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RC3000-15 (P100R001) Hardware Description (Rel_14)

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Notice

Preface

Objectives

This document describes hardware of the RC3000-15, including chassis, power modules, fans, cards, and cables.

Versions

The following table lists the product versions related to this document.

Product name	Version
RC3000-15	• E.30 • E.40

Note

- Compared with E.30, E.40 uses E.40 DXC card which supports 64 ways of VCCs.
- Compared with E.20, E.30 uses a new chassis, new DXC card, and new STM1 card.

Conventions

Symbol conventions

The symbols that may be found in this document are defined as below.

Symbol	Description
Warning	Indicate a hazard with a medium or low level of risk which, if not avoided, could result in minor or moderate injury.
Caution	Indicate a potentially hazardous situation that, if not avoided, could cause equipment damage, data loss, and performance degradation, or unexpected results.

Symbol	Description
	Provide additional information to emphasize or supplement important points of the main text.
	Indicate a tip that may help you solve a problem or save time.

General conventions

Convention	Description
Times New Roman	Normal paragraphs are in Times New Roman.
Arial	Paragraphs in Warning, Caution, Notes, and Tip are in Arial.
Boldface	Buttons and navigation path are in **Boldface**.
Italic	Book titles are in *italics*.
`Lucida Console`	Terminal display is in `Lucida Console`.
Book Antiqua	Heading 1, Heading 2, Heading 3, and Block are in Book Antiqua.

Change history

Updates between document versions are cumulative. Therefore, the latest document version contains all updates made to previous versions.

Issue 14 (2017-06-01)

Fourteenth commercial release

- Added the RC3000-15-DXC (F) and RC3000-15-TEST (B).

Issue 13 (2017-02-01)

Thirteenth commercial release

- Deleted the EOL card RC3000-15-FXS/FXO (A).
- Added the RC3000-15-FXS/FXO (B).
- Added the configuration of the signaling mode of the RC3000-15-Audio.

Issue 12 (2016-08-01)

Twelfth commercial release

- Added the configuration of the N value of the RC3000-15-TP.

Issue 11 (2016-04-01)

Eleventh commercial release

- Added the RC3000-15-TEST.

Issue 10 (2016-03-01)

Tenth commercial release

- Added loopback and BERT of 64K timeslot on the RC3000-15-8E1 (C).
- Added description that the maximum length of the cable used for the RS232 interface was 15 m based on RS232 standard.

Issue 09 (2015-09-01)

Ninth commercial release

- Added the RC3000-15 Audio card, FANS360, and SUB-PWRM-DC.
- Modified the noise index on the idle channel.
- Deleted EOL cards, including the RC3000-15-P480FE, RC3000-15-DXC (E.20), RC3000-15-8E1-LH, RC3000-15-16S16O, and RC3000-15-120×2-OPT.
- Added the wiring section in the appendix.

Issue 08 (2015-04-01)

Eighth commercial release

- Added three cards: RC3000-15-TP, RC3000-4V35H, and RC3000-10E&M.

Issue 07 (2014-07-01)

Seventh commercial release

- Added descriptions of EXC (E.40) card which supports 64 ways of VCCs.
- Fixed bug: the STM1 (A) supports being inserted into the new E.30 chassis, but cannot be mixed with the STM1 (B) in the same chassis.
- Fixed bug: the slot supported by the ESW-2GE is slot 9.
- Fixed bug: the E&M interface on the 16E&M and 16MULTI cards uses the CBL-EM-HDB26M/NC cable.
- Fixed bug: for the E&M interface on the 16MULTI, the Rx A/D gain ranges from -10 to +19 dB, and the Tx D/A gain ranges from -23 to +7 dB.

Issue 06 (2013-01-20)

Sixth commercial release

- Added chapter 12 Telecontrol service card, which is a newly developed card.

Issue 05 (2012-12-29)

Fifth commercial release

- Added section 4.2 DXC (E.30 and E.40), which is a newly developed DXC card.

- Added section 5.1 STM1 (B), which is a newly developed SDH card.
- Added the type of the configuration cable in section 13.4 Configuration cable.
- Added description of the alarm terminal and alarm cable.

Issue 04 (2012-11-15)

Fourth commercial release

- Added data shared line function to the 8RS232H card in section 9.2 8RS232H.

Issue 03 (2012-09-15)

Third commercial release

- Added section 7.3 P240×2L. The P240×2L is a newly-developed Ethernet multiplexing card.
- Added color descriptions of audio cable and MUL cable in chapter 13 Cables.

Issue 02 (2012-03-15)

Second commercial release

- Added section 8.5 12MT, which is a newly developed magneto telephone card.
- Deleted EOL cards.
- Modified section 1.2 Slots
- Modified section 7.1 8E1.

Issue 01 (2011-12-01)

Initial commercial release

Contents

Figures

Tables

1 Chassis

This chapter includes the following sections:

- Structure
- Slots
- Specifications

1.1 Structure

The RC3000-15 chassis meets design standards for 19-inch 6U standard chassis defined in the IEC297, and dimensions are 480 mm (Width) × 248 mm (Depth) × 267 mm (Height).

Figure 1-1 and Figure 1-2 show the appearance of the RC3000-15 chassis.

Figure 1-1 Front appearance

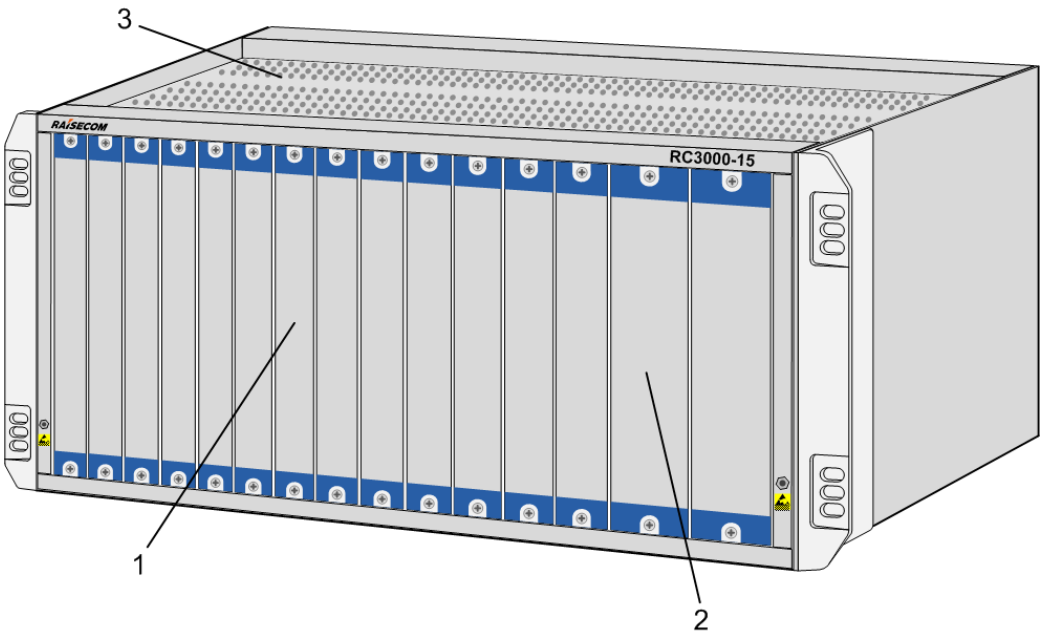
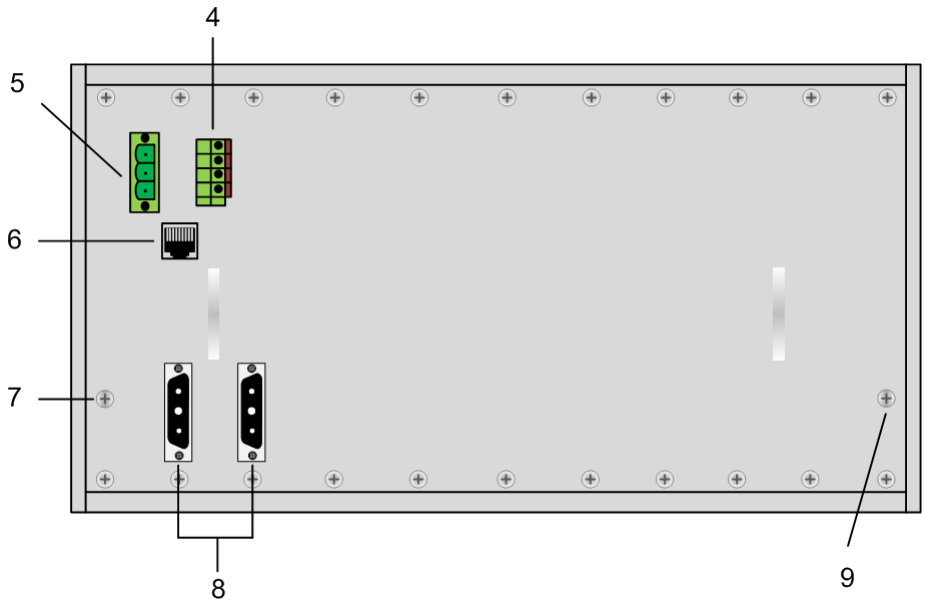


Figure 1-2 Rear appearance

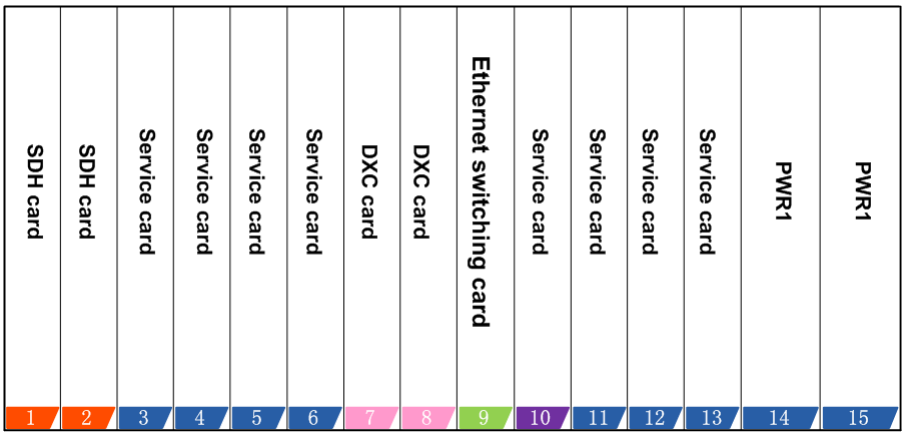


No.	Name	Description
1	Service card slots	Slots 1–6 and 9–13 are inserted into with service cards.
2	Power supply card slots	Slots 14–15 are inserted with power supply cards.
3	Heat dissipation area	The fan is installed on the top of the heat dissipation area.
4	Alarm terminal	Four-pin spring terminal block, supporting 1 way of alarm input and 1 way of alarm output **Caution** Between two lines of the alarm output terminal, the DC voltage must be within 30 V and the DC current must be within 1 A; the AC voltage must be within 125 V and the AC current must be within 0.3 A.
5	Fan power interface	Supply power for the fan.
6	Fan monitoring interface	Be connected to the fan and monitor the fan status.
7 and 9	Ground terminals	Be used for grounding.
8	DC power interface	Input DC power.

1.2 Slots

Figure 1-3 shows slot assignment in the RC3000-15 chassis.

Figure 1-3 Slot assignment



Slot	Description
1–6 and 9–13	Support common service cards for PDH, data, and voice.
1–2	Support STM1 aggregation cards.
7–8	Support DXC cards. These slots support service cards in the E.20 chassis but does not support service cards in the E.30 chassis.
9	Support Ethernet switching card.
14–15	Support power modules.

1.3 Specifications

Table 1-1 lists overall parameters of the RC3000-15.

Table 1-1 Overall parameters

Parameter	Description
Dimensions	480 mm (Width) × 248 mm (Depth) × 267 mm (Height)
Operating voltage	• DC: -48 V • AC: 220 V
Operating temperature	-5°C to 50°C
Operating humidity	10%–90% RH

Parameter	Description
Lightning protection level	For power interfaces: • AC power: 4 kV in both differential mode and common mode • DC power: 2 kV in common mode and 1 kV in differential mode For signal interfaces: • 2 kV in differential mode • 4 kV in common mode

2 Fans

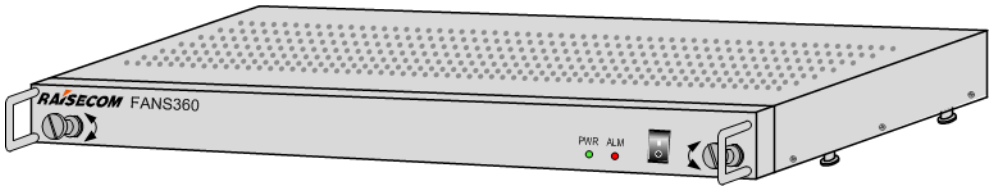
This chapter includes the following sections:

- FANS360
- RC006-FANS1

2.1 FANS360

The FANS360 is an independent intelligent external fan with 19-inch width and 1U height. Four hooks on the bottom of the fan are used to fix the fan on the chassis.

2.1.1 Functions and appearance

Appearance

Function
• Be embedded with 3 fans. • Apply slow start to stabilize the system in hot swapping. • Support up to 8 levels of rotational speed. • Support fan fault alarm, including work stopping and decreasing of speed due to fan aging. • Support intelligent speed control, thus automatically adapt the rotational speed to temperature. • Support manually adjusting the rotational speed. • Support speed feedback. • Support cold start.

2.1.2 LEDs

Table 2-1lists LEDs on the FANS360.

Table 2-1 LEDs on the FANS360

LED	Color	Description
POWER	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
ALM	Red	Working status LED • Green: the fan is working abnormally. • Off: the fan is working normally.

2.1.3 Specifications

Table 2-2 lists parameters of the FANS360.

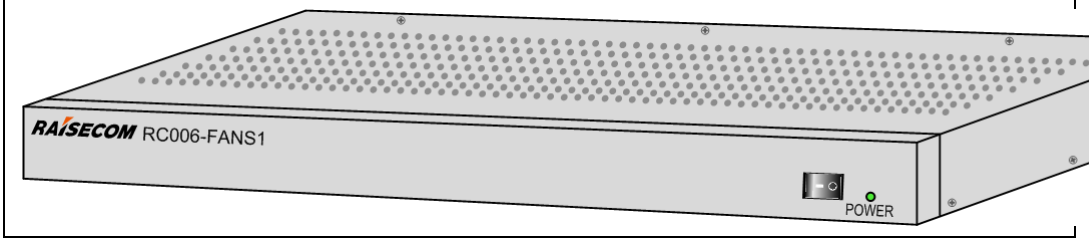
Table 2-2 Parameters of the FANS360

Parameter	Description
Dimensions	440 mm (Width) × 247 mm (Depth) × 44 mm (Height)
Weight	3.0 kg
Maximum power	28 W
Number of fans	3
Maximum rotational speed	3250 r/min
Voltage	30–57 V
Maximum current	0.3 A

2.2 RC006-FANS1

The FANS360 is an independent intelligent external fan with 19-inch width and 1U height. Fans are stacked up on the chassis, and are fixed on the rack or cabinet through fan brackets.

2.2.1 Functions and appearance

Appearance


Function
• Be embedded with 2 fans. • Be equipped with a power switch. • Adopt upwards ventilation design, which ensures better heat dissipation and stable and long-time operation. • Support in-position monitoring and rotational speed monitoring, which facilitates operation and maintenance.

2.2.2 LEDs

Table 2-3 lists the LED on the fan.

Table 2-3 LED on the fan

LED	Color	Description
POWER	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.

2.2.3 Specifications

Table 2-4 lists parameters of the fan.

Table 2-4 Parameters of the fan

Parameter	Description
Dimensions	440 mm (Width) × 247 mm (Depth) × 44 mm (Height)
Weight	1.595 kg
Number of fans	2
Maximum rotational speed	2700 r/min
Voltage	48 V
Maximum current	0.3 A

3 Power supply cards

This chapter includes the following sections:

- SUB-PWRII-DC/DC-300
- SUB-PWRII-AC
- SUB-PWRM-DC
- SUB-PWRM-AC

Note

When the RC3000-15 is installed with the FXS card, E&M card, or magneto telephone card, you must choose the -48 VDC power supply card or the power card that supports outputting -48 VDC power, rather than other power supply cards.

3.1 SUB-PWRII-DC/DC-300

3.1.1 Functions and appearance

Panel	Function
	The SUB-PWRII-DC and SUB-PWRII-DC-300 are DC power supply cards. These two cards provide the following functions: • Output +5 V power to the backplane. Then, the backplane supplies power to other cards. • Conduct Electromagnetic Compatibility (EMC) filtering over input power. • Support input reverse polarity protection (recoverable), input undervoltage protection, output overvoltage protection, output overcurrent protection. • Support over temperature protection. • Support input surge current suppression. • Support in-position monitoring and fault reporting. • Support 1+1 hot backup. • Support hot swapping. **Note** When using the FE16E1 or 32FXS card, you should use 2 SUB-PWRII-DC-300 DC power cards with the fan as mandatory configuration.

3.1.2 Version

Card	Version
SUB-PWRII-DC	A
SUB-PWRII-DC-300	A

3.1.3 Slots

Chassis version	Slot
E.30 and E.20	14 and 15

3.1.4 LEDs

Table 3-1 lists LEDs on the SUB-PWRII-DC/DC-300 card.

Table 3-1 LEDs on the SUB-PWRII-DC/DC-300 card

LED	Color	Description
5V PWR	Green	+5 V power output LED • Green: the +5 V power output is normal. • Off: the +5 V power output is off.
5V ALM	Red	+5 V power alarm LED • Red: the +5 V power output is off or the voltage is abnormal. • Off: the voltage is normal.
-48V	Green	-48 V power working LED • Green: the -48 V power input is normal. • Off: the -48 V power input is off.

3.1.5 Specifications

Table 3-2 lists parameters for the SUB-PWRII-DC/DC-300 card, in which three are three models for the SUB-PWRII-DC card.

Table 3-2 Parameters for the SUB-PWRII-DC/DC-300 card

Description / Parameter		DC	DC-300	Remarks
Basic parameter	Dimensions	38.5 mm (Width) × 224 (Depth) × 240 mm (Height)		
	Weight	1.05 kg		

Description / Parameter		DC	DC-300	Remarks
	No-load power consumption	5 W		Under rated input voltage
	Rated power	150 W	300 W	–
Input feature	Rated input voltage	-48 V	-48 V	–
	Input voltage range	-36 to -72 V	-36 to -72 V	Under full load
	Input current	< 11 A	< 11 A	Under minimum input voltage and rated full load
	Rated input power	375 W	375 W	–
Protection feature	Input undervoltage protection	34 V	34 V	–
	Input overvoltage protection	75 V	75 V	–
	Output overcurrent protection	72 A	72 A	–

3.2 SUB-PWRII-AC

3.2.1 Functions and appearance

Panel	Function
	The SUB-PWRII-AC card is a 600 W unintelligent power supply card. It provides the following functions: • Support full-range voltage input. • Support short-circuit protection. • Support input overcurrent protection, output overcurrent protection, input undervoltage protection, and output overvoltage protection. • Support hybrid AC/DC power. • Support hybrid intelligent and unintelligent power. • Support over temperature protection. • Support 1+1 hot backup. • Support hot swapping.

3.2.2 Version

Card	Version
SUB-PWRII-AC	E

3.2.3 Slots

Chassis version	Slot
E.30 and E.20	14 and 15

3.2.4 Interfaces

Table 3-3 lists the interface on the SUB-PWRII-AC card.

Table 3-3 Interface on the SUB-PWRII-AC card

Name	Description
–	AC power interface

3.2.5 LEDs

Table 3-4 lists LEDs on the SUB-PWRII-AC card.

Table 3-4 LEDs on the SUB-PWRII-AC

LED	Color	Description
SYS	Green	System working LED • Blinking green: the system is working properly. • Off: the system is working improperly.
-48V PWR	Green	-48 V power output LED • Green: -48 V power output is normal. • Off: -48 V power output is off.
-48V ALM	Red	-48 V power alarm LED • Red: -48 V power output is off or the voltage is abnormal. • Off: -48 V voltage is normal.
5V PWR	Green	+5V power output LED • Green: +5V power output is normal. • Off: +5 V power output is off.

LED	Color	Description
5V ALM	Red	+5V power alarm LED • Red: +5V power output is off or the voltage is abnormal. • Off: +5V voltage is normal.
100-240V	Green	Power input LED • Green: 110 V/200 V power input is normal. • Off: power input is off.
Min	Yellow	Input voltage hierarchical alarm LED • Yellow: the deviation between the input voltage and the centered voltage is within range 1. • Off: the deviation between the input voltage and the centered voltage is beyond range 1.
Maj	Red	Input voltage hierarchical alarm LED • Red: the deviation between the input voltage and the centered voltage is within range 2. • Off: the deviation between the input voltage and the centered voltage is beyond range 2.
Cri	Red	Input voltage hierarchical alarm LED • Red: the deviation between the input voltage and the centered voltage is within range 3. • Off: the deviation between the input voltage and the centered voltage is beyond range 3.

Note

- You can configure range 1, range 2, and range 3, but they must be between -36 V and -72 V.
- If input voltage hierarchical alarm LED is Yellow or Red, the input voltage is within the allowed range.
- If the alarm LED is Yellow or Red, the power supply is communicating with the backplane and reporting power alarm status.

3.2.6 Specifications

Table 3-5 lists parameters of the SUB-PWRII-AC card.

Table 3-5 Parameters of the SUB-PWRII-AC card

Parameter	Description
Dimensions	38.5 mm (Width) × 224 mm (Depth) × 240 mm (Height)
Weight	1.1 kg
No-load power consumption	10 W
Rated power	600 W

Table 3-6 lists input parameters of the SUB-PWRII-AC card.

Table 3-6 Input parameters of the SUB-PWRII-AC card

Parameter		Description
Nominal input voltage range		100–240 V
Input voltage range		90–264 V
Rated input voltage		110/220 V
AC input frequency		47–63 Hz
Power factor		0.95
Overall efficiency	110 V input (full load)	80%
	220 V input (full load)	80%

Table 3-7 lists protection parameters of the SUB-PWRII-AC card.

Table 3-7 Protection parameters of the SUB-PWRII-AC card

Parameter		Description
Input overcurrent protection		15 A
Input undervoltage protection		85 V
Output overcurrent protection	-50 V	9 A
	+5 V	90 A
Output overvoltage protection	-50 V	-60 V
	+5 V	6 V

3.3 SUB-PWRM-DC

3.3.1 Functions and appearance

Appearance	Function
	The SUB-PWRM-DC is an intelligent 300 W DC power supply. • Provide power switch. • Provide 2:1 wide-range voltage: -36 to -72 V. • Provide +5 V rated output voltage per card. • Support hybrid AC/DC power. • Support hybrid intelligent and unintelligent power. • Support input reverse polarity protection (recoverable), input undervoltage protection, input overvoltage protection, output overvoltage protection, output overcurrent protection. • Support over temperature protection. • Support input surge current suppression. • Support in-position monitoring and fault reporting. • Support hierarchical alarms of input overvoltage and input undervoltage. • Support single-level alarms of output overvoltage and output undervoltage. • Support realtime reporting of environment temperature. • Support 1+1 hot backup. • Support hot swapping.

3.3.2 Version

Card	Version
SUB-PWRM-DC	A

3.3.3 Slots

Chassis version	Slot
E.30 and E.20	14 and 15

3.3.4 LEDs

Table 3-8 lists LEDs on the SUB-PWRM-DC panel.

Table 3-8 LEDs on the SUB-PWRM-DC panel

LED	Color	Description
5V PWR	Green	+5 V power output LED • Green: +5 V power output is normal. • Off: +5 V power output is off.
5V ALM	Red	+5 V power alarm LED • Red: +5 V power output is off or the voltage is abnormal. • Off: +5 V voltage is normal.
Vin	Green	Power input LED • Green: there is voltage input. • Off: there is no voltage input or there is positive/negative error.
Min	Yellow	Input voltage hierarchical alarm LED • Yellow: the input voltage is within range 1. • Off: the input voltage is beyond range 1.
Maj	Red	Input voltage hierarchical alarm LED • Red: the input voltage is within range 2. • Off: the input voltage is beyond range 2.
Cri	Red	Input voltage hierarchical alarm LED • Red: the input voltage is within range 3. • Off: the input voltage is beyond range 3.

Note

- By default, range 1 for the absolute value of input voltage is (0,46) U (56,+∞); range 2 for the absolute value of input voltage is (0,42) U (60,+∞); range 3 for the absolute value of input voltage is (0,40) U (70,+∞). If the input voltage is -36 V and

thus the absolute value 36 is within range 1, range 2, and range 3, the Min, Maj, and Cri LEDs are on.
- You can configure range 1, range 2, and range 3 through the NView NNM system but they must be between -36 V and -72 V.
- If the input voltage hierarchical alarm LED is yellow or red, the input voltage is within the allowed range.
- If the alarm LED is yellow or red, the power supply is supplying power to the backplane and power alarm Trap will be reported.

3.3.5 Specifications

Table 3-9 lists parameters of the SUB-PWRM-DC.

Table 3-9 Parameters of the SUB-PWRM-DC

Parameter	Description
Dimensions	38.5 mm (Width) × 224 mm (Depth) × 240 mm (Height)
Weight	1.05 kg
Zero-load power consumption	5 W
Rated power consumption	300 W

Table 3-10 lists input parameters of the SUB-PWRM-DC.

Table 3-10 Input parameters of the SUB-PWRM-DC

Parameter	Description	Remarks
Rated input voltage	-48 V	–
Input voltage range	-36 to -72 V	Under full load
Zero-load power consumption	5 W	Under rated input voltage

Table 3-11 lists protection parameters of the SUB-PWRM-DC.

Table 3-11 Protection parameters of the SUB-PWRM-DC

Parameter	Description
Input undervoltage protection	34 V
Input overvoltage protection	90 V
Output overvoltage protection	6 V
Output overcurrent protection	72 A

3.4 SUB-PWRM-AC

3.4.1 Functions and appearance

Panel	Function
	The SUB-PWRM-AC is a 600 W intelligent AC power supply card. It provides the following functions: • Support full-range voltage input. • Support short-circuit protection. • Support hybrid AC/DC power. • Support hybrid intelligent and unintelligent power. • Support input overcurrent protection, output overcurrent protection, input undervoltage protection, and output overvoltage protection. • Support alarms on power supply type, power failure, over high or over low input voltage. • Support monitoring information on the card. • Support over temperature protection. • Support 1+1 hot backup of power. • Support hot swapping.

