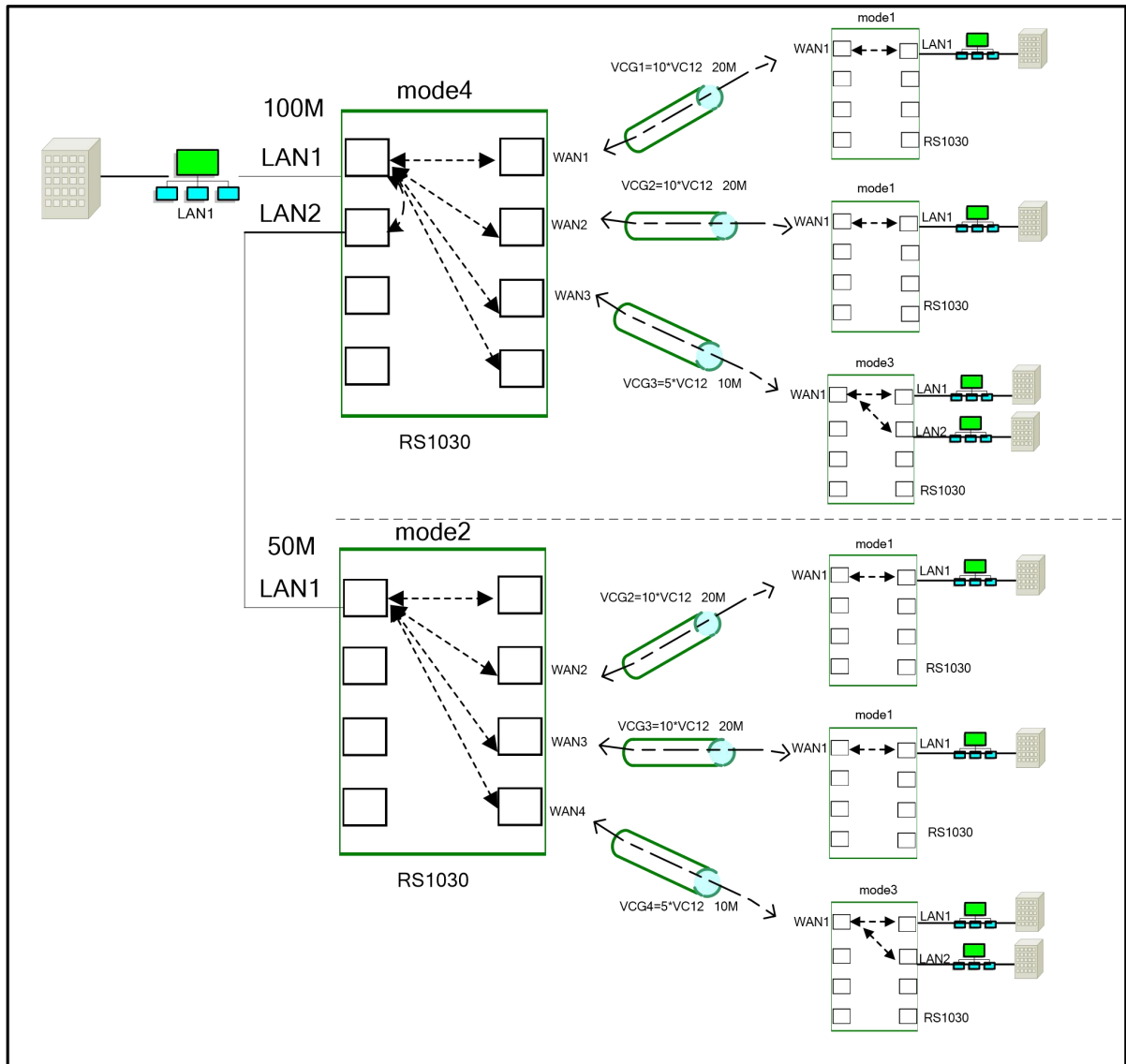


Fig. 5-7-1-1-3 Application III for port-based VLAN

5.7.1.2 Configuration Instance

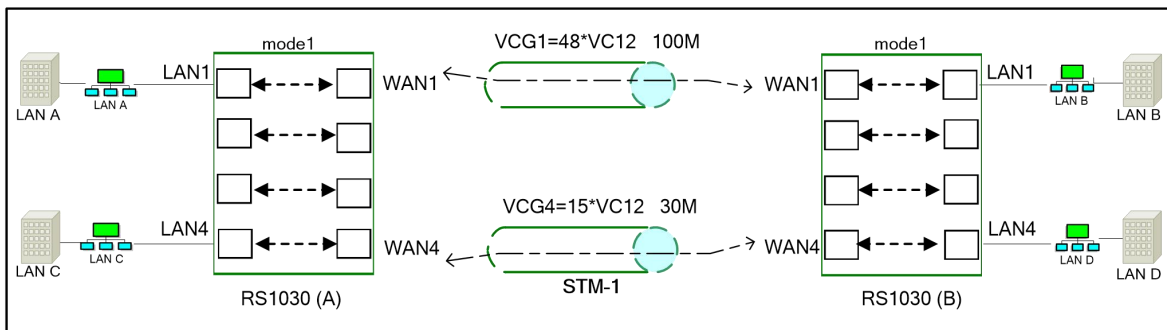


Fig. 5-7-1-2-1 Application I for port-based VLAN

As Fig. 5-7-1-2-1 shows, by creating port-based VLAN to the two equipments (BD-MSOT (A) and BD-MSOT (B)) separately, the following communication can be implemented via VCG

channel:

LAN A<----->LAN B

LAN C<----->LAN D

Configuration steps:

Step 1: Disable the 802.1Q tag-based VLAN of both the two equipments;

Step 2: Configure the port table of BD-MSOT (A), as table5-7-1-2-1 shows:

Table 5-7-1-2-1

port	Port Member
LAN1	LAN1, WAN1
LAN4	LAN4, WAN4
WAN1	LAN1, WAN1
WAN4	LAN4, WAN4

Note: If you use RayView management software to do the configuration, just select application1 for both the LAN interface and the WAN interface.

Step 3: Configure port table for BD-MSOT (B), as table 5-7-1-2-1 shows, therefore, the port-based VLAN has been created for the two equipments;

Step 4: Configure cross-connection for the two equipments, Assign 48 VC-12 to VCG1(WAN1 port) of the two equipments separately, and 15 VC-12 to VCG2 (WAN4 port).

-----Config finish-----

Note: If the 802.1Q Tag-based VLAN is disabled, the VLAN ID and priority is invalid, and the port VLAN mode should be fixed to 'Hybrid'.

5.7.1.3 Network Loop

The usage of Application2, Application4 and Application5 should be taken care. As Fig.5-7-1-3-1 shows, both devices are set as Application5, and that will cause network loop. All the mode configurations resulting in Ethernet abnormal should be forbidden, such as both two sides are set as Application2 or one side is Application2 and the other side is Application5, and so on.

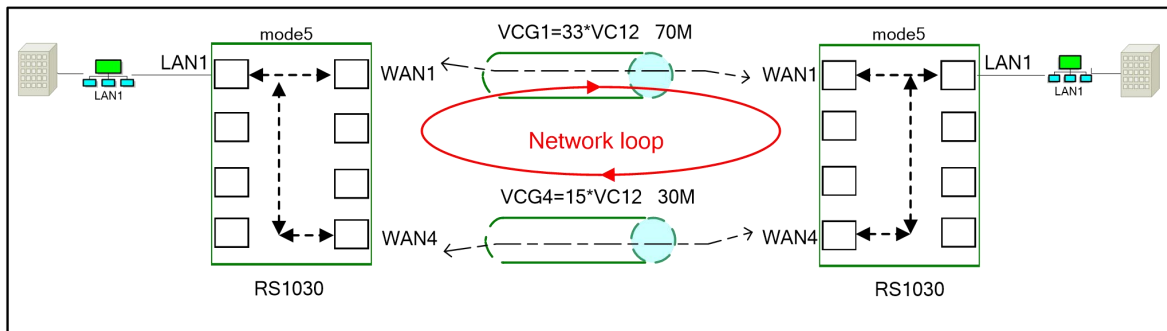


Fig. 5-7-1-3-1 Network Loop Avoiding

5.7.2 802.1Q Tag-based VLAN

The 802.1Q Tag-based VLAN requires its bridge to recognize frames with a VLAN tag; lookup the VLAN table to find out the record whose VLAN ID is identical with the packet tag; forward packet according to both the record of VLAN table and the port members.

