RS1010

Multi-Service SDH Transmission System

User Handbook

V1.02

Oct. 2012

Revision History

Version	Date	Remarks
V1.00	2012-09-10	Primarily Released
V1.01	2012-10-29	Changed the CARM type
V1.02	2015-5-4	Added XS060 card

Contents

1 Introduction

1.1 Overview

RS1010 is the STM-1 level multi-service Synchronous Digital Hierarchy (SDH) transmission system compatible with ITU-T standard. It is designed as a modular system with two 155.520Mb/s optical interfaces to provide an ultra-compact, cost-effective and flexible multi-service platform. With optional cards such as E1 card, Ethernet card and Engineering Order Wire card (EOW), it is easy to meet user's various requirements. It provides fully cross connectivity between all tributaries, and can be used as a Terminal Multiplexer (TM) or an Add-Drop-Multiplexer (ADM) to build point-to-point, ring and chain transmission network.

1.2 Main Features

- ■ 1U height, 19 Inch width standard ,1 main board with 3 service card slots
- ■ Service interface
  - ➢ Two STM-1 optical interfaces, SFP optical module
  - ➢ Maximum 16 E1 interfaces compliant with ITU-T G.703 (8 per card), optional unbalanced/ balanced interfaces
  - ➢ Maximum four 10/100Mb/s Ethernet electric interfaces(4 per card); Or maximum two 10/100/1000Mb/s Ethernet electric interfaces(2 per card); Or maximum one 100/1000Mb/s Ethernet optical interface(1 per card)
- ■ System interface
  - ➢ Ethernet management interface: EMU (RJ45 connector)
  - ➢ RS232 network management interface: CONSOLE (RJ45 connector)
  - ➢ RS232 user channel interface: RS232 (RJ45 connector)
  - ➢ External synchronization interface / Extendable management interface : ETS1/EXM1, ETS2/EXM2 (RJ45 connector)
  - ➢ EOW interface: PHONE (RJ11 connector)
  - ➢ UALM and DALM output interface: U/DALMO (DB9 connector)
- ■ Timing mode
  - ➢ STM-1 line timing (T11,T12)
  - ➢ Tributary timing from E1-1 to E1-16 (T2)
  - ➢ External timing source input (T31/T32), 2048Kbit/s by default and 2048KHz selectable
  - ➢ External timing output (T41/T42), 2048Kbit/s by default and 2048KHz selectable
  - ➢ ITU-T G.813 internal oscillator
  - ➢ The timing source can be auto-switched according to SSM or operator settings
- ■ Ethernet functionality

➢ Generic Framing Procedure GFP-F compliant with ITU-T G.7041

➢ VCAT compliant with ITU-T G.707 and LCAS compliant with ITU-T G.7042

➢ Ethernet flow control on WAN port and LAN port

➢ Frame Length(maximum):1552 bytes

➢ Auto-negotiation of LAN port

■ Supports 1+1 path protection and Automatic Protect Switch (APS) with switching time less than 50ms

■ Supports Remote power Down Detection (RPD) and Auto Laser Shutdown (ALS)

■ Supports embedded BERT and various loop back for troubleshooting

■ Supports firmware download locally without disturbance of existing traffic

■ NE management

➢ Supports NE management based on CLI command via RS232 interface or TELNET; CLI supports local management only, it cannot manage the remote NE

➢ Supports RAYVIEW network management software based on SNMP protocol

■ Two hot-spare power cards, both 220V AC and -48VDC are available, power consumption less than 15W

2 System Architecture

2.1 Functional Diagram

In order to meet the various needs and requirements of users, a main board and a diverse range of cards, such as E1 card and Ethernet card, are made available inside the RS1010 system.
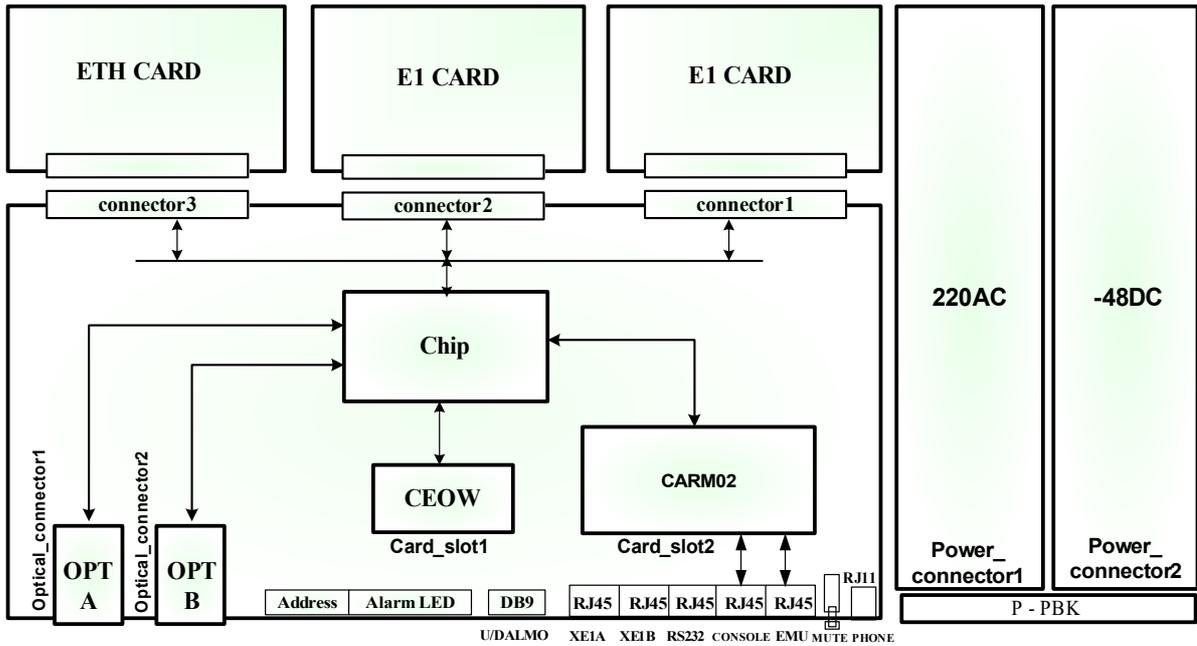
Fig. 2-1 Functional Diagram

2.2 Components of RS1010

Table 2-2-1 Components of RS1010

Type	Specification		Description	Remarks
Motherboard	RS1010 main board		Optical transmission system main board	Required
ARM Card	CARM02		Realize card management and network-based management	Required
E1 card	X8DU	DB37F-BNC-8E1 cable adapter(8E1, 75Ω)	Provides 8 unbalanced E1 ports	Optional
	X8DB	DB37F-RJ48C-8E1 adapter(8E1, 120Ω)	Provides 8 balanced E1 ports	Optional
ETH card	XS030		4-Channel Optical / Electrical Gigabit Ethernet Mapping card, provides one optical Gigabit Ethernet interface (SFP optical module) or two electrical Gigabit	Optional

		Ethernet interfaces (RJ45 connector) compliant with IEEE802.3 serial standard, 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 employs 1~4 separate Virtual Concatenation Groups (VCG), and each VCG can be assigned to one or more Ethernet ports.	
	XS050	4-Channel Fast Ethernet Mapping card, provides four Electrical Ethernet interfaces compatible with IEEE802.3 / 802.3u standards, 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 employs 1~4 separate Virtual Concatenation Groups (VCG), and each VCG can be assigned to one or more Ethernet ports.	Optional
	XS060	single-Channel Gigabit Ethernet Mapping card, adopts ITU-T G.7041, G.7042 and G.707-compliant EOSDH (Ethernet Over SDH) technology, provides one optical Gigabit Ethernet interface and one copper	Optional

		Gigabit Ethernet interface, it employs one VCG and the bandwidth can be flexibly configured from 1~63 VC12*(133Mb/s).	
EOW card	CEOW(not include telephone set)	Engineering Order Wire card	Optional
SFP module	□ 1310nm , 40Km □ 1550nm, 80Km □ 1550nm, 120Km □ Single fiber, 20Km	Single mode SFP optical module	Optional
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	RPW25DC-K5V5, -48V to +5.5V (DC/DC）； RPW25AC-K5V5, ~220V to +5.5V (AC/DC)；	One is required, the other is optional; If both the two power modules are ordered, they are the standby power to each other
Power converter	P-PBK	Connect the power module to the Motherboard, providing +5V for motherboard.	Required

Note 1: Items with □ symbol means optional.