3.4.2 Version

Card	Version
SUB-PWRM-AC	A

3.4.3 Slots

Chassis version	Slot
E.30 and E.20	14 and 15

3.4.4 Interfaces

Table 3-12 lists the interface on the SUB-PWRM-AC card.

Table 3-12 Interface on the SUB-PWRM-AC card

Name	Description
–	AC power interface

3.4.5 LEDs

Table 3-13 lists LEDs on the SUB-PWRM-AC card.

Table 3-13 LEDs on the SUB-PWRM-AC card

LED	Color	Description
SYS	Green	System working LED • Blinking green: the system is working properly. • Off: the system is working improperly.
-48V PWR	Green	-48 V power output LED • Green: -48 V power output is normal. • Off: -48 V power output is off.
-48V ALM	Red	-48 V power alarm LED • Red: -48 V power output is off or the voltage is abnormal. • Off: -48 V voltage is normal.
5V PWR	Green	+5V power output LED • Green: +5V power output is normal. • Off: +5 V power output is off.
5V ALM	Red	+5V power alarm LED • Red: +5V power output is off or the voltage is abnormal. • Off: +5V voltage is normal.

LED	Color	Description
100-240V	Green	Power input LED • Green: 110/200 V power input is normal. • Off: power input is off.
Min	Yellow	Input voltage hierarchical alarm LED • Yellow: the deviation between the input voltage and the centered voltage is within range 1. • Off: the deviation between the input voltage and the centered voltage is beyond range 1.
Maj	Red	Input voltage hierarchical alarm LED • Red: the deviation between the input voltage and the centered voltage is within range 2. • Off: the deviation between the input voltage and the centered voltage is beyond range 2.
Cri	Red	Input voltage hierarchical alarm LED • Red: the deviation between the input voltage and the centered voltage is within range 3. • Off: the deviation between the input voltage and the centered voltage is beyond range 3.

Note

- You can configure range 1, range 2, and range 3, but they must be between -36 V and -72 V.
- If input voltage hierarchical alarm LED is Yellow or Red, the input voltage is within the allowed range.
- If the alarm LED is Yellow or Red, the power supply card is communicating with the backplane and reporting power alarm status.

3.4.6 Specifications

Table 3-14 lists parameters of the SUB-PWRM-AC card.

Table 3-14 Parameters of the SUB-PWRM-AC card

Parameter	Description
Dimensions	38.5 mm (Width) × 224 mm (Depth) × 240 mm (Height)
Weight	1.1 kg
No-load power consumption	10 W
Rated power	600 W

Table 3-15 lists input parameters of the SUB-PWRM-AC card.

Table 3-15 Input parameters of the SUB-PWRM-AC

Parameter		Description
Nominal input voltage range		100–240 V
Input voltage range		90–264 V
Rated input voltage		110 V/220 V
AC input frequency		47–63 Hz
Power factor		0.95
Overall efficiency	110 V input (full load)	80%
	220 V input (full load)	80%

Table 3-16 lists protection parameters of the SUB-PWRM-AC card.

Table 3-16 Protection parameters of the SUB-PWRM-AC card

Parameter		Description
Input overcurrent protection		15 A
Input undervoltage protection		85 V
Output overcurrent protection	-50 V	9 A
	+5 V	90 A
Output overvoltage protection	-50 V	-60 V
	+5 V	6 V

4 DXC cards

This chapter includes the following sections:

- DXC (F.00)
- DXC (E.30 and E.40)

4.1 DXC (F.00)

4.1.1 Functions and appearance

Panel	Function
	The DXC card is a card used for network management and cross connection. It provides the following functions: • Communicate with the Network Management System (NMS) and be managed by the NMS. • Manage the RC3000-15 and its connected remote devices. • Provide cross connection and signaling processing. • Provide the Console interface, SNMP interface, extended network management interface (NM-EXT interface), and on/off value input/output interface (ALMI/ALMO interface). • Provide the 2 MHz or 2 Mbit/s clock interface. • Support clock phase-locked loop. • Provide E1 network management channel. • Support VCC network management channel. Support 64 ways of VCCs. The maximum bandwidth of each VCC is 32×64 kbit/s. • Support monitoring and managing the RC3000-15 by the NMS through the SNMP interface and NM-EXT interface (extended SNMP interface). • Support online system software upgrade for Central Office (CO) devices and remote devices. • Support 1+1 hot backup. • Support hot swapping. • Support testing voice services, such as three-way calling, bidirectional monitoring, and sending audio, when cooperating with the RC3000-15-TEST (B). **Note** Compared with the DXC (E.40) card, the DXC (F.00) card has the following changes. • The DXC (F.00) card can be inserted into the new chassis (E.30) only. • The RC3000-15-TEST (B) supports cooperating with the DXC (F.00) card only.

4.1.2 Version

Card	Version
RC3000-15-DXC	F.00

4.1.3 Slots

Chassis version	Slot
E.30	7 and 8

4.1.4 Interfaces

Interface type

Table 4-1 Table 4-12 lists interfaces on the DXC (F.00) card.

Table 4-1 Interfaces on the DXC (F.00) card

Name	Type	Description	Description
SNMP	RJ45	Network management interface	–
NM-EXT	RJ45	Extended network management interface	Manage the cascaded RC3000-15 and interconnect network management channels between cascaded devices.
CONSOLE	RJ45	Console interface	–
ALMI/ALMO	RJ45	On/Off value input/output interface	2 ways of on/off value input and 2 ways of on/off value output
SYNC-RX	CC3 male interface	2 MHz clock synchronization input interface	Customized interface
SYNC-TX	CC3 male interface	2 MHz clock synchronization output interface	Customized interface

Interface parameter

Table 4-2 lists parameters of the SNMP interface.

Table 4-2 Parameters of the SNMP interface

Parameter	Description
Connector type	RJ45
Interface rate	10/100 Mbit/s auto-negotiation
Wiring	Auto-MDI/MDIX
Compliant standard	IEEE 802.3

Table 4-3 lists parameters of the NM-EXT interface.

Table 4-3 Parameters of the NM-EXT interface

Parameter	Description
Connector type	RJ45
Interface rate	10/100 Mbit/s auto-negotiation
Wiring	Auto-MDI/MDIX
Compliant standard	IEEE 802.3

Table 4-4 lists parameters of the Console interface.

Table 4-4 Parameters of the Console interface

Parameter	Description
Connector type	RJ45
Interface rate	9600 baud
Compliant standard	RS232

Table 4-5 lists the parameter of the ALMI/ALMO interface.

Table 4-5 Parameter of the ALMI/ALMO interface

Parameter	Description
Connector type	RJ45

Table 4-6 and Table 4-7 list parameters of the clock interface.

Table 4-6 Parameters of the 2 Mbit/s clock interface

Parameter	Description
Connector type	CC3 male connector
Signal rate	2048 kbit/s ±50 ppm
Interface code	HDB3 coding
Interface impedance	75 Ω
Electrical features	Complying with ITU-T G.703 recommendations
Jitter feature	Complying with ITU-T G.823 recommendations

Table 4-7 Parameters of the 2 MHz clock interface

Parameter	Description
Connector type	CC3 male connector
Code rate	2048 kHz ±50 ppm
Interface impedance	75 Ω
Electrical features	Complying with ITU-T G.703 recommendations
Jitter feature	Complying with ITU-T G.823 recommendations

PIN definitions

Table 4-8 lists PIN definitions of the ALMI/ALMO interface.

Table 4-8 PIN definitions of the ALMI/ALMO interface

RJ45 PIN	Definition	Function
1	IN1+	On/Off value input 1
2	IN1-	On/Off value input 1
3	IN2+	On/Off value input 2
4	OUT1+	On/Off value output 1
5	OUT1-	On/Off value output 1
6	IN2-	On/Off value input 2
7	OUT2+	On/Off value output 2
8	OUT2-	On/Off value output 2

4.1.5 Buttons

Table 4-9 lists buttons on the DXC card (F.00).

Table 4-9 Buttons on the DXC card (F.00)

Print	Button	Status	Description
–	Buzzer control button	MUTE (Up)	In this status, when an alarm is being generated, the buzzer is mute. You cannot change this status through software.
		RING (Down)	In this status, when an alarm is being generated, the buzzer rings. You can shield this status through software.

4.1.6 LEDs

Table 4-10 lists LEDs on the DXC card (F.00).

Table 4-10 LEDs on the DXC card (F.00)

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
ACT	Green	Working mode LED • Green: the card is the master. • Off: the card is the slave.
100M (SNMP)	Green	SNMP interface rate LED • Green: the Ethernet rate is 100 Mbit/s. • Off: the Ethernet rate is 10 Mbit/s or the interface is disconnected.
LNK/ACT (SNMP)	Green	SNMP interface working LED • Green: the SNMP interface is working properly. • Off: the SNMP interface is disconnected or is working improperly. • Blinking green: the SNMP interface is receiving or sending data.
100M (NM-EXT)	Green	NM-EXT interface rate LED • Green: the NM-EXT interface is working at 100 Mbit/s. • Off: the NM-EXT interface is working at 10 Mbit/s.

LED	Color	Description
LNK/ACT (NM-EXT)	Green	NM-EXT interface working LED • Green: the NM-EXT interface is working properly. • Off: the NM-EXT interface is disconnected or is working improperly. • Blinking green: the NM-EXT interface is receiving or sending data.

4.1.7 Specifications

Table 4-11 lists parameters of the DXC card (F.00).

Table 4-11 Parameters of the DXC card (F.00)

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.41 kg
Power consumption	≤ 7 W

4.1.8 Cables

- The SNMP interface, NM-EXT interface, Console interface, and ALMI/ALMO interface on the DXC use the twisted pair cable with the RJ45 connector. Make the cable by yourself according to specifications of the RJ45 connectors. Usually, a common Ethernet cable is suitable.
- The SYNC-RX interface and SYNC-TR interface on the DXC uses the CBL-E1-CC3/BNCF-1m clock cable.

4.2 DXC (E.30 and E.40)

4.2.1 Functions and appearance

Panel	Function
	The DXC card is used for network management and cross connection. It provides the following functions: • Communicate with the Network Management System (NMS) and be managed by the NMS. • Manage the RC3000-15 and its connected remote devices. • Provide cross connection and signaling processing. • Provide the Console interface, SNMP interface, extended network management interface (NM-EXT interface), and on/off value input/output interface (ALMI/ALMO interface). • Provide 2 MHz or 2 Mbit/s clock interface. • Support clock phase-locked loop. • Provide E1 network management channel. • Support VCC network management channel. E.40 supports 64 ways of VCCs. E.30 supports 8 ways of VCCs. The maximum bandwidth of each VCC is 32×64 kbit/s. • Support monitoring and managing the RC3000-15 by the NMS through the SNMP interface and NM-EXT interface (extended SNMP interface). • Support online system software upgrade for Central Office (CO) devices and remote devices. • Support 1+1 hot backup. • Support hot swapping. **Note** Compared with the DXC (E.20), the DXC (E.30 and E.40) has the following changes. • When being inserted into the new chassis (E.30 chassis) or old chassis (E.20 chassis), it supports inter-card E1 channel protection. • When being inserted into the new chassis, it supports STM1 (A) card and STM1 (B) card. • When being inserted into the old chassis, it supports all functions of the DXC (E.20). • When being inserted into the old chassis, it does not support the STM1 (B) card, which will be prompted by the NMS or CLI.

4.2.2 Version

Card	Version
RC3000-15-DXC	E.30 and E.40

4.2.3 Slots

Chassis version	Slot
E.20 and E.30	7 and 8

4.2.4 Interfaces

Interface type

Table 4-12 lists interfaces on the DXC (E.30 and E.40) card.

Table 4-12 Interfaces on the DXC (E.30 and E.40) card

Name	Type	Description	Description
SNMP	RJ45	Network management interface	–
NM-EXT	RJ45	Extended network management interface	Manage the cascaded RC3000-15 and interconnect network management channels between cascaded devices.
CONSOLE	RJ45	Console interface	–
ALMI/ALMO	RJ45	On/Off value input/output interface	2 ways of on/off value input and 2 ways of on/off value output
SYNC-RX	CC3 male interface	2 MHz clock synchronization input interface	Customized interface
SYNC-TX	CC3 male interface	2 MHz clock synchronization output interface	Customized interface

Interface parameter

Table 4-13 lists parameters of the SNMP interface.

Table 4-13 Parameters of the SNMP interface

Parameter	Description
Connector type	RJ45
Interface rate	10/100 Mbit/s auto-negotiation
Wiring	Auto-MDI/MDIX
Compliant standard	IEEE 802.3

Table 4-14 lists parameters of the NM-EXT interface.

Table 4-14 Parameters of the NM-EXT interface

Parameter	Description
Connector type	RJ45
Interface rate	10/100 Mbit/s auto-negotiation
Wiring	Auto-MDI/MDIX
Compliant standard	IEEE 802.3

Table 4-15 lists parameters of the Console interface.

Table 4-15 Parameters of the Console interface

Parameter	Description
Connector type	RJ45
Interface rate	9600 baud
Compliant standard	RS232

Table 4-16 lists the parameter of the ALMI/ALMO interface.

Table 4-16 Parameter of the ALMI/ALMO interface

Parameter	Description
Connector type	RJ45

Table 4-17 and Table 4-18 list parameters of clock interfaces.

Table 4-17 Parameters of the 2 Mbit/s clock interface

Parameter	Description
Connector type	CC3 male connector
Signal rate	2048 kbit/s ±50 ppm
Interface code	HDB3 coding
Interface impedance	75 Ω
Electrical features	Complying with ITU-T G.703 recommendations
Jitter feature	Complying with ITU-T G.823 recommendations

Table 4-18 Parameters of the 2 MHz clock interface

Parameter	Description
Connector type	CC3 male connector
Code rate	2048 kHz ±50 ppm
Interface impedance	75 Ω
Electrical features	Complying with ITU-T G.703 recommendations
Jitter feature	Complying with ITU-T G.823 recommendations

PIN definitions

Table 4-19 lists PIN definitions of the ALMI/ALMO interface.

Table 4-19 PIN definitions of the ALMI/ALMO interface

RJ45 PIN	Definition	Function
1	IN1+	On/Off value input 1
2	IN1-	On/Off value input 1
3	IN2+	On/Off value input 2
4	OUT1+	On/Off value output 1
5	OUT1-	On/Off value output 1
6	IN2-	On/Off value input 2
7	OUT2+	On/Off value output 2
8	OUT2-	On/Off value output 2

4.2.5 Buttons

Table 4-20 lists buttons on the DXC card (E.30).

Table 4-20 Buttons on the DXC card (E.30)

Print	Button	Status	Description
–	Buzzer control button	MUTE (Up)	In this status, when an alarm is being generated, the buzzer is mute. You cannot change this status through software.
		RING (Down)	In this status, when an alarm is being generated, the buzzer rings. You can shield this status through software.

4.2.6 LEDs

Table 4-21 lists LEDs on the DXC card (E.30).

Table 4-21 LEDs on the DXC card (E.30)

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
ACT	Green	Working mode LED • Green: the card is the master. • Off: the card is the slave.
100M (SNMP)	Green	SNMP interface rate LED • Green: the Ethernet rate is 100 Mbit/s. • Off: the Ethernet rate is 10 Mbit/s or the interface is disconnected.
LNK/ACT (SNMP)	Green	SNMP interface working LED • Green: the SNMP interface is working properly. • Off: the SNMP interface is disconnected or is working improperly. • Blinking green: the SNMP interface is receiving or sending data.
100M (NM-EXT)	Green	NM-EXT interface rate LED • Green: the NM-EXT interface is working at 100 Mbit/s. • Off: the NM-EXT interface is working at 10 Mbit/s.

LED	Color	Description
LNK/ACT (NM-EXT)	Green	NM-EXT interface working LED • Green: the NM-EXT interface is working properly. • Off: the NM-EXT interface is disconnected or is working improperly. • Blinking green: the NM-EXT interface is receiving or sending data.

4.2.7 Specifications

Table 4-22 lists parameters of the DXC card (E.30).

Table 4-22 Parameters of the DXC card (E.30)

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.41 kg
Power consumption	≤ 7 W

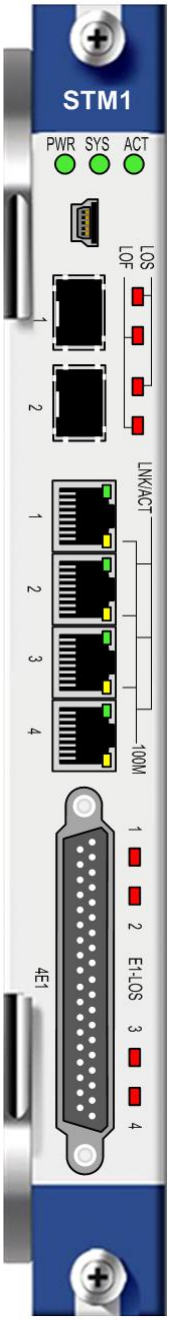
5 SDH cards

This chapter includes the following sections:

- STM1 (B)
- STM1 (A)

5.1 STM1 (B)

5.1.1 Functions and appearance

Panel	Function
	The STM1 card is a Synchronous Digital Hierarchy (SDH) aggregation card. It is connected to the SDH transmission network. It provides the following functions: • Provide 2 STM1 optical interfaces which are SFP optical module interfaces. • Provide 1 DB37 interface to transmit 4 ways of transparent E1 services. • Support balanced or unbalanced E1 interface. The default configuration is unbalanced E1 interface. • Provide 4 Ethernet Over SDH (EOS) interfaces which are 10/100 Mbit/s auto-negotiation electrical interface. • Support isolating or switching 4 EOS interfaces. In switching mode, 4 EOS interfaces can be connected to the switching card through the backplane. • The EOS interface supports Generic Framing Procedure (GFP) encapsulation, supports Link Capacity Adjustment Scheme (LCAS), supports VC12 mapping, and does not support VC3/VC4 mapping. The EOS timeslot is fixed to occupy No.1–47 VC12 of VC4-3. • The EOS interface supports rich Ethernet features, such as VLAN, QinQ, link aggregation, flow control, storm control, Quality of Service (QoS), rate limiting, MAC address learning, loop detection, Layer 2 protocol transparent transmission, and Access Control List (ACL). • Support cross connection of 32 ways of 64K E1 services. The E1 can be configured to protection or independent mode. In protection mode, there are 32 ways of E1 services. In independent mode, there are 64 ways of E1 services which can be transmitted uplink to any optical interface. • Support STM1 inter-card protection, and support chain, star, ring, or hybrid networking topology. • Support intra-card or inter-card SDH optical interface protection. • Support Low-order Path (LP) protection and Multiplexing Section (MS) protection. • Support Sa bit and 64K network management. • Support 1 way of Bit Error Rate (BER) signals which can be cross connected to the backplane or an optical interface. • Support remote power failure alarm. • Support Automatic Laser Shutdown (ALS) and Digital Diagnosis Monitoring (DDM). • The clock supports protection, locking, and free oscillation working modes, and SSM clock synchronization information. • Support clock sources of local crystal, SDH line clock (4 lines), and system clock signals from the DXC card. • Provide 1 way of 2 Mbit/s clock signals to the backplane and the DXC card as a slave for system clock. The system clock can choose any E1 of 32 ways of E1 signals or 4 ways of sampled clock signals of the aggregation card. • Be exclusive with the STM1 (A).

5.1.2 Version

Card	Version
RC3000-15-STM1	B

5.1.3 Slots

Chassis version	Slot
E.30	1 and 2

5.1.4 Interfaces

Interface type

Table 5-1 lists interfaces on the STM1 (B) card.

Table 5-1 Interfaces on the STM1 (B) card

Name	Type	Description
1, 2	SFP optical interface	2 STM1 (B) interfaces
1, 2, 3, 4	RJ45	4 Ethernet interfaces for transmitting Ethernet services
4E1	DB37	4 E1 interfaces for transparently transmitting E1 services
–	Mini USB	For local debugging

Interface parameter

Table 5-2 lists parameters of the optical interface on the STM1 (B) card.

Table 5-2 Parameters of the optical interface on the STM1 (B) card

Parameter	Description
Interface rate	155.52 Mbit/s
Line code	NRZ
Optical interface type	SFP
Multiplexing structure	Complying with ITU-T G.707 recommendations
Optical interface features	Complying with ITU-T G.957 recommendations
Jitter features	Complying with ITU-T G.783 and G.825 recommendations

Table 5-3 lists parameters of the SFP optical interface.

Table 5-3 Parameters of the SFP optical interface

Model	Working wavelength (nm)	Tx optical power (dBm)	Rx sensitivity (dBm)	Extinction ratio	Minimum overload (dBm)	Transmission distance (km)
-M	1310	-20 to -14	< -29	> 8.2	> -14	2
-S1	1310	-15 to -8	< -34	> 8.2	> -8	15
-S2	1310	-5 to 0	< -34	> 8.2	> -8	40
-S3	1550	-5 to 0	< -34	> 10	> -10	80
-S13	1310	-15 to -8	< -28	> 8.2	> -8	15
-S15	1550	-15 to -8	< -28	> 8.2	> -8	15
-S23	1310	-5 to 0	< -32	> 8.2	> -8	40
-S25	1550	-5 to 0	< -32	> 8.2	> -8	40

Note

The transmission distance is the maximum one under typical fiber conditions, so it depends on actual network situations.

Table 5-4 parameters of the E1 interface.

Table 5-4 Parameters of the E1 interface

Parameter	Description
Interface type	DB37 male interface
Interface rate	2048 kbit/s (±50 ppm)
Interface code	HDB3
Interface impedance	• Unbalanced interface: 75 Ω • Balanced interface: 120 Ω
Clock	Master/Slave clock
Frame structure	Unframed
Electrical features	Complying with ITU-T G.703 recommendations
Jitter features	Complying with ITU-T G.823 recommendations

Table 5-5 lists parameters of the Ethernet interface.

Table 5-5 Parameters of the Ethernet interface

Parameter	Description
Connector type	RJ45
Interface rate	10/100 Mbit/s auto-negotiation
Supported framelength	1536 bytes
Duplex mode	Full/Half duplex auto-negotiation
Flow control	• Support IEEE 802.3x flow control in full duplex. • Support backpressure flow control in half duplex.
Wiring	Auto MDI/MDI-X
Compliant standard	IEEE 802.3x, IEEE 802.3u, IEEE 802.1Q, and MSAN-126

5.1.5 LEDs

Table 5-6 lists LEDs on the STM1 (B) card.

Table 5-6 LEDs on the STM1 (B) card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
ACT	Green	Primary/Slave LED • Green: when two STM1 cards are installed on the RC3000-15 (E), this card is primary; when one STM1 card is installed on the RC3000-15 (E), this LED keeps green. • Off: when two STM1 cards are installed on the RC3000-15 (E), this card is slave.
LOS	Red	LOS alarm LED • Red: Loss of Signal (LOS) alarms are generated. • Off: no LOS alarms are generated.
LOF	Red	LOF alarm LED • Red: Loss of Frame (LOF) alarms are generated. • Off: input LOF alarms are generated.
LNK/ACT	Green	Ethernet link LED • Green: Ethernet link interfaces are connected properly. • Off: Ethernet link interfaces are disconnected or are improperly connected. • Blinking green: Ethernet link interfaces are receiving or sending data.

LED	Color	Description
100M	Green	Ethernet interface rate LED • Green: the interface is working at 100 Mbit/s. • Off: the interface is working at 10 Mbit/s.
E1-LOS	Red	LOS alarm LED • Red: LOS alarms are generated on the E1 interface. • Off: no LOS alarms are generated on the E1 interface.

5.1.6 Specifications

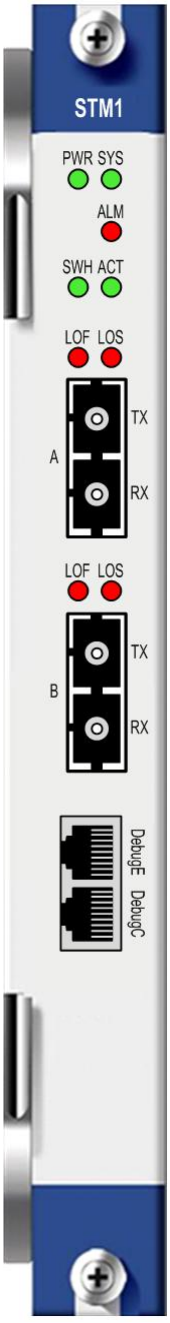
Table 5-7 lists parameters of the STM1 (B) card.

Table 5-7 Parameters of the STM1 (B) card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.75 kg
Power consumption	≤ 22 W

5.2 STM1 (A)

5.2.1 Functions and appearance

Panel	Function
	The STM1 card, a SDH aggregation card, provides high-capacity uplink ways so that data and voice services are transmitted to the RC3000-15 for cross connection and aggregation. It provides the following functions: • Provide two 155 Mbit/s SDH optical interfaces which support 63 ways of E1 services. • Support scheduling of 126 ways of E1 services with one SDH card and 252 ways with two SDH cards. • Support multiple protection switching modes: – SDH optical interface protection – SDH LP protection – Card-level 1+1 hot backup • Provide ALS for optical modules. • Support external and internal loopback on the SDH optical interface. • Support loopback and Bit Error Rate Tester (BERT) for each path. • Support chain and ring networking. • Support online software upgrade. • Be exclusive with the STM1 (B) currently.

5.2.2 Version

Card	Version
RC3000-15-STM1	A

5.2.3 Slots

Chassis version	Slot
E.20 and E.30	1 and 2

5.2.4 Interfaces

Interface type

Table 5-8 lists interfaces on the STM1 (A) card.

Table 5-8 Interfaces on the STM1 (A) card

Name	Type	Description
A, B	1×9 optical interface	Service uplink interface, connected to the SDH network
DebugE, DebugC	RJ45	Debugging interface

Interface parameter

Table 5-9 lists parameters of the optical interface on the STM1 (A) card.