The 802.1Q Tag-based VLAN is used to achieve VLAN across switches, that is, it allows the ports of different switches be assigned to the same VLAN, as Fig.5-7-2-1 shows;

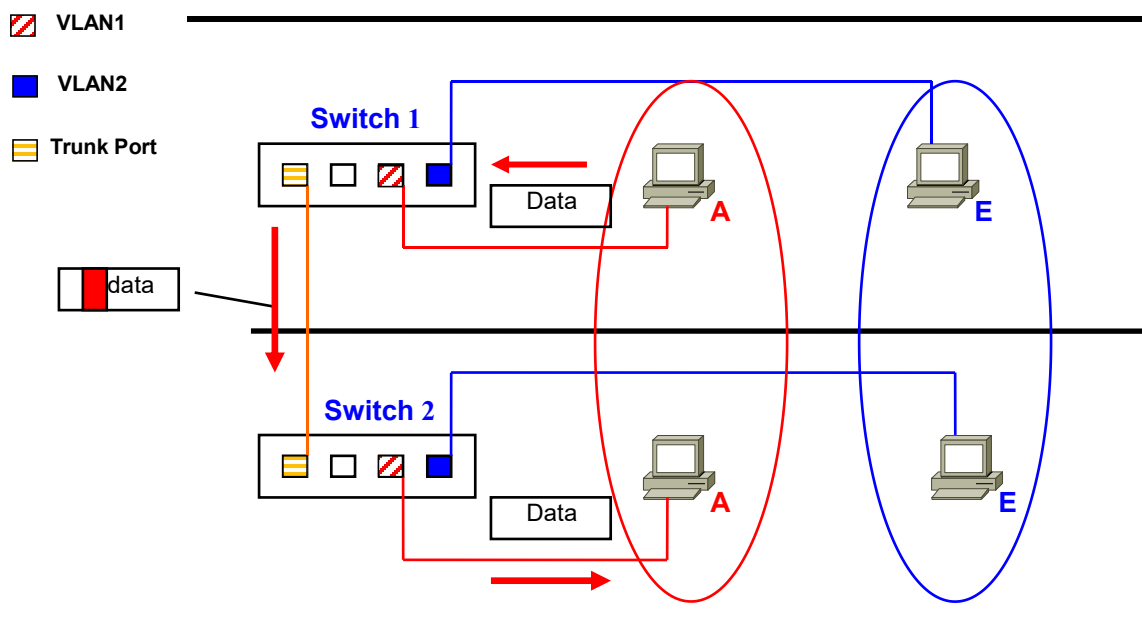


Fig. 5-7-2-1 802.1Q Tag-based VLAN

BD-MSOT supports IEEE802.1Q Tag-based VLAN, which can be configured by RayView management software and CLI command. The 802.1Q Tag-based VLAN will achieve more network application than that configured by port-based VLAN, and it is also important to caution the network loop mentioned above. Refer 'RayView management software user guide' and 'Guide to CLI command OF BD-MSOT' for more

5.7.2.1 802.1Q Tag-based VLAN Term

Tag: 802.1Q VLAN Tag header, which is a field within a frame that identifies the VLAN.

Tagged frame: A data frame that contains 802.1Q VLAN tag header.

Untagged frame: A data frame that does not contain 802.1Q VLAN tag header.

VLAN ID: VLAN IDentification, a unique number (between 1 and 4094) that identifies a particular VLAN. The default VLAN ID is '1'. (VLAN ID=0 is NULLVLAN, 4095 is reserved.)

PVID: Port VLAN ID, a unique number (between 1 and 4094), the default PVID for all the ports is '1'. PVID is an identification used to classify incoming untagged frames when they are received, for example, if PVID of port 1 of switch is '2', it means that any untagged incoming traffic received on port 1 of switch will be considered as traffic of VLAN 2 in the switch.

Access, Trunk, Hybrid: The port mode for VLAN, refer to Table 5-7-2-1 for more.

Table 5-7-2-1 VLAN port mode

Mode	Description	Remark
Access	All the packets received on the ingress of the 'Access port' can only belong to one VLAN; On the ingress of the port, when the tagged packet received on the port, if the VLAN ID is consistent to the port PVID, the packet will be forward; otherwise, the packet will be discarded; when the untagged packet received on the port, the packet will be added on PVID tag, then go forward to the specific VLAN according to the PVID; On the egress of the port, the tag will be removed before forwarding to the end station.	When an Ethernet port is connected with terminal device such as a PC, this port mode is recommended.
Trunk	It is also called Tag-aware port mode; Packets with different Tag received on the ingress of the 'Trunk port' could belong to different VLANs. On the ingress of the port, the received packet that is already VLAN-tagged can be correctly forwarded; the untagged packet received will be added on PVID tag and forwarded to the specific VLAN according to the PVID; On the egress of the port, the tagged packet will be transmitted directly.	when an Ethernet port is connected with device that can distinguish and deal with VLAN tag such as SWITCH with VLAN function, this mode is recommended

Hybrid	Packets with different Tag received on the ingress of the 'Hybrid port' could belong to different VLANs; On the ingress of the port, the process of forwarding in Hybrid mode is the same as that in Trunk mode. On the egress of the port, if it is the untagged packet before entering into the device, the output will be untagged packet on the egress of the port; if it is the tagged packet before entering into the device, the output will be the tagged packet on the egress of the port.	Hybrid Port connects LAN that combines tagged or untagged devices or switches, this port mode can be adopted in more complex environment
--------	--	--

5.7.2.2 Typical Application for 802.1Q tag-based VLAN

The 802.1Q Tag-based VLAN will achieve more network application than that configured by port-based VLAN; it won't be enumerated here.

Note: It is also important to caution the network loop mentioned above.

5.7.2.3 Configuration Instance

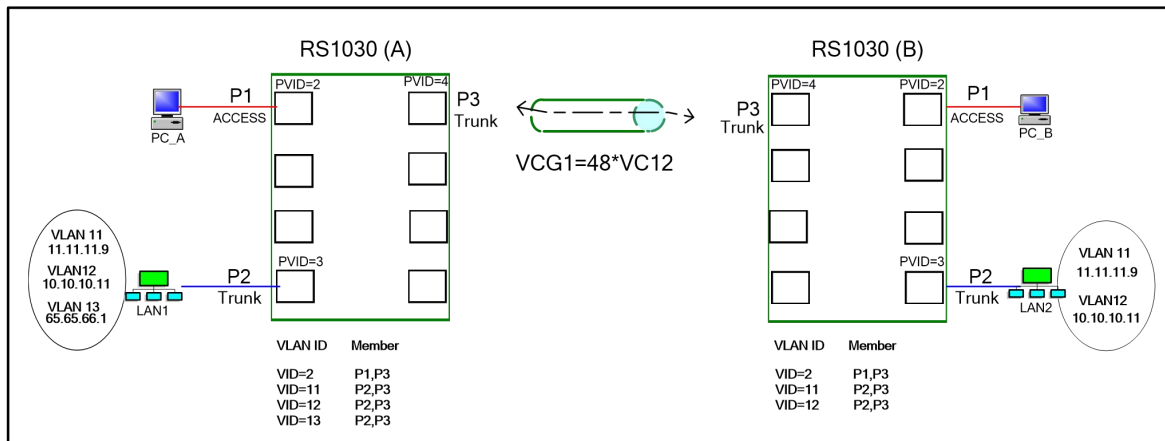


Fig. 5-7-2-3-1 Typical Application for 802.1Q Tag-based VLAN

As Fig. 5-7-2-3-1 shows, the port P1 of the two equipments connects to a PC separately, and port P2 connects to a LAN separately. The following communication can be implemented by VCG channel.

PC_A<----->PC_B
 LAN1(VLAN11,VLAN12)<----->LAN2(VLAN11,VLAN12)

Note:

- 1) Port P1 in Fig. 5-7-2-3-1 is LAN1 port, P2 is LAN4 port, and P3 is WAN1 port;
- 2) Port P2 of BD-MSOT (A) belongs to three different VLANs: VLAN11, VLAN12 and VLAN13; port P2 of BD-MSOT (B) belongs to VLAN11 and VLAN12. The isolation of the three VLANs is implemented by other routers.

Configuration steps:

For equipment A:

Step 1: Enable the 802.1Q tag-based VLAN;;

Step 2: Add the VLAN records in the following table to VLAN table:

VLAN ID	VLAN members
2	P1, P3
11	P2, P3
12	P2, P3
13	P2, P3

Step 3: Configure the port mode for each Ethernet port:

Port	Mode
P1	Access
P2	Trunk
P3	Trunk

Step 4: Configure the port PVID for each Ethernet port

port	VLAN_ID (PVID)	priority
P1	2	0 (default)
P2	3	0 (default)
P3	4	0 (default)

Step 5: Configure the port table for each port

port	Port members
P1	P1, P3
P2	P2, P3
P3	P1, P2, P3

For equipment B:

Step 1: Enable the 802.1Q tag-based VLAN;;

Step 2: Add the VLAN records in the following table to VLAN table:

VLAN ID	VLAN members
2	P1, P3
11	P2, P3
12	P2, P3

Step 3: Configure the port mode for each Ethernet port:

Port	Mode
P1	Access
P2	Trunk
P3	Trunk

Step 4: Configure the port PVID for each Ethernet port

port	VLAN_ID (PVID)	priority
P1	2	0 (default)
P2	3	0 (default)
P3	4	0 (default)

Step 5: Configure the port table for each port

port	Port members
P1	P1, P3
P2	P2, P3
P3	P1, P2, P3

Therefore, the Tag-based VLAN has been created for the two equipments;

Step 6: Configure cross-connection for the two equipments, Assign 48 VC-12 to the VCG1(WAN1 port) of the two equipments separately,

-----Config finish-----

5.8 GFP-F frame

GFP-F (Frame-mapped Generic Framing Procedure) is a protocol specified in the ITU G.7041 which mapping variable length payload into an octet-synchronous transport container. As shown in Figure 5-8-1, the Ethernet frame (not contain of Preamble and Start of Frame Delimiter) is encapsulate into the GFP frame, the GFP FCS, GFP extension header is optional field and the Type is configurable.