Note 2: Refer to '2.4 service card introduction' for more.

Note3: All the above SFP optical modules support DDM function, if the users use other SFP modules, 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 RS1010

Table 2-3 Card slot of RS1010

Name	Description	Remark
Card_ slot1	CEOW card slot	
Card_ slot2	CARM02 card slot	
Connector 1	E1 card slot	Ethernet card is not allowed to

		plug in
Connector 2	E1 card slot	Ethernet card is not allowed to plug in
Connector 3	Ethernet card slot	E1 card is not allowed to plug in
Optical_ connector 1	SFP optical module	
Optical_ connector 2	SFP optical module	
Power_connector1	Power connector, both AC220V and DC-48V are allowed to access.	
Power_connector2	Power connector, both AC220V and DC-48V are allowed to access.	

Note1: For the service 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 the Service Card

2.4.1 X8DU E1 card

X8DU is the unbalanced E1 card providing 8 E1 unbalanced interfaces with a bit rate of 2.048 Mb/s, compliant with ITU-T G.703 standard. It connects with the RS1010 device and should be inserted into the 1st and 2nd slot of the device.

X8DU adopts DB37 connector as its physical interface, combined with DB37F-BNC-8E1 cable adapter. Refer to Appendix 5 for E1 adapter.

2.4.2 X8DB E1 Card

X8DB is the balanced E1 card providing 8 E1 balanced interfaces with a bit rate of 2.048 Mb/s, compliant with ITU-T G.703 standard. It connects with the RS1010 device and should be inserted into the 1st and 2nd slot of the device.

X8DB adopts DB37 connector as its physical interface, combined with DB37F-RJ48C-8E1 adapter. Refer to Appendix 5 for E1 adapter.

2.4.3 XS030 4-channel Optical/electrical Gigabit Ethernet Mapping Card

XS030, the 4-Channel Optical/Electrical Gigabit Ethernet Mapping card, is one of the important plug-in cards in RS1010 equipment. It is connected to a mainboard of the RS1010 equipment via TELECOM-BUS, inserted into the 3rd slot. XS030 can be managed by the RS1010 network management platform which implements device management based on CLI command and network management based on SNMP.

XS030 provides one optical Gigabit Ethernet interface (SFP optical module) or two electrical Gigabit Ethernet interfaces (RJ45 connector) compliant with IEEE802.3 serial standard, 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 employs 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. Refer to 'XS030 user Handbook' for more.

2.4.4 XS050 4-channel Fast Ethernet Mapping Card

XS050, the 4-Channel Fast Ethernet Mapping card, is one of the important plug-in cards in RS1010 equipment. It is connected to a mainboard of the RS1010 equipment via TELECOM-BUS, inserted into the 3rd slot.

XS050 provides four Electrical Ethernet interfaces compatible with IEEE802.3/802.3u standards, 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 employs 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.

2.4.5 XS060 Single-Channel Gigabit Ethernet Mapping Card

XS060, the single-Channel Gigabit Ethernet Mapping card, is one of the important plug-in cards of RS1010 equipment. It is connected to a mainboard of the RS1010 equipment via TELECOM-BUS, inserted into the 3rd slot. XS060 can be managed by the RS1010 network management platform which implements device management based on CLI command and network management based on SNMP.

XS060 adopts ITU-T G.7041, G.7042 and G.707-compliant EOSDH (Ethernet Over SDH) technology, provides one optical Gigabit Ethernet interface and one copper Gigabit Ethernet interface, it employs one VCG and the bandwidth can be flexibly configured from 1~63 VC12*(133Mb/s).

*Note: XS060 provides an internal Ethernet WAN port (invisible) adopting TMII (Turbo MII) with the bit rate of 200Mb/s, which replace the traditional internal fast Ethernet interface, make the 63 VC12 pass-through at full speed. Therefore, the two gigabit Ethernet interfaces share 133Mb/s bandwidth.

3 Network Application

RS1010 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:
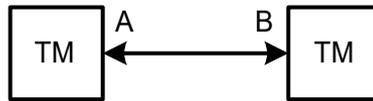
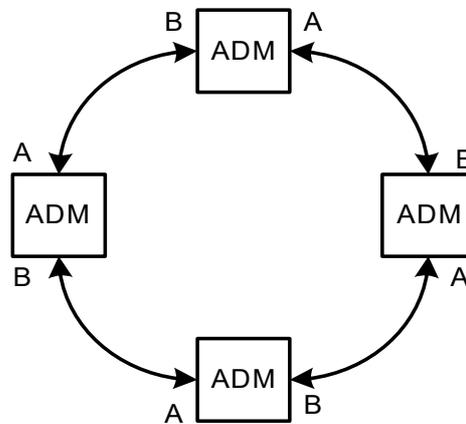Fig. 3-1 Point to point network

Fig. 3-2 Chain network

Fig. 3-3 Ring network

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

4 Functional Description

4.1 Front Panel

The front panel is arranged with various indicating lights, optical interfaces, ETS/EXM interfaces, EOW interface, interfaces for control and management, address switch and so on. As Fig. 4-1 shows;

Fig. 4-1 Front panel

Table 4-1-1 Switches on front panel

Name	Functional Description
MUTE	ON（the button is pressed）:alarm tone is not allowed OFF（the button is released）: alarm tone is allowed
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. For example, the address of '10011000' is '98' Note: the device address is unique mark used for network element management, as well as the number for phone. Different devices in a network can't be set to the same address.

Table 4-1-2 LEDs 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 ON or OFF: Abnormal working status
UALM	Urgent alarm indicator, red ON: Urgent alarm present OFF: No urgent alarm Note: Refer to Table 4-12-1 to see more about urgent alarm
DALM	Non-urgent alarm indicator, yellow.

	ON: Non-urgent alarm present
	OFF: No non-urgent alarm
	Note: Refer to Table 4-12-1 to see more about Non-urgent alarm
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.
	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
	Note: RPDA/B must be used combined with NOP LED to indicate the remote power down or fiber break. Refer to '4.4 RPD' for more.
CARD1、CARD2、CARD3	CARD1/2/3 existing status indicator, green.
	ON: Card exists, and the corresponding card has been detected.
	OFF: The corresponding card is not existed or be detected by microprocessor since something is wrong with the serial port
TALM1、TALM2、TALM3	General alarm indicator for card1/2/3 (including TLOS of E1 port and LINKDOWN of Ethernet port), red.
	ON: TLOS alarm or LINKDOWN alarm is detected on some E1/ Ethernet port of the corresponding card
	OFF: TLOS alarm or LINKDOWN alarm is detected on none of E1 /Ethernet ports
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.
BUSY	EOW indicator ,green
	ON: EOW is on busy state;
	OFF: EOW is on idle state

	Note: This indication may also be on if the device is powered on or the optical fiber is pulled out and plugged, do hook-off and hook-on operation to clear this indication.

Table 4-1-3 EMU interface indicator

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 optical 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. Whether the 10 dB/ 15 dB attenuator being required is depended on the optical module.
U/DALMO	Urgent/non-urgent alarm output, DB9 connector. It is available only if CUDA module is used.	Refer to appendix 1 for CUDA module.
ETS/EXM	ETS1/EXM1 and ETS2/EXM2 are two shared interfaces with the same function. They can be selected as either External Timing Source (ETS) interface or Extendable Management (EXM) interface simultaneously by CLI command or RAYVIEW management software. By default, the two interfaces are used as ETS interface.	The EXM interface and the ETS interface is a shared interface, which means that the two kinds of interface cannot be used at the same time. Refer to '4.7.3 notice' for more.
RS232	User channel interface (RJ-45 interface), RS232 level, which used to transmit the user control information,	For the cable information, refer to appendix 3 for details. In networking application, make sure

	and etc. The 'forward enable' status of the interface can be configured by software, the default status is 'enable'.	that the 'forward enable' of one NE at least be configured as 'disable'. Otherwise, the user channel will be blocked.
CONSOLE	Serial network management interface(RJ-45 interface), for CLI management	Refer to appendix 4 for the cable definition
EMU	Ethernet network management interface（RJ-45 interface）, for SDH network management	crossover and straight through cable auto-adaptive
PHONE	EOW Interface(Standard RJ-11 interface) NOTE: When the device has no EOW card, this interface is invalid	Ordinary telephone set with two line mode can be used.