Table 5-9 Parameters of the optical interface on the STM1 (A) card

Parameter	Description
Type of the optical module	1×9 optical module
Interface rate	155 Mbit/s

5.2.5 LEDs

Table 5-10 lists LEDs on the STM1 (A) card.

Table 5-10 LEDs on the STM1 (A) card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
ALM	Red	Alarm LED • Red: MS-AIS, MS-EXC, AU-AIS, or AU-LOP alarms are generated. • Off: no MS-AIS, MS-EXC, AU-AIS, or AU-LOP alarms are generated.
SWH	Green	Protection switching LED • Green: a switchover occurs. • Off: no switchover occurs.
ACT	Green	Primary/Slave LED • Green: when two STM1 cards are installed on the RC3000-15 (E), this card is primary; when one STM1 card is installed on the RC3000-15 (E), this LED keeps green. • Off: when two STM1 cards are installed on the RC3000-15 (E), this card is slave.
LOF (A, B)	Red	LOF alarm LED • Red: LOF alarms are generated on optical interfaces A and B. • Off: no LOF alarms are generated on optical interfaces A and B.
LOS (A, B)	Red	LOS alarm LED • Red: LOS alarms are generated on optical interfaces A and B. • Off: no LOS alarms are generated on optical interfaces A and B.

5.2.6 Specifications

Table 5-11 lists parameters of the STM1 (A) card.

Table 5-11 Parameters of the STM1 (A) card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.39 kg
Power consumption	< 20 W

5.2.7 Alarms

Table 5-12 lists alarms for the STM (A) card.

Table 5-12 Alarms for the STM (A) card

Alarm	Cause	Level
RS-LOS	• Attenuation of received signals is over great. • The peer sender fails. • The connector of fiber is dirty or improperly connected. • The local receiver fails.	Critical
RS-LOF	• The Tx clock of the peer device fails. • Optical signals do not match. • The local Rx reference clock fails.	Critical
RS-TIM	• The received trace byte of the local device and the sent trace byte of the peer device are inconsistent. • Services are improperly configured.	Critical
AU-AIS	• The AU-AIS alarm of the VC4 channel is triggered by MS-AIS, R-LOS, R-LOF alarms. • Services are improperly configured. • The peer device sends AU-AIS alarms. • The sender of the peer device or the receiver of the local device fails.	Minor
AU-LOP	• The sender of the peer device fails. • Services are improperly configured on the peer device. • Bit Error Rate (BER) of the local device is over great.	Critical
MS-EXC	• BER in the multiplexing section is over high. • Optical signals are improperly transmitted. • The performance of the local card is bad.	Major
MS-AIS	Multiplexing section alarm LED • Alarm signals are inserted in the optical signals sent by the peer device. • The peer device is a regenerator and receives LOS, LOF, or OOF alarms.	Minor
HP-LOM	High order path Loss of Multiframe (LOM) alarm • Services are improperly configured. • Byte H4 is lost or incorrect.	Critical
HP-TIM	• The received channel trace byte of the local device and the sent channel trace byte of the peer device are inconsistent. • Services are improperly configured.	Critical
HP-PLM	• The received signal marking byte of the local device and the sent signal marking byte of the peer device are inconsistent. • Services are improperly configured.	Critical
TU-AIS	• Services are improperly configured. • The channel of the peer device fails. • Higher order path alarms, such as R-LOS, trigger the alarm. • The cross connection card fails.	Minor
TU-LOP	• The interface between the tributary card and the cross connection card fails. • Services are improperly configured.	Critical
LP-TIM	• The low order path trace identifiers of the local device and the peer device are inconsistent. • Services are improperly configured.	Critical

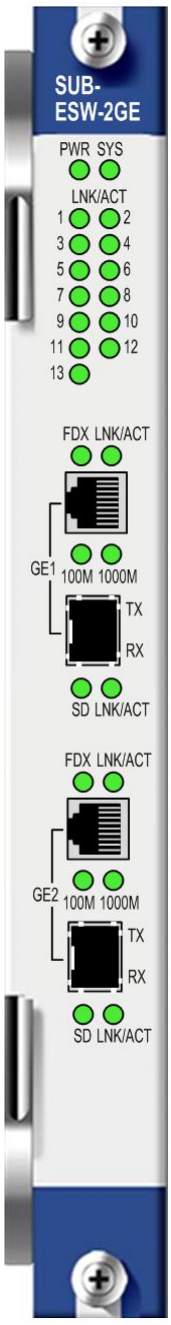
6 Ethernet switching card

This chapter includes the following section:

- ESW-2GE

6.1 ESW-2GE

6.1.1 Functions and appearance

Panel	Function
	The SUB-ESW-2GE card, an Ethernet aggregation switching card, implements service switching and aggregation between other slots on the backplane and 2 GE interfaces on the front panel. It provides the following functions: • Provide 2 groups of GE Combo interfaces. Each group contains an optical interface and an electrical interface. The RC3000-15 automatically selects them. • Support maximum Ethernet frame length of 1632 bytes. • Support 802.3x flow control and back pressure flow control. • Support 8K MAC addresses and 30 static MAC addresses. • Support enabling or disabling interface-based MAC address learning. • Support configurable aging time ranging from 0s to 3825s. • Support 802.1q VLAN and Double Tag (QinQ). • Support QoS and determine four output queues by priority. • Support interface-based rate limiting. • Support storm control over broadcast messages, unknown multicast messages, and DLF messages. • Support link aggregation. • Support interface isolation protection. • Support BUDU, LACP, and 802.1x transparent transmission for protocol frames. • Support loop detection, automatic shutdown, and recovery. • Support monitoring and gather statistics about alarms and performance. • Support gathering statistics about the switching interface. • Support hot swapping.

6.1.2 Version

Card	Version
SUB-ESW-2GE	A

6.1.3 Slots

Chassis version	Slot
E.30 and E.20	9

6.1.4 Interfaces

Interface type

Table 6-1 lists interfaces on the ESW-2GE card.

Table 6-1 Interfaces on the ESW-2GE card

Name	Type	Description
GE1/GE2 electrical interface	RJ45	2 groups of GE interfaces. Each group contains one optical interface and one electrical interface. The RC3000-15 automatically selects them.
GE1/GE2 optical interface	SFP optical interface	

Interface parameter

Table 6-2 lists parameters of the GE1/GE2 electrical interface.

Table 6-2 Parameters of the GE1/GE2 electrical interface on the ESW-2GE card

Parameter	Description
Connector type	RJ45
Interface rate	10/100/1000 Mbit/s auto-negotiation
Wiring	Host mode, auto-MDI/MDIX
Duplex mode	Full/Half duplex auto-negotiation
Flow control	• Support IEEE 802.3x flow control in full duplex. • Support back pressure flow control in half duplex.
Compliant standard	IEEE 802.3z

Table 6-3 lists parameters of the GE1/GE2 optical interface on the ESW-2GE card.

Table 6-3 Parameters of the GE1/GE2 optical interface on the ESW-2GE card

Parameter	Description
Connector type	LC
Interface rate	1000 Mbit/s

6.1.5 LEDs

Table 6-4 lists LEDs on the SUB-ESW-2GE card.

Table 6-4 LEDs on the SUB-ESW-2GE card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
LNK/ACT (1–13)	Green	Link working LED for slots 1–6 and 9–13 on the backplane • Green: the link interface is properly connected. • Off: the link interface is improperly connected or disconnected. • Blinking green: the link interface is receiving or sending data. **Note** The LNK/ACT LED for the Ethernet switching card is steadily Green.
FDX (GE1/GE2)	Green	GE1/GE2 electrical interface duplex mode LED • Green: the GE1/GE2 electrical interface is working in full duplex. • Off: the GE1/GE2 electrical interface is working in half duplex.
LNK/ACT (GE1/GE2 electrical interface)	Green	GE1/GE2 electrical interface working LED • Green: the GE1/GE2 electrical interface is properly connected. • Off: the GE1/GE2 electrical interface improperly connected or disconnected. • Blinking green: the GE1/GE2 electrical interface is receiving or sending data.

LED	Color	Description
100M (GE1/GE2 electrical interface)	Green	GE1/GE2 electrical interface 100 Mbit/s LED • Green: the GE1/GE2 electrical interface is working at 100 Mbit/s. • Off: the GE1/GE2 electrical interface is working at 10 Mbit/s.
1000M (GE1/GE2 electrical interface)	Green	GE1/GE2 electrical interface 1000 Mbit/s LED • Green: the GE1/GE2 electrical interface is working at 1000 Mbit/s. • Off: the GE1/GE2 electrical interface is working at 100 Mbit/s or 10 Mbit/s.
SD (GE1/GE2)	Green	GE1/GE2 optical interface signal LED • Green: optical signals are detected. • Off: no optical signals are detected.
LNK/ACT (GE1/GE2 optical interface)	Green	GE1/GE2 optical interface working LED • Green: the GE1/GE2 optical interface is properly connected. • Off: the GE1/GE2 optical interface is improperly connected or disconnected. • Blinking green: the GE1/GE2 optical interface is receiving or sending data.

6.1.6 DIP switch

Table 6-5 lists configurations of the DIP switch on the SUB-ESW-2GE card.

Table 6-5 DIP switch on the SUB-ESW-2GE card

SW1		Function	Status	Description
No.	Name			
1	NMS	Set management mode.	ON	NMS-SLA, slave control device
			OFF	NMS-AUTO, automatically recognizable by slot number
2	BP	Set chassis and backplane type.	ON	BP-3000, used on the RC3000-15
			OFF	BP-3500E&006, used on the OPCOM3500E and RC006-12

6.1.7 Specifications

Table 6-6 lists parameters of the ESW-2GE card.

Table 6-6 Parameters of the ESW-2GE card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.38 kg
Power consumption	< 10 W

6.1.8 Alarms

Table 6-7 lists alarms on the SUB-ESW-2GE card.

Table 6-7 Alarms on the SUB-ESW-2GE card

Alarm	Cause	Level	LED	LED status
Ethernet interface loopback alarm	Loopback is detected on the switching interface.	Major	N/A	N/A
Ethernet interface loopback clearing alarm	Loopback is cleared on the switching interface.	Major	N/A	N/A
Slot-specified LED ON alarm	The switching interface corresponding to a slot is connected.	Major	LNK/ACT	ON
Slot-specified LED OFF alarm	The switching interface corresponding to a slot is disconnected.	Critical	LNK/ACT	OFF
GE electrical interface LINKUP alarm	The link is in Link up status.	Major	LNK/ACT	ON
GE electrical interface LINKDOWN alarm	The link is in Link down status.	Critical	LNK/ACT	OFF
GE optical interface RLINKUP alarm	The link is in Rlink up status.	Major	LNK/ACT	ON
GE optical interface RLINKDOWN alarm	The link is in Rlink down status.	Critical	LNK/ACT	OFF
GE interface connection alarm	The GE interface is connected through Ethernet cable or fiber.	Prompt	N/A	N/A
GE interface disconnection alarm	The GE interface is disconnected.	Prompt	N/A	N/A
SFP in-position alarm	SFP is in position.	Prompt	N/A	N/A
SFP out-of-position alarm	SFP is out of position.	Prompt	N/A	N/A

Alarm	Cause	Level	LED	LED status
SFP RXLOS alarm	The SFP Rx LOS alarm is generated.	Major	N/A	N/A
SFP RXLOS cleared alarm	The SFP Rx LOS alarm is cleared.	Prompt	N/A	N/A
SFP TXFAULT alarm	Laser Tx is faulty.	Major	N/A	N/A
SFP TXFAULT cleared alarm	Laser Tx is normal.	Prompt	N/A	N/A

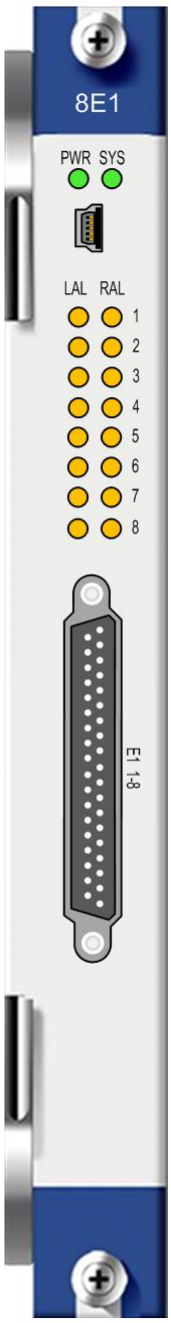
7 PDH cards

This chapter includes the following sections:

- 8E1
- P240-4FE
- P240×2L

7.1 8E1

7.1.1 Functions and appearance

Panel	Function
	The 8E1, a service access card, supports 8 ways of E1 services. It provides the following functions: • Provide 8 E1 electrical interfaces. • Adopt HDB3 coding for E1 which can be configured to PCM31, PCM30, or unframed structure. • Support configuring E1 interfaces to balanced or unbalanced interface through software. You can configure each E1 interface individually. • Support main clock mode or link clock mode for E1 interfaces. You can configure each E1 interface individually. • Support reporting LOS, LOF, AIS, CRC, E-3, E-6, LOMF, and remote alarms. • Support local internal loopback and external loopback based on E1 interface or 64K timeslot. • Support BERT for one-way E1 or one-way 64K timeslot. • Support signaling cross connection and transparent transmission of the Sa bit. • Support adding and intelligently identifying of remote connected devices. • Support adopting independent timeslot for the network management channel in SA4 or SA5 mode. • Support disabling output of signaling bits. The chip automatically generates control signals according to link alarms or is controlled by software. • Support E1 channel protection and four E1 protection pairs (1/2, 3/4, 5/6, and 7/8). • Support LOS, LOF, AIS, and E-3 alarms as protection switching triggers on the E1 interface. Whether the E-3 alarm triggers protection switching is configurable and it can be configured to 0–15s. • Support automatic mode, manual mode, locked mode, and forced mode for E1 interface protection. • Provide debugging and downloading interfaces which is connected to the front panel through the same Mini USB connector.

7.1.2 Version

Card	Version
RC3000-15-8E1	C

7.1.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

7.1.4 Interfaces

Interface type

Table 7-1 lists interfaces on the 8E1 card.

Table 7-1 Interfaces on the 8E1 card

Name	Type	Description
E1 1–8	DB37 male interface	Accessing 8 ways of E1 services

Interface parameter

Table 7-2 lists parameters of the E1 interface on the 8E1 card.

Table 7-2 Parameters of the E1 interface on the 8E1 card

Parameter	Description
Interface type	DB37 male interface
Interface rate	2048 kbit/s
Frequency offset	±50 ppm (±102.4 bit/s)
Interface code	HDB3
Interface impedance	• 75 Ω for unbalanced interfaces • 120 Ω for balanced interfaces
Clock	Master/Slave
Frame structure	Unframed, PCM31, and PCM30
Electrical features	Complying with ITU-T G.703 recommendations
Jitter feature	Complying with ITU-T G.823 recommendations

Interface PINs

Table 7-3 lists PIN definitions of the dB37 interface.

Table 7-3 PIN definitions of the dB37 interface

PIN	Definition	Cable No.	Print	PIN	Definition	Cable No.	Print
1	–	–	–	–	–	–	–
2	–	–	–	20	–	–	–
3	OUT1-	1	TX1	21	IN1+	9	RX1
4	OUT1+			22	IN1-		
5	OUT2-	2	TX2	23	IN2+	10	RX2
6	OUT2+			24	IN2-		
7	OUT3-	3	TX3	25	IN3+	11	RX3
8	OUT3+			26	IN3-		
9	OUT4-	4	TX4	27	IN4+	12	RX4
10	OUT4+			28	IN4-		
11	OUT5-	5	TX5	29	IN5+	13	RX5
12	OUT5+			30	IN5-		
13	OUT6-	6	TX6	31	IN6+	14	RX6
14	OUT6+			32	IN6-		
15	OUT7-	7	TX7	33	IN7+	15	RX7
16	OUT7+			34	IN7-		
17	OUT8-	8	TX8	35	IN8+	16	RX8
18	OUT8+			36	IN8-		
19	–	–	–	37	–	–	–

- When the E1 interface is configured to unbalanced mode, it is connected to the core of coaxial cables if marked with "+" and it is grounded if marked with "-".
- When the E1 interface is configured to balanced mode, it is the positive polarity of differentiated signals if marked with "+" and it is the negative polarity of differentiated signals if marked with "-".

When the peer device uses the RJ45 connector, its PIN definitions should be the same as listed in Table 7-4.

Table 7-4 PIN definitions of the RJ45 connector

PIN	Name	Description
1	OUT+	Tx positive pin for the balanced E1 interface
2	OUT-	Tx negative pin for the balanced E1 interface
4	IN+	Rx positive pin for the balanced E1 interface
5	IN-	Rx negative pin for the balanced E1 interface

7.1.5 LEDs

Table 7-5 lists LEDs on the 8E1 card.

Table 7-5 LEDs on the 8E1 card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
LAL1–8	Red/ Yellow	Local fault LED • Red: LOS alarms are generated on the local device. • Blinking red: AIS alarms are generated on the uplink of the local device. • Yellow: LOF alarms generated on the local device. • Blinking yellow: CRC alarms are generated on the local device.
RAL1–8	Red/ Yellow	Remote fault LED • Red: LOS alarms are generated on the peer device. • Blinking red: AIS alarms are generated on the uplink of the peer device. • Yellow: LOF alarms generated on the peer device. • Blinking yellow: CRC alarms are generated on the peer device.

7.1.6 Internal jumper

Table 7-6 lists jumpers used by the 8E1 card.

Table 7-6 Jumpers used by the 8E1 card

Jumper	Function
J4, J8, J14	Connected to the USB (J5) inside the 8E1 card. When J4, J8, and J14 are short-circuited, the 8E1 card enters BOOTROM downloading, through which you can upgrade the BOOTROM.

Jumper	Function
J7	Connected to JTAG (J6)

7.1.7 Specifications

Table 7-7 lists parameters of the 8E1 card.

Table 7-7 Parameters of the 8E1 card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Power consumption	5 W

7.1.8 Cables

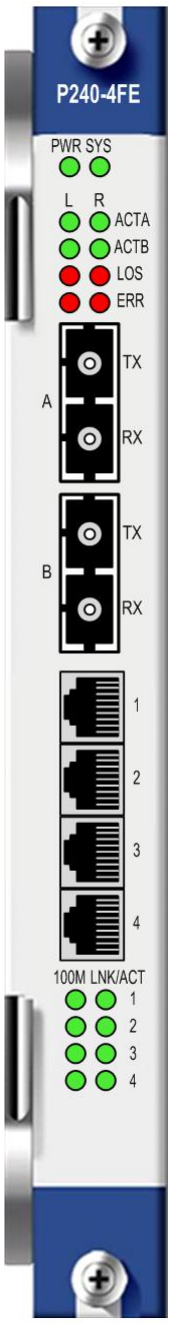
Table 7-8 lists the cable used by the unbalanced 8E1 interface.

Table 7-8 Cable used by the unbalanced 8E1 interface

Card	Recommended cable	Description
8E1	CBL-E1-DB37F(40)/16NC-D	(Oblique head) dB37 female interface to 16-way suspended E1 cable

7.2 P240-4FE

7.2.1 Functions and appearance

Panel	Function
	The P240-4FE card, a service multiplexing card, supports 8 ways of E1 services and 4 ways of Ethernet services. It provides the following functions: • Provide 2 PDH optical interfaces and 4 Ethernet electrical interfaces, through which 8 ways of E1 services and 4 ways of Ethernet service can be connected. • Support Automatic Protection Switching (APS) for 2 optical interfaces. • Support ALS on optical interfaces. • Support directional loopback on optical interfaces. • Support failover passing from the optical interface to the electrical interface. • Support unframed and framed E1 mode. You can configure farmed E1 mode to PCM30 or PCM31. • Support signaling cross connection by framed E1. • Support E1 network management channel through which the RC3000-15 manages remote connected devices. • Support BERT for E1 channel. • Support local and remote bidirectional loopback by E1 channel. • Support auto-negotiation, flow control, rate limiting on Ethernet interfaces. • Support three working modes on Ethernet modes: all switching, PORT VLAN, and 802.1Q TAG VLAN. • Support gathering statistics about performance, Tx and Rx packets, and Rx errored packets on all interfaces.

7.2.2 Version

Card	Version
RC3000-15-P240-4FE	A

7.2.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

7.2.4 Interfaces

Interface type

Table 7-9 lists interfaces on the P240-4FE card.

Table 7-9 Interfaces on the P240-4FE card

Name	Type	Description
A, B	1×9 optical interface	Two optical interfaces support APS.
1–4	RJ45 electrical interface	Accessing Ethernet services

Interface parameter

Table 7-10 lists parameters of optical interfaces on the P240-4FE card.

Table 7-10 Parameters of optical interfaces on the P240-4FE card

Model	Interface type	Working wavelength (nm)	Tx optical power (dBm)	Rx sensitivity (dBm)	Extinction ratio	Min. overload (dBm)	Transmission distance (km)
-M	SC	1310	-15 to -8	-31	> 8.2	-8	0–25
-S1	SC	1310	-15 to -8	-31	> 8.2	-8	0–15
-S2	SC	1310	-5 to 0	-35	> 8.2	-3	10–60
-S3	SC	1310	-5 to 0	-35	> 8.2	-3	15–120
-SS1	SC	T1310/ R1550	-15 to -8	-31	> 8.2	-8	0–25

Model	Interface type	Working wavelength (nm)	Tx optical power (dBm)	Rx sensitivity (dBm)	Extinction ratio	Min. overload (dBm)	Transmission distance (km)
-SS2	SC	T1310/ R1550	-5 to 0	-35	> 8.2	-3	10–60

Note

- The Device model column is omitted with "P240-4FE" before hyphen (-), and the full form is "P240-4FE + Device model", such as P240-4FE-M.
- The transmission distance is the maximum one under typical fiber conditions, so it depends on actual network situations.

Table 7-11 lists parameters of the electrical interface on the P240-4FE card.

Table 7-11 Parameters of the electrical interface on the P240-4FE card

Parameter	Description
Connector type	RJ45
Interface rate	10/100 Mbit/s auto-negotiation
Duplex mode	Full/Half duplex auto-negotiation
Flow control	• Support IEEE 802.3x flow control in full duplex. • Support back pressure flow control in half duplex.
MTU	1536 bytes
Wiring	Auto-MDI/MDIX
Compliant standard	IEEE 802.3x, IEEE 802.3u, IEEE 802.1q, and MSAN-126

7.2.5 LEDs

Table 7-12 list LEDs on the P240-4FE card.

Table 7-12 LEDs on the P240-4FE card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.

LED	Color	Description
L ACTA	Green	Local optical interface A working LED • Green: local optical interface A is the working interface. • Off: local optical interface A is not the working interface.
R ACTA	Green	Remote optical interface A working LED • Green: remote optical interface A is the working interface. • Off: remote optical interface A is not the working interface.
L ACTB	Green	Local optical interface B working LED • Green: local optical interface B is the working interface. • Off: local optical interface B is not the working interface.
R ACTB	Green	Remote optical interface B working LED • Green: remote optical interface B is the working interface. • Off: remote optical interface B is not the working interface.
L LOS	Red	Local optical interface LOS alarm LED • Red: input LOS alarms are generated on the local optical interface. • Off: no input LOS alarms are generated on the local optical interface.
R LOS	Red	Remote optical interface LOS alarm LED • Red: input LOS alarms are generated on the remote optical interface. • Off: no input LOS alarms are generated on the remote optical interface.
L ERR	Red	Local optical interface LOF, E-3, and E-6 alarm LED • Green: LOF, E-3, and E-6 alarms are generated on local optical interfaces. • Off: no LOF, E-3, and E-6 alarms are generated on local optical interfaces.
R ERR	Red	• Remote optical interface LOF, E-3, and E-6 alarm LED • Green: LOF, E-3, and E-6 alarms are generated on remote optical interfaces. • Off: no LOF, E-3, and E-6 alarms are generated on remote optical interfaces.
100M (1–4)	Green	• FE interface working rate LED • Green: the FE interface is working at 100 Mbit/s. • Off: the FE interface is working at 10 Mbit/s.
LNK/ACT (1–4)	Green	Link working LED • Green: the interface is working properly. • Off: the interface is disconnected or is working improperly. • Blinking green: the interface is receiving or sending data.

7.2.6 Internal jumper

Table 7-13 lists the jumper used by the P240-4FE card.

Table 7-13 Jumper used by the P240-4FE card

Jumper	Function	Status	Description
J9	Configure the mode for downloading the MCU program.	Short-circuited	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.
		Disconnected	Enter normal working mode.

By default, jumper J9 is disconnected; namely, the MCU is in normal working mode.

7.2.7 Specifications

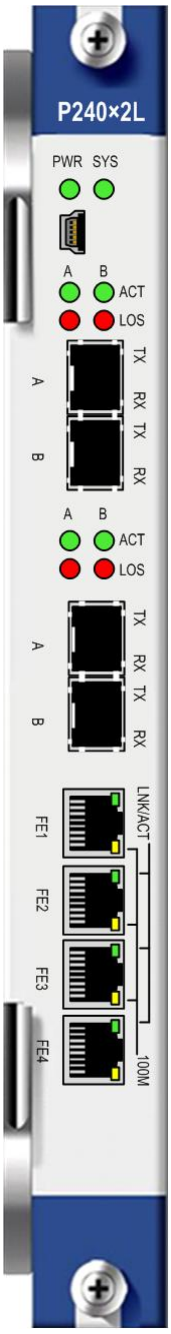
Table 7-14 lists parameters of the P240-4FE card.