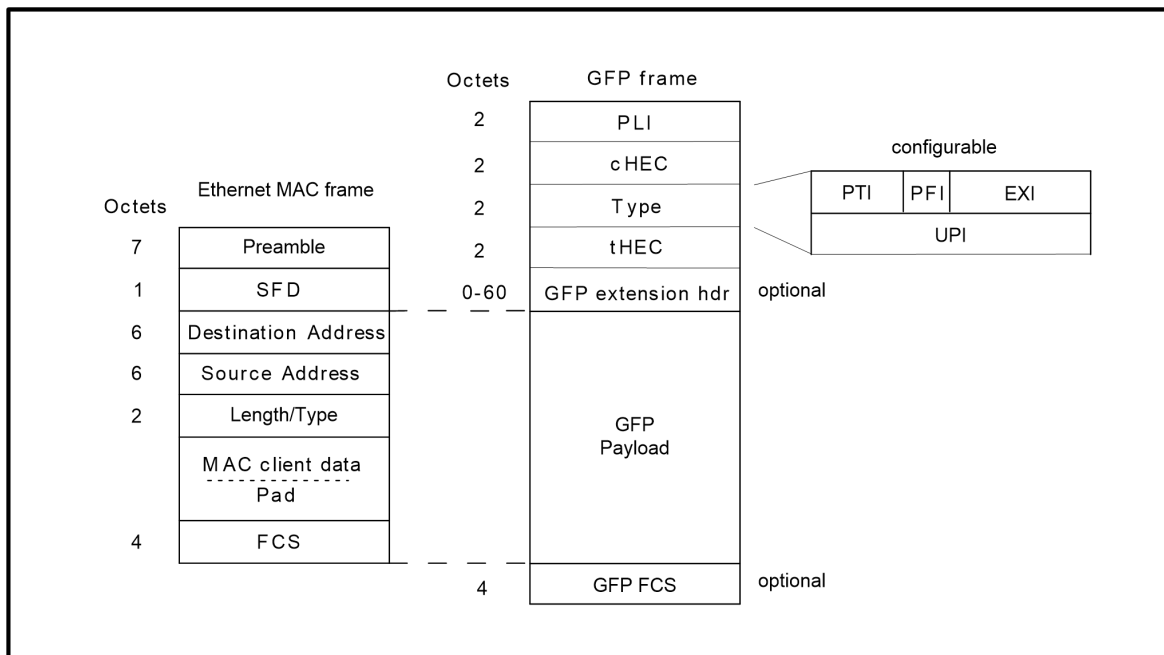


Fig. 5-8-1 GFP frame structure

In order to communicate with equipment from other vendors, BD-MSOT supports the following configuration for GFP frame implemented by management software:

- **PFI (Payload FCS Indicator):** it is used to indicate the presence or the absence of the payload FCS filed.
 Enable PFI: use the payload FCS filed;
 Disable PFI: Not use the payload FCS filed.
 Default value: Disable PFI.
- **EXI (Extension Header Identifier):** it is used to identify the type of extension header, Null header or linear header is optional.
 Default value: Null header

Note: keep the default value of the GFP configuration when communicating with the same equipment; when communicating with equipment from other vendors, change the default value appropriately to guarantee the normal communication between the two different equipments.

Refer to 'RayView management software user guide' or 'Guide to CLI command OF BD-MSOT' for more.

5.9 VCAT & LCAS function

Low speed tributaries with same frame structures may be virtually concatenated together to form larger transport entities (VCG), this is called virtual concatenation (VCAT). Link Capacity Adjustment Scheme (LCAS) is defined in The ITU-T Recommendation G.7042 that specifies a link capacity adjustment scheme which should be used to increase or decrease the capacity of a container using virtual concatenation, automatically decrease the capacity if a member experiences a failure in the network and increase the capacity when the network fault is repaired.

BD-MSOT supports VCAT & LCAS function: it provides 4 independent VCG; each VCG can achieve LCAS enabled/ disabled and the configuration of V5 and K4_B1.

When LCAS is enabled, the following functions can be achieved:

- I Smooth bandwidth adjustment: when users send bandwidth adjustment command, the allocated bandwidth for an Ethernet link can be dynamically reconfigured without packet discarding;
- II Automatically decrease the capacity if a member experience a failure: The device is able to decrease the capacity if there are alarms such as TU-LOP or TU-AIS, and increase the capacity when the fault is repaired;
- III Trial signal degrade: The device is able to temporary decrease the capacity if the bit error rate exceed the threshold;
- IV Asymmetry connection: The LCAS generally assumes that the links between two sides can be arranged randomly. This implies connection asymmetry

Both V5(b5~b7) and K4_B1 indicate the status of VCG, V5(b5~b7) is the Transmitted Signal Label (TSL), used to identify the type of signal carried on the channel. K4_B1 is the Extended Signal Label (ESL), used to indicate the data encapsulation format. In default, the value of V5 is 0A, and K4_B1 is 0D. When communicating with the equipment of other vendors, if the sending and receiving of V5 / K4_B1 is not identical, the receiving side will generate Payload Mismatched (PLM) alarm, it is recommended that the V5 of equipment of other vendor is set as 0x0A and K4_B1 is set as 0x0D.

Refer to “RayView User Guide” or “Guide to CLI command OF BD-MSOT ” for more.

Note: keep the default value of V5 and K4_B1 when communicating with the same equipment; when communicating with equipment from other vendors, change the default value appropriately to guarantee the normal communication between the two different equipments.

5.10 SDH Timing Architecture

5.10.1 Timing Source

BD-MSOT provides multiple timing source:

- Tracing from the received STM-1 line A as timing source (T11)

- Tracing from the received STM-1 line B as timing source (T12);
- Tracing from an internal oscillator in accordance to ITU G.813

5.10.2 Clock Status

According to the Recommendation ITU-T G.813 and G.783, the equipment clock has three working modes, and those can be changed in a certain situation.

Locked mode

The clock of SDH will trace the same or higher quality input clock source, and locked the timing source.

Hold-over mode

If all the timing source supply fail, the clock signal is kept relatively accurate by controlling the oscillator and applying the stored frequency correction values for the previous signal.

Free run mode

If the oscillator don't store the previous signal or is on the hold-over mode over 24 hours, the device will work on the free run mode.

5.10.3 Source Selection

Source selection may be operated automatically or controlled.

Automatic selection

In the automatic select mode (auto mode), the system selects the timing source according to a programmed principle:

First of all, check if the signal of the selected timing source is failure;

Second, check the SSM (Synchronization Status Message) if this feature is active;

At the last, check the selection priority of the sources in the synchronization source hierarchy lists.

As the timing source is selected and traced, the equipment clock will enter locked mode. If all the timing source supply fail, it will switch to hold-over mode and keep the current clock for 24 hours.

Operator selection

In the operator select mode (forced mode), the operator can force the NE to a particular timing source and override the automatic selection.

The operator select mode makes a testing facility. In some simple network application, the operator select mode can make the configuration simple. The settings of operator selection can be saved; it doesn't need to reconfigure the settings when the equipment is rebooting.

The operator selection includes forced timing source and forced timing mode:

- Forced timing source: force the equipment to trace a timing source from T11, T12 or LOCAL. When the forced timing source is failure, this timing source cannot be switched

to be tracing, and the clock status of the equipment will enter into holdover mode if it is non-free-run mode before, or the clock status of the equipment will still be free-run mode if it is free-run mode before. If the operator select LOCAL as the timing source , it means to force the equipment into the free-run mode. The operator selection does not support SSM function.

- Forced timing mode- from locked mode into hold-over mode: only if the clock status of the equipment entering into the locked mode, the holdover mode can be forced to operate.
- Forced timing mode- from locked or hold-over mode into free-run mode: when the equipment is in locked mode or hold-over mode, the free-run mode can be forced to operate.

5.10.4 Synchronization Status Message (SSM)

SSM is used for indicating quality level (QL) of clock reference timing. SSM can be transmitted through either S1 byte of SDH, which is fully complied with ITU-T G.781. The default setting is for SSM to be switched off.