4.2 Rear Panel

The rear panel of RS1010 consists of two parts: power card slot and service card slot, as Fig. 4-2 shows;
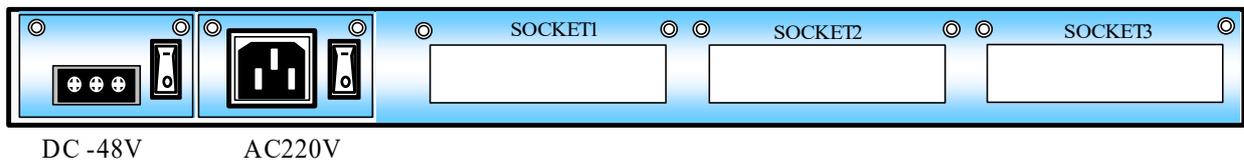

DC -48V   AC220V

Fig. 4-2 Rear panel

Table 4-2 Rear panel description

Name	Functional description	Remarks
Power card slot	Two power card slots, one for AC 220V, the other is DC-48V. Whether or not the two cards are the same, they can be inserted into the device at the same time. NOTE: The power in Fig. 4-2 may not accord with the actual device. For example, when two 220V AC power modules are ordered, there will be two AC 220V connectors on the rear panel.	AC 220V and DC-48V can be accessed simultaneity
Power switch	'I': Power on; 'O': Power off	Power switch
SOCKET1/2/3	3 service card slots, available for E1 cards and Ethernet cards, refer to '2.4 service card introduction' for more card information, and refer to '2.3 card slot of RS1010' for the card slot rule.	Hot plug the card is not supported!

4.3 Automatic Laser Shutdown

In order to minimize or eliminate risk of exposure to laser radiation from fiber breaks, all optical interfaces in the RS1010 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 RS1010 can be disabled.

RS1010 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.

RS1010 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 RS1010' 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.

4.4 Remote Power down Detection

During the project launching 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 identify these two defects to make maintenance facility. 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 4-4 lists the corresponding alarm LED status in case of fiber broken or device power down.

Table 4-4 RPD description

LED Case	RPDA(B)	NOPA(B)
The remote device connected with port A(B) power- off and optical fiber is normal	ON	OFF
Fiber A(B) is broken	OFF	ON
Both the remote device connected with port A(B) and optical fiber are normal	OFF	OFF

4.5 Loop back

RS1010 supports various loop back modes configured by management software for fault localization and failure detection:

1   : Line port outer_ loopback: As Fig. 4-5 shows, at loop back point ①, the incoming signal from optical line shall be transmitted back towards the optical line;

2   : Line port inner_ loopback: As Fig. 4-5 shows, at loop back point ②, the received bit stream over optical module shall be transmitted back towards the transmitting station.

3   :E1 port inner_ loopback: As Fig. 4-5 shows, at loop back point ③, the received bit stream over E1 channel shall be transmitted back towards the optical line direction. At the same time, it automatically inserts all 'I' bits (AIS) serially into the local side.

4   :E1 port outer_ loopback: As Fig. 4-5 shows, at loop back point ④, the incoming signal from E1 receive path shall be transmitted back towards the E1 transmit path. At the same time, it automatically insert all '1' bits (AIS) serially into the line direction.
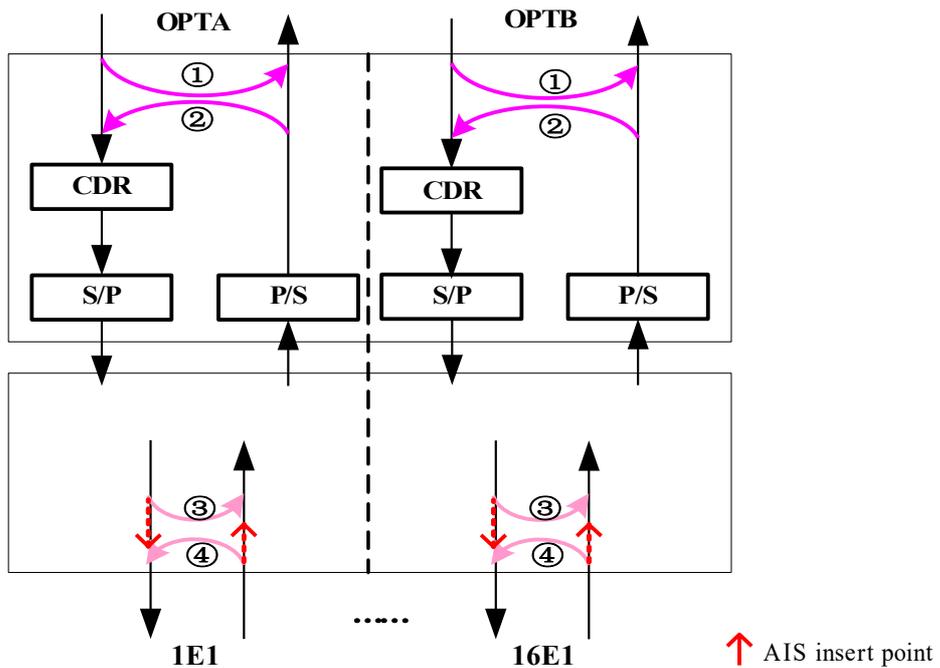
Fig. 4-5 loop back mode

RS1010 supports various loop back configuration through RAYVIEW management software or CLI command line, Refer to 'RAYVIEW management software user guide' and 'Guide to CLI command of RS1010' for more.

Note1: Line port loopback (①, ②) is not available for RAYVIEW management software .

Note2: The loopback configuration will be lost after restarting device (or the device is power off).

4.6 Embedded BERT

RS1010 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.

4.6.1 Features

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

4.6.2 Application

The BERT generate $2^{15}-1$ pseudo random sequence which is inserted into the transmitting VC12 channel(choose one channel from E1_1 to E1_16), 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 the tested VC12 channel must map to E1 port before using of the embedded BERT. And the received VC12 number must be identified with the transmitted VC12 number.

RS1010 provides two positions for transmitting and two positions for receiving, as figure 4-6-2 shows:

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

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

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

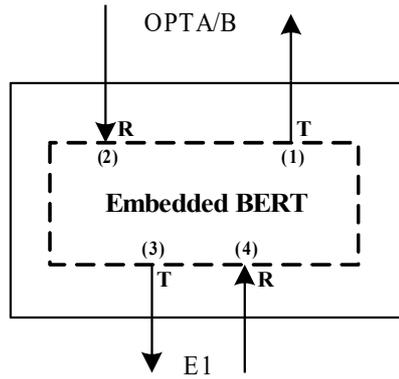Position (4): Receiving from E1 interface (E1);