Table 7-14 Parameters of the P240-4FE card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.35 kg
Power consumption	≤ 10 W

7.3 P240×2L

7.3.1 Functions and appearance

Panel	Function
	The P240×2L is an Ethernet service multiplexing card. It provides the following functions: • Provide 2 groups of PDH optical interfaces which are enabled with APS. Each group of PDH optical interface multiplexes 8 ways of E1 services and 100Base-TX Ethernet service; wherein, 8 ways of E1 services are allocated to the 2 groups. • Provide 8 ways of E1 services. The number of E1 services for each group of optical interface is configurable and is 4 by default. The first 4 ways of E1 services of two groups correspond to 8 E1 interfaces on the backplane. • Support ALS on optical interface. By default, ALS is disabled. • Support failover from the optical interface to the Ethernet interface. By default, fault pass is disabled. – The triggers of failover include local LOS, local LOF, remote LOF, and remote LOF. The triggers cannot be configurable. – When alarms are generated on the working optical interface, disable 4 FE electrical interfaces on the front panel. – When alarms are generated on all 4 optical interfaces in all switching working mode, disable the working FE interface. – In Access VLAN or Tunnel VLAN working mode, you can disable the corresponding working FE interface according to VLAN configurations. • Support framed and unframed E1 mode. By default, framed E1 mode is used. • Support PCM30 and PCM31 modes. By default, PCM30 mode is used. • Support signaling cross connection in framed E1 mode. • Support E1 BERT. Only one of 8 BERTs can be enabled at a time. • Support external loopback on optical interfaces. • Support E1 local bidirectional loopback. • Support network management of remote E1 module devices. E1 network management channel can be configured to SA4, SA5, or independent timeslot; by default, it is SA5. Baud rate is configurable and is 2400 by default. • Provide 7 Ethernet interfaces naming FE1 to FE7. Wherein, – FE1 to FE4 are the 4 FE interfaces on the front panel. They support automatic negotiation of duplex mode and interface rate. They also support flow control and rate limiting. – FE5 is the FX interface connected to the backplane. It is fixed to 100 Mbit/s in duplex mode. It does not support rate limiting. – FE6 and FE7 are for transmission. • Support managing remote devices, such as the RC3000 (versions B and C), RC3000E, RCMS29 series, and RC86 series.

7.3.2 Version

Card	Version
RC3000-15-P240×2L	A

7.3.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

7.3.4 Interfaces

Interface type

Table 7-15 lists interfaces on the P240×2L card.

Table 7-15 Interfaces on the P240×2L card

Name	Type	Description
A, B	SFP optical interface	Dual optical interface. Each optical interface supports 8 ways of E1 services. In each group, optical interfaces A and B are enabled with APS.
FE1 to FE4	RJ45	For transmitting Ethernet services
–	Mini USB	For debugging

Interface parameter

Table 7-16 lists parameters of Ethernet interfaces on the P240×2L card.

Table 7-16 Parameters of Ethernet interfaces on the P240×2L card

Parameter	Description
Connector type	RJ45
Interface rate	10/100 Mbit/s auto-negotiation
MTU	1536 bytes
Duplex mode	Full/Half duplex auto-negotiation
Flow control	• Support IEEE 802.3x flow control in full duplex. • Support back pressure flow control in half duplex.
Wiring	Auto-MDI/MDIX

Parameter	Description
Compliant standard	IEEE 802.3x, IEEE 802.3u, IEEE 802.1q, and MSAN-126

Table 7-17 lists parameters of optical interfaces on the P240×2L card.

Table 7-17 Parameters of optical interfaces on the P240×2L card

Model	Working wavelength (nm)	Tx optical power (dBm)	Rx sensitivity (dBm)	Extinction ratio	Minimum overload (dBm)	Transmission distance (km)
-M	1310	-20 to -14	< -29	> 8.2	> -14	2
-S1	1310	-15 to -8	< -34	> 8.2	> -8	15
-S2	1310	-5 to 0	< -34	> 8.2	> -8	40
-S3	1550	-5 to 0	< -34	> 10	> -10	80
-S13	1310	-15 to -8	< -28	> 8.2	> -8	15
-S15	1550	-15 to -8	< -28	> 8.2	> -8	15
-S23	1310	-5 to 0	< -32	> 8.2	> -8	40
-S25	1550	-5 to 0	< -32	> 8.2	> -8	40

Note

The transmission distance is the maximum one under typical fiber conditions, so it depends on actual network situations.

7.3.5 LEDs

Table 7-18 lists LEDs on the P240×2L card.

Table 7-18 LEDs on the P240×2L card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.

LED	Color	Description
ACT	Green	Optical interface working LED • Green: the optical interface is working. • Off: the optical interface is not working.
LOS	Red	LOS alarm LED • Red: LOS alarms are generated. • Blinking red: LOS alarms are generated on remote devices. • Off: no LOS alarms are generated.
LNK/ACT	Green	Ethernet link interface LED • Green: Ethernet link interfaces are connected properly. • Off: Ethernet link interfaces are disconnected or are improperly connected. • Blinking green: Ethernet link interfaces are receiving or sending data.
100M	Yellow	Ethernet interface rate LED • Yellow: the interface is working at 100 Mbit/s. • Off: the interface is working at 10 Mbit/s.

7.3.6 Specifications

Table 7-19 lists parameters of the P240×2L card.

Table 7-19 Parameters of the P240×2L card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.75 kg
Power consumption	≤ 10 W

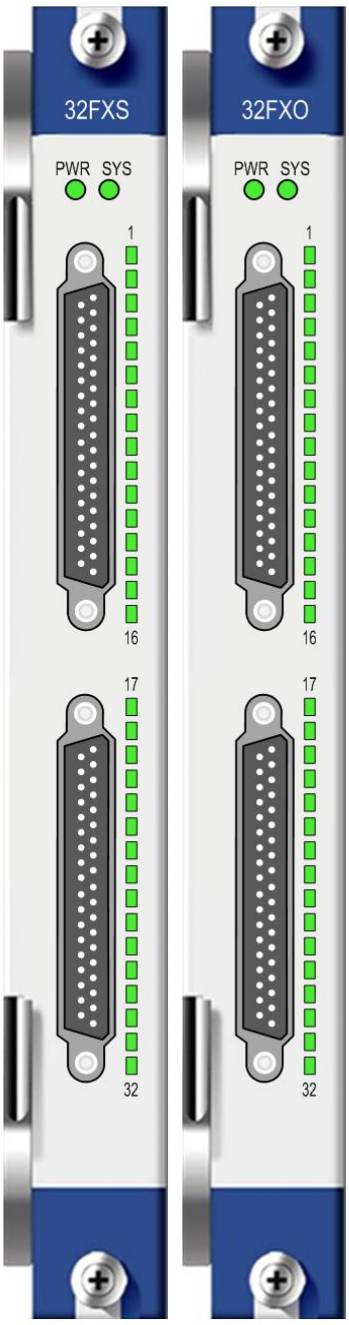
8 Voice cards

This chapter includes the following sections:

- 32FXS/32FXO
- FXS/FXO
- 16E&M/8E&M/4E&M
- 10E&M
- 12MT
- Audio
- TEST

8.1 32FXS/32FXO

8.1.1 Functions and appearance

Panel	Function
	The 32FXS/32FXO card is a 32-way voice access card. It provides the following functions: • Provide 32 ways of voice services. There are three voice modules: 32FXS, 32FXO, and 16FXS16FXO. • Support signaling occupation bits: a-bit and b-bit. By default, it is a-bit. • Support configuring voice gain through software: – The A/D gain ranges from -10 to 16 dB, and is 0 dB by default. – The D/A gain ranges from -13 to 10 dB, and is -3.5 dB by default. – The step is 0.1 dB. • Support configuring the signaling mode to RAISECOM, user-defined mode, or other modes. By default, it is RAISECOM. • Support querying signaling status. • Support reverse polarity switching. • Support CID. • Support lightning protection and overcurrent protection. **Note** • The 32FXS card is of high power when multiple ways of services are in off-hook status, so hot swapping is prohibited. • To avoid abnormalities such as false ringing, remove the cable of each voice interface before hot swapping of the 32FXS or 32FXO card.

8.1.2 Version

Card	Version
RC3000-15-32FXS	A
RC3000-15-32FXO	A
RC3000-15-16FXS16FXO	A

8.1.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

8.1.4 Interfaces

Interface type

Table 8-1 lists interfaces on the 32FXS/32FXO card.

Table 8-1 Interfaces on the 32FXS/32FXO card

Name	Type	Description
–	DB37 male interface	Each interface transmits 16 ways of voice services.

Interface parameter

Table 8-2 lists parameters of interfaces on 32FXS/32FXO card.

Table 8-2 Parameters of interfaces on 32FXS/32FXO card

Parameter	Description
Coding scheme	A-law
Bit rate	64 kbit/s
Audio port impedance	On-hook impedance is 2 MΩ.
	Off-hook loopback impedance is 600+200//0.1.
Effective transmission bandwidth	300–3400 Hz/600Ω
Gain frequency features	The Rx (A/D) gain ranges from -3 to +13 dB, and is 0 dB by default. Its step is 0.1 dB.

Parameter	Description
	The Tx (D/A) gain ranges from -13 to +3 dB, and is -3.5 dB by default. Its step is 0.1 dB.
Frequency distortion	300–3000 Hz; < 0.5 dB
	3000–3400 Hz; < 3.0 dB
Total distortion (1020 Hz)	0 to -30 dBm0; < 33 dB
	-30 to -40 dBm0; < (33–22) dB
	-40 to -45 dBm0; < 22 dB
Gain change according to level	+3 to -40 dBm0; Δ < 0.5 dB
	-40 to -50 dBm0; Δ < 1.0 dB
	-50 to -55 dBm0; Δ < 3.0 dB
Degree of unbalance about earth	300–600 Hz: > 40 dB
	600–2400 Hz: > 46 dB
	2400–3400 Hz: > 41 dB
Idle channel noise	< -67 dBm0p
Feed voltage (off-hook)	Typical -48 V
Feed current	Typical 20 mA
Ringing voltage	Typical 60 V/30 Hz
Return loss	300–600 Hz: > 12 dB
	600–3400 Hz: > 15 dB

Interface PINs

For colors of the cable used on interfaces, see section 13.13 Audio cable.

Table 8-3 lists PIN definitions of the interface on the 32FXS/32FXO card.

Table 8-3 PIN definitions of the 32FXS/32FXO card

DB37 PIN	Channel No.	Channel name
3	No. 1	CHANN1A
21		CHANN1B
4	No. 2	CHANN2A
22		CHANN2B

DB37 PIN	Channel No.	Channel name
5	No. 3	CHANN3A
23		CHANN3B
6	No. 4	CHANN4A
24		CHANN4B
7	No. 5	CHANN5A
25		CHANN5B
8	No. 6	CHANN6A
26		CHANN6B
9	No. 7	CHANN7A
27		CHANN7B
10	No. 8	CHANN8A
28		CHANN8B
11	No.9	CHANN9A
29		CHANN9B
12	No. 10	CHANN10A
30		CHANN10B
13	No. 11	CHANN11A
31		CHANN11B
14	No. 12	CHANN12A
32		CHANN12B
15	No. 13	CHANN13A
33		CHANN13B
16	No. 14	CHANN14A
34		CHANN14B
17	No. 15	CHANN15A
35		CHANN15B
18	No. 16	CHANN16A
36		CHANN16B

Note

PINs 1, 2, 19, 20, and 37 are idle.

8.1.5 LEDs

Table 8-4 lists LEDs on the 32FXS/32FXO card.

Table 8-4 LEDs on the 32FXS/32FXO card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Green: the system is working improperly. • Blinking green: the system is working properly. • Off: the system is working improperly.
1–32	Green	Channel in-use status LED • Green: the voice channel is being used. During local off-hook, local ringing, and calling, the LED is Green. • Off: the voice channel is idle.

8.1.6 DIP switch

Table 8-5 lists the DIP switch on the 32FXS/32FXO card.

Table 8-5 DIP switch on the 32FXS/32FXO card

SW1	Function	Status	Description
KEY1	Enter or quit ISP mode	ON	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.
		OFF	Enter normal working mode.
KEY2	Reserved	–	

Note

After upgrade, SW1 must be in all OFF status; otherwise, the RC3000-15 will malfunction.

8.1.7 Specifications

32FXS

Table 8-6 lists parameters of the 32FXS card.

Table 8-6 Parameters of the 32FXS card.

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.75 kg
Power consumption	• < 7 W (+5 VDC) • < 30 W (-48 VDC)

32FXO

Table 8-7 lists parameters of the 32FXO card.

Table 8-7 Parameters of the 32FXO card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.75 kg
Power consumption	< 5 W (+5 VDC)

8.1.8 Cables

Table 8-8 lists the cable used by the 32FXS/32FXO card.

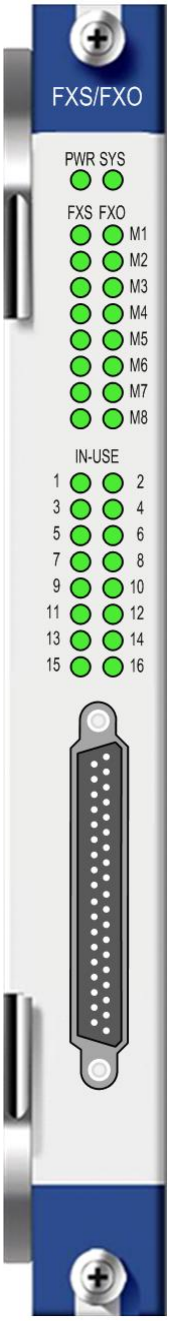
Table 8-8 Cable used by the 32FXS/32FXO card

Card	Recommended cable	Description
32FXS/32FXO	CBL-VOICE-DB37F/NC	M37 female interface to bare 32-core audio cable

For colors of the cable, see section 13.13 Audio cable.

8.2 FXS/FXO

8.2.1 Functions and appearance

Panel	Function
	The FXS/FXO card is a 16-way voice access card. It provides the following functions: • Provide 16 ways of voice services. There are four voice modules: 16FXS/16FXO, 8FXS/8FXO, and 8S8O. • Support signaling occupation bits: a-bit and b-bit. By default, it is a-bit. • Support configuring voice gain through software: – The A/D gain ranges from -10 to 16 dB, and is 0 dB by default. – The D/A gain ranges from -13 to 10 dB, and is -3.5 dB by default. • Support configuring the signaling mode to RAISECOM, user-defined mode, or other modes. By default, it is RAISECOM. • Support querying signaling status. • Support reverse polarity switching. • Support CID. • Support lightning protection and overcurrent protection. **Note** • The 16FXS/8FXS card is of high power when multiple ways of services are in off-hook status, so hot swapping is prohibited. • To avoid abnormalities such as false ringing, remove the cable of each voice interface before hot swapping of the 16FXS, 16FXO, 8FXS, 8FXO, and 8S8O cards.

8.2.2 Version

Card	Slot
RC3000-15-FXS/FXO	B

8.2.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

8.2.4 Interfaces

Interface type

Table 8-9 lists the interface on the FXS/FXO card.

Table 8-9 Interface on the FXS/FXO card

Name	Type	Description
• 1-4 • 5-8 • 9-12 • 13-16	RJ45 interface	Accessing up to 16 ways of FXS/FXO services, with 4 ways occupying one RJ45 interface

Interface parameter

Table 8-10 lists parameters of the FXS/FXO card.

Table 8-10 Parameters of the FXS/FXO card

Parameter	Description
Coding scheme	A-law
Bit rate	64 kbit/s
Audio port impedance	On-hook impedance is 2 MΩ.
	Off-hook loopback impedance is 600+200//0.1.
Effective transmission bandwidth	300–3400 Hz/600 Ω
Gain frequency features	The Rx (A/D) gain ranges from -10 to +16 dB, and is 0 dB by default. Its step is 0.1 dB.

Parameter	Description
	The Tx (D/A) gain ranges from -13 to +10 dB, and is -3.5 dB by default. Its step is 0.1 dB.
Frequency distortion	300–3000 Hz; < 0.5 dB
	3000–3400 Hz; < 3.0 dB
Total distortion (1020 Hz)	0 to -30 dBm0; < 33 dB
	-30 to -40 dBm0; < (33–22) dB
	-40 to -45 dBm0; < 22 dB
Gain change according to level	+3 to -40 dBm0; Δ < 0.5 dB
	-40 to -50 dBm0; Δ < 1.0 dB
	-50 to -55 dBm0; Δ < 3.0 dB
Degree of unbalance about earth	300–600 Hz: > 40 dB
	600–2400 Hz: > 46 dB
	2400–3400 Hz: > 41 dB
Idle channel noise	< -67 dBm0p
Feed voltage (off-hook)	Typical -48 V
Feed current	Typical 20 mA
Ringing voltage	Typical 60 V/30 Hz
Return loss	300–600 Hz: > 12 dB
	600–3400 Hz: > 30 dB

Interface PINs

Figure 8-1 shows PINs of the RJ45 interface.

Figure 8-1 PINs of the RJ45 interface

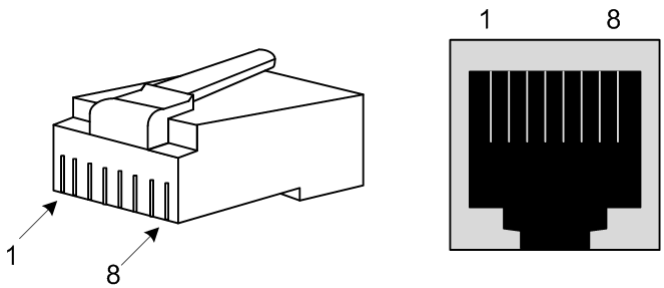


Table 8-11 lists PIN definitions of the interface on the FXS/FXO card.

Table 8-11 PIN definitions of the FXS/FXO card

DB37 PIN	Channel No.	Channel name
1	CH-01A	No.1 voice
2	CH-01B	
3	CH-02A	No.2 voice
4	CH-02B	
5	CH-03A	No.3 voice
6	CH-03B	
7	CH-04A	No.4 voice
8	CH-04B	

Note

- For the card supporting fewer than 16 ways of services, each way of voice services is transmitted through the channel from front to back successively and consecutively.
- For FXS/FXO hybrid service card, the transmission order follows the principle of FXS first and FXO second.

8.2.5 LEDs

Table 8-12 lists LEDs on the FXS/FXO card.

Table 8-12 LEDs on the FXS/FXO card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
FXS (M1–M8)	Green	Module interface type LED • Green: the corresponding voice module uses the FXS interface. • Off: the corresponding voice module does not use the FXS interface.
FXO (M1–M8)	Green	Module interface type LED • Green: the corresponding voice module uses the FXO interface. • Off: the corresponding voice module does not use the FXO interface.

LED	Color	Description
IN-USE (1–16)	Green	Channel in-use status LED • Green: the voice channel is being used. During local off-hook, local ringing, and calling, the LED is green. • Off: the voice channel is idle.

8.2.6 DIP switch

N/A

8.2.7 Specifications

Table 8-13 lists parameters of the FXS/FXO card.

Table 8-13 Parameters of the FXS/FXO card

Parameter	16FXS	16FXO	8FXS	8FXO	8S8O
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)				
Weight	0.5 kg	0.5 kg	0.4 kg	0.4 kg	0.5 kg
Power consumption	Note The card works under +5 VDC power, with power consumption as below.				
	< 20 W	< 20 W	< 15 W	< 15 W	< 20 W

8.2.8 Cables

The FXS/FXO card uses the twisted pair cable with the RJ45 connector. Make the cable by yourself according to specifications of the RJ45 connectors. Usually, a common Ethernet cable is suitable.

8.3 16E&M/8E&M/4E&M

8.3.1 Functions and appearance

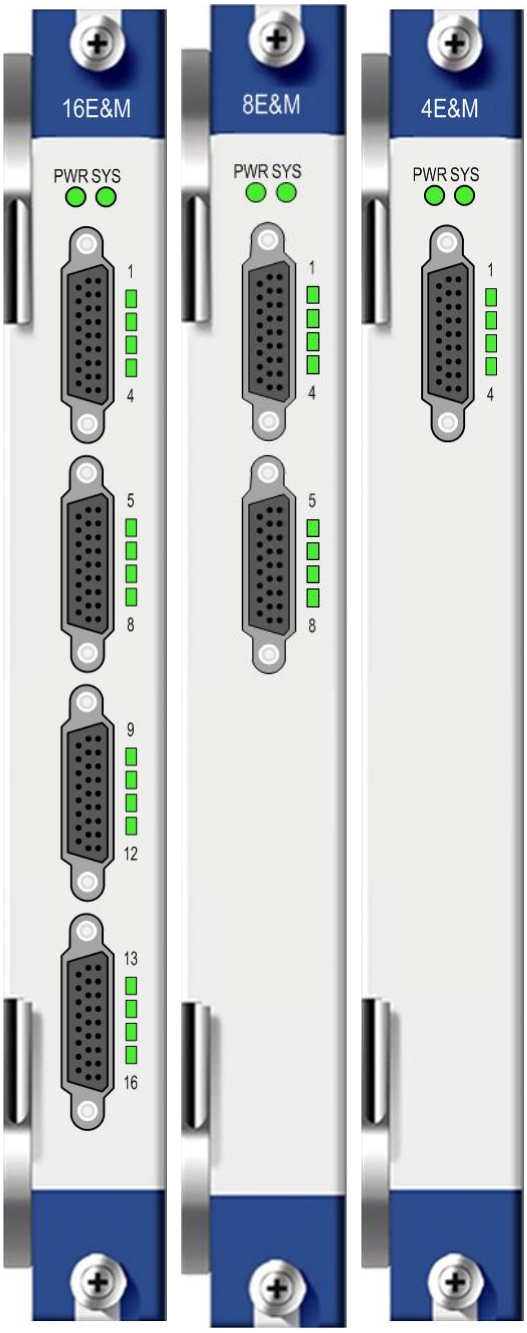
Panel	Function
	The 16E&M/8E&M/4E&M card is a 16-way/8-way/4-way E&M audio access card. It provides the following functions: • Support configuring signaling mode: – Support original signaling and reverse signaling. By default, it is original signaling. – Support signaling occupation a-bit and b-bit. By default, it is a-bit. • Support configuring 2-wire/4-wire mode through software. • Support configuring voice gain through software: – The Rx D/A gain ranges from -3 to 27 dB. – The Tx D/A gain ranges from -13 to +7 dB. • Support three default configurations, as listed in Table 8-14. When the card leaves factory, the configuration is the third one. Configuring jumper implements three default configurations, but has lower priority than configuring through network management. For details, see section 8.3.6 Internal jumper. • Support inwards loopback for analog audio and outwards loopback for analog audio (in 4-wire mode only), and support inwards loopback for E&M signaling. • Support querying signaling status. • The E&M signaling type is fixed to V.

Table 8-14 Default configurations for startup of the 16E&M/8E&M/4E&M card

No.	Mode	RX (A-D) gain	TX (D-A) gain
1	E&M2	0 dB	-3.5 dB
2	E&M4	+14 dB	+ 4 dB
3	E&M4	0 dB	0 dB

8.3.2 Version

Card	Version
RC3000-15-16E&M	A
RC3000-15-8E&M	A
RC3000-15-4E&M	A

8.3.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

8.3.4 Interfaces

Interface type

Table 8-15 lists interfaces on the 16E&M/8E&M/4E&M card.

Table 8-15 Interfaces on the 16E&M/8E&M/4E&M card

Name	Type	Description
–	HDB26 female interface	Each interface accesses 4 ways of E&M voice services.

Interface parameter

Table 8-16 lists parameters of the interface on the 16E&M/8E&M/4E&M card.

Table 8-16 Parameters of the interface on the 16E&M/8E&M/4E&M card

Parameter	Description
Coding scheme	A-law
Bit rate	64 kbit/s
Audio port impedance	On-hook impedance is 2 MΩ.
	Off-hook loopback impedance is 600+200//0.1.
Effective transmission bandwidth	300–3400 Hz/600 Ω
Gain frequency features	The Rx (A/D) gain ranges from -3 to 27 dB. The default value is controlled by the internal jumper. Its step is 0.1 dB.
	The Tx (D/A) gain ranges from -13 to 7 dB. The default value is controlled by the internal jumper. Its step is 0.1 dB.
Frequency distortion	300–3000 Hz; < 0.5 dB
	3000–3400 Hz; < 3.0 dB
Total distortion (1020 Hz)	0 to -30 dBm0; < 33 dB
	-30 to -40 dBm0; < (33–22) dB
	-40 to -45 dBm0; < 22 dB
Gain change according to level	+3 to -40 dBm0; Δ < 0.5 dB
	-40 to -50 dBm0; Δ < 1.0 dB
	-50 to -55 dBm0; Δ < 3.0 dB
Degree of unbalance about earth	300–600 Hz: > 40 dB
	600–2400 Hz: > 46 dB
	2400–3400 Hz: > 41 dB
Idle channel noise	< -67 dBm0p
Feed voltage (off-hook)	Typical -48 V
Feed current	Typical 20 mA
Ringing voltage	Typical 60 V/30 Hz
Return loss	300–600 Hz: > 12 dB
	600–3400 Hz: > 15 dB

Interface PINs

For colors of the cable used by the interface, see section 13.14 MUL cable.

Table 8-17 lists PIN definitions of the interface on the 16E&M/8E&M/4E&M card.

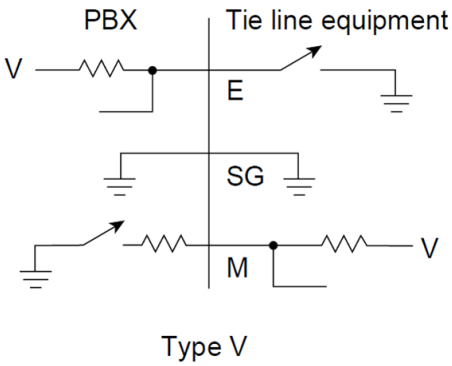
Table 8-17 PIN definitions of the interface on the 16E&M/8E&M/4E&M card

HDB26 PIN	Definition	
	Cable	Description
1	R_A4	No. 4 way • Audio RX A in 4-wire mode • Idle in 2-wire mode
11	R_B4	No. 4 way • Audio RX B in 4-wire mode • Idle in 2-wire mode
2	T/RA_4	No. 4 way • Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
12	T/RB_4	No. 4 way • Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
3	R_A3	No. 3 way • Audio RX A in 4-wire mode • Idle in 2-wire mode
13	R_B3	No. 3 way • Audio RX B in 4-wire mode • Idle in 2-wire mode
4	T/RA_3	No. 3 way • Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
14	T/RB_3	No. 3 way • Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
5	R_A2	No. 2 way • Audio RX A in 4-wire mode • Idle in 2-wire mode
15	R_B2	No. 2 way • Audio RX B in 4-wire mode • Idle in 2-wire mode
6	T/RA_2	No. 2 way • Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode

HDB26 PIN	Definition	
	Cable	Description
16	T/RB_2	No. 2 way • Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
7	R_A1	No. 1 way • Audio RX A in 4-wire mode • Idle in 2-wire mode
17	R_B1	No. 1 way • Audio RX B in 4-wire mode • Idle in 2-wire mode
8	T/RA_1	No. 1 way • Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
18	T/RB_1	No. 1 way • Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
19	E4	No. 4 way E signaling cable
20	M4	No. 4 way M signaling cable
21	E3	No. 3 way E signaling cable
22	M3	No. 3 way M signaling cable
23	E2	No. 2 way E signaling cable
24	M2	No. 2 way M signaling cable
25	E1	No. 1 way E signaling cable
26	M1	No. 1 way M signaling cable
9	NC	Idle
10	NC	Idle

The RC3000-15, as a Tie line device, uses the E&M signalling type of Type V, as shown in Figure 8-2.