Table 5-10-4-1 SSM description

QL	S1(b5-b8))	Synchronization Quality Level (QL) description
0	0000	Quality unknown (existing synchronization network)
2	0010	Rec. G.811
4	0100	Rec.G.812 transit
8	1000	Rec.G.812 local
11	1011	Synchronous Equipment Timing Source (SETS) It is the internal oscillator of the equipment. Note: This is the default setting.
15	1111	Do not use for synchronization
Others	----	Reserved

Note: The following two problems should be avoided in engineering:

- 1) Avoid optical loop, otherwise the clock status may change between locked and free-run mode.
- 2) Avoid SSM value continuous change in normal state (no protection occur), otherwise the equipment timing may be failed.

5.10.5 Timing Settings in Default

BD-MSOT supports timing configuration through RayView management software or CLI command, such as timing processing mode settings, timing source selection, clock priority,

enable/ disable SSM (Synchronization Status Message) and so on. Refer "RayView management software user guide" or 'Guide to CLI command of BD-MSOT' for more.

The default timing settings is as follows:

The synchronization source hierarchy listed in order of Local, T11 (OPTA), T12 (OPTB),

Timing source selection: Automatic Selection;

Frequency offset detection: enabled;

SSM function: disabled

5.11 Loop back

BD-MSOT supports various loop back modes configured by management software for fault localization and failure detection, including optical loop, E1 loop and V.35 loop.

Note: The default configuration is no loop. The loopback configuration will be lost after restarting device (or the device is power off).

5.11.1 Optical loop

Optical loop can only be configured by CLI command, as Figure 5-11-1 shows:

- ①: A/B optical loop back to line side
- ②: A/B optical loop back to device side

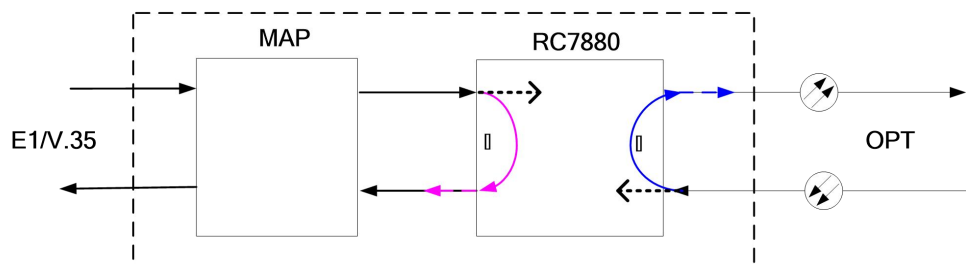


Figure 5-11-1 Optical loop

5.11.2 E1 loop

E1 loop includes E1 loop to line side and E1 loop to device side. The loopback command can be implemented for each E1 channel or a batch of E1 channels. The default configuration is no loop. Note: The loopback configuration will be lost after restarting device (or the device is power off).

- ③: E1 loop back to line side. AIS can be inserted to device side.
- ④: E1 loopback to device side. AIS can be inserted to line side.

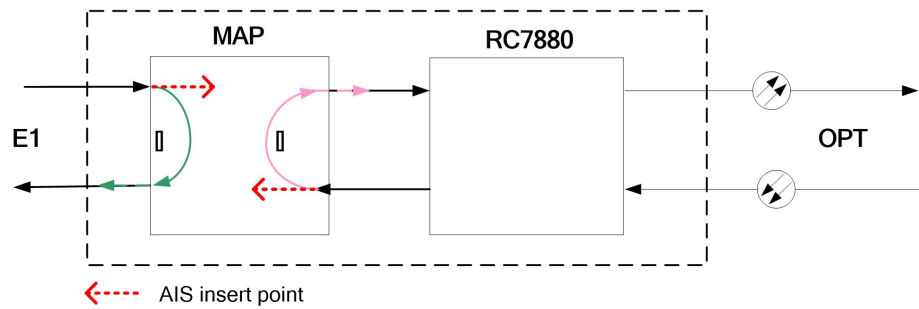


Figure 5-11-2 E1 loop

5.11.3 V.35 loop

V.35 loop includes V.35 device loop and line loop, as Figure 5-11-3 shows:

- ⑤: V.35 loop to line side
- ⑥: V.35 loop to device side

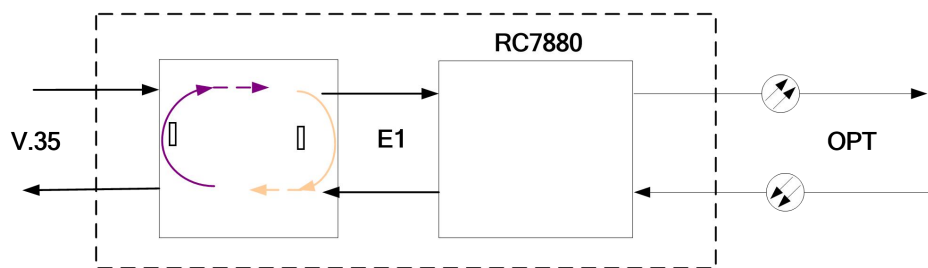


Figure 5-11-3 V.35 loop

5.12 Embedded BERT

BD-MSOT provides an embedded BERT (Bit Error Ratio Tester) for maintenance actions such as fault localization and failure detection. It makes a great facility for operator in environment without any external BERT.

5.12.1 Feature

- Built-in a 2.048Mb/s, 2E15-1 pattern, PRBS generator and detector
- PRBS can be add(drop) to(from) line side E1 paths as well as E1 physical ports
- Provides error counters at each receiving side

5.12.2 Application

The BERT generate $2^{15} - 1$ pseudo random sequence which is inserted into the transmitting channel (choose one channel from E1_1 to E1_8), and the sequence is received from the receiving channel (choose the same channel number as the transmitting channel number) and be checked for bit error static by BERT. Note that normal data transfer on the tested channel will be interrupted.

It also supports single bit error inserting to test the E1 channel when BERT is enabled.

BD-MSOT provides two positions for transmitting and two positions for receiving, as figure 5-12-2 shows:

Position (1): Transmitting toward STM-1 line (OPT);

Position (2): Receiving from STM-1 line (OPT);

Position (3): Transmitting toward E1 interface (E1);

Position (4): Receiving from E1 interface (E1);

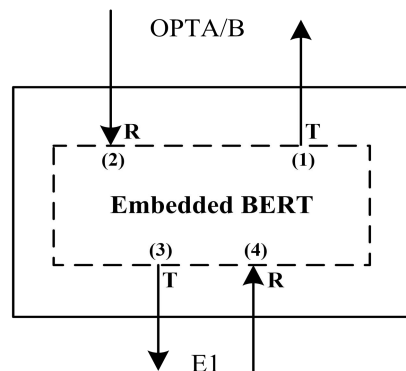


Fig. 5-12-2 four positions

Application1: Transmitting at position (1) and Receiving at position (2)

choose one channel from E1_1 to E1_8 as the tested channel, map that E1 to the VC-12 channel, open to transmit at position (1) of device 1, thus, the BERT start to insert $2^{15} - 1$ pseudo random sequence into the transmitting VC-12 channel; on device 2, map the corresponding VC-12 channel to the E1 port, configure that E1 as loopback to line side or use cable to loop the E1 port, open to receive at position(2) of device 1, check for bit error static by BERT, as Fig.5-12-2-1 (a) shows; while open to receive at position (2) of device 2 can tests a signal direction line as Fig.5-12-2-1(b) shows.

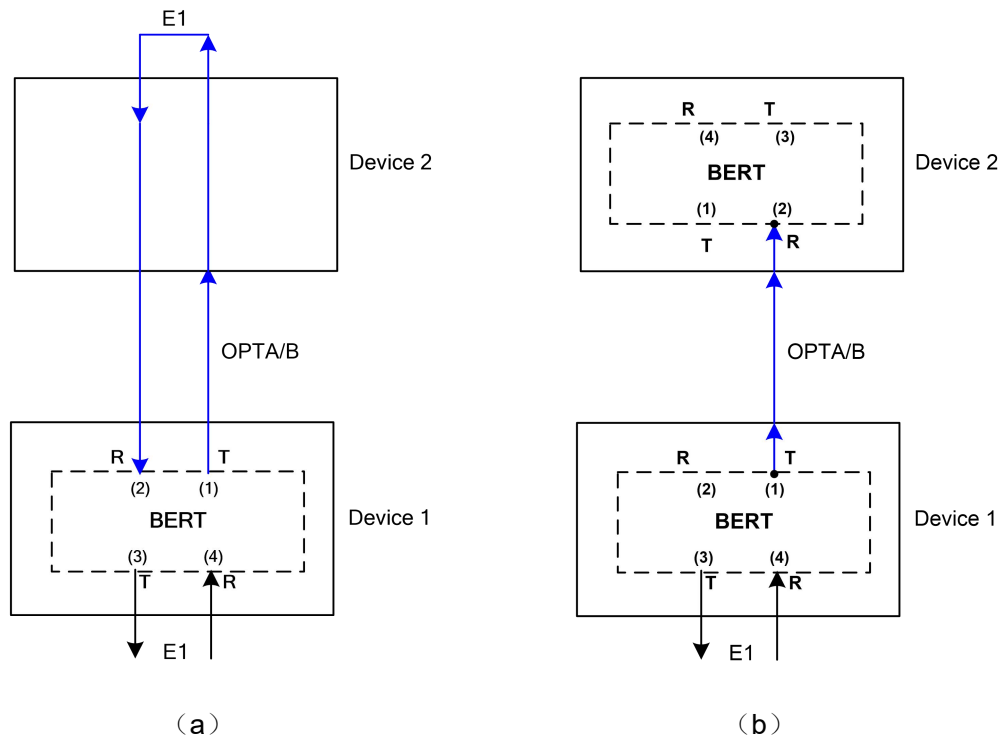


Fig. 5-12-2-1 Application1

Application 2: Transmitting at position (1) and Receiving at position (4)

choose one channel from E1_1 to E1_8 as the tested channel, map that E1 to the VC-12 channel, open to transmit at position (1) of device1, thus, the BERT start to insert $2^{15} - 1$ pseudo random sequence into the transmitting VC-12 channel, on device 2, map the corresponding VC-12 channel to the E1 port, configure that E1 as loopback to line side or use cable to loop the E1 port, open to receive at position(4) of device2, checked for bit error static by BERT, as Fig.5-12-2-2 shows:

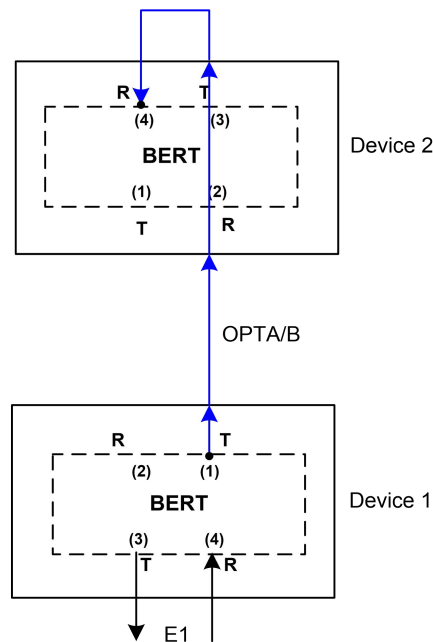


Fig. 5-12-2-2 Application 2

Application 3: Transmitting at position (3) and Receiving at position (4)

This application is use to test the E1 cable. Choose one channel from E1_1 to E1_8 as the tested channel, open to transmit at position (3), use E1 cable to loop the E1 port, open to receive at position(4) of device1, check for bit error static by BERT, as Fig.5-12-2-3 shows:

Note: In application 3, if configure E1 loop by management software, LOS alarm will occur on the embedded BERT, this alarm can disappear after using E1 cable to loop the E1 port.

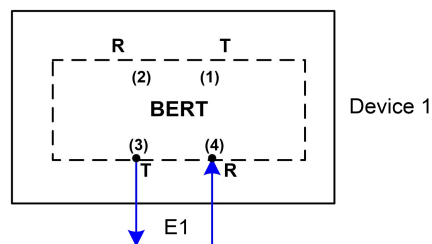


Fig. 5-12-2-3 Application 3

BD-MSOT supports embedded BERT configuration through RayView management software or CLI command line, Refer to 'RayView management user guide' and 'Guide to CLI command of BD-MSOT' for more.

Note: the BERT configuration will be lost after restarting the device(or the device is power off)

5.13 Network management channel

BD-MSOT provides network management channel to facilitate the unified network management of two or more SDH equipments in different areas. The system can either adopts

SDH Overhead (D1 ~D3 or D6~D8) as an management channel for the purpose of transmitting network management data or use a framed G.704 E1 signal as an management channel to complete unified network management among NEs or subnets.

5.13.1 Network management based on SDH overhead

The network management based on SDH Overhead is also called DCC network management. There are two modes available, one is SOH-based channel comprising D1, D2, D3 bytes in standard mode, giving a 192 Kbit/s channel; the other is SOH-based channel comprising D6, D7, D8 bytes in non-standard mode, giving a 192 Kbit/s channel. This network management is only applicable to the network composed of equipments in our product family. As Fig. 5-13-1 shows, through SOH-based management way, the NMS which connect to site 1 complete network management for the three equipments. Refer to 'RayView management software user guide' and 'Guide to CLI command of BD-MSOT' for more.

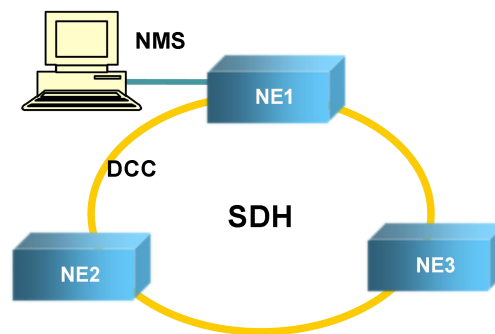


Fig. 5-13-1 network management based on SDH overhead

Note: Make sure optical A of one NE must be connected with optical B of its neighboring NE.

5.13.2 Network management based on internal E1 channel-by IEXM interface

BD-MSOT provides two internal management interfaces (IEXM1 and IEXM2), compliant to G.704 framed structure. Those two interfaces are inside and invisible. IEXM1 and IEXM2 can be enabled/disabled by RayView management software or CLI command. Refer to 'RayView management software user guide' and 'Guide to CLI command of BD-MSOT' for more.

The network management based on internal E1 channel uses a framed G.704 E1 signal as an management channel, which map IEXM1/2 interface to STM-1 signal, each occupies a VC-12 timeslot to complete DCC channel transmission from local to remote, thus, the unified network management among NEs or subnets is implemented.

Note: If PCM card is installed, the IEXM1 will be invalid and unavailable.

5.13.2.1 Application 1

As shown in Fig.5-13-2-1, the three BD-MSOT devices (marked as NE) from different areas access to SDH network composed by the 3rd party equipments (marked as ADM) via STM-1 optical fiber.

The IEXM1 and IEXM2 interfaces can be used to achieve the unified management among BD-MSOT devices.

Configuration requirements:

In the 3rd party SDH network, the E1 channel needs to be configured and assigned to BD-MSOT for network management. This E1 channel can connect all of the BD-MSOT devices.

The E1 channel for management needs to be protected; there are two ways for protection:

1. Adopts “1+1” mode. Different VC-12 slot can be used to compose the E1 channel, such as M, N, K in Fig.5-13-2-1. M, N, and K slots are set as 1+1 protection mode. If more BD-MSOT is to be managed, more VC-12 slots will be occupied in STM-1.

2. Adopts “channel loopback” mode. All BD-MSOT shares an E1 channel consisting of one VC-12 slot, which can save resources in the 3rd party SDH network. See Fig.5-13-2-2-1 and Fig. 5-13-2-2-2.

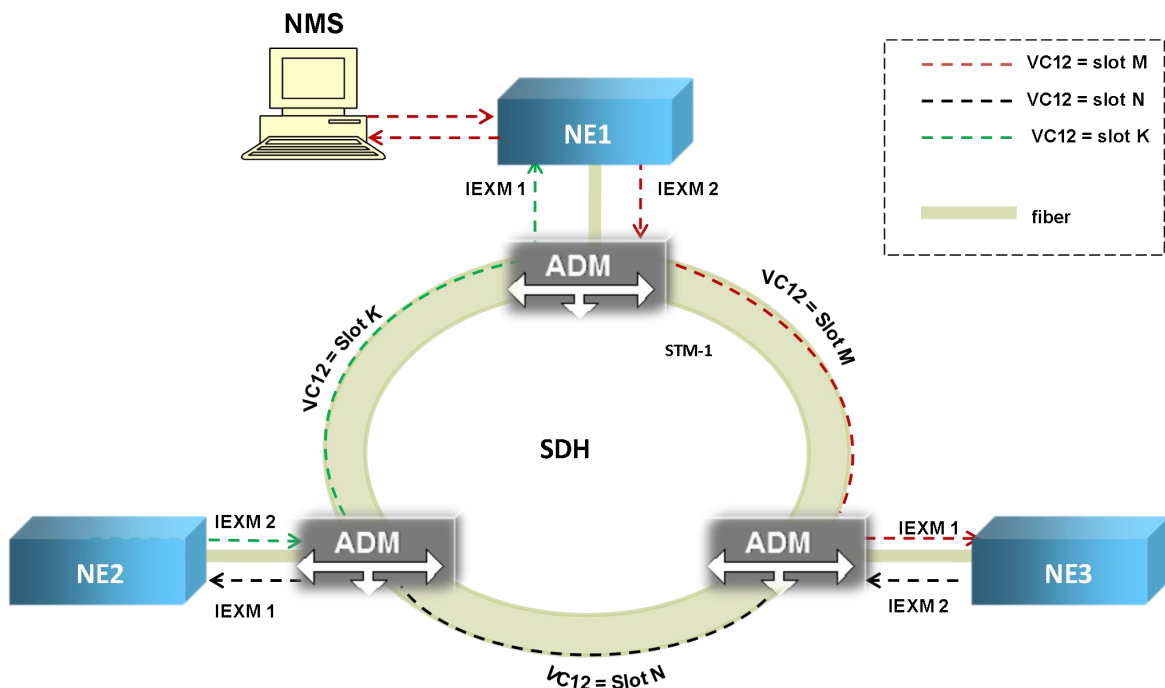


Fig. 5-13-2-1 Application I

The following will describe the configuration steps in case of “1+1 mode”:

Steps in configuration:

- Set the NE address of the three devices separately, make sure that each NE address is unique.
- Assign NE1 as gateway
- Make sure to close DCC channel of optical A/B
- Configure E1 management channel in the 3rd party SDH equipment: configure VC-12 timeslot K to the ADM device which is between NE1 and NE2, timeslot N to the ADM which is between NE1 and NE2, timeslot M to the ADM which is between NE1 and NE3, make sure K, M, N works at 1+1 mode.