Fig. 4-6-2 four positions

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

Choose any VC12 from E1_1 to E1_16 as the tested channel, Open to transmit at position (1) of device 1, the BERT start to insert $2^{15}-1$ pseudo random sequence into the transmitting VC12 channel, configure E1 port inner_ loopback of device2 and open to receive at position(2) of device 1, check for bit error static by BERT, as Fig.4-6-2-1 (a) shows; while open to receive at position (2) of device 2 can tests a signal direction line as Fig.4-6-2-1(b) shows.
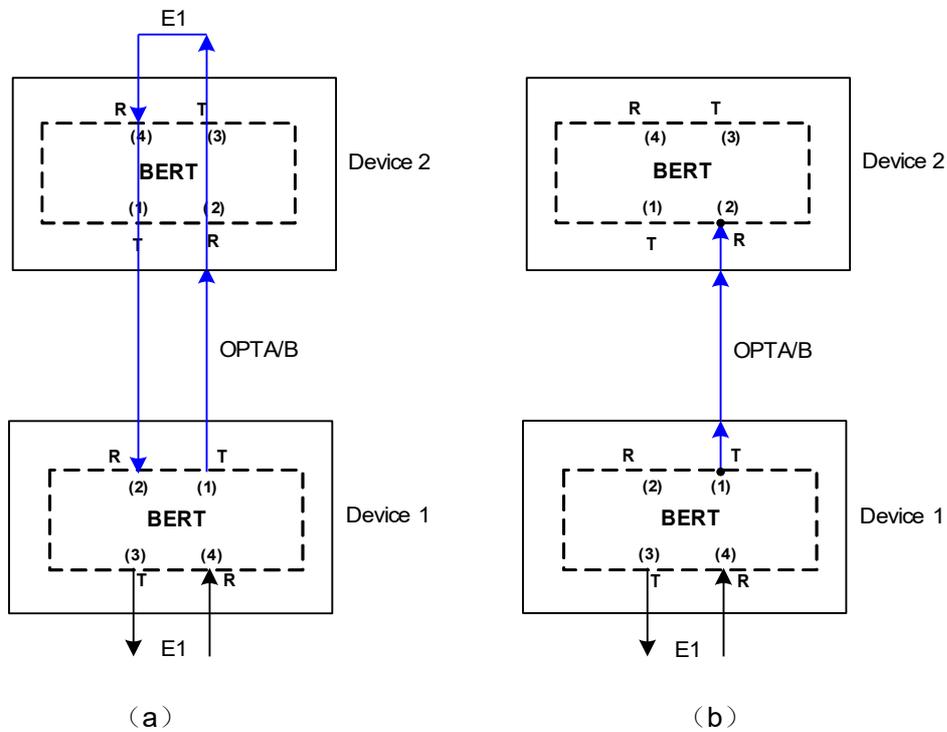

（a）   （b）

Fig.4-6-2-1 Appication1

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

Choose any VC12 from E1_1 to E1_16 as the tested channel, Open to transmit at position (1) of device1, the BERT start to insert $2^{15} - 1$ pseudo random sequence into the transmitting VC12 channel, configure E1 port inner_ loopback of device2, open to receive at position(4) of device2, checked for bit error static by BERT, as Fig.4-6-2-2 shows:
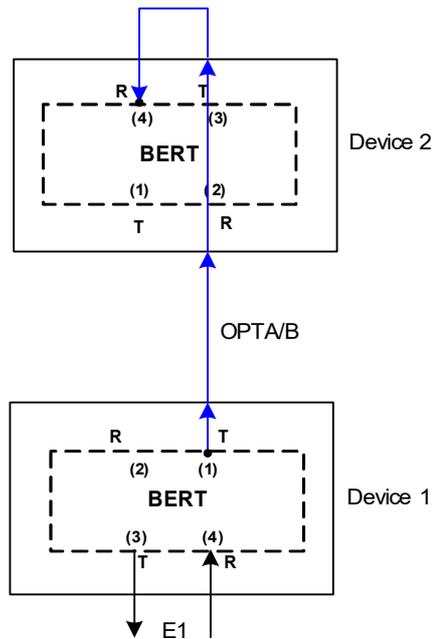

Fig.4-6-2-2 Application 2

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

Choose any VC12 from E1_1 to E1_16 as the tested channel, Open to transmit at position (3), the BERT start to insert $2^{15} - 1$ pseudo random sequence into the transmitting VC12 channel, configure E1 port inner_loopback and open to receive at position(4) of device1, check for bit error static by BERT, as Fig.4-6-2-3 shows:
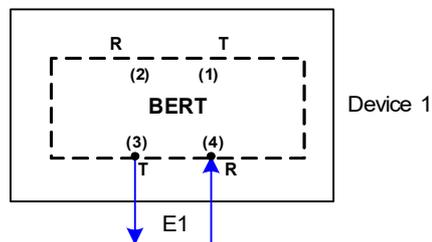

Fig.4-6-2-3 Application 3

RS1010 support embedded BERT configuration through RAYVIEW management software or CLI command line, Refer to 'RAYVIEW management user guide' and 'Guide to CLI command of RS1010' for more.

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

4.7 ETS/EXM

ETS1/EXM1 and ETS2/EXM2 are two shared interfaces with the same function. They can be selected as either External Timing Source (ETS) interface or Extendable Management (EXM) interface simultaneously by CLI command or RAYVIEW management software. By default, the two interfaces are used as ETS interface.

4.7.1 ETS（External Timing source）

As ETS interface, it provides external reference clock input (T31/T32) and output (T41/T42), (T31 is the input of ETS1, T41 is the output of ETS1, T32 is the input of ETS2 and T42 is the output of ETS2).

The input of ETS1/2（T31/T32）can either be the signal extracted from E1 stream of the external SDH/PDH equipment, or be the clock signal directly from a certain external accurate clock, which can be achieved by CLI command or RAYVIEW management software. When 2.048 Mb/s mode is selected by management software, T31/T32 will be the signal extracted from E1 stream of the external SDH/PDH equipment, while 2.048MHz mode is selected by management software, T31 and T32 will be the clock signal directly from a certain external accurate clock. In default, 2.048Mb/s mode is selected.

The source of T41/T42 can be selected by operator;
- Tracing from the received STM-1 line A (OPTA)
- Tracing from the received STM-1 line B (OPTB)
- Tracing from the device current timing signal

There are two modes provided for T41/T42: 2.048Mb/s (output in HDB3 code format) and 2.048 MHz (output in clock format), which can be selected by jumper 'J6' on the mainboard. In default, the jumper should be connected to the '2.048Mb/s' point on the mainboard).When 2.048MHz mode is wanted to be selected for T41/T42, the jumper 'J6' must be removed from the '2Mb/s' point on the mainboard and should be connected to the '2MHz' point.

Notice: 2.048MHz mode is not available temperately.

4.7.2 EXM（Extendable Management）

EXM interface is used to create E1-based management network to facilitates the unite network management of two or more possible distinct networks.

EXM interface can be selected as either Outer Extendable Management (OEXM) interface or

Inner Extendable Management (IEXM) interface by CLI command or RAYVIEW management software.

OEXM interface is a RJ45 interface which is on the front panel of the device, it is very important to connect the external E1 cable when the OEXM interface is selected to be used. It is used to build E1-based management network which implements network management data transmitting either through the E1 cable or SDH/PDH E1 transmission network without occupying optical channels. This kind of management is especially good for the NEs or subnets without optical interface available. Refer to '4.11 network management' for more.

IEXM interface is the invisible interface inside the device; it is used to build E1-based management network which achieves mapping the network management data to VC12 channel. You can assign any VC-12 available on the STM-1 port to carry the E1-based management channel across an SDH network. Refer to '4.11 network management' for more.

4.7.3 Note

- ■   ETS or OEXM interface is a RJ45 interface which is on the front panel, it is very important to use an E1 cable connected to the RJ45 interface, as the medium, to implement the signal transmission. Refer to Appendix 2 for cable definition.
- ■   IEXM interface, used as the invisible interface inside the device, implement signal transmission without any physical cable connected to.
- ■   2.048MHz mode is not available temporarily for ETS / EXM interface.
- ■   In order to meet user's various requirements, RS1010 devices provide IMP, the single E1 impedance converter, to implement impedance convention and provide ETS / EXM interface with 75Ω impedance. The IMP module is not included in the component of equipment, it need to be declared before ordering.

4.8 Timing Architecture

4.8.1 Timing Source

RS1010 provides multiple timing source:

- ●   Tracing from the received STM-1 line A as timing source (T11) or tracing from the received STM-1 line B as timing source (T12);
- ●   Tracing from T31/T32 external timing source 2048kHz / 2048Kbit/s, output T41/T42 (refer to '4.7 ETS/EXM');
- ●   Tracing from any received 1-16 E1 line as timing source(T2);
- ●   Tracing from an internal oscillator in accordance to ITU G.813

4.8.2 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.

4.8.3 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.

In default, the system enters into the automatic selection mode; the synchronization source hierarchy listed in order of Local , T11 (OPTA), T12 (OPTB) ；Frequency offset detection: is enabled; And SSM is switched off.

Operator selection

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

For facility of testing, the system provides forced to holdover mode. As the holdover mode is set successfully, the system will always run in this mode until the next operator selection.

RS1010 supports timing configuration through RAYVIEW management software or CLI command line, such as timing processing mode settings, timing source selection, configure

T31/T32 and T41/T42 as 2 2.048 MHz or 2.048Mbit/s modes, configure clock priority, enable/ disable SSM (Synchronization Status Message) and so on. Refer to 'RAYVIEW management software user guide' and 'Guide to CLI command of RS1010' for more.