Figure 8-2 E&M signaling type



8.3.5 LEDs

Table 8-18 lists LEDs on the 16E&M/8E&M/4E&M card.

Table 8-18 LEDs on the 16E&M/8E&M/4E&M card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Green: the system is working improperly. • Off: the system is working improperly. • Blinking green: the system is working properly.
• 1–16 (16E&M) • 1–8 (8E&M) • 1–4 (4E&M)	Green	Channel in-use status LED • Green: the corresponding channel is receiving E signaling. • Off: the corresponding channel is idle. **Note** In inwards loopback for E&M signaling, the LED indicates status of the physical port for E signaling.

8.3.6 Internal jumper

Table 8-19 and Table 8-20 list the jumper used by the 16E&M/8E&M/4E&M card.

Table 8-19 Jumper used by the 16E&M/8E&M/4E&M card

Jumper	Function	Status	Description
JP1	Configure the mode for downloading the MCU program.	Short-circuited	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.
		Disconnected	Enter normal working mode.

After upgrade, JP1 must be in all OFF status; otherwise, the RC3000-15 will malfunction.

Table 8-20 lists jumpers S1, S2, and S3 used by the 16E&M/8E&M/4E&M card.

Table 8-20 Jumpers S1, S2, and S3 used by the 16E&M/8E&M/4E&M card

No.	Jumper	Function	Mode	Rx gain	Tx gain
1	Short-circuited S1	Configure initial values upon card startup.	E&M2	0 dB	-3.5 dB
2	Short-circuited S2		E&M4	+14 dB	+4 dB
3	Short-circuited S3		E&M4	0 dB	0 dB

- Only one of S1, S2, and S3 should be short circuited while others should be disconnected.
- If all of S1, S2, and S3 are disconnected, the default value is No.1 upon startup.
- If two or all of S1, S2, and S3 are concurrently short circuited, the default value is according to priority: S1 > S2 > S3.
- To configuring default value, configuring jumper is of lower priority than configuring through network management; it becomes invalid after the configuration through network management takes effects.

8.3.7 Specifications

16E&M

Table 8-21 lists parameters of the 16E&M card.

Table 8-21 Parameters of the 16E&M card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Power consumption	• < 3.0 W (+5 VDC) • < 1.0 W (-48 VDC)

8E&M

Table 8-22 lists parameters of the 8E&M card.

Table 8-22 Parameters of the 8E&M card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.4 kg
Power consumption	• < 2.5 W (+5 VDC) • < 1.0 W (-48 VDC)

4E&M

Table 8-23 lists parameters of the 4E&M card.

Table 8-23 Parameters of the 4E&M card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.4 kg
Power consumption	• < 2.5 W (+5 VDC) • < 0.7 W (-48 VDC)

8.3.8 Cables

Table 8-24 lists the cable used by the 16E&M/8E&M/4E&M card.

Table 8-24 Cable used by the 16E&M/8E&M/4E&M card

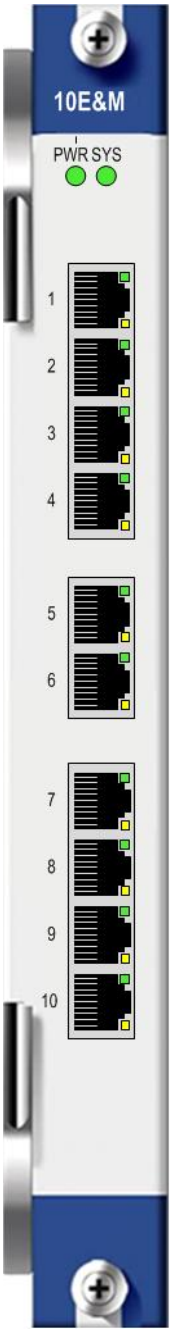
Card	Recommended cable	Description
16E&M/8E&M/4E&M	CBL-EM-HDB26M/NC	HDB26 male interface to suspended E&M cable

Note

For colors of the cable, see section 13.15 E&M cable.

8.4 10E&M

8.4.1 Functions and appearance

Panel	Function
	The 10E&M is a 10-way audio access card. It provides the following functions: • Provide 10 RJ45 E&M interfaces. Each interface supports 1 way of 64 kbit/s E&M service. Interfaces 1–10 are corresponding to timeslots from TS0 to TS9 on the card. • Support configuring the signaling type to I, II, III, IV, or V through the jumper. By default, it is V. • Support configuring the wiring mode to 2-wire or 4-wire. By default, it is 4-wire. • Support configuring the signaling mode through software: – Support original signaling and reverse signaling. By default, it is original signaling. – Support signaling occupation a-bit and b-bit. By default, it is a-bit. • Support configurable gain: – Rx D/A gain ranges from -3 to +27 dB. – Tx D/A gain ranges from -13 to +7 dB. – By default, the gain is 0 dB. – The step is 0.1 dB. • Support configuring analog audio to conduct internal loopback and external loopback (supported in 4-wire mode only); support E&M signaling to conduct internal loopback. • Support viewing signaling status.

8.4.2 Version

Card	Version
RC3000-15-10E&M	A

8.4.3 Slots

Chassis version	Slot
E.30	1–6 and 9–13

8.4.4 Interfaces

Interface type

Table 8-25 lists interfaces on the 10E&M card.

Table 8-25 Interfaces on the 10E&M card

Name	Type	Description
1–10	RJ45	Each interface accesses 1 way of E&M voice service.

Interface parameter

Table 8-26 lists parameters of the interface on the 10E&M card.

Table 8-26 Parameters of the interface on the 10E&M card

Parameter	Description
Coding scheme	A-law
Bit rate	64 kbit/s
Audio port impedance	2000 kΩ during on-hook
	600+200//0.1 Ω during off-hook
Effective transmission bandwidth	300–3400 Hz/600 Ω
Gain frequency features	The Rx (A/D) gain ranges from -3 to 27 dB. The default value is controlled by an internal jumper. Its step is 0.1 dB.

Parameter	Description
	The Tx (D/A) gain ranges from -17 to 8 dB. The default value is controlled by an internal jumper. Its step is 0.1 dB.
Frequency distortion	300–3000 Hz; < 0.5 dB
	3000–3400 Hz; < 3.0 dB
Total distortion (1020 Hz)	0 to -30 dBm0; < 33 dB
	-30 to -40 dBm0; < (33–22) dB
	-40 to -45 dBm0; < 22 dB
Gain change according to level	+3 to -40 dBm0; Δ < 0.5 dB
	-40 to -50 dBm0; Δ < 1.0 dB
	-50 to -55 dBm0; Δ < 3.0 dB
Degree of unbalance about earth	300–600 Hz: > 40 dB
	600–2400 Hz: > 46 dB
	2400–3400 Hz: > 41 dB
Idle channel noise	< -67 dBm0p
Feeding voltage (on-hook)	Typical -48 V
Feeding current	Typical 20 mA
Ringing voltage	Typical 60 V/30 Hz
Return loss	300–600 Hz: > 12 dB
	600–3400 Hz: > 15 dB

Interface PINs

Figure 8-3 shows the interface PINs of the interface on the E&M. Table 8-27 lists PIN definitions of the interface on the E&M.

Figure 8-3 Interface PINs of the interface on the E&M

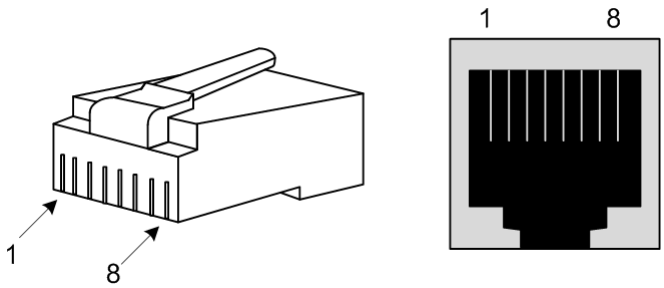


Table 8-27 PIN definitions of the interface on the E&M

PIN	Cable	Definition
1	SB	Signal battery, used for II, III, and IV signaling
2	E	E signaling cable
3	R1	• Idle in 2-wire mode • Rx R1 in 4-wire mode
4	R	• Rx R in 2-wire mode • Tx T1 in 4-wire mode
5	T	• Tx T in 2-wire mode • Tx T in 4-wire mode
6	T1	• Idle in 2-wire mode • Rx R in 4-wire mode
7	M	M signaling cable
8	SG	Signal ground, used for II, III, and IV signaling

The E&M signaling is used to indicate the on-hook or off-hook status of the telephone. It transmits the corresponding status through the wiring mode of the E wire and M wire. Table 8-28 lists types of E&M signaling

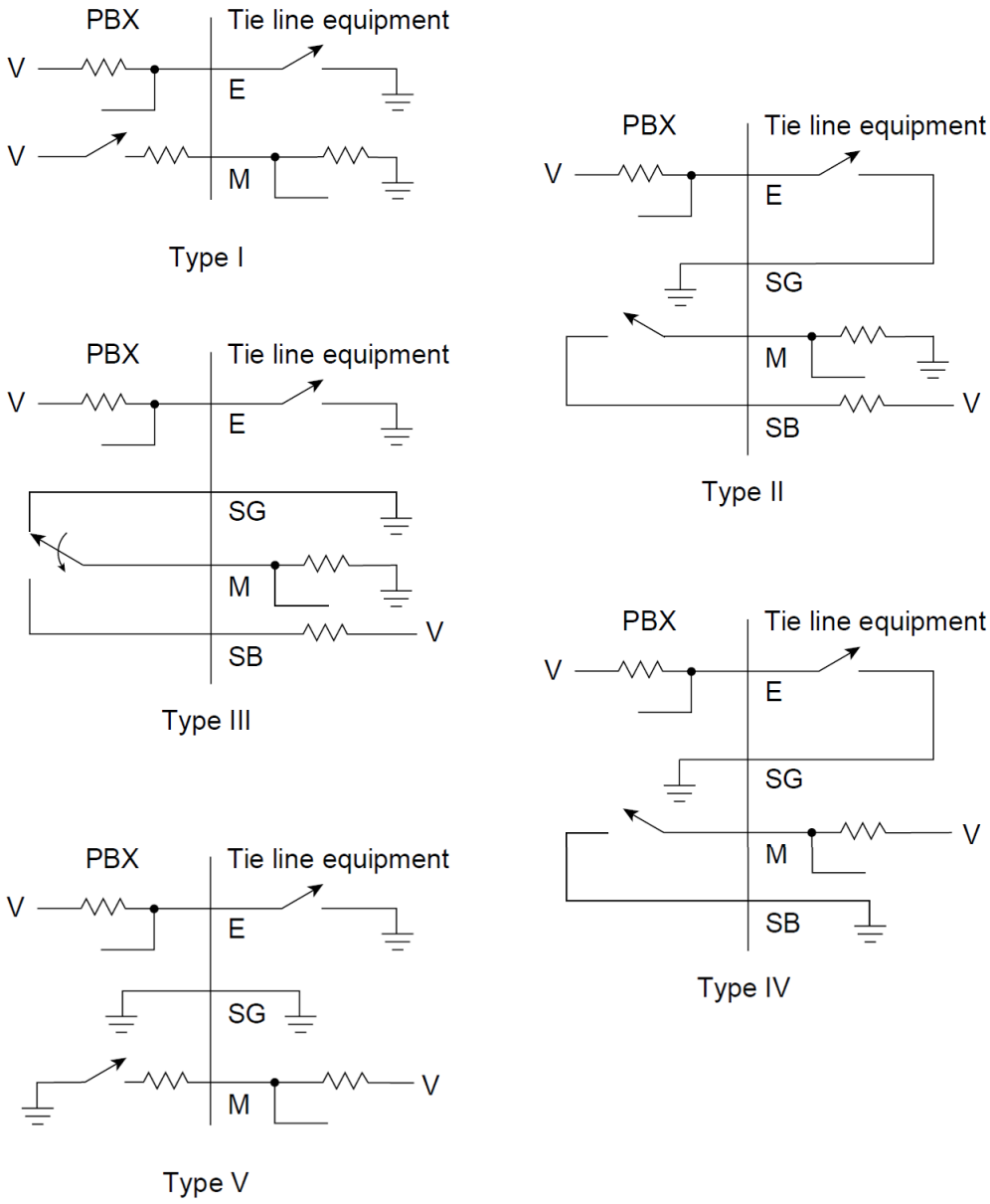
- The 10E&M supports configuring the type of E&M signaling of the voice interface through the jumper on the card.
- Each voice interface can be configured to support one of the I, II, III, IV, or V signaling.
- By default, the signaling type of the voice interface is V.
- The signaling types of the PBX and E&M must be the same.

Table 8-28 Types of E&M signaling

Signaling type	Description
I	Usually used in North American areas
II	Seldom used
III	Usually used in the traditional telephone center
IV	Seldom used
V	Usually used in areas except North American

The RC3000-15, as a Tie line device, uses the following E&M signalling type shown in Figure 8-4.

Figure 8-4 E&M signaling types



8.4.5 LEDs

Table 8-29 lists LEDs on the 10E&M card.

Table 8-29 LEDs on the 10E&M card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.

LED	Color	Description
SYS	Green	System status LED • Green: the system is working improperly. • Off: the system is working improperly. • Blinking green: the system is working properly.
1–10	Green Yellow	• E&M signaling status LED • Green: E signaling • Yellow: M signaling • On: the corresponding channel is receiving the E or M signaling. • Off: the corresponding channel is idle. **Note** When the E&M signaling is conducting internal loopback, the LED indicates the status of the physical status of the E signaling only.

8.4.6 Internal jumper

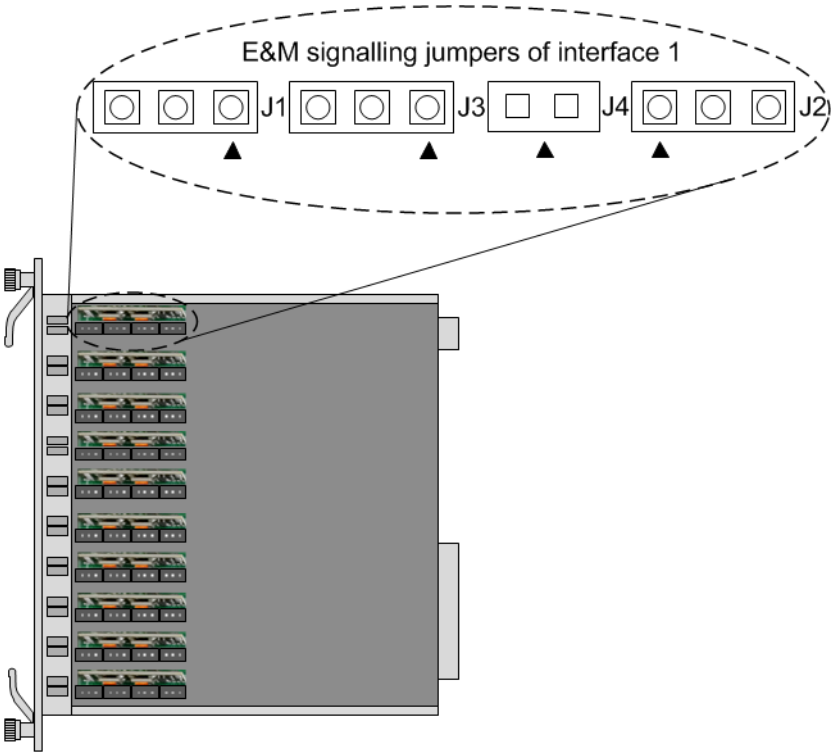
Location

There are multiple jumpers on the card, but you need to configure the E&M signaling jumper only.

On the card, each interface provides a group of 4 E&M signaling jumpers.

Figure 8-5 shows the location of the E&M signaling jumper.

Figure 8-5 Location of the E&M signaling jumper



Configurations

The E&M signaling type can be configured through the jumper. To conduct jumper connection, use the jumper cover attached to the E&M to sheathe the jumper pin vertically to the bottom of the jumper pin.

To configure the jumper, you do not need to care about the jumper No., but just conduct jumper connection in the direction from the panel to the backplane. By default, the signaling type is V. Table 8-30 lists the jumper connection of each E&M signaling type.

Table 8-30 Jumper connection of each E&M signaling type

E&M signaling type	Jumper connection mode
I	
II	
III	
IV	
V	

In Table 8-30:

- ┴┴: stand for a 3-pin jumper pin.
- ┴: stand for a 2-pin jumper pin.
- ■: stand for a jumper cover, namely, the location for the jumper connection

Note

The 10E&M supports an internal jumper J44, which is reserved for Raisecom technical support engineers only.

- The jumper enables you to enter the ISP mode, in which you can upgrade the MCU program through the serial interface on the backplane. In ISP mode, the system is waiting to be upgraded.
- After the upgrade is complete, JP1 must be disconnected; otherwise, the RC3000-15 cannot work.
- By default, the jumper is not jump-connected.

8.4.7 Specifications

Table 8-31 lists parameters of the 10E&M card.

Table 8-31 Parameters of the 10E&M card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Power consumption	• < 2.0 W (+5 VDC) • < 0.5 W (-48 VDC)

8.4.8 Cables

The 10E&M uses the common twisted pair cable with the RJ45 connector, which needs to be prepared by yourself.

8.5 12MT

8.5.1 Functions and appearance

Panel	Function
	The 12MT is a 12-way magneto telephone access card. It provides the following functions: • Provide 12 magneto telephone interfaces. • Support configurable gain: – The Rx A/D gain ranges from -23 to +2 dB, and is 0 dB by default. – The Tx D/A gain ranges from -17 to +8 dB, and is -3.5 dB by default. • Support configuring signaling mode through software: – Support original signaling and reverse signaling. By default, it is original signaling. – Support signaling occupation a-bit and b-bit. By default, it is a-bit. • Support configuring signaling mode (original signaling and reverse signaling). • Support overcurrent protection for voice interfaces and ringing output. • Support online software upgrade. **Caution** Avoid short circuit when the 12MT card is running. If short circuit occurs and ringing lasts 10 minutes, the 12MT card will be damaged.

8.5.2 Version

Card	Version
RC3000-15-12MT	A

8.5.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

8.5.4 Interfaces

Interface type

Table 8-32 lists interfaces on the 12MT card.

Table 8-32 Interfaces on the 12MT card

Name	Type	Description
1–12	HDB26 female interface	For accessing 12 magneto telephone interfaces

Interface parameter

Table 8-33 lists parameters of the interface on the 12MT card.

Table 8-33 Parameters of the interface on the 12MT card

Parameter	Description
Coding scheme	A-law
Bit rate	64 kbit/s
Audio port impedance	100 kΩ (high impedance) during ringing
	600 Ω (low impedance) under other situations
Effective transmission bandwidth	300–3400 Hz
Gain frequency features	The Rx (A/D) gain ranges from -23 to 2 dB, and is 0 dB by default. Its step is 0.1 dB.
	The Tx (D/A) gain ranges from -17 to 8 dB, and is -3.5 dB by default. Its step is 0.1 dB.

Parameter	Description
Frequency distortion	300–3000 Hz; < 0.5 dB
	3000–3400 Hz; < 3.0 dB
Total distortion (1020 Hz)	0 to -30 dBm0; < 33 dB
	-30 to -40 dBm0; < (33–22) dB
	-40 to -45 dBm0; < 22 dB
Gain change according to level	+3 to -40 dBm0; Δ < 0.5 dB
	-40 to -50 dBm0; Δ < 1.0 dB
	-50 to -55 dBm0; Δ < 3.0 dB
Degree of unbalance about earth	300–600 Hz: > 40 dB
	600–2400 Hz: > 46 dB
	2400–3400 Hz: > 41 dB
Idle channel noise	< -67 dBm0p
Ringing voltage	Typical 75 VAC sinusoidal wave/30 Hz
Return loss	300–600 Hz: > 12 dB
	600–3400 Hz: > 15 dB

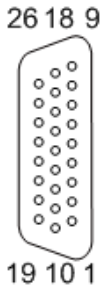
Interface PINs

Note

For colors of the cable used by the interface, see section 13.14 MUL cable.

Table 8-34 lists PIN definitions of the interface on the 12MT card.

Table 8-34 PIN definitions of the interface on the 12MT card

HDB26M figure	HDB26M PIN	PIN definition	Description
	7	CH-01A	No.1 voice
	17	CH-01B	
	8	CH-02A	No.2 voice
	18	CH-02B	
	25	CH-03A	No.3 voice
	26	CH-03B	
	5	CH-04A	No.4 voice
	15	CH-04B	

HDB26M figure	HDB26M PIN	PIN definition	Description
	6	CH-05A	No.5 voice
	16	CH-05B	
	23	CH-06A	No.6 voice
	24	CH-06B	
	3	CH-07A	No.7 voice
	13	CH-07B	
	4	CH-08A	No.8 voice
	14	CH-08B	
	21	CH-09A	No.9 voice
	22	CH-09B	
	1	CH-10A	No.10 voice
	11	CH-10B	
	2	CH-11A	No.11 voice
	12	CH-11B	
	19	CH-12A	No.12 voice
	20	CH-12B	
	9	Idle	–
	10	Idle	–

8.5.5 LEDs

Table 8-35 lists LEDs on the 12MT card.

Table 8-35 LEDs on the 12MT card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Green: the system is working improperly. • Off: the system is working improperly. • Blinking green: the system is working properly.

LED	Color	Description
TX	Green	Sending data LED • Green: signaling is being outputting. • Off: no signaling is being outputting. **Note** Signaling direction is based on magneto phone. Tx direction is from the magneto phone to the 12MT card.
RX	Green	Receiving data LED • Green: signaling is being inputting. • Off: no signaling is being inputting. **Note** Signaling direction is based on magneto phone. RX direction is from the 12MT card to the magneto phone.

8.5.6 Specifications

Table 8-36 lists parameters of the 12MT card.

Table 8-36 Parameters of the 12MT card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.75 kg
Power consumption	A single card works under both two types of voltages: • < 5.0 W (+5 VDC) • < 30.0 W (-48 VDC)

8.5.7 Cables

Note

For colors of the cable, see section 13.14 MUL cable.

Table 8-37 lists cables used by the 12MT card.

Table 8-37 Cables used by the 12MT card

Card	Recommended cable	Description
12MT	CBL-MUL-HDB26M/NC	HDB26 male interface to suspended multifunction cable

Card	Recommended cable	Description
	CBL-MUL-HDB26M(40)/NC	(Oblique interface) HDB26 male interface to suspended multifunction cable

8.6 Audio

8.6.1 Functions and appearance

Panel	Function
	The Audio is a 16-way FXS/ FXO /magneto telephone access card. It provides the following functions: • Support 16 voice interfaces. The voice interface types are specified as FXS, FXO, and magneto telephone. • Every 2 voice interfaces use 1 voice module. Each voice module supports being specified as one of FXS, FXO, and magneto telephone. • The voice gain is adjustable. Its step is 0.1dB: – FXS/FXO/ magneto telephone Rx (A/D) gain ranges from -10 to 16 dB. By default, it is 0 dB. – FXS/FXO Tx (D/A) gain ranges from -13 to 10 dB. By default, it is -3.5 dB. – Magneto telephone Tx (D/A) gain ranges from -17 to 8 dB. By default, it is -3.5 dB. • Support configuring signaling occupation bits: a-bit and b-bit. By default, it is a-bit. • The voice interface and ringing output support overcurrent protection. • Magneto telephone supports detecting and generating the 2100 Hz audio. • Support E1 timeslots from TS0 to TS15 occupied by 1 to 16 ways of voice services on the backplane. • Support online upgrade. • Support configuring signaling mode to RAISECOM, user-defined mode, or other mode. By default, it is RAISECOM. **Caution** The Audio card is used with E.40 or later RC3000-15-DXC. Avoid short circuit when the Audio card is running. If short circuit occurs and ringing lasts over 10 minutes, the Audio card will be damaged. Do not insert and pull out the voice module. For hardware operations on the voice module, contact Raisecom technique support engineers. Hot swapping the voice module is forbidden under any condition; otherwise, the Audio card and RC3000-15 will be faulty. If a voice module fault occurs, the Raisecom technical support engineer need to notice the following matters: • When the voice module on the Audio card is faulty, rebooting the RC3000-15 or inserting and pulling out the Audio card will clear configurations about all interfaces and cross connection (you can use the normal voice module again by re-configuring the card.); if rebooting the RC3000-15 or inserting and pulling out the Audio card is not executed, the current service of other voice modules will not be influenced. • When the voice module on the Audio card is faulty, if there are normal voice modules connected to an interface neighboring to the interface with the faulty one (for example, the voice module on No. 2 interface is faulty, but the one on No. 3 interface is normal), at this time, you can configure normal voice modules through the NMS or CLI. In this case, you cannot delete the NE which the Audio card is located. Otherwise, you cannot configure the Audio card through the NMS even though you re-add the NE.

Note

- No buttons, DIP switch, and jumper on the Audio card are available for users.
- The FXS, FXO, or magneto telephone voice modules inserted into the Audio card should be specified when being ordered. The type of voice module cannot be configured through software and the NMS.
- In slot configuration slot, you can view ordering information about the Audio card through the **show info** command, including the number and types of the voice modules. If ordering information changes (the RC3000-15 checks items in ordering information only when the card is being powered on. For example, when the card is being powered on, the RC3000-15 detects that the number of voice modules changes, a card with voice modules of different types is replaced, or a voice module is faulty), the RC3000-15 will automatically clear configurations of all interfaces and cross connection on the slot, thus you need to reconfigure the Audio card.