- e Assign one end of timeslot K to IEXM1 of NE1, the other end to IEXM2 of NE2.
Assign one end of timeslot M to IEXM2 of NE1, the other end to IEXM1 of NE3.
Assign one end of timeslot N to IEXM1 of NE2, the other end to IEXM2 of NE3.

5.13.2.2 Application 2

As shown in Fig.5-13-2-2-1 and Fig.5-13-2-2-2, the three BD-MSOT devices (marked as NE) connect to the 3rd party equipments (marked as ADM) via STM-1 optical fiber, they are in the same layer of SDH network.

The configuration requirements are the same to that in chapter “5.13.2.1”.

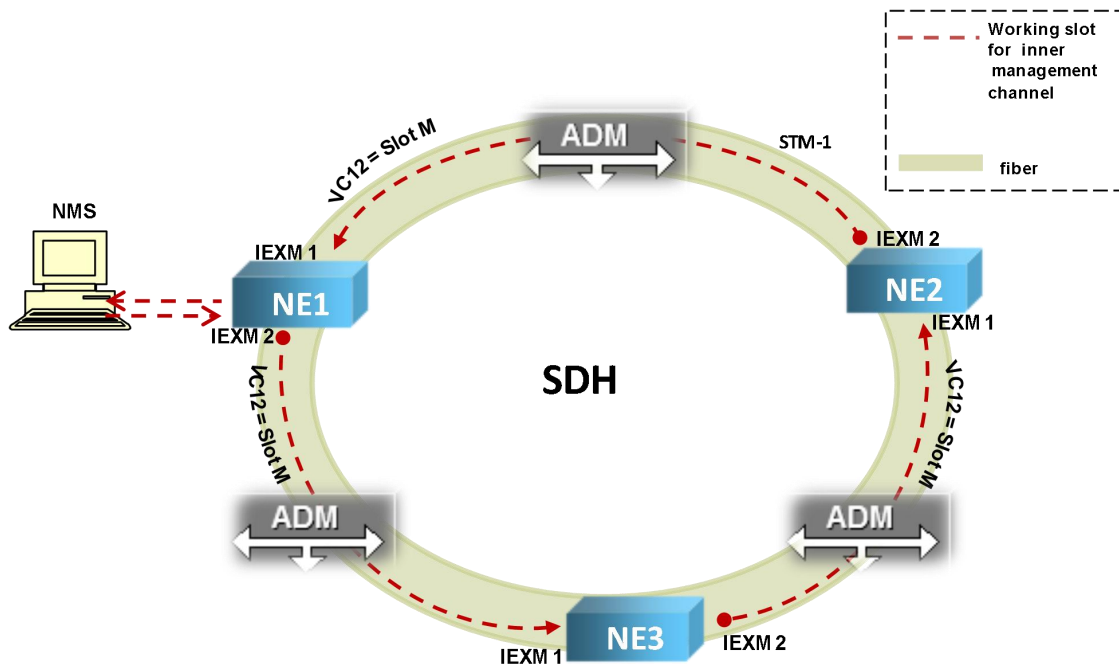


Fig. 5-13-2-2-1 Application 2 – Management channel in normal status

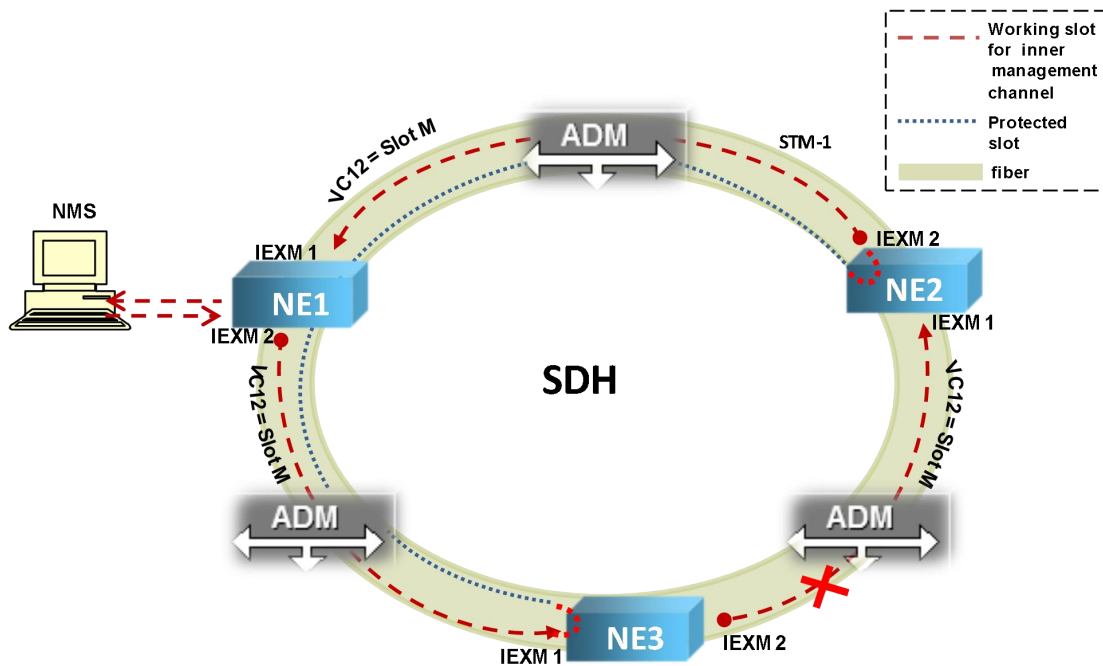


Fig. 5-13-2-2-1 Application 2 – Management channel in normal status

The following will describe the configuration steps in case of “channel loopback”:

Steps in configuration:

- Make sure optical A of one NE must be connected with optical B of the neighboring NE. for example, connect optical A of NE1 with optical B of NE2, and connect optical B of NE1 with optical A of NE2 as well.
- Set the NE address of the three devices separately, make sure that each NE address is unique.
- Assign NE1 as gateway
- Make sure to close DCC channel of optical A/B
- Configure E1 management channel in the 3rd party SDH equipment: Just configure only one VC-12 timeslot to E1 channel, such as timeslot M in Fig.5-13-2-2-1 and Fig.5-13-2-2-2.
- Assign timeslot M of optical A/B to the two IEXM ports separately. (Configure the type of IEXM DXC as 1+0 mode). For example, map IEXM1 of NE1 to slot 1 of optical A, map IEXM2 of NE1 to slot 1 of optical B; map IEXM1 of NE2 to slot 1 of optical A, map IEXM2 of NE2 to slot 1 of optical B; map IEXM1 of NE3 to slot 1 of optical A, map IEXM2 of NE3 to slot 1 of optical B.

5.14 Alarm and Performance

BD-MSOT provides many alarm monitoring. Refer to Table 5-14-1 for details:

Table 5-14-1 Alarm list

Alarm Name	Alarm Description	Severity	U/DALM
------------	-------------------	----------	--------

Alarm for Optical Port (A/B)			
RPD	Remote power down	Major	UALM
NOP	Loss of Optical Signal on the receive line	Critical	UALM
*TF	Transmit Fault	Critical	UALM
*TD	Transmit Degraded Signal (bias-current excessive)	Major	UALM
*RPL	RX Power Low	Minor	DALM
*RPH	RX Power High	Major	UALM
*LPL	TX Power Low	Minor	DALM
*LTH	Laser Temperature High	Minor	DALM
Alarm for Regenerator Section (RS)			
OOF	Out Of Frame	Critical	UALM
LOF	Loss Of Frame	Critical	UALM
RS-TIM	Regenerator trace identifier mismatch	Minor	DALM
Alarm for Multiplex Section (MS)			
MS-RDI	Multiplex Section Remote Defect Indication	Minor	DALM
MS-EXC	Multiplex Section Excessive error	Major	UALM
MS-DEG	Multiplex Section Degraded signal defects	Minor	DALM
MS-AIS	Multiplex Section Alarm Indication Signal	Minor	DALM
AU-LOP	Loss of Pointer of Administrative Unit	Critical	UALM
AU-AIS	Alarm Indicator Signal of Administrative Unit	Minor	DALM
Alarm for High-Order Path (HOPL)			
HP-UNEQ	High-order Path Unequipped	Critical	UALM
HP-TIM	High-order Path trace identifier mismatch	Critical	UALM
HP-PLM	High-order Path payload mismatch	Critical	UALM
HP-RDI	High-order Path Remote Defect Indication	Minor	DALM
HP-EXC	High-order Path Excessive error	Major	UALM
HP-DEG	High-order Path Degraded signal defects	Minor	DALM
HP-AIS	High-order Path Alarm Indication Signal	Minor	DALM
TU-LOM	Tributary Unit Loss Of Multiframe	Critical	UALM
Low-order path			
TU-LOP	TU loss of pointer	Critical	UALM
TU-AIS	Alarm Indicator Signal of Tributary Unit	Major	UALM
LP-RDI	Low-order path remote defect indication	Major	UALM
LP-PLM	Low-order path payload mismatch	Major	UALM