4.9 Protection Architecture

4.9.1 1+1 path protection mode

As Fig.4-9-1 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 (VC12 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（without manual operation）, 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 VC12.

Note: The ' …….' in Figure 4-9-1 indicates the omitted SDH equipment；The NE1 and NE2 in Figure 4-9-1 indicates the RS1010 equipment respectively.
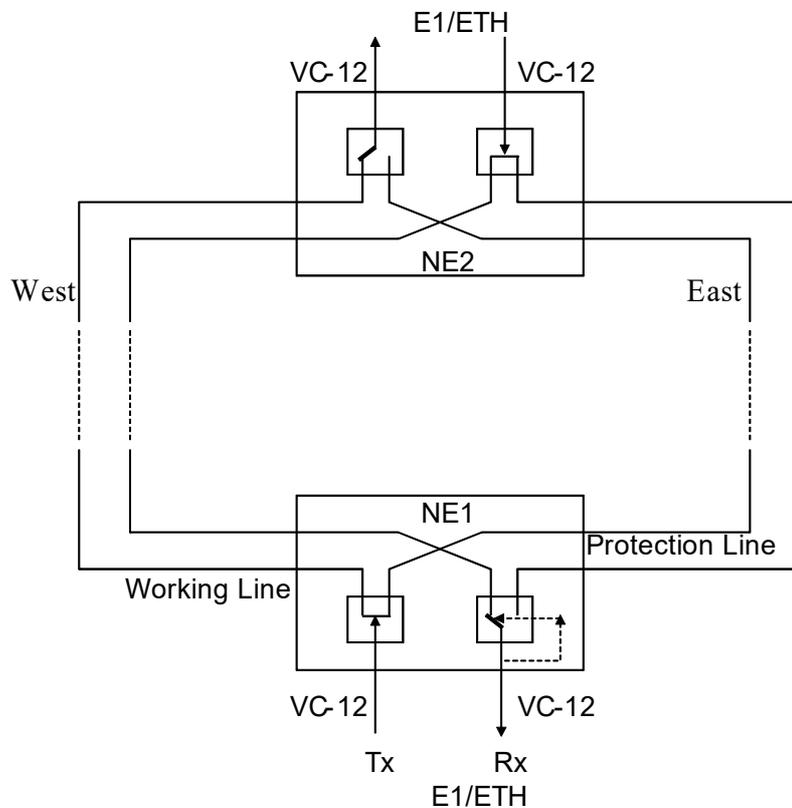
Fig.4-9-1 1+1 path protection mode

RS1010 supports two modes in 1+1 path protection mode for configuration: auto protection mode and manual protection mode. For ring network, if auto protection is enabled, the traffic is transmitted over both the path of port A and path of port B simultaneously. At the sink end, the normal traffic signal is selected from the better of the two ports. In the case of fiber break or alarm occurred (such as TU-LOP, TU-AIS), the device detects the fault and the switching fabric will automatically select the incoming traffic from the protection path.

When auto protection is disabled, Manual protection is available. The operator can do 'preferred A/B' and 'forced to A/B' in CLI command line or RAYVIEW management software . For 'preferred A' operation, the alarm (TU-AIS, TU-LOP) will be checked for the corresponding timeslot of optical A/B. If there is alarm, this operation will not be executed; while for 'forced to A/B' operation, the system will switch to the pointed port without checking any alarm. Refer to 'RAYVIEW management software user guide' and 'Guide to CLI command of RS1010' for more about the configuration.

4.9.2 1+0 mode

As Fig.4-9-2 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 VC12 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 x 2) VC12. Refer to 'RAYVIEW management software user guide' and 'Guide to CLI command of RS1010' for more about the configuration.
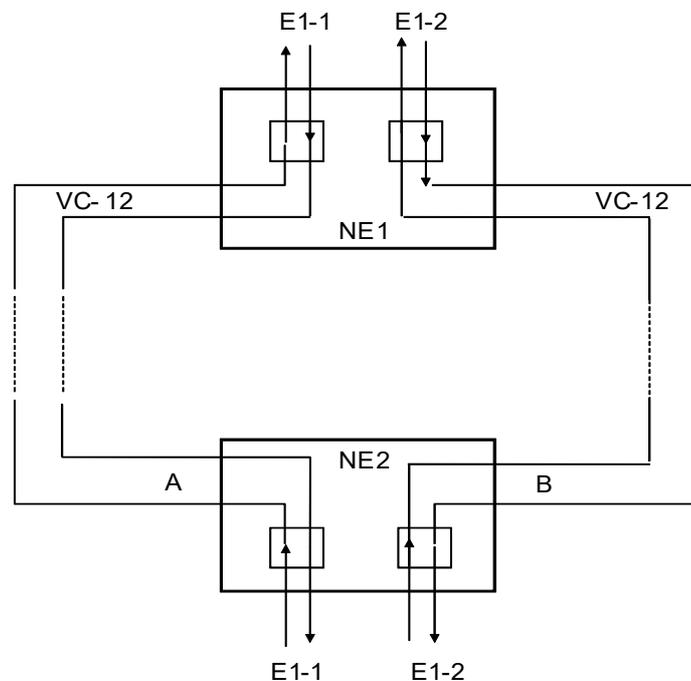

Fig.4-9-2 1+0 mode

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

4.10 EOW

4.10.1 Introduction

EOW (Engineering order wire) unit uses E1 section overhead bytes to implement the site-selection call among SDH subnets. This function is selectable: when there is no EOW card, this function is not supported.

4.10.2 Steps in configuration

A. Take point-to-point network application as example, connect the two devices by fiber in point-to- point mode, make sure that the optical B of NE2 is connected with optical A of NE1, and optical A of NE2 is connected with optical B of NE1, as figure 4-10-2-1 shows:
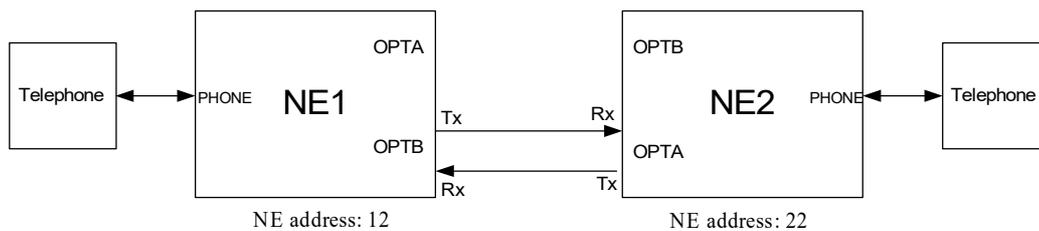

Figure 4-10-2-1

B. As the two equipments power on, the EOW channel between the two devices will be occupied and their respective 'BUSY' indications on the front panel are on, press the "#" key or hook off and hook on the handset to restore the channel to idle state and make sure EOW works properly (make 'BUSY' indication off).

C. The calling party (here take NE1 as the calling party) hooks-off and hears dialing tone, meanwhile both sides are on busy status and their respective 'BUSY' indications are on.

D. The calling party dials the correct number to call (as figure 4-10-2-1 shows, the NE2 address is 22, so the correct number is 22), the called party rings at the same time, otherwise the calling party will not hear the ring back tone. As figure4-10-2-2 shows:

Figure 4-10-2-2

E. After the called party hooks-off, the two parties enter talking status. As figure 4-10-2-3 shows:
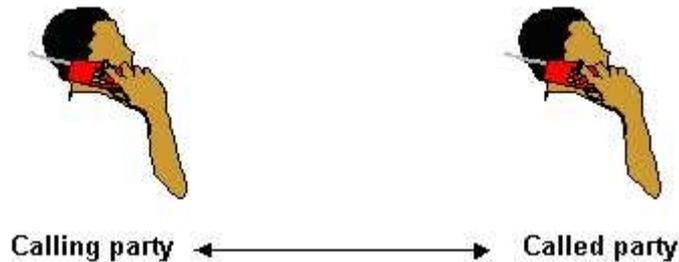

Calling party ←————————→ Called party

Figure 4-10-2-3

F. If the calling party hooks on first, the called party will hear busy tone, after the called party hooks on, both sides will on idle status and their respective 'BUSY' indications are off. As figure 4-10-2-4 shows;

Calling party ------------------------- Called party

Figure 4-10-2-4

If the called party hooks on first, the calling party will hear no busy tone, after the calling party hooks on, both sides will on idle status and their respective 'BUSY' indications are off. As figure 4-10-2-5 shows;

Calling party ------------------------- Called party

Figure 4-10-2-5

4.10.3 Note

a. Fiber A of each device must be connected with fiber B of the adjacent device.

b. As the equipments power on or optical fiber be reconnected, the EOW channel will be occupied and the respective 'busy' indications on the front panel of each equipments are on, do pressing the "#" key or hook off and hook on operation to restore the channel to idle state and make sure EOW works properly (make 'BUSY' indication off).

c. If calling party hears busy tone when hooking off the handset, do pressing the "#" key or hook off and hook on operation to restore the channel to idle state, therefore, the next conversation may cruise to the final.