8.6.2 Version

Card	Version
RC3000-15-Audio	A or later

8.6.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

8.6.4 Interfaces

Interface type

Table 8-38 lists interfaces on the Audio card.

Table 8-38 Interfaces on the Audio card

Name	Type	Description
• 1–4 • 5–8 • 9–12 • 13–16	RJ45 interface	• Access 16 ways of FXS/FXO/magneto telephone services. • Every 4 voice interfaces use 1 RJ45 interface.

Interface parameter

Table 8-39 lists parameters of magneto telephone interface on the Audio card. Table 8-40 lists parameters of FXS/FXO interfaces on the Audio card.

Table 8-39 Parameters of the magneto telephone interface on the Audio card

Parameter	Description
Coding scheme	A-law
Bit rate	64 kbit/s
Audio port impedance	100 kΩ (high impedance) during ringing
	600 Ω (low impedance) under other situations
Effective transmission bandwidth	300–3400 Hz
Gain frequency features	The Rx (A/D) gain ranges from -10 to 16 dB, and is 0 dB by default. Its step is 0.1 dB.
	The Tx (D/A) gain ranges from -17 to 8 dB, and is -3.5 dB by default. Its step is 0.1 dB.
Frequency distortion	300–3000 Hz; < 0.5 dB
	3000–3400 Hz; < 3.0 dB
Total distortion (1020 Hz)	0 to -30 dBm0; < 33 dB
	-30 to -40 dBm0; < (33–22) dB
	-40 to -45 dBm0; < 22 dB
Gain change according to level	+3 to -40 dBm0; Δ < 0.5 dB
	-40 to -50 dBm0; Δ < 1.0 dB
	-50 to -55 dBm0; Δ < 3.0 dB
Degree of unbalance about earth	300–600 Hz: > 40 dB
	600–2400 Hz: > 46 dB
	2400–3400 Hz: > 41 dB
Idle channel noise	< -67 dBm0p
Ringing voltage	Typical 75 VAC sinusoidal wave/30 Hz
Return loss	300–600 Hz: > 12 dB
	600–3400 Hz: > 30 dB

Table 8-40 Parameters of FXS/FXO interfaces on the Audio card

Parameter	Description
Coding scheme	A-law
Bit rate	64 kbit/s
Audio port impedance	On-hook impedance is 2 MΩ.

Parameter	Description
	Off-hook loopback impedance is 600+200//0.1.
Effective transmission bandwidth	300–3400 Hz/600 Ω
Gain frequency features	The Rx (A/D) gain ranges from -10 to 16 dB, and is 0 dB by default. Its step is 0.1 dB.
	The Tx (D/A) gain ranges from -13 to 10 dB, and is -3.5 dB by default. Its step is 0.1 dB.
Frequency distortion	300–3000 Hz; < 0.5 dB
	3000–3400 Hz; < 3.0 dB
Total distortion (1020 Hz)	0 to -30 dBm0; < 33 dB
	-30 to -40 dBm0; < (33–22) dB
	-40 to -45 dBm0; < 22 dB
Gain change according to level	+3 to -40 dBm0; Δ < 0.5 dB
	-40 to -50 dBm0; Δ < 1.0 dB
	-50 to -55 dBm0; Δ < 3.0 dB
Degree of unbalance about earth	300–600 Hz: > 40 dB
	600–2400 Hz: > 46 dB
	2400–3400 Hz: > 41 dB
Idle channel noise	< -67 dBm0p
Feed voltage (on-hook)	Typical -48 V
Parameter	Description
Feed current	Typical 20 mA
Ringing voltage	Typical 60 V/30 Hz
Return loss	300–600 Hz: > 12 dB
	600–3400 Hz: > 30 dB

Interface PINs

Figure 8-6 shows PINs of the RJ45 interface on the Audio card. Table 8-41 lists PIN definitions of the RJ45 interface on the Audio card.

Figure 8-6 PIN definitions of the RJ45 interface on the Audio card

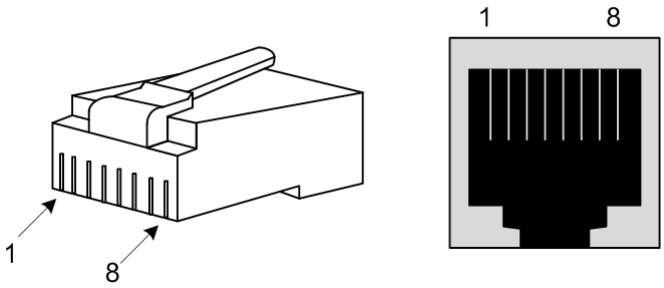


Table 8-41 PIN definitions of the interface on the Audio card

PIN	Name	Description
1	CH-01A	No. 1 voice
2	CH-01B	
3	CH-02A	No. 2 voice
4	CH-02B	
5	CH-03A	No. 3 voice
6	CH-03B	
7	CH-04A	No. 4 voice
8	CH-04B	

8.6.5 LEDs

Table 8-42 lists LEDs on the Audio card.

Table 8-42 LEDs on the Audio card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Green: the system is working improperly. • Off: the system is working improperly.

LED	Color	Description
MT FXS/O M1–M8	Green	Data module type LED. Every 2 voice interfaces use 1 voice module. Voice modules from M1 to M8 support being customized as one of FXS, FXO, and magneto telephone. • MT green: the voice module is magneto telephone. • FXS/FXO green: the voice module is FXS or FXO. • Off: the voice module in use does not match the interface or is powered off.
IN-USE	Green	Voice signaling LED • Magneto: green represents that the RC3000-15 is sending/receiving ringing data. When the telephone is ringing, the LED is green; when the call is ongoing, the LED is off. • Voice: green represents off-hook or ringing. • Off: no signaling is input.

8.6.6 Specifications

Table 8-43 lists parameters of the Audio card.

Table 8-43 Parameters of the Audio card

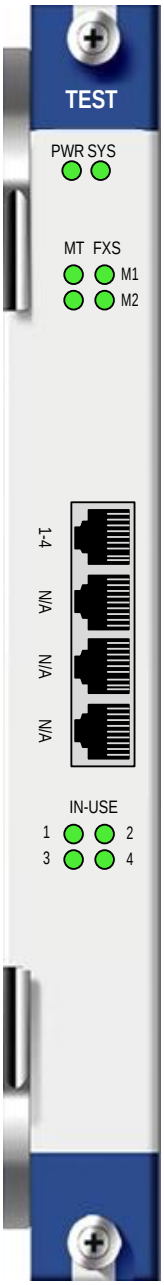
Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Power consumption	< 20 W

8.6.7 Cables

The Audio card uses the twisted pair cable with the RJ45 connector. Make the cable by yourself according to specifications of the RJ45 connectors. Usually, a common Ethernet cable is suitable.

8.7 TEST

8.7.1 Functions and appearance

Panel	Function
	The TEST is a voice service test card for the common telephone and magneto telephone. It provides the following functions: • Support 4 voice interfaces. Each voice interface can work as a test end which can test 1 way of voice services on three-way calling, bidirectional monitoring, and audio test. In other words, the TEST card supports testing 4 ways of voice services concurrently. • Provide two FXS interfaces and 2 MT interfaces. Every 2 voice interfaces use 1 voice module. Every 2 FXS interfaces use 1 voice module. Every 2 MT interfaces use 1 voice module. • Support the voice signaling test: No. 1 and No. 2 voice interfaces support sending ring current to the telephone or sending signaling to the PBX for the signaling test. No. 3 and No. 4 voice interfaces supports sending ring current of common ring or 2100 MHz magneto ring. • Support the voice call test: the test end performs a two-way/three-way call with one or two ends of tested voice services. The two-way call is applicable to the test from the test end to the local device, or test end to the remote device. The three-way call is applicable to the test among the test end, local device, and remote device. • Support the audio sending test: send audio signals to one or two ends of tested voice services. It also supports sending the frequency and level of audio signals. Configured parameters of frequency and level of audio signals take effect on all test ends. Audio signals support 11 types of frequency (700 Hz, 775 Hz, 800 Hz, 825 Hz, 900 Hz, 2000 Hz, 2075 Hz, 2100 Hz, 2125 Hz, 2200 Hz, and 2600 Hz, and 6 types of level (0 dBm, -4 dBm, -8 dBm, -12 dBm, -18 dBm, and -22 dBm). • Support the voice monitoring test: the test end monitors both parties' call of tested voice services. The two parties can call normally while the test end can only monitor the call. • Support the voice timeslot loopback test: configure timeslot loopback on one or two ends of tested voice services. • The voice gain is adjustable. Its step is 0.1dB: – Rx (A/D) gain of FXS/FXO/ and magneto telephone ranges from -10 to 16 dB. By default, it is 0 dB. – FXS/FXO Tx (D/A) gain ranges from -13 to 10 dB. By default, it is -3.5 dB. – Magneto telephone Tx (D/A) gain ranges from -17 to 8 dB. By default, it is -3.5 dB. • Support configuring signaling mode through software to RAISECOM, user-defined mode, or other modes. • The voice interface and ring current output support overcurrent protection. • The magneto telephone supports detecting and generating the 2100 Hz audio. • Support online upgrade.

Note

- The TEST (B) must be used with the RC3000-15-DXC (F.00 or later). Only one TEST (B) can be inserted into a RC3000-15.

- Avoid short circuit when using the TEST card. If short circuit occurs and the ringing lasts over 10min, the TEST card may be damaged.
- Do not remove and insert the voice module. For hardware operations, contact Raisecom technical support personnel. Do not remove and insert a powered voice module under any situation; otherwise, the TEST card or RC3000-15 may fail.
- No buttons, DIP switch, and jumper on the Audio card are available for users.
- In slot configuration slot, you can view ordering information about the TEST card through the **show info** command, including the number and types of the voice modules. If ordering information changes (the RC3000-15 checks items in ordering information only when the TEST card is being powered on. For example, when the TEST card is being powered on, the RC3000-15 detects that the number of voice modules changes, a card with voice modules of different types is replaced, or a voice module is faulty), the RC3000-15 will automatically clear configurations of all interfaces, and then you need to reconfigure the TEST card.

If a voice module is faulty, the Raisecom technical support personnel should pay attention to the following points:

- When a voice module of the TEST card is faulty, restarting the RC3000-15 or inserting or removing the TEST card will clear all configurations of the TEST card (under this situation, you can continue to use the TEST card by reconfiguring it). If you do not perform these operations, current services of other voice modules of the TEST card will not be affected.
- When a voice module of the TEST card is faulty and the following voice module works properly (for example, the voice module in interface 1 or 2 is faulty while that of interface 3 or 4 works properly), you can configure the normal voice module in the NMS or through CLI. In this case, do not delete the NE of the TEST card in the NMS; otherwise, you will fail to configure the TEST card even by re-adding the NE in the NMS.

8.7.2 Version

Card	Version
RC3000-15-TEST	B.00 or later

8.7.3 Slots

Chassis version	Slot
E.30	1–6 and 9–13

8.7.4 Interfaces

Interface type

Table 8-44 lists interfaces on the Audio card.

Table 8-44 Interfaces on the Audio card

Name	Type	Description
1–4	RJ45 interface	Every 4 voice interfaces use 1 RJ45 interface.
N/A	RJ45 interface	Reserved

Interface parameters

Table 8-45 lists parameters of magneto telephone interface on the TEST card. Table 8-46 lists parameters of FXS interfaces on the TEST card.

Table 8-45 Parameters of the magneto telephone interface on the TEST card

Parameter	Description
Coding scheme	A-law
Bit rate	64 kbit/s
Audio port impedance	100 kΩ (high impedance) during ringing
	600 Ω (low impedance) under other situations
Effective transmission bandwidth	300–3400 Hz
Gain frequency features	The Rx (A/D) gain ranges from -10 to 16 dB, and is 0 dB by default. Its step is 0.1 dB.
	The Tx (D/A) gain ranges from -17 to 8 dB, and is -3.5 dB by default. Its step is 0.1 dB.
Frequency distortion	300–3000 Hz; < 0.5 dB
	3000–3400 Hz; < 3.0 dB
Total distortion (1020 Hz)	0 to -30 dBm0; < 33 dB
	-30 to -40 dBm0; < (33–22) dB
	-40 to -45 dBm0; < 22 dB
Gain change according to level	+3 to -40 dBm0; Δ < 0.5 dB
	-40 to -50 dBm0; Δ < 1.0 dB
	-50 to -55 dBm0; Δ < 3.0 dB
Degree of unbalance about earth	300–600 Hz: > 40 dB
	600–2400 Hz: > 46 dB
	2400–3400 Hz: > 41 dB
Idle channel noise	< -67 dBm0p
Ringing voltage	Typical 75 VAC sinusoidal wave/30 Hz

Parameter	Description
Return loss	300–600 Hz: > 12 dB
	600–3400 Hz: > 30 dB

Table 8-46 Parameters of FXS interfaces on the Audio card

Parameter	Description
Coding scheme	A-law
Bit rate	64 kbit/s
Audio port impedance	On-hook impedance is 2 MΩ.
	Off-hook loopback impedance is 600+200//0.1.
Effective transmission bandwidth	300–3400 Hz/600 Ω
Gain frequency features	The Rx (A/D) gain ranges from -10 to 16 dB, and is 0 dB by default. Its step is 0.1 dB.
	The Tx (D/A) gain ranges from -13 to 10 dB, and is -3.5 dB by default. Its step is 0.1 dB.
Frequency distortion	300–3000 Hz; < 0.5 dB
	3000–3400 Hz; < 3.0 dB
Total distortion (1020 Hz)	0 to -30 dBm0; < 33 dB
	-30 to -40 dBm0; < (33–22) dB
	-40 to -45 dBm0; < 22 dB
Gain change according to level	+3 to -40 dBm0; Δ < 0.5 dB
	-40 to -50 dBm0; Δ < 1.0 dB
	-50 to -55 dBm0; Δ < 3.0 dB
Degree of unbalance about earth	300–600 Hz: > 40 dB
	600–2400 Hz: > 46 dB
	2400–3400 Hz: > 41 dB
Idle channel noise	< -67 dBm0p
Feed voltage (on-hook)	Typical -48 V
Feed current	Typical 20 mA
Ringing voltage	Typical 60 V/30 Hz
Return loss	300–600 Hz: > 12 dB
	600–3400 Hz: > 30 dB

Interface PINs

Figure 8-7 shows PINs of the RJ45 interface on the TEST card. Table 8-47 lists PIN definitions of the RJ45 interface on the TEST card.

Figure 8-7 PIN definitions of the RJ45 interface on the Audio card

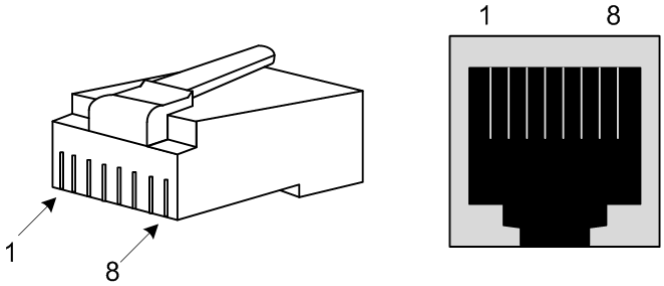


Table 8-47 PIN definitions of the interface on the TEST card

PIN	Name	Description
1	CH-01A	No. 1 voice
2	CH-01B	
3	CH-02A	No. 2 voice
4	CH-02B	
5	CH-03A	No. 3 voice
6	CH-03B	
7	CH-04A	No. 4 voice
8	CH-04B	

8.7.5 LEDs

Table 8-48 lists LEDs on the TEST card.

Table 8-48 LEDs on the TEST card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Green: the system is working improperly. • Off: the system is working improperly.

LED	Color	Description
• MT FXSM1 • MT FXSM2	Green	Data module type LED. Every 2 voice interfaces use 1 voice module. Voice modules M1 and M2 support being customized as one of FXS and magneto telephone. • MT green: the voice module is magneto telephone. • FXS green: the voice module is FXS. • Off: the voice module in use does not match the interface or is powered off.
IN-USE 1–4	Green	Voice signaling LED • Green: the status is off-hook or ringing. • Off: no signaling is input.

8.7.6 Specifications

Table 8-49 lists parameters of the TEST card.

Table 8-49 Parameters of the TEST card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Power consumption	< 5 W

8.7.7 Cables

The TEST uses the twisted pair cable with the RJ45 connector. Make the cable by yourself according to specifications of the RJ45 connectors. Usually, a common Ethernet cable is suitable.

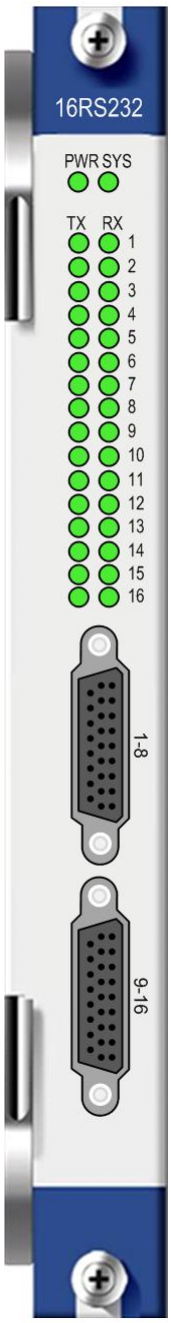
9 Asynchronous data cards

This chapter includes the following sections:

- 16RS232
- 8RS232H
- 8RS485

9.1 16RS232

9.1.1 Functions and appearance

Panel	Function
	The 16RS232 is a 16-way RS232 service access card. It provides the following functions: • Provide 16 RS232 interfaces. Bandwidth of each interface is configurable and is up to 1024 kbit/s. • Support multiple serial interface server modes. • Support EMC and overcurrent protection on interfaces. • Support independent outwards loopback (at TTL level side, digital loopback) for data channels.

9.1.2 Version

Card	Version
RC3000-15-16RS232	A

9.1.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

9.1.4 Interfaces

Interface type

Table 9-1 lists interfaces on the 16RS232 card. The maximum length of the cable used for the RS232 interface is 15 m based on RS232 standard.

Table 9-1 Interfaces on the 16RS232 card

Name	Type	Description
1–8, 9–16	HDB26 female interface	Each interface outputs 8 ways of RS232 data.

Interface parameter

Table 9-2 lists parameters of interfaces on the 16RS232 card.

Table 9-2 Parameters of interfaces on the 16RS232 card

Parameter	Description
Connector type	HDB26 female connector
Compliant standard	RS232 standard
Collection frequency/Interface rate	64 kHz, 128 kHz, 256 kHz, 512 kHz, and 1 MHz The corresponding interface bandwidth: 64 kbit/s, 128 kbit/s, 256 kbit/s, 512 kbit/s, and 1024 kbit/s

Parameter	Description
Interface rate	The interface rate is related to the collection frequency: • The interface rate is up to 9.6 kbit/s when the collection frequency is 64 kHz. • The interface rate is up to 19.2 kbit/s when the collection frequency is 128 kHz. • The interface rate is up to 38.46 kbit/s when the collection frequency is 256 kHz. • The interface rate is up to 57.6 kbit/s when the collection frequency is 512 kHz. • The interface rate is up to 115.2 kbit/s when the collection frequency is 1 MHz.

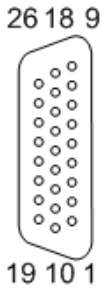
Interface PINs

Note

For colors of the cable used by the interface, see section 13.14 MUL cable.

Table 9-3 lists PIN definitions of interfaces on the RS232 interface.

Table 9-3 PIN definitions of interfaces on the RS232 interface

HDB26 figure	HDB26 PIN	PIN definition	
		Cable	Description
	1	TXD_8	No.8 way of data
	11	RXD_8	
	19	GND8	No.8 way of grounding
	2	TXD_7	No.7 way of data
	12	RXD_7	
	20	GND7	No.7 way of grounding
	3	TXD_6	No.6 way of data
	13	RXD_6	
	21	GND6	No.6 way of grounding
	4	TXD_5	No.5 way of data
	14	RXD_5	
	22	GND5	No.5 way of grounding
	5	TXD_4	No.4 way of data
	15	RXD_4	
	23	GND4	No.4 way of grounding

HDB26 figure	HDB26 PIN	PIN definition	
		Cable	Description
	6	TXD_3	No.3 way of data
	16	RXD_3	
	24	GND3	No.3 way of grounding
	7	TXD_2	No.2 way of data
	17	RXD_2	
	25	GND2	No.2 way of grounding
	8	TXD_1	No.1 way of data
	18	RXD_1	
	26	GND1	No.1 way of grounding
	9	NC	Idle
	10	NC	Idle

Note

As described in PIN definitions, TXD indicates sending data and RXD indicates receiving data, and both of them are for the local device.

9.1.5 LEDs

Table 9-4 lists LEDs on the 16RS232 card.

Table 9-4 LEDs on the 16RS232 card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
TX1–TX16	Green	Sending data LED • Blinking green: the corresponding channel is sending data. The blinking frequency is related to the volume of data being sent. • Off: the corresponding channel is not sending data.

LED	Color	Description
RX1–RX16	Green	Receiving data LED • Blinking green: the corresponding channel is receiving data. The blinking frequency is related to the volume of data being received. • Off: the corresponding channel is not receiving data.

Note

Sending and receiving here are for the local device.

9.1.6 DIP switch

Table 9-5 lists configurations of the DIP switch on the 16RS232 card.

Table 9-5 Configurations of the DIP switch on the 16RS232 card

SW1	Function	Status	Description
KEY1	Enter or quit ISP mode.	ON	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.
		OFF	Enter normal working mode.
KEY2	Reserved	–	

Note

- SW1 is in all OFF status after delivery, so it can work properly.
- After upgrade, SW1 must be in all OFF status; otherwise, the RC3000-15 will malfunction.

9.1.7 Specifications

Table 9-6 lists parameters of the 16RS232 card.

Table 9-6 Parameters of the 16RS232 card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Power consumption	3 W

9.1.8 Cables

Table 9-7 lists the cable used by the 16RS232 card.

Table 9-7 Cable used by the 16RS232 card

Card	Recommended cable	Description
16RS232	CBL-MUL-HDB26M/NC	HDB26 male interface to suspended multifunction cable

For colors of the cable, see section 13.14 MUL cable.

9.2 8RS232H

9.2.1 Functions and appearance

Panel	Function
	The 8RS232H card is a RS232 service access card. It can work as a Data Circuit Terminating Equipment (DCE) or Data Terminal Equipment (DTE). It provides the following functions: • Provide 8 ways of RS232 service access. • Support concurrent transmission of handshake signals and data services. You can configure the 8RS232H card to transmit data services only. • Support configurable bandwidth of 64 kbit/s, 128 kbit/s, and 256 kbit/s. • Support configuring an interface to DCE or DTE mode. The RC3000-15 automatically chooses the interface mode according to the cable (provided by Raisecom or made as specified in the appendix) connecting it and the peer device. By default, the interface mode is DCE. • Support realtime querying of content of each handshake signal through the NMS. • Support data collinear function. Namely, among multiple nodes, data sent by a node can be received by other nodes. • Support configuring data collinear interface group for each RS232H interface. By default, RS232H interfaces 1–8 are mapped into data collinear interfaces 1–8 respectively. The rest of data collinear interfaces 9–16 are idle. Each RS232H interface can be mapped into up to 16 data collinear interfaces. • Support external loopback on each interface. • Support EMC and overcurrent protection.

9.2.2 Version

Card	Version
RC3000-15-8RS232H	A.10

9.2.3 Slots

Chassis version	Slot
E.20 and E.30	1–6 and 9–13

9.2.4 Interfaces

Interface type

Table 9-8 lists interfaces on the 8RS232H card. The maximum length of the cable used for the RS232 interface is 15 m based on RS232 standard.

Table 9-8 Interfaces on the 8RS232H card

Name	Type	Description
–	HDB26 female interface	Each interface accesses 2 ways of RS232 services.

Interface parameter

Table 9-9 lists parameters of the RS232 interface.

Table 9-9 Parameters of the RS232 interface

Parameter	Description
Connector type	HDB26 female connector
Output voltage	• 9 V (high level) • -9 V (low level)
Output end short-circuit current	45 mA (measured in status of continuously outputting high and low level)
Interface impedance	4.8 kΩ
Collection frequency/Interface rate	64 kHz, 128 kHz, and 256 kHz The corresponding interface bandwidth: 64 kbit/s, 128 kbit/s, and 256 kbit/s

Parameter	Description
Interface rate	The interface rate is related to the collection frequency: • The interface rate is up to 9.6 kbit/s when the collection frequency is 64 kHz. • The interface rate is up to 19.2 kbit/s when the collection frequency is 128 kHz. • The interface rate is up to 38.46 kbit/s when the collection frequency is 256 kHz.

9.2.5 LEDs

Table 9-10 lists LEDs on the 8RS232H card.

Table 9-10 LEDs on the 8RS232H card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Green: the system is working improperly. • Off: the system is working improperly. • Blinking green: the system is working properly.
TD1–TD8	Green	Sending data LED • Blinking green: the corresponding channel is sending data. The blinking frequency is related to the volume of data being sent. • Off: the corresponding channel is not sending data.
RD1–RD8	Green	Receiving data LED • Blinking green: the corresponding channel is receiving data. The blinking frequency is related to the volume of data being received. • Off: the corresponding channel is not receiving data.

9.2.6 DIP switch

Table 9-11 lists configurations of the DIP switch on the 8RS232H card.

Table 9-11 Configurations of the DIP switch on the 8RS232H card

SW1	Function	Status	Description
KEY1	Enter or quit ISP mode.	ON	Enter ISP mode. You can upgrade MCU program through the serial interface on the backplane.
		OFF	Enter normal working mode, and the card works properly.

SW1	Function	Status	Description
KEY2	Reserved	–	

Note

- SW1 is in all OFF status after delivery, so it can work properly.
- When KEY1 is in ON status, the card waits for upgrade and all service operations are stopped.