LP-UNEQ	Low-order path unequipped	Critical	UALM
EOS channel alarm (alarm different from that of E1 channel is shown below)			
LP-AIS	Low-order path alarm indication	Major	DALM
K4B1-LOM	Loss of Multiframe of K4B1	Minor	DALM
K4B1-PLM	label of K4B1 Mismatch	Major	UALM
Alarm for Equipment Timing source			
LTI	Loss of Timing Source	Critical	UALM
TIMEDeg	Degraded signal defects of Timing (Frequency offset out of limit alarm) This alarm will be inhibited when the frequency offset detection function is disabled by CLI command.	Major	UALM
SSMBMismatch	In the case of SSM is enabled, when the QL level of the timing source is lower than the SSM close up threshold, the SSMBMismatch alarm will be occurred, and that timing source will be known as invalid; The SSM close up threshold can be configured by CLI command, the default is 0x0F. in the case of SSM is disabled, the SSMBMismatch alarm is inhibited.	Major	UALM
E1 interface alarm (E1_1~8)			
TLOS	Loss of E1 signal	Critical	UALM
V.35 alarm			
E1-AIS	E1 AIS alarm indication		
E1-LOF	E1 loss of frame		
E1-LOMF	E1 loss of multi-frame		
E1-RAL	E1 remote alarm		
E1-CRC	E1 CRC alarm		
VLinkDown	V.35 link down		
Internal extension management interface (IEXM1/2) status, which will not light the alarm indicator			
LOS	Loss of IEXM input signal		
AIS	Alarm indication alarm of IEXM input interface		

LOF	Loss of G.704 frame		
LOMF	Loss of G.704 CRC-4 multiframe		
RAL	Remote alarm		
RAL-CRC	Remote CRC error		
LAL-CRC	Local receive CRC error		
Ethernet alarm			
GFP-LOF	GFP loss of frame	Major	UALM
LaVCR-GIDM	GID mismatch latch	Minor	DALM
LaVCR-GLOA	Loss of group alignment	Minor	DALM
LINKDOWN	Ethernet physical interface LINK_DOWN	Critical	UALM
LINE-MACLOOP	Ethernet line side loopback	Minor	DALM
Performance threshold exceed alarm			
RS-EXCEED	Regenerator Section threshold exceed alarm	Major	UALM
MS-EXCEED	Multiplex Section threshold exceed alarm	Major	UALM
HP-EXCEED	High order path threshold exceed alarm	Major	UALM
LP-EXCEED	Low order path threshold exceed alarm	Major	UALM

Note:

(1) Table 5-14-1 shows the alarm severity in default, which can be changed by RayView software or CLI command; when the severity is changed, the corresponding U/DALM will be certainly changed.

(2) The urgent alarm will inhibit Non-urgent alarm.

(3) The alarm with * means: if the SFP optical module does not support DDM function, these alarms will not be viewed.

BD-MSOT also provides performance statistic, as table 5-14-2, 5-14-3 shows:

Table 5-14-2 Path Performance

Performance Item	Definition	Standard
Regenerator Section (RS))		
Local EB	Local Error Block performance statistic	ITU-T G.826 G.784
Local ES	Local Error Second performance statistic	ITU-T G.826 G.784
Local SEC	Severely Local Error Second performance statistic	ITU-T G.826 G.784
Local UAS	Local Unavailable Second performance statistic	ITU-T G.826 G.784
Multiplex Section (MS)		
Local EB	Local Error Block performance statistic	ITU-T G.826 G.784

Local ES	Local Error Second performance statistic	ITU-T G.826 G.784
Local SEC	Severely Local Error Second performance statistic	ITU-T G.826 G.784
Local UAS	Local Unavailable Second performance statistic	ITU-T G.826 G.784
Remote EB	Remote Error Block performance statistic	ITU-T G.826 G.784
Remote ES	Remote Error Second performance statistic	ITU-T G.826 G.784
Remote SEC	Severely Remote Error Second performance statistic	ITU-T G.826 G.784
Remote UAS	Remote Unavailable Second performance statistic	ITU-T G.826 G.784
High-order Path (HP)		
Local EB	Local Error Block performance statistic	ITU-T G.826 G.784
Local ES	Local Error Second performance statistic	ITU-T G.826 G.784
Local SEC	Severely Local Error Second performance statistic	ITU-T G.826 G.784
Local UAS	Local Unavailable Second performance statistic	ITU-T G.826 G.784
Remote EB	Remote Error Block performance statistic	ITU-T G.826 G.784
Remote ES	Remote Error Second performance statistic	ITU-T G.826 G.784
Remote SEC	Severely Remote Error Second performance statistic	ITU-T G.826 G.784
Remote UAS	Remote Unavailable Second performance statistic	ITU-T G.826 G.784
PJP	AU positive pointer adjustment performance exceeding threshold	ITU-T G.826 G.784
PJN	AU negative pointer adjustment performance exceeding threshold	ITU-T G.826 G.784
low-order Path (LP)		
Local EB	Local Error Block performance statistic	ITU-T G.826 G.784
Local ES	Local Error Second performance statistic	ITU-T G.826 G.784
Local SEC	Severely Local Error Second performance statistic	ITU-T G.826 G.784
Local UAS	Local Unavailable Second performance statistic	ITU-T G.826 G.784
Remote EB	Remote Error Block performance statistic	ITU-T G.826 G.784
Remote ES	Remote Error Second performance statistic	ITU-T G.826 G.784
Remote SEC	Severely Remote Error Second performance statistic	ITU-T G.826 G.784
Remote UAS	Remote Unavailable Second performance statistic	ITU-T G.826 G.784
PJP	AU positive pointer adjustment performance	ITU-T G.826 G.784

	exceeding threshold	
PJN	AU negative pointer adjustment performance exceeding threshold	ITU-T G.826 G.784
CV	E1 port code violation count statistic	

Table 5-14-3 Ethernet performance

Performance Item		Definition
LAN port and WAN port	RX Byte Count	Ethernet byte counter for the receiving client data frames
	RX Packet Count	Ethernet packet counter for the receiving client data frames
	TX Byte Count	Ethernet byte counter for the transmitting client data frames
	TX Packet Count	Ethernet packet counter for the transmitting client data frames
	Drop packet Count	Packets discarded (including oversize packets, undersize packet , CRC error packet and so on)
	Drop Byte Count	The bytes of dropped packets

Note that the ETH performance can be statistic by bytes or packets; Refer to “RayView User Guide” or “Guide to CLI command of BD-MSOT” for more.

5.15 Device management

BD-MSOT supports management via CLI command based on serial RS232 port (CONSOLE) and telnet (EMU interface). With the super terminal or software with similar function, the configuration can be executed (such as setting clock, enable/disable ALS, protection switching settings, Ethernet settings and so on), the alarm & status can be monitored, and the trouble can be fixed up by loop back and embedded BERT testing. Refer to ‘Guide to CLI command of BD-MSOT’ for detail.

BD-MSOT also supports network management platform based on SNMP (V1 and V2C) to complete configuration management and kinds of alarm monitoring. Refer to ‘RayView management software user guide’ for more.

Table 5-15-1 Default Management Configuration

No.	Item	Factory Settings	CLI management		RayView
			Telnet	CONSOLE	

1	MAC address	fixed and unique	Read only	Read/write	Read only
2	IP Address	192.168.0.155	Read only	Read/write	Read/write
3	Subnet mask	255.255.255.0	Read only	Read/write	Read/write
4	gateway	192.168.0.1	Read only	Read/write	Read/write
5	TRAP IP	127.0.0.1	-	Read/write	Read/write
6	Telnet user information	User name: user Password: user	-	Read/write	-

6 Device installation and notice

- I Open the package, check out the package contents such as equipment and parts according to the packing list; for any damage, contact with the supplier instantly;
- II Connect to the interfaces
 - ✓ connect the various interfaces with suitable cables respectively ;
 - ✓ Connect the optical lines with optical fiber cable
 - ✓ Connect the control terminal to the front panel CONSOL connector or a SNMP management station to the front EMU port.
- III connect to the power
 - ✓ Always set the power switch at OFF position first and then connect the power.
 - ✓ Connect the power cable. For AC power supply, the accessory power cable can be used; for DC power supply, please take caution of the connector's polarity, reverse connection is forbidden.
 - ✓ Connect the PGND connector on the rear panel to the earth of the telecommunication house in a reliable way.