4.11 Network Management Channel

RS1010 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.

4.11.1 Network management based on SDH overhead

The network management channel based on SDH Overhead (SOH), called DCC also, adopts overhead bytes to complete network management information transmission. 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 all our equipments. As Fig. 4-11-1 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 RS1010' for more.
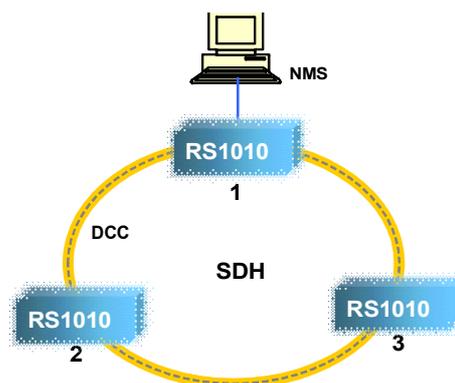
Fig. 4-11-1 network management based on SDH overhead

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

4.11.2 Network management based on E1 channel-by IEXM interface
4.11.2.1 Application 1

As shown in Figure 4-11-2-1, the three RS1010 devices (marked as NE in figure 4-11-2-1)

from different areas access to SDH network through the three equipments of other manufacturers (marked as ADM in figure 4-11-2-1) via only a pair of optical fiber (optical A or B). You can assign any available VC-12 on the STM-1 port to carry the E1-based management channel across an SDH network by device configuring via CLI command or RAYVIEW software. (Refer to the following steps for details.) After configuration, the NMS connected with NE1 can implement unite network management over the E1-based management network. Note that management data from interface IEXM1 and IEXM2 of the two neighboring NEs must be mapped to the same VC-12 channel.

This application completes the unified network management by using only one optical interface provided by SDH transmission network. The E1- based management channel will be protected when both of the two IEXM interfaces are used; in this case slot M, slot N and Slot k in Fig.4-11-2-1 cannot be the same slot. While the E1- based management channel will not be protected when only one of the two IEXM interfaces is used; in this case slot M, slot N and Slot k in Fig.4-11-2-1 can be the same slot to improve the bandwidth efficiency.
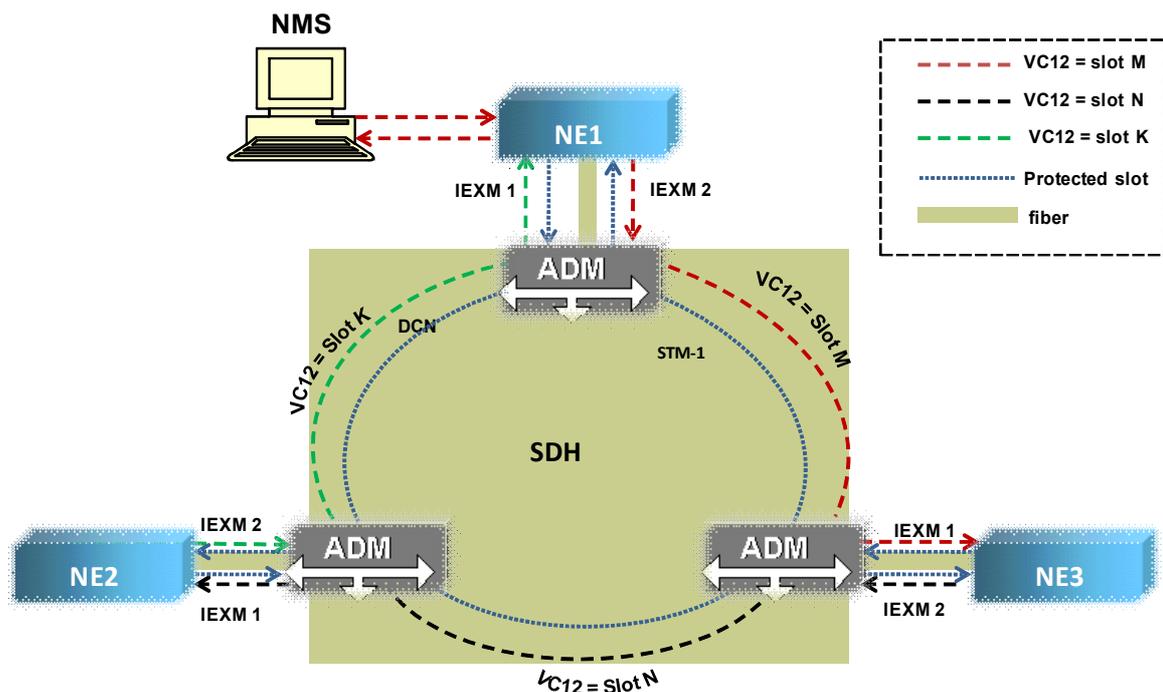

Fig. 4-11-2-1 Application 1

Steps in configuration：

a. Set the NE address of the three devices separately, make sure that each NE address is unique.

b. Assign NE1 as gateway

c. Set each EXM/ETS interface as inner EXM interface (IEXM) separately by CLI command or RAYVIEW management software.

   Note that if IEXM is selected by software, the ETS function and OEXM function will be

unavailable.

d. Make sure to close DCC channel of optical A/B

e. Do Cross-Connect operation to ensure that management data from interface IEXM1 and IEXM2 of the two neighboring NEs be mapped to the same VC-12 channel, and the VC-12 channel of IEXM1 and IEXM2 in one device must be different. for example, map both IEXM1 of NE1 and IEXM2 of NE2 to slot 1 of optical A; Map both IEXM2 of NE1 and IEXM1 of NE3 to slot 2 of optical A; Map both IEXM1 of NE2 and IEXM 2 of NE3 to slot 3 of optical A

4.11.2.2 Application 2

As shown in Figure 4-11-2-2, the three RS1010 devices (marked as NE in figure 4-11-2-2) from different areas access to SDH network through the three equipments of other manufacturers (marked as ADM in figure 4-11-2-2) via two pairs of optical fiber (optical A and B). You can assign any available VC-12 on the STM-1 port to carry the E1-based management channel across an SDH network by device configuring via CLI command or RAYVIEW software. (Refer to the following steps for details.) After configuration, the NMS connected with NE1 can implement unite network management over the E1-based managment network. Note that management data from interface IEXM1 and IEXM2 of the two neighboring NEs must be mapped to the same VC-12 channel, while if the RS1010 devices adopt 1+0 mode, slot M, slot N and Slot k are supposed to be the same but not necessarily.