9.2.7 Settings

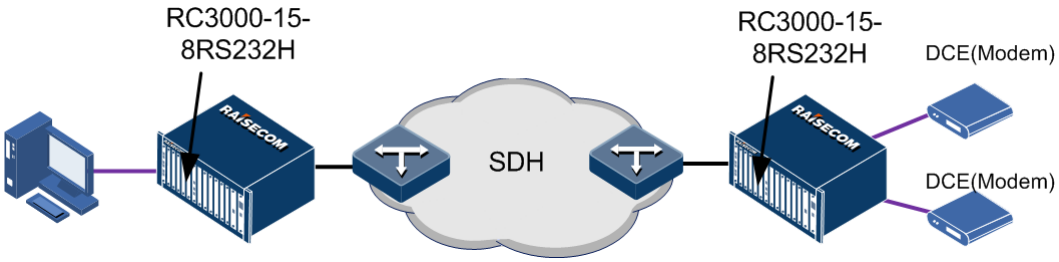
- When the RS232H interface type is configured to automatic mode, you must use the cable provided by Raisecom or make the cable as specified in the appendix; otherwise, the correct interface type (DCE or DTE) cannot be identified.
- When interface handshake signals are disabled, the terminal-mode and handshake-info-reference do not take effect.

9.2.8 Application scenario

Transmitting handshake signals and data services

The DTE is connected to the 8RS232H card of the local RC3000-15, which transmits services to the remote RC3000-15. As a DTE, the RS232H card of the remote RC3000-15 controls the remote DCEs.

Figure 9-1 Handshaking signals and data services



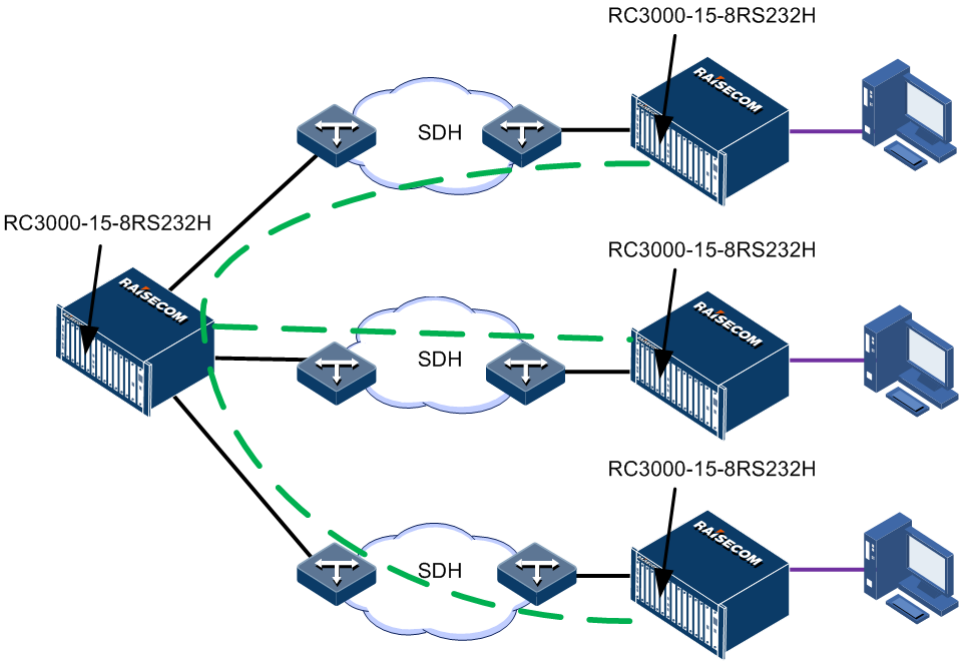
Data collinear service

The 8RS232H card supports data collinear function. After this function is configured, data transmitted by any node of multiple nodes can be concurrently received by other nodes. In this case, start or bus topology can be used for networking.

- Star networking

The RC3000-15 devices of multiple users are connected to the CO RC3000-15. After the CO RC3000-15 is configured with data collinear function, data sent by a user can be concurrently received by other users.

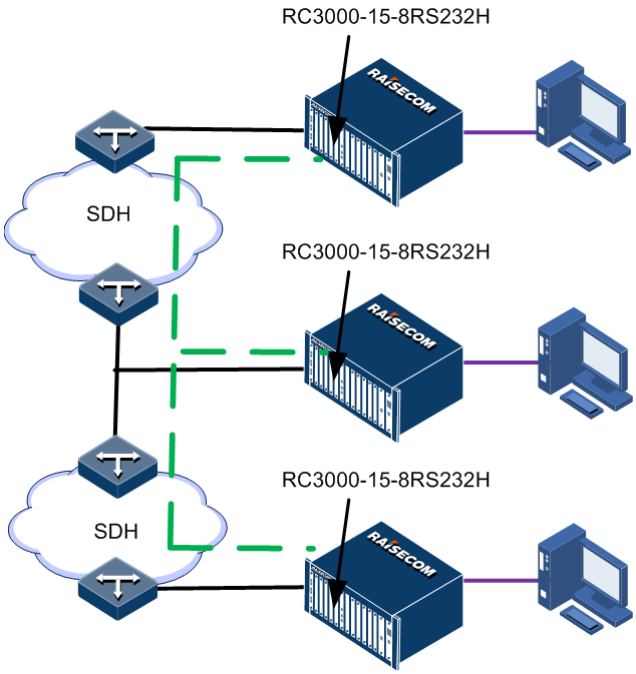
Figure 9-2 Data collinear service star networking



- Bus networking

Multiple users use the RC3000-15 to transmit data services. After each RC3000-15 is configured with data collinear function, data sent by a user can be concurrently received by other users.

Figure 9-3 Data collinear service bus networking



9.2.9 Specifications

Table 9-12 lists parameters of the 8RS232H card.

Table 9-12 Parameters of the 8RS232H card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Input voltage	+5 VDC
Power consumption	1 W
Operating voltage	• +5 VDC • +3.3 VDC • +1.8 VDC
Power ripple	≤ 50 mV

9.2.10 Cables

Table 9-13 lists cables used by the 8RS232H card.

Table 9-13 Cables used by the 8RS232H card

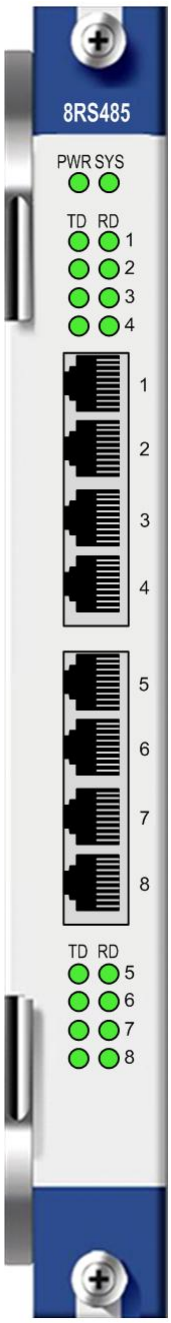
Card	Recommended cable	Description
8RS232H	CBL-RS232H-HDB26M/2DB9F	HDB26 male interface to 2 DB9 female interfaces
	CBL-RS232H-HDB26M/2DB9M	HDB26 male interface to 2 DB9 male interfaces

Note

For cable definitions, see section 13.12 RS232/RS232H cable.

9.3 8RS485

9.3.1 Functions and appearance

Panel	Function
	The 8RS485 is an 8-way RS485/422 data service access card. It provides the following functions: • Provide 8 RJ45 interfaces which can be configured to RS485 or RS422. • Support configuring a single way to 2-wire half duplex (RS485) or 4-wire full duplex (RS422). • Support configuring the bandwidth allocated for each serial interface to N×64 kbit/s (N = 1, 2, 4, 8, 16, or 32). • Support a maximum serial rate of 460.8 kbit/s. • Support EMC and overcurrent protection on interfaces. • Support channel external loopback (at TTL level side, digital loopback).

9.3.2 Version

Card	Version
RC3000-15-8RS485	A

9.3.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

9.3.4 Interfaces

Interface type

Table 9-14 lists interfaces on the 8RS485 card.

Table 9-14 Interfaces on the 8RS485 card

Name	Type	Description
1–8	RS485 or RS422	You can configure each interface to RS485 or RS422 in the following ways: • CLI: configure the type for each interface individually. • Network management software: configure the type for each interface individually. • DIP switch: SW2 is used to configure the interface type. If you configure SW2 to OFF, all the 8 interfaces will be configured to RS485 (half duplex); if you configure SW2 to ON, all the 8 interfaces will be configured to RS422 (full duplex). **Note** • If no configurations for the 8RS485 card are saved on the cross connection card inserted to the RC3000-15, configuring the DIP switch takes effect. • If configurations for the 8RS485 card are saved on the cross connection card inserted to the RC3000-15, these configurations take effect.

Interface parameter

Table 9-15 lists parameters of the 8RS485 interface.

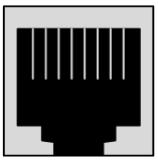
Table 9-15 Parameters of the 8RS485 interface

Parameter	Description
Connector type	RJ45
Collection frequency	64 kHz, 128 kHz, 256 kHz, 512 kHz, 1 MHz, and 2 MHz The corresponding interface bandwidth: 64 kbit/s, 128 kbit/s, 256 kbit/s, 512 kbit/s, 1024 kbit/s and 2048 kbit/s
Interface rate	The interface rate is related to the collection frequency: • The interface rate is up to 9.6 kbit/s when the collection frequency is 64 kHz. • The interface rate is up to 19.2 kbit/s when the collection frequency is 128 kHz. • The interface rate is up to 38.46 kbit/s when the collection frequency is 256 kHz. • The interface rate is up to 57.6 kbit/s when the collection frequency is 512 kHz. • The interface rate is up to 115.2 kbit/s when the collection frequency is 1 MHz. • The interface rate is up to 460.8 kbit/s when the collection frequency is 2 MHz.
Compliant standard	Complying with interface standards of RS485 and RS422 protocols

Interface PINs

Table 9-16 lists PIN definitions of the RS485 interface.

Table 9-16 PIN definitions of the RS485 interface

Interface figure	Type	PIN							
		1	2	3	4	5	6	7	8
	RS485 half duplex	DATAP	DATAN	–	–	–	–	–	–
	RS422 full duplex	TXP	TXN	RXP	RXN	–	–	–	–

Note

- To configure the interface to RS485 half duplex, connect PINs 1 and 2 only.
- To configure the interface to RS422 full duplex, connect PINs 1, 2, 3, and 4 only.

9.3.5 LEDs

Table 9-17 lists LEDs on the 8RS485 card.

Table 9-17 LEDs on the 8RS485 card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Green: the system is working improperly. • Off: the system is working improperly. • Blinking green: the system is working properly.
TD1–TD8	Green	Sending data LED • Blinking green: the corresponding channel is sending data. The blinking frequency is related to the volume of data being sent. • Off: the corresponding channel is not sending data.
RD1–RD8	Green	Receiving data LED • Blinking green: the corresponding channel is receiving data. The blinking frequency is related to the volume of data being received. • Off: the corresponding channel is not receiving data.

9.3.6 DIP switch

Table 9-18 lists configurations of the DIP switch on the 8RS485 card.

Table 9-18 Configurations of the DIP switch on the 8RS485 card

SW1	Function	Status	Description
BIT1	Enter or quit ISP mode.	ON	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.
		OFF	Enter normal working mode.
BIT2	Configure the interface type.	ON	Set all the 8 interfaces to RS422 full duplex.
		OFF	Set all the 8 interfaces to RS485 half duplex.

- BIT1 and BIT2 of SW1 are in all OFF status after delivery, so the RC3000-15 can work properly.

- After upgrade, BIT1 of SW1 must be in OFF status; otherwise, the RC3000-15 will malfunction.
- If no configurations for the 8RS485 card are saved on the cross connection card inserted to the RC3000-15, configuring BIT2 of SW1 takes effect. If configurations for the 8RS485 card are saved on the cross connection card inserted to the RC3000-15, configuring BIT2 of SW1 is invalid.

9.3.7 Specifications

Table 9-19 lists parameters of the 8RS485 card.

Table 9-19 Parameters of the 8RS485 card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Power consumption	8 W

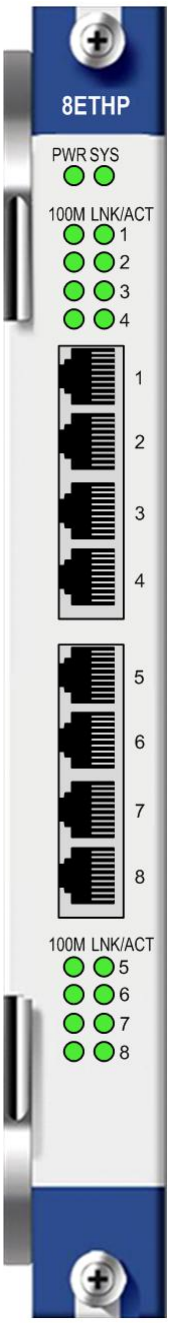
10 Data cards

This chapter includes the following sections:

- 8ETHP
- 8V24
- 8V24H
- 8V35
- FE16E1
- HT-8FE16E1
- 16C64K

10.1 8ETHP

10.1.1 Functions and appearance

Panel	Function
	The 8ETHP card, a service access card, supports 8 ways of dependent Ethernet services. It transmits 8 ways of Ethernet (EoPDH) services to 8 local Ethernet interfaces through the cross connection card. These 8 local Ethernet interfaces are independent of each other. The 8ETHP card provides the following functions: • Provide 8 independent Ethernet interfaces. • Support configuring bandwidth of Ethernet interfaces to N ×64 kbit/s (N = 1–32). It does not support reverse multiplexing. • Support a maximum frame length of 2048 bytes. • Support 10/100 Mbit/s rate and half/full duplex auto-negotiation. • Support 802.3x and back pressure flow control. • Support loopback on each Ethernet interface. • Support traffic statistics.

10.1.2 Version

Card	Version
RC3000-15-8ETHP	A

10.1.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

10.1.4 Interfaces

Interface type

Table 10-1 lists interfaces on the 8ETHP card.

Table 10-1 Interfaces on the 8ETHP card

Name	Type	Description
1–8	RJ45	Corresponding to 8 ways of remote Ethernet services

Interface parameter

Table 10-2 lists parameters of the interface on the 8ETHP card.

Table 10-2 Parameters of the interface on the 8ETHP card

Parameter	Description
Interface type	RJ45
Interface rate	10/100 Mbit/s auto-negotiation
Duplex mode	Full/Half duplex auto-negotiation
MTU	2048 bytes
Flow control	• Support IEEE 802.3x flow control in full duplex. • Support back pressure flow control in half duplex.
Wiring	Auto-MDI/MDIX
Compliant standard	IEEE 802.3x

10.1.5 LEDs

Table 10-3 lists LEDs on the 8ETHP card.

Table 10-3 LEDs on the 8ETHP card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
100M (1–8)	Green	Electrical interface rate LED • Green: the electrical interface is working at 100 Mbit/s. • Off: the electrical interface is working at 10 Mbit/s.
LNK/ACT (1–8)	Green	Ethernet link interface LED • Green: Ethernet link interfaces are connected properly. • Blinking green: Ethernet link interfaces are receiving or sending data. • Off: Ethernet link interfaces are disconnected or are improperly connected.

10.1.6 Internal jumper

Table 10-4 lists the internal jumper used by the 8ETHP card.

Table 10-4 Internal jumper used by the 8ETHP card

Jumper	Function	Status	Description
J9	Configure the mode for downloading the MCU program.	Short-circuited	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.
		Disconnected	Enter normal working mode.

Note

After upgrade, J9 must be disconnected; otherwise, the RC3000-15 will malfunction.

10.1.7 Specifications

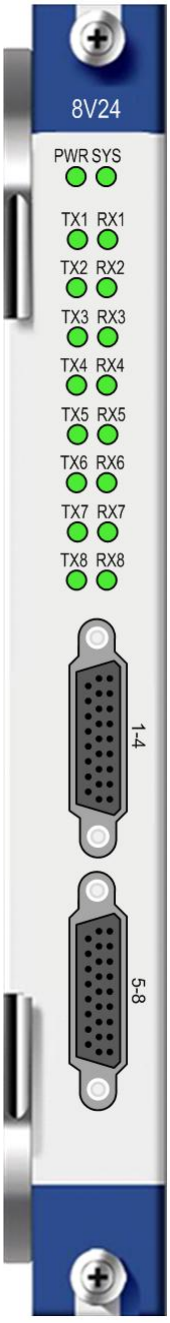
Table 10-5 lists parameters of the 8ETHP card.

Table 10-5 Parameters of the 8ETHP card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.35 kg
Power consumption	10 W

10.2 8V24

10.2.1 Functions and appearance

Panel	Function
	The 8V24 card provides 8 synchronous V.24 data DCE interfaces. It provides the following functions: • Provide 8 synchronous V.24 data DCE interfaces. • Support configurable bandwidth of 64 kbit/s, 128 kbit/s, and 256 kbit/s. • Support phase adjustment. • Provide DCE mode interfaces through which the 8V24 card provides clock source to external devices. • Support external loopback on interfaces. • Support EMC and overcurrent protection.

10.2.2 Version

Card	Version
RC3000-15-8V24	A

10.2.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

10.2.4 Interfaces

Interface type

Table 10-6 lists interfaces on the 8V24 card.

Table 10-6 Interfaces on the 8V24 card

Name	Type	Description
1–4	HDB26 female interface	Outputting No. 1–4 ways of synchronous V.24 data
5–8	HDB26 female interface	Outputting No. 5–8 ways of synchronous V.24 data

Interface parameter

Table 10-7 lists parameters of the V.24 interface.

Table 10-7 Parameters of the V.24 interface

Parameter	Description
Interface mode	DCE mode
Connector type	HDB26 female connector
Collection frequency/Interface rate	64 kbit/s, 128 kbit/s, and 256 kbit/s (512 kbit/s and 1 Mbit/s are reserved) The corresponding interface bandwidth: 64 kbit/s, 128 kbit/s, and 256 kbit/s
Features	Complying with ITU-T V.24 recommendations
Electrical features	Complying with V.28 recommendations

Parameter	Description
Transmission distance	15 m (according to standards for the serial interface)

Interface PINs

Table 10-8 lists PIN definitions of the HDB26 interface.

Table 10-8 PIN definitions of the HDB26 interface

HDB26 PIN	PIN definitions	
	Cable	Description
1	TXD_4	No. 4 way of data output
2	TXC_4	No. 4 way of clock output
3	TXD_3	No. 3 way of data output
4	TXC_3	No. 3 way of clock output
5	TXD_2	No. 2 way of data output
6	TXC_2	No. 2 way of clock output
7	TXD_1	No. 1 way of data output
8	TXC_1	No. 1 way of clock output
9	NC	Idle
10	NC	Idle
11	RXD_4	No. 4 way of data input
12	RXC_4	No. 4 way of clock input (reserved)
13	RXD_3	No. 3 way of data input
14	RXC_3	No. 3 way of clock input (reserved)
15	RXD_2	No. 2 way of data input
16	RXC_2	No. 2 way of clock input (reserved)
17	RXD_1	No. 1 way of data input
18	RXC_1	No. 1 way of clock input (reserved)
19	GND	No.4 way of ground
20	GND	No.4 way of ground
21	GND	No.3 way of ground
22	GND	No.3 way of ground

HDB26 PIN	PIN definitions	
	Cable	Description
23	GND	No.2 way of ground
24	GND	No.2 way of ground
25	GND	No.1 way of ground
26	GND	No.1 way of ground

10.2.5 LEDs

Table 10-9 lists LEDs on the 8V24 card.

Table 10-9 LEDs on the 8V24 card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
TX1–TX8	Green	Sending data LED • Blinking green: the corresponding channel is sending data. The blinking frequency is related to the volume of data being sent. • Off: the corresponding channel is not sending data.
RX1–RX8	Green	Receiving data LED • Blinking green: the corresponding channel is receiving data. The blinking frequency is related to the volume of data being received. • Off: the corresponding channel is not receiving data.

10.2.6 DIP switch

Table 10-10 lists the DIP switch on the 8V24 card.

Table 10-10 DIP switch on the 8V24 card

SW1	Function	Status	Description
KEY1	Enter or quit ISP mode.	ON	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.

SW1	Function	Status	Description
		OFF	Enter normal working mode.
KEY2	Reserved	–	

Note

- SW1 is in all OFF status before delivery, so the RC3000-15 can work properly.
- After upgrade, SW1 must be disconnected; otherwise, the RC3000-15 will malfunction.

10.2.7 Specifications

Table 10-11 lists parameters of the 8V24 card.

Table 10-11 Parameters of the 8V24 card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.35 kg
Power consumption	8 W

10.2.8 Cables

Table 10-12 list the cable used by the 8V24 card.

Table 10-12 Cable used by the 8V24 card

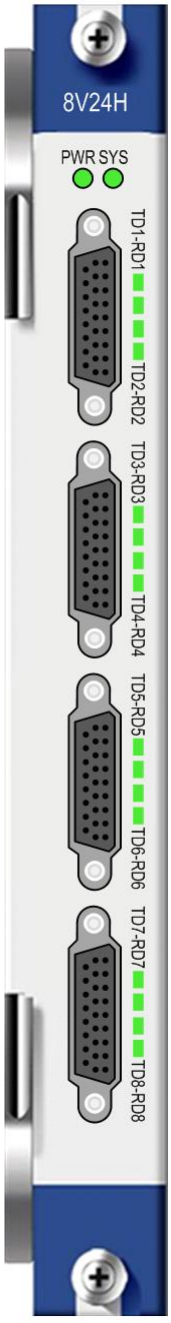
Card	Recommended cable	Description
8V24	CBL-V24-HDB26M/4DB25M-D	HDB26 male interface to 4 DB25 male interfaces

Note

For cable definitions, see section 13.10 V.24/V.24H cable.

10.3 8V24H

10.3.1 Functions and appearance

Panel	Function
	The 8V24H card is an 8-way V.24 data service card. It includes data communication and transmission of handshake signals. Wherein, the transmission of handshake signals is enabled or disabled according to the need of users. It provides the following functions: • Provide 8 ways of V.24 data services. • Support concurrent transmission of handshake signals and data services. You can configure the 8V24H card to transmit data services only. • Support configurable bandwidth of 128 kbit/s, 64 kbit/s, 56 kbit/s, 48 kbit/s, 38.4 kbit/s, 19.2 kbit/s, 9600 bit/s, 4800 bit/s, 2400 bit/s, 1200 bit/s, and 600 bit/s. • Support querying content of each handshake signal through the NMS. • Support configuring external loop for each interface (at TTL level side, emulated loopback).

10.3.2 Version

Card	Version
RC3000-15-8V24H	A

10.3.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

10.3.4 Interfaces

Interface type

Table 10-13 lists interfaces on the 8V24H card.

Table 10-13 Interfaces on the 8V24H card

Name	Type	Description
–	HDB26 female interface	Each interfaces outputs 2 ways of V.24 services. All the 8 interfaces can implement synchronous data transmission through connection to terminals that support V.24 services.

Interface parameter

Table 10-14 lists parameters of the V.24 interface.

Table 10-14 Parameters of the V.24 interface

Parameter	Description
Connector type	HDB26 female connector
Interface rate	Following serial rates can be configured: 128 kbit/s, 64 kbit/s, 56 kbit/s, 48 kbit/s, 38.4 kbit/s, 19.2 kbit/s, 9600 bit/s, 4800 bit/s, 2400 bit/s, 1200 bit/s, and 600 bit/s
Output voltage	• 9 V (high level) • -9 V (low level)
Output terminal short-circuited current	45 mA (measured in status of outputting continuous high level)
Export/Import impedance	4.8 kΩ

10.3.5 LEDs

Table 10-15 lists LEDs on the 8V24H card.

Table 10-15 LEDs on the 8V24H card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Green: the system is working improperly. • Off: the system is working improperly. • Blinking green: the system is working properly.
TD1–TD8	Green	Sending data LED • Blinking green: the corresponding channel is sending data. The blinking frequency is related to the volume of data being sent. • Off: the corresponding channel is not sending data.
RD1–RD8	Green	Receiving data LED • Blinking green: the corresponding channel is receiving data. The blinking frequency is related to the volume of data being received. • Off: the corresponding channel is not receiving data.

10.3.6 Internal jumper

Table 10-16 lists the internal jumper used by the 8V24H card.

Table 10-16 Internal jumper used by the 8V24H card

Jumper	Function	Status	Description
JP1	Configure the mode for downloading the MCU program.	Short-circuited	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.
		Disconnected	Enter normal working mode.

- By default, JP1 is disconnected; namely, MCU is in normal working mode.
- After upgrade, JP1 must be disconnected; otherwise, the 8V24H card will malfunction.

10.3.7 Specifications

Table 10-17 lists parameters of the 8V24H card.

Table 10-17 Parameters of the 8V24H card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Power consumption	1 W

10.3.8 Cables

Table 10-18 lists cables used by the 8V24H card.

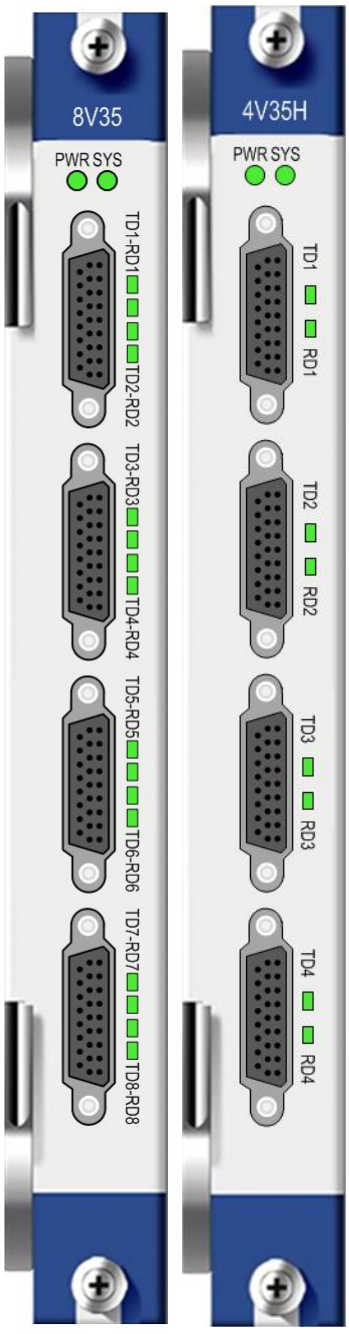
Table 10-18 Cables used by the 8V24H card

Card	Recommended cable	Description
8V24H	CBL-V24H-HDB26M/2DB25F-D	HDB26 male interface to 2 DB25 female interfaces
	CBL-V24H-HDB26M/2DB25M-D	HDB26 male interface to 2 DB25 male interfaces

For cable definitions, see section 13.10 V.24/V.24H cable.

10.4 8V35/4V35H

10.4.1 Functions and appearance

Panel	Function
	The 8V35/4V35H card is a V.35 data service card. It provides the following functions: • Provide 8/4 V.35 data DCE interfaces. • Support configuring bandwidth of each interface to N ×64 kbit/s (N = 1–31). • Support data phase adjustment (such as enabling or disabling adjustment, normal phase adjustment, and reversed phase adjustment). • Support bidirectional loopback (at TTL level side, digital loopback). • Support BERT for each channel. • Support disabling interfaces. • Provide external clock in DCE interface mode. • Support EMC and overcurrent protection on interfaces. • The 4V35H supports showing the status of CTS, DSR, DCD, DTR, and RTS handshaking signals.

10.4.2 Version

Card	Version
RC3000-15-8V35	A
RC3000-15-4V35H	A

10.4.3 Slots

Chassis version	Slot
• E.30 and E.20: 8V35 • E.30: 4V35H	1–6 and 9–13

10.4.4 Interfaces

Interface type

Table 10-19 lists interfaces of the 8V35 card.

Table 10-19 Interfaces of the 8V35 card

Name	Type	Description
–	HDB26 female interface	• 8V35: each interface outputs 2 ways of synchronous V.35 data. • 4V35H: each interface outputs 1 way of synchronous V.35 data with handshaking signals.

Interface parameter

Table 10-20 lists parameters of the V.35 interface.

Table 10-20 Parameters of the V.35 interface

Parameter	Description
Interface mode	DCE mode
Connector type	HDB26 female connector
Compliant standard	Complying with CCITT V.35 standards
Interface rate	N ×64 kbit/s (N = 1–31), supporting disabling interfaces
Clock	Providing external clock
Phase	Supporting data phase adjustment (such as enabling or disabling adjustment, normal phase adjustment, and reversed phase adjustment)

10.4.5 LEDs

Table 10-21 lists LEDs on the 8V35 card.

Table 10-21 LEDs on the 8V35 card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Green: the system is working improperly. • Off: the system is working improperly. • Blinking green: the system is working properly.
• TD1–TD8 (8V35) • TD1–TD4 (4V35H)	Green	Sending data LED • Blinking green: the corresponding channel is sending data. The blinking frequency is related to the volume of data being sent. • Off: the corresponding channel is not sending data.
• RD1–RD8 (8V35) • RD1–RD4 (4V35H)	Green	Receiving data LED • Blinking green: the corresponding channel is receiving data. The blinking frequency is related to the volume of data being received. • Off: the corresponding channel is not receiving data.

10.4.6 DIP switch

Table 10-22 lists the DIP switch on the 8V35 card.

Table 10-22 DIP switch on the 8V35 card

SW1	Function	Status	Description
KEY1	Enter or quit ISP mode.	ON	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.
		OFF	Enter normal working mode.
KEY2	Reserved	–	

- SW1 is in all OFF status before delivery, so the RC3000-15 can work properly.
- After upgrade, J9 must be disconnected; otherwise, the RC3000-15 will malfunction.

Table 10-23 lists the DIP switch on the 4V35H card.

Table 10-23 DIP switch on the 4V35H card

SW1	Function	Status	Description
J3	Enter or quit ISP mode.	ON	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.
		OFF	Enter normal working mode.

Note

- J3 is in all OFF status before delivery, so the RC3000-15 can work properly.
- After upgrade, J3 must be disconnected; otherwise, the RC3000-15 will malfunction.

10.4.7 Specifications

Table 10-24 lists parameters of the 8V35 card.

Table 10-24 Parameters of the 8V35 card

Parameter	8V35	4V35H
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)	
Weight	0.5 kg	
Power consumption	8 W	2.4 W

10.4.8 Cables

Table 10-25 lists the cable used by the 8V35/4V35H card.

Table 10-25 Cable used by the 8V35/4V35H card

Card	Recommended cable	Description
8V35	CBL-V35-HDB26M/2M34F-D	DCE cable of HDB26 male interface to 2 M34 female interfaces
4V35H	CBL-V35-HDB26M/M34F-2m/RoHS	DCE cable of HDB26 male interface to 1 M34 female interface

Note

For cable definitions, see section 13.14 MUL cable.

10.5 FE16E1

10.5.1 Functions and appearance

Panel	Function
	The FE16E1 card aggregates 16 ways of Ethernet data from the backplane to the 1 Ethernet interface on the front panel or to the ESW-2GE card. The 16 ways of Ethernet data are isolated by VLANs and support reverse multiplexing. The FE16E1 card provides the following functions: • Aggregate 16 ways of Ethernet data from the backplane to the 1 Ethernet interface on the front panel or to the ESW-2GE card. • Support independent configuration of 16 ways of Ethernet data to N×64 kbit/s (N = 1–32). • Support reverse multiplexing. Ways 1–8 cannot be reverse multiplexed with ways 9–16. • Support interface-based flow control. • Support interface-based storm control over broadcast, multicast, and DLF packets. • Support loop detection, ASP, and automatic recovery on each Ethernet interface. • Support local and remote loopback for channels. • Support BERT for channels. • Support interface isolation protection. • Support transparent transmission of Layer 2 protocol frames (BPDU, LACP, and 802.1x). • Support VLAN and QinQ. • Support traffic statistics on interfaces. • Support interface-based MAC address learning and configurable aging time for MAC addresses. • Support fixed configuration of internal Ethernet interfaces to 100 Mbit/s full duplex mode and traffic statistics. • Support configuring internal E1 interfaces to PCM31 mode when the bandwidth is N×64 kbit/s (N = 1–31) and reverse multiplexing is used; support configuring internal E1 interfaces to unframed mode when the bandwidth is 32×64 kbit/s.

10.5.2 Version

Card	Version
RC3000-15-FE16E1	A

10.5.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

10.5.4 Interfaces

Interface type

Table 10-26 lists interfaces on the FE16E1 card.

Table 10-26 Interfaces on the FE16E1 card

Name	Type	Description
–	RJ45 interface	Outputting aggregated data to one Ethernet data interface on the front panel
DebugC	RJ45 interface	Debugging interface

Interface parameter

Table 10-27 lists parameters of the FE interface.

Table 10-27 Parameters of the FE interface

Parameter	Description
Interface type	RJ45
Interface rate	10/100 Mbit/s auto-negotiation
Duplex mode	Full/Half duplex auto-negotiation
MTU	1632 bytes

10.5.5 LEDs

Table 10-28 lists LEDs on the FE16E1 card.

Table 10-28 LEDs on the FE16E1 card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
100M	Green	FE electrical interface rate LED: • Green: the FE electrical interface is working at 100 Mbit/s. • Off: the FE electrical interface is working at 10 Mbit/s.
LNK/ACT	Green	Link working LED • Green: the link interface is working properly. • Off: the link interface is disconnected or is working improperly. • Blinking green: the link interface is receiving or sending data.
FDX	Green	Duplex mode LED • Green: the FE electrical interface is working in full duplex mode. • Off: the FE electrical interface is working in half duplex mode.

10.5.6 DIP switch

Table 10-29 lists configurations of the DIP switch on the FE16E1 card.

Table 10-29 Configurations of the DIP switch on the FE16E1 card

SW1	Function	Status	Description
KEY1	Configure default aggregation mode for data.	OFF	Aggregating data to the FE electrical interface on the front panel
		ON	Aggregating data to the Ethernet switching card through the backplane
KEY2	Reserved	–	

Caution

SW2 on the DIP switch is the global reset button. Press it with caution, because this restarts the RC3000-15 globally.

The previous configuration is the default one. It can be overridden by software configuration.

10.5.7 Specifications

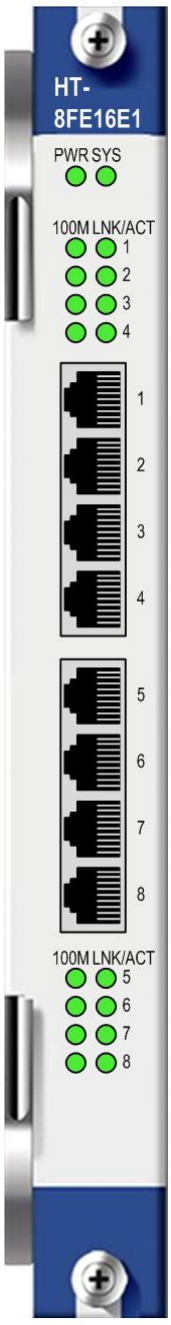
Table 10-30 lists parameters of the FE16E1 card.

Table 10-30 Parameters of the FE16E1 card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Power consumption	16 W

10.6 HT-8FE16E1

10.6.1 Functions and appearance

Panel	Function
	The HT-8FE16E1 card supports reverse multiplexing on 8 Ethernet interfaces. Up to 8 E1s can be used as reverse multiplexing channels for each Ethernet interface. PCM31 mode transmission is fixed for multiple ways of E1 reserve multiplexing. Each Ethernet interface can use a single E1 for transmission in unframed or PCM31 mode. The HT-8FE16E1 card provides the following functions: • Provide 8 independent Ethernet interfaces. • Support single E1 transmission in unframed or PCM31 mode. • Support reverse multiplexing. Up to 8 E1s can be used as reverse multiplexing channels for each Ethernet interface in PCM31 fixedly, • Ethernet interfaces 1–4 can use No. 1–8 ways of E1 services only in reserve multiplexing. • Ethernet interfaces 5–8 can use No. 9–16 ways of E1 services only in reserve multiplexing. • Support E1 channel loopback, including local external loopback and remote external loopback. • Support querying LOS, AIS, CRC, and GID-ERR alarms. • Support inhibiting or adaptively detecting CRC frames. • Support statistics of error codes for E1 channels. • Support cooperation between error code statistics and loopback. Execute remote external loopback before enabling BERT. Disable BERT before release loopback. • Support automatic adjustment of bandwidth through LCAS-LINK mechanism. **Note** The 300-W power supply card is required.

10.6.2 Version

Card	Version
RC3000-15-HT-8FE16E1	A

10.6.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

10.6.4 Interfaces

Interface type

Table 10-31 lists interfaces on the HT-8FE16E1 card.

Table 10-31 Interfaces on the HT-8FE16E1 card

Name	Type	Description
1–8	RJ45	8 Ethernet electrical interfaces

Interface parameter

Table 10-32 lists parameters of the Ethernet electrical interface.

Table 10-32 Parameters of the Ethernet electrical interface

Parameter	Description
Interface type	RJ45
Interface rate	10/100 Mbit/s auto-negotiation
Duplex mode	Full/Half duplex auto-negotiation

By default, 8 FE electrical interfaces are configured to 100 Mbit/s and full duplex mode.

Caution

When the FE electrical interface is configured to 10 Mbit/s through auto-negotiation or manual configuration, it cannot transmit services.

10.6.5 LEDs

Table 10-33 lists LEDs on the HT-8FE16E1.

Table 10-33 LEDs on the HT-8FE16E1

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
100M (1–8)	Green	FE electrical interface rate LED: • Green: the FE electrical interface is working at 100 Mbit/s. • Off: the FE electrical interface is working at 10 Mbit/s.
LNK/ACT (1–8)	Green	Link working LED • Green: the link interface is working properly. • Blinking green: the link interface is receiving or sending data. • Off: the link interface is disconnected or is working improperly.

10.6.6 Internal jumper

Table 10-34 lists the internal jumper used by the HT-8FE16E1.

Table 10-34 Internal jumper used by the HT-8FE16E1

Jumper	Function	Status	Description
JP101	Configure the mode for downloading the MCU program.	Short-circuited	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.
		Disconnected	Enter normal working mode.

Note

- By default, JP101 is disconnected; namely, MCU is in normal working mode.

- After upgrade, JP101 must be disconnected; otherwise, the RC3000-15 will malfunction.

10.6.7 Specifications

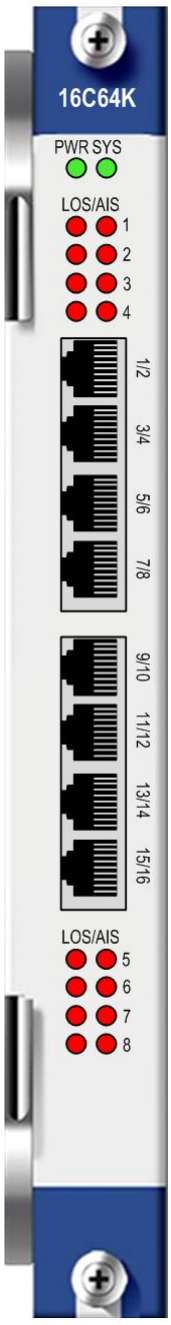
Table 10-35 lists parameters of the HT-8FE16E1 card.

Table 10-35 Parameters of the HT-8FE16E1 card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Power consumption	9 W

10.7 16C64K

10.7.1 Functions and appearance

Panel	Function
	The 16C64K, a 16-way codirectional 64K data service card, transmits codirectional 64K data from 16 directions to the cross connection card through the backplane for the use of cross connection. It provides the following functions: • Provide 16 codirectional 64K data interfaces which are independent of each other. • Support fixed bandwidth of 64 kbit/s on the interface. These 16 interfaces use 16 timeslots in turn. • Support embedded BERT for channels. BERT can be concurrently conducted on only one interface while other interfaces are transmitting services. • Support channel loopback, including internal and external loopback. • Support EMC and overcurrent protection.

10.7.2 Version

Card	Version
RC3000-15-16C64K	A

10.7.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

10.7.4 Interfaces

Interface type

Table 10-36 lists interfaces on the 16C64K card.

Table 10-36 Interfaces on the 16C64K card

Name	Type	Description
1/2, 3/4, 5/6, 7/8, 9/10, 11/12, 13/14, 15/16	RJ45 interface	Each RJ45 interface transmits 2 ways of codirectional 64K data.

Interface parameter

Table 10-37 lists parameters of the 16C64K interface.

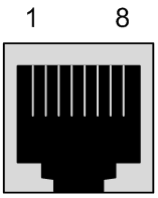
Table 10-37 Parameters of the 16C64K interface

Parameter	Description
Connector type	RJ45
Interface type	Codirectional 64 kbit/s
Frame format	Unframed
Line coding	Codirectional coding
Transmission distance	300 m, 24AWG
Impedance	120 Ω (balanced)
Symbol rate	256 kbaud
Compliant standard	Complying with interface standards in ITU-T G.703 and ITU-T G.823 recommendations

Interface PINs

Table 10-38 lists PIN definitions of the 16C64K interface.

Table 10-38 PIN definitions of the 16C64K interface

Interface figure	PIN	64K signal name
	1	TD1+
	2	TD1-
	3	RD2+
	4	RD1+
	5	RD1-
	6	RD2-
	7	TD2+
	8	TD2-

10.7.5 LEDs

Table 10-39 lists LEDs on the 16C64K card.

Table 10-39 LEDs on the 16C64K card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Blinking green: the system is working properly. • Off: the system is working improperly.
LOS/AIS (1–8)	Red	LOS and all-1 alarm LED • Green: LOS alarms are generated. • Blinking green: all-1 alarms are generated. • Off: no alarms are generated.

10.7.6 Internal jumper

Table 10-40 lists the jumper used by the 16C64K card.

Table 10-40 Jumper used by the 16C64K card

Jumper	Function	Status	Description
JP1	Enter or quit ISP mode.	Short-circuited	Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.
		Disconnected	Enter normal working mode.

After upgrade, JP1 must be disconnected; otherwise, the RC3000-15 will malfunction.

10.7.7 Specifications

Table 10-41 lists parameters of the 16C64K card.

Table 10-41 Parameters of the 16C64K card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg
Power consumption	3 W

11 Multi-service card

This chapter includes the following section:

- 16MULTI

11.1 16MULTI

11.1.1 Functions and appearance

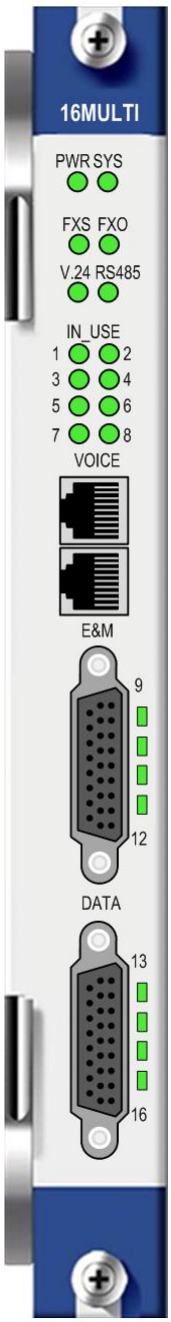
Panel	Function
	The 16MULTI card, a multi-service access card, supports up to 8 FXS/FXO voice interfaces, 4E&M audio interfaces, and 4 data interfaces. It provides the following functions: • Provide 2 voice modules: FXS and FXO, and provide up to 8 FXS/FXO interfaces, which use 2 RJ45 interfaces and are marked with "VOICE". • Support configuring voice gain through software on FXS/FXO interfaces: – The A/D gain ranges from -3 to 13 dB, and is 0 dB by default. – The D/A gain ranges from -13 to 3 dB, and is 3.5 dB by default. • Support internal and external loopback on FXS/FXO interfaces. • Provide 4E&M interfaces which use a HDB26 connector and are marked with "E&M". • Support 2/4 wire configuration on E&M interfaces. • Support configuring voice gain through software on E&M interfaces: – The Rx A/D gain ranges from -10 to +19 dB, and its default value can be configured according to the DIP switch. – The Tx D/A gain ranges from -23 to +7 dB, and its default value can be configured according to the DIP switch. • Support E&M signaling mode of TYPE5. • Support internal loopback for E&M signaling. • Support V.24 and RS485 data modules and provide up to 4 ways of data access. The data interface uses a HDB26F connector and is marked with "DATA". • Support configuring V24 interface to synchronous mode (V.24) or asynchronous mode (RS232). • Support configuring RS485 interface to full duplex mode (RS422) or half duplex mode (RS485). • Support configuring interface bandwidth to 64 kbit/s or 128 kbit/s. • Support internal and external loopback on data interfaces. • Support lightning protection and overcurrent protection • Support assigning timeslots as below: – For 8 ways of voice, each way occupies one timeslot in turn fixedly of TS0–TS7. – For 4 ways of E&M voice, each way occupies one timeslot in turn fixedly of TS8–TS11. – For 4 ways of E&M voice, each way occupies two timeslots. For details, see Table 11-1.

Table 11-1 Timeslot for data services

Data	Timeslot	
No. 1 way of data	TS12 (64 kbit/s)	TS12–TS13 (128 kbit/s)
No. 2 way of data	TS14 (64 kbit/s)	TS14–TS15 (128 kbit/s)
No. 3 way of data	TS16 (64 kbit/s)	TS16–TS17 (128 kbit/s)
No. 4 way of data	TS18 (64 kbit/s)	TS18–TS19 (128 kbit/s)

11.1.2 Version

Card	Version
RC3000-15-16MULTI	A

11.1.3 Slots

Chassis version	Slot
E.30 and E.20	1–6 and 9–13

11.1.4 Interfaces

Interface type

Table 11-2 lists interfaces on the 16MULTI card. The maximum length of the cable used for the RS232 interface is 15 m based on RS232 standard when the V.24 interface is configured to asynchronous RS232 mode.

Table 11-2 Interfaces on the 16MULTI card

Name	Type	Description
VOICE	RJ45	Each interface outputs 4 ways of FXS or FXO voice services.
E&M	HDB26 female interface	Each interface outputs 4 ways of E&M voice services.
DATA	HDB26 female interface	Each interface outputs 4 ways of V.24 or RS485 voice services.

Interface parameter

Table 11-3 lists parameters of the FXS/FXO interface.

Table 11-3 Parameters of the FXS/FXO interface

Parameter	Description
Coding scheme	A-law
Bit rate	64 kbit/s
Audio port impedance	On-hook impedance is 2 MΩ.
	Off-hook loopback impedance is 600+200//0.1.
Effective transmission bandwidth	300–3400 Hz/600 Ω
Gain frequency features	The Rx (A/D) gain ranges from -3 to +27 dB, and is 0 dB by default. Its step is 0.1 dB.
	The Tx (D/A) gain ranges from -13 to +7 dB, and is -3.5 dB by default. Its step is 0.1 dB.
Frequency distortion	300–3000 Hz; < 0.5 dB
	3000–3400 Hz; < 3.0 dB
Total distortion (1020 Hz)	0 to -30 dBm0; < 33 dB
	-30 to -40 dBm0; < (33–22) dB
	-40 to -45 dBm0; < 22 dB
Gain change according to level	+3 to -40 dBm0; Δ < 0.5 dB
	-40 to -50 dBm0; Δ < 1.0 dB
	-50 to -55 dBm0; Δ < 3.0 dB
Degree of unbalance about earth	300–600 Hz: > 40 dB
	600–2400 Hz: > 46 dB
	2400–3400 Hz: > 41 dB
Idle channel noise	< -67 dBm0p
Feed voltage (on-hook)	Typical -48 V
Feed current	Typical 20 mA
Ringing voltage	Typical 60 V/30 Hz
Return loss	300–600 Hz: > 12 dB
	600–3400 Hz: > 15 dB

Table 11-4 lists parameters of the E&M interface.

Table 11-4 Parameters of the E&M interface

Parameter	Description
Connector type	HDB26 female connector
Coding scheme	A-law
Bit rate	64 kbit/s
Audio port impedance	On-hook impedance is 2000 Ω.
	Off-hook loopback impedance is 600+200//0.1.
Effective transmission bandwidth	300–3400 Hz/600 Ω
Gain frequency features	The Rx (A/D) gain ranges from -3 to +13 dB, and is 0 dB by default. Its step is 0.1 dB.
	The Tx (D/A) gain ranges from -13 to +3 dB, and is -3.5 dB by default. Its step is 0.1 dB.
Frequency distortion	300–3000 Hz; < 0.5 dB
	3000–3400 Hz; < 3.0 dB
Total distortion (1020 Hz)	0 dBm0 to -30 dBm0 < 33 dB
	-30 to -40 dBm0; < (33–22) dB
	-40 to -45 dBm0; < 22 dB
Gain change according to level	+3 to -40 dBm0; Δ < 0.5 dB
	-40 to -50 dBm0; Δ < 1.0 dB
	-50 to -55 dBm0; Δ < 3.0 dB
Degree of unbalance about earth	300–600 Hz: > 40 dB
	600–2400 Hz: > 46 dB
	2400–3400 Hz: > 41 dB
Idle channel noise	< -67 dBm0p
Feed voltage (on-hook)	Typical -48 V
Feed current	Typical 20 mA
Ringing voltage	Typical 60 V/30 Hz
Return loss	300–600 Hz: > 12 dB
	600–3400 Hz: > 15 dB

Table 11-5 lists parameters of the V.24 interface.

Table 11-5 Parameters of the V.24 interface

Parameter	Description
Interface mode	DCE mode
Connector type	HDB26 female connector
Collection frequency/Interface rate	64 kbit/s and 128 kbit/s The corresponding bandwidth: 64 kbit/s and 128 kbit/s
Features	Complying with ITU-T V.24 recommendations
Electrical features	Complying with V.28 recommendations
Transmission distance	15 m (serial interface standards)

Table 11-6 lists parameters of the RS485 interface.

Table 11-6 Parameters of the RS485 interface

Parameter	Description
Connector type	RJ45
Collection frequency/ Interface rate	64 kHz, 128 kHz, 256 kHz, 512 kHz, 1 MHz, and 2 MHz The corresponding bandwidth: 64 kbit/s, 128 kbit/s, 256 kbit/s, 512 kbit/s, 1024 kbit/s, and 2048 kbit/s
Interface rate	The interface rate is related to the collection frequency: • The interface rate is up to 9.6 kbit/s when the collection frequency is 64 kHz. • The interface rate is up to 19.2 kbit/s when the collection frequency is 128 kHz. • The interface rate is up to 38.46 kbit/s when the collection frequency is 256 kHz. • The interface rate is up to 57.6 kbit/s when the collection frequency is 512 kHz. • The interface rate is up to 115.2 kbit/s when the collection frequency is 1 MHz. • The interface rate is up to 460.8 kbit/s when the collection frequency is 2 MHz.
Compliant standard	Complying with interface standards of RS485 and RS422 protocols

Interface PINs

Note

For colors of the cable, see section 13.14 MUL cable.

Table 11-7 lists PIN definitions of the FXS/FXO interface on the 16MULTI card.

Table 11-7 PIN definitions of the FXS/FXO interface on the 16MULTI card

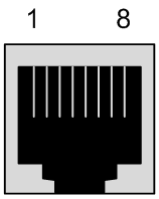
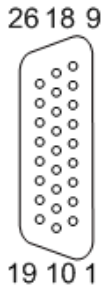
RJ45 figure	RJ45 PIN	Cable name	Description
	1	TIP1	No. 1 way of voice
	2	RING1	
	3	TIP2	No. 2 way of voice
	4	RING2	
	5	TIP3	No. 3 way of voice
	6	RING3	
	7	TIP4	No. 4 way of voice
	8	RING4	

Table 11-8 lists PIN definitions of the E&M interface. The RC3000-15, as a Tie line device, uses the E&M signalling type of Type V on the 16MULTI, as shown in Figure 8-2.

Table 11-8 PIN definitions of the E&M interface

HDB26 figure	HDB26 PIN	Definition	
		Name	Description
	1	R_A4	No. 4 way • Audio RX A in 4-wire mode • Idle in 2-wire mode
	11	R_B4	No. 4 way • Audio RX B in 4-wire mode • Idle in 2-wire mode
	2	T/RA_4	No. 4 way • Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	12	T/RB_4	No. 4 way • Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	3	R_A3	No. 3 way • Audio RX A in 4-wire mode • Idle in 2-wire mode
	13	R_B3	No. 3 way • Audio RX B