Notice:

- a. Before hot plugging the SFP optical module, both the operator and the device must be connected to the same earth in a reliable way! Otherwise, the device may be damaged!
- b. Make sure optical A of one NE must be connected with optical B of its neighboring NE.
- c. Before using fiber to connect the two devices, the parameters of STM-1 optical interface (Mean launched power– maximum and Minimum overload) should be considered carefully.

7 Technical Specifications

Table 7-1 STM-1 optical interface

Type	wavelength (nm)	Bit rate (bps)	Mean launched power (dBm)	Temperature (°C)	Sensitivity (dBm)	distance (Km)	others	Application code
RTXM139-400	1310FP	155M	-15~-8	-10~70	<-23	15	DDM	S-1.1
RTXM140-400	1310 FP	155M	-5~0	-10~70	<-34	40	DDM	L-1.1
RTXM140-500	1550 DFB	155M	-5~0	-10~70	<-34	80	DDM	L-1.2

Note:

1. The Minimum overload power of all the above SFP optical modules are less than -8dBm, if the mean launched power-maximum is over the minimum overload, the attenuator should be used.
2. The SFP optical module is optional for users, and the parameters above is just an reference value; if users select the SFP module supplied by us, the parameters of the SFP module is as table 7-1 shows; if users purchase other types of SFP optical module by themselves, the parameters may be different.

Table 7-2 E1 interface

Subject	Description
Bit rate	2.048Mb/s±50ppm
Coding	HDB3
Impedance	75Ω unbalanced or 120Ω balanced
Standard	ITU-T G.703、G.704、G.823

Table 7-3 Electric Ethernet interface

Subject	Description
Connector	RJ-45
Work mode	Support auto-negotiation and forced mode, the default is auto-negotiation
Minimum frame size	64 bytes
Maximum frame size	1536/1552 bytes
Speed	10M/100M
Duplex	Full/half duplex
VLAN	Disable
Flow control	Default: enable

Cable	CAT-5, cross-over and straight-through auto-detect
Standard	IEEE802.3 10Base-T IEEE802.3u 100Base-Tx

Table 7-4 V.35 interface

Subject	Description
Connector	DB25 connector
Bit rate	N×64Kbit/s (N=1~32)
Work mode	The default is DCE mode
Standard	Comply to ITU-T V.35 standard

Table 7-5 Ethernet management interface (EMU)

Subject	Description
Bit rate	100Mb/s
Connector	RJ45

Table 7-6 RS232 network management interface (CONSOLE)

Subject	Description
Baud rate	19200
bits	8
Stop bit	1
parity check	None
Electricity level	EIA-RS232 standard
Connector	RJ45

Table 7-7 PCM Interface

Interface	Specification	
FXS	Companding law:	A-law
	Bit rate	64Kbps
	DC Loop impedance	2000 Ω
	Valid transmission bandwidth	300-3400Hz/600 Ω
	Frequency character	
	300Hz—400Hz	-0.3 ~ -0.1dB
	400Hz—2400Hz	-0.2 ~ 0.1dB
	2400Hz—3400Hz	0 ~ 0.7dB
	Return Loss	

	300Hz—600Hz	40dB
	600Hz—3400Hz	46dB
	Background noise	<-67dB
	Ring Voltage	25±3Hz, 75±15V _{Rms}
	Gain	-16.5dBr~13.5dBr (within ±0.1dBr)
FXO	Coding	A-law
	Bit rate	64Kbps
	DC Loop impedance	2000 Ω
	Valid transmission bandwidth	300-3400Hz/600 Ω
	Frequency character	
	300Hz—400Hz	-0.3 ~ -0.1dB
	400Hz—2400Hz	-0.2 ~ 0.1dB
	2400Hz—3400Hz	0 ~ 0.7dB
	Return Loss	
	300Hz—600Hz	40dB
	600Hz—3400Hz	46dB
	Background noise	<-67dB
	Gain	-15.5dBr~12.5dBr (within ±0.1dBr)
Magneto telephone interface	2- wire Tx	0dBr±0.5dBr or -3.5dBr±0.5dBr
	2-wire Rx	-3.5dBr±0.5dBr or -7.0dBr±0.5dBr
	Ring Voltage	20Vrms
	Signaling	inband carrier ---2100Hz single frequency
	Gain	Tx: -6.0dBr~4.0dBr(within ±0.5dBr) Rx: -8.0dBr~2.0dBr(within ±0.5dBr)
E/M audio	Frequency character	Comply to ITU-T G.713
	Level character	Comply to ITU-T G.713
	Valid transmission bandwidth	300 ~ 3400 Hz/600 Ω
	Audio transmit type	2-wire/4-wire
	2-wire Rx	0dBr/600 Ω (-6.0dBr~6.0dBr, within ±0.5dBr)
	2- wire Tx	-3.5dBr/600 Ω (-10.0dBr~10.0dBr, within ±0.5dBr)

	4-wire Rx	-14dBr/600 Ω (-6.0dBr~6.0dBr, within ± 0.5 dBr)
	4- wire Tx	+4dBr/600 Ω (10.0dBr~10.0dBr, within ± 0.5 dBr)
	Overload level	+3.14dBm

Table 7-8 Power supply

Subject	Description
Input DC voltage	-36~-72V DC
Input AC voltage	176~264V AC
Power consumption	When adopting BD-MSOT-5V5 mainboard, the power consumption is 15W $\pm$ 10% When adopting BD-MSOT-12 mainboard, the power consumption is 25W $\pm$ 10%

Table 7-9 Dimension and weight

Subject	Description
Dimension	482.6mm×44mm×195mm (width×height×depth)
Weight	1.8kg

Table 7-10 Environment requirements

Subject	Description
Working temperature	-5℃~50℃
Storage temperature	-40℃~70℃
Relative Humidity	≤95%, no condensation

Appendix 1 RS232 network management interface (CONSOLE)

Table A-1 Console (RJ45) cable definition

Pin	Definition	Remarks
PIN1	-	-
PIN2	-	-
PIN3	-	-
PIN4	-	-
PIN5		
PIN6	GND	Ground
PIN7	RSNM-IN	Serial data input (RS232 level)
PIN8	RSNM-OUT	Serial data output (RS232 level)

The CONSOLE cable adopts RJ45 connector at one end to connect the front panel of equipment, and DB9 connector at the other end to connect PC, the diagram is as Fig. A-1-1 and Fig. A-1-2 shows:



7: Receive data 8: Transmit data 6: Ground

Fig. A-1-1 RJ45 connector

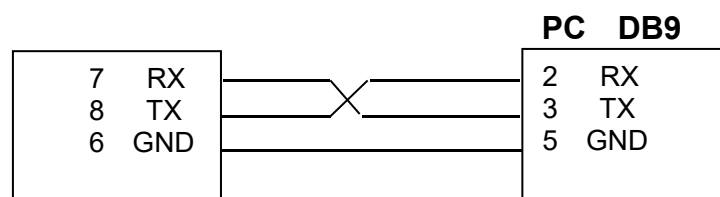


Fig. A-1-2 Connection

Appendix 2 E1 interface

The unbalanced E1 interface of CLIU4/8 card adopts DB37 connector as physical interface, which has the corresponded adapters: DB37F-BNC-4E1 cable adapter for 4E1 75Ω, as Fig. A-2-1 shows; DB37F-BNC-8E1 cable adapter for 8E1 75Ω, as Fig. A-2-2 shows;



Fig. A-2-1 DB37F-BNC-4E1 cable adapter



Fig. A-2-2 DB37F-BNC-8E1 cable adapter

If CLIU8CH8 or CLIU8CH16 card is installed, there are 8 E1 interface (DB37, unbalanced in default, combined with DB37F-BNC-8E1 cable adapter, as shown in Fig A-2-2. For balanced E1 interface, it combined with DB37F-RJ48C-8E1 cable adapter, as shown in Fig A-2-3. Please declare when placing an order.



Fig. A-2-3 DB37F-RJ48C-8E1 cable adapter

The balanced E1 interface adopts RJ45 interface, as Table A-2 shows:

Table A-2 120Ω E1 interface (RJ45 connector) definition

Pin	Definition	Remarks
PIN1	RXD+	P-input of 120 Ω E1 interface
PIN2	RXD-	N-input of 120 Ω E1 interface
PIN3	-	Null
PIN4	TXD+	P-output of 120 Ω E1 interface

PIN5	TXD-	N-output of 120 Ω E1 interface
PIN6	-	Null
PIN7	-	Null
PIN8	-	Null

Appendix 3 Related documents

Table A-3 BD-MSOT Related documents list

Item	Name	Remarks
1	Guide to CLI command of BD-MSOT	
2	BD-MSOT User Handbook	

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