This application complete the unified network management by using two optical interfaces provided by SDH transmission network. If the VC-12 channel carried E1-based management data adopt 1+0 mode, the bandwidth efficiency will be improved.
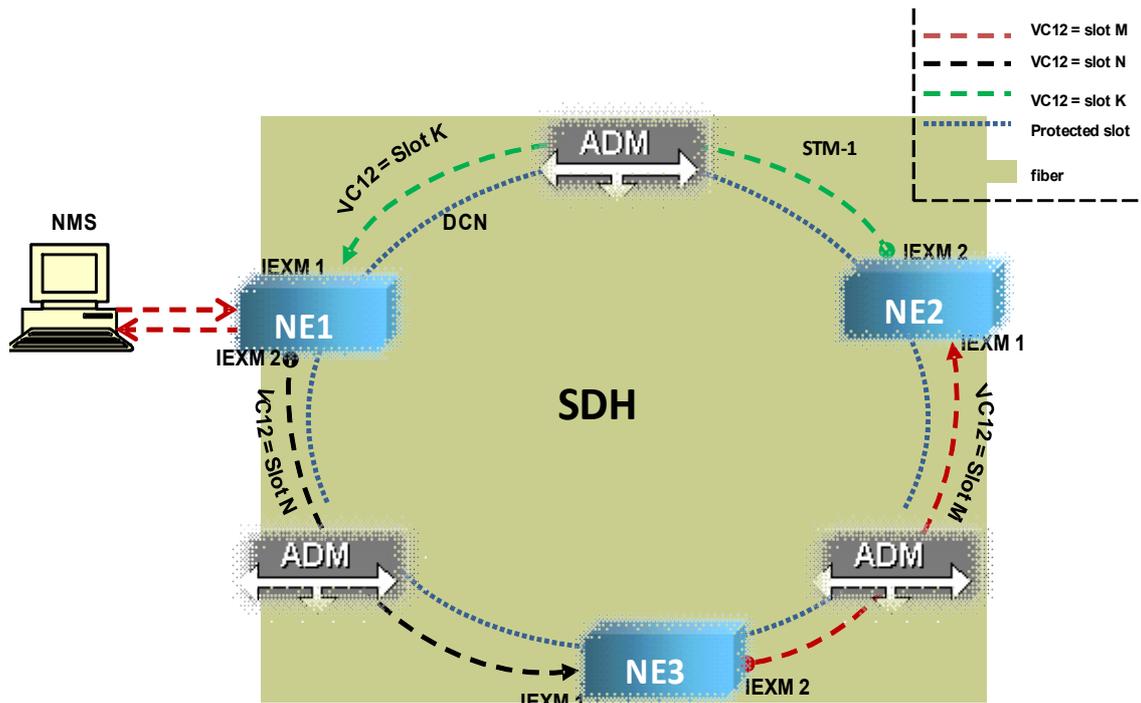
Fig. 4-11-2-2 Application 2

Steps in configuration：

a. 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.

b. Set the NE address of the three devices separately, make sure that each NE address is unique.

c. Assign NE1 as gateway

d. Set each EXM/ETS interface as inner EXM interface (IEXM) separately by CLI command or RAYVIEW management software.

   Note that if IEXM is selected by software, the ETS function and OEXM function will be unavailable.

e. Make sure to close DCC channel of optical A/B

f. Do Cross-Connect operation to ensure that management data from interface IEXM1 and IEXM2 of the two neighboring NEs be mapped to the same VC-12 channel; and in order to improve the bandwidth available efficiency , it is suggested to map IEXM1 and IEXM2 of one device to the same VC-12 channel of the two ports (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.

4.11.3 Network management based on E1 channel-by OEXM interface

As shown in figure 4-11-3, three RS1010 equipments from different areas are connected by E1 cable via outer EXM interfaces (OEXM), the E1-based management channel of each devices are connected by the SDH/PDH E1 transmission network, the NMS connected with NE1 can implement unified network management over E1-based management network. When an E1 link corresponded to some OEXM interface failed (such as alarm TLOS, TAIS or RAL is detected), the interface will be discarded and a new route will be automatically created to protect the management channel. This kind of management is especially good for the NEs or subnets without optical interface available.
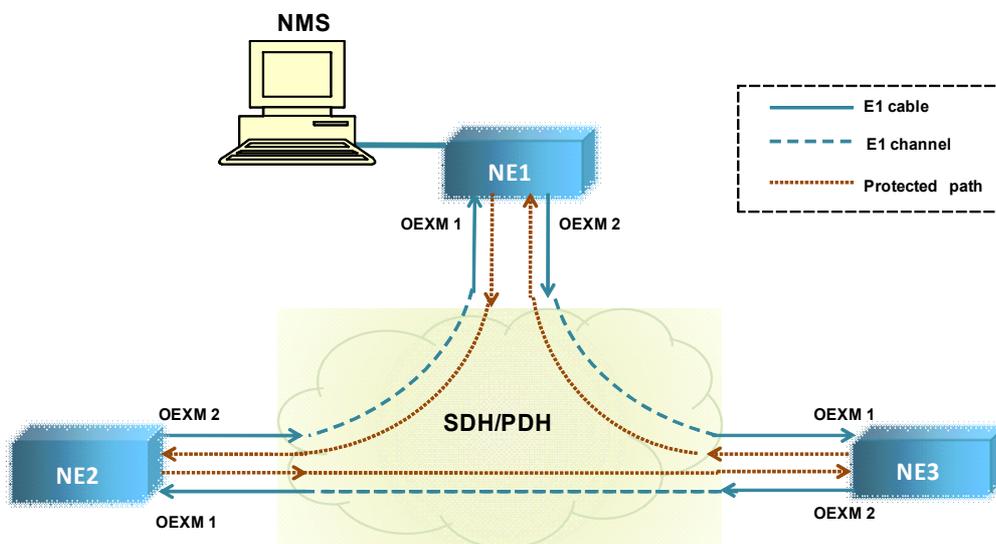

Fig. 4-11-3 Network management base on E1 channel-by OEXM interface

Steps in configuration:

a. Set the NE address of the three devices separately, make sure that each NE address is unique.

b. Assign NE1 as gateway

c. Set each EXM/ETS interface as outer EXM interface (OEXM) separately by CLI command or RAYVIEW management software.

   Note that if OEXM is selected by software, the ETS function and IEXM function will be unavailable.

d. Make sure physical connecting correctly of OEXM1 and OEXM2 of the two neighboring NEs; for example, OEXM1 of NE1 must be connected with OEXM2 of NE2 over E1 link.

4.12 Alarm

RS1010 provides abundant alarm, as table 4-12-1 shows:

Table 4-12-1 Alarm list

Alarm Name	Alarm Description	Severity	U/DALM
Alarm for Optical Port			
NOP	Loss of Optical Signal on the receive line	Critical	UALM
RPD	Remote power down	Major	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	Minior	DALM
RS-EXC	Regenerator Section Excessive Error	Major	UALM
RS_DEG	Regenerator Section Degraded signal defects	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-RDI	High-order Path Remote Defect Indication	Critical	UALM
HP-EXC	High-order Path Excessive error	Minor	DALM
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
HP-TIM	High-order Path trace identifier mismatch	Critical	UALM
HP-PLM	High-order Path payload mismatch	Critical	UALM
Low-order path			
TU-LOP	TU loss of pointer	Critical	UALM
TU-AIS	Alarm Indicator Signal of Tributary Unit	Critical	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
E1 interface alarm			
TLOS	Loss of E1 signal	Critical	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 SSMBMissmatch 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
IEXM alarm			
EXM_FAIL	EXM channel fault	Critical	UALM

Note:

(1)Table 4-12-1 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.

4.13 Device management

RS1010 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 BERT testing. Refer to 'Guide to CLI command of RS1010' for detail.

RS1010 also supports network management platform based on SNMP (V1 and V2C) to complete configuration management and kinds of alarm monitoring. The device's default IP address is 192.168.0.155, subnet mask is 255.255.255.0, and gateway is 192.168.0.1. Refer to 'RAYVIEW management software user guide' for more.

5 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 Mount the unit in a 19-inch rack with screwdriver;

III Connect to the interfaces

  ✓ Insert the selected cards into the corresponding slots and 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.

  ✓ Connect the ETS/EXM interface if ETS or EXM is used

IV 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. Whether or not the 10 dB/ 15 dB attenuator being required depends on the optical module. For example, for the SFP optical module with 40Km, the mean launched power-maximum is 0dBm and the minimum overload is -10dBm, the 10 dB attenuator is required to undertake the short distance (much less than 40Km) testing in the laboratory. as figure 5 shows:
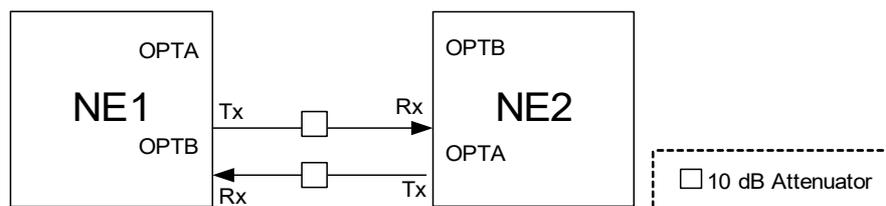

Figure 5

6 Technical Specifications

Table 6-1 Parameters specified for STM-1 optical interfaces

Subject		Unit	Values			
Digital signal Nominal bit rate		kbit/s	STM-1 155520			
Application code		-	L-1.1	L-1.2	-	-
Operating wavelength range		nm	1280-1335	1480-1580	1480-1580	1310/1550 1550/1310
Distance (km)		Km	40	80	120	20
DDM		-	Available	Available	Available	Available
Type of interface		-	LC	LC	LC	LC
Type of fiber	G.652	G.652	G.652	G.652	G.652
Transmitter at reference point S	Source type	-	MLM	SLM	SLM	MLM
	Spectral characteristics -maximum RMS width (σ)	nm	3	-	-	-
	Spectral characteristics -maximum −20 dB width	Nm	-	1	1	-
	Spectral characteristics -minimum side mode	dB	-	30	30	-
	Mean launched power– maximum	dBm	0	0	5	-8
	Mean launched power– minimum	dBm	-5	-5	0	-15
	Minimum extinction ratio	dB	10	10	10	10
Optical path between S and R	Attenuation range	dB	10-28	10-28	10~31	10-28
	Maximum dispersion	ps/nm	246	NA	NA	96
	Minimum optical return loss of cable plant at S, including any connectors	dB	NA	20	NA	NA
	Maximum discrete reflectance between S and R	dB	NA	-25	NA	NA
Receiver at reference point R	Minimum sensitivity	dBm	-34	-34	-34	-34
	Minimum overload	dBm	-10	-10	-10	-10
	Maximum optical path penalty	dB	1	1	1	2
	Maximum reflectance of receiver, measured at R	dB	NA	-25	NA	NA

Note: 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 6-1 shows; if users purchase other types of SFP optical module by themselves, the parameters may be different.

Table 6-2 E1 interface

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

Table 6-3 ETS/EXM interface

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

Table 6-4 Ethernet electric interface

Subject	Description
Connector	RJ-45
Auto-negotiate	Enable
Speed	10M/100M
Duplex	Full/half duplex
VLAN	Disable
Flow control	Default: enable
Standard	IEEE802.3 10Base-T IEEE802.3u 100Base-Tx

Table 6-5 Ethernet management interface(EMU)

Subject	Description
Bit rate	100Mb/s
Connector	RJ45

Table 6-6 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 6-7 RS232 user channel interface (RS232)

Subject	Description
Maximum bit rate	9600
Electricity level	EIA-RS232 standard
Connector	RJ45

Table 6-8 U/DALMO interface

Subject	Description
Connector	DB9
Electrify level	TTL

Table 6-9 Power supply

Subject	Description
Input DC voltage	-36～-72V DC
Input AC voltage	176～264V AC
Power consumption	15W±10％

Table 6-10 Device dimension and weights

Subject	Description
Dimension	483mm×44mm×255mm(width ×height ×depth)
weights	3.5kg

Table 6-11 Environment requirements

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

Appendix 1 CUDA (with 4 terminals) definition

The urgent/ non-urgent alarm output function is usually used together with the CUDA module. As Fig.A-1 shows, connect CUDA module to RS1010 device via U/DALMO interface, and connect pin UALM+ ,UALM-, DALM+, DALM- of CUDA module separately to the rack aggregated variety of devices. The CUDA Module will output open/close. When RS1010 has urgent alarm the pin UALM+ and UALM- of CUDA will be short and the LED of UALM will be ON. When RS1010 has non-urgent alarm the pin DALM+ and DALM- of CUDA will be short and the LED of DALM will be ON.
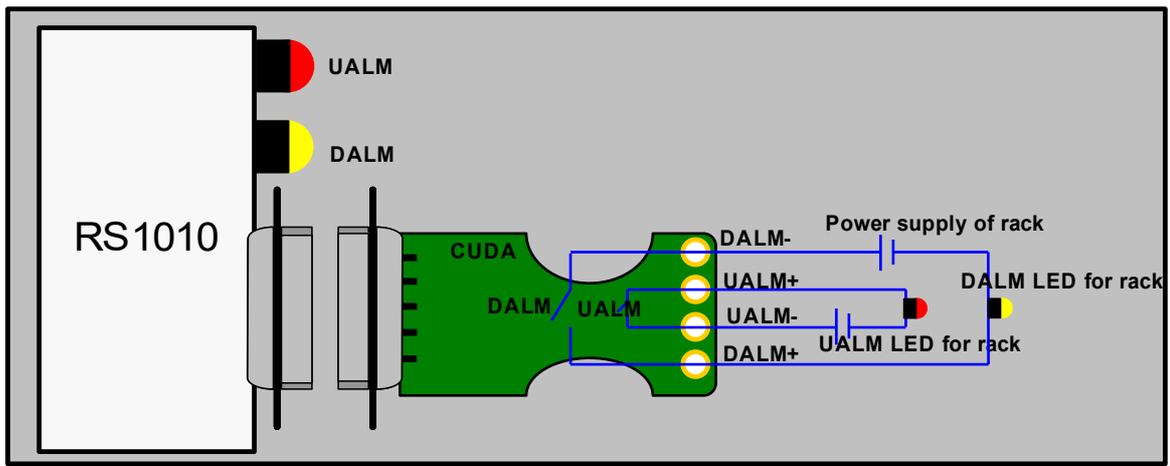
Fig.A-1 CUDA working process

Table A-1-1 CUDA definition

Pin	Definition	Remarks
PIN1	DALM-	DALM output
PIN2	UALM+	UALM input
PIN3	UALM-	UALM output
PIN4	DALM+	DALM input

Appendix 2 ETS/EXM interface definition（RJ45）

Table A-2 ETS/EXM definition

Pin	Definition	Remarks
PIN1	RXD+	Balanced E1 interface input P
PIN2	RXD-	Balanced E1 interface input N
PIN3	-	--
PIN4	TXD+	Balanced E1 interface P-output
PIN5	TXD-	Balanced E1 interface N-output
PIN6	-	--
PIN7	-	--
PIN8	-	--

Appendix 3 RS232 User channel interface

Table A-3 User (RJ45) channel cable definition

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

Appendix 4 RS232 network management interface （CONSOLE）

Table A-4 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-4-1 and Fig. A-4-2 shows:

7: Receive data   8：Transmit data   6：Ground

Fig. A-4-1 RJ45 connector
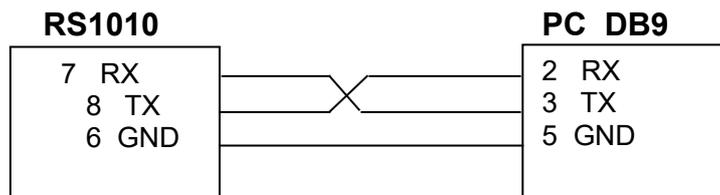
Fig. A-4-2 Connection

Appendix 5 E1 interface

E1 interface adopts DB37 connector as physical interface, which has the corresponded adapters: DB37F-BNC-8E1 cable adapter for 75Ω, as Fig. A-5-1 shows; DB37F-RJ48C-8E1 adapter for 120Ω, as Fig.A-5-2 shows;.

Fig. A-5-1 demonstrates DB37F-BNC-8E1 cable adapter

Fig. A-5-1 DB37F-BNC-8E1 cable adapter

Fig. A-5-2 illustrates DB37F-RJ48C-8E1 adapter;

Fig. A-5-2 DB37F-RJ48C-8E1 adapter

Table A-5 120Ohm E1 interface (RJ45 connector) definition

Pin	Definition	Remarks
PIN1	RXD+	P-input of 120 Ohm E1 interface
PIN2	RXD-	N-input of 120 Ohm E1 interface
PIN3	-	Null
PIN4	TXD+	P-output of 120 Ohm E1 interface
PIN5	TXD-	N-output of 120 Ohm E1 interface
PIN6	-	Null
PIN7	-	Null
PIN8	-	Null

Appendix 6 Related Documents

Table A-6 RS1010 Related documents list

Item	Name	Remarks
1	RAYVIEW management software User guide	
2	Guide to CLI command of RS1010	
3	XS030 User Handbook	
4	XS050 User Handbook	
5	RS1010 User Handbook	

Figures Index

Tables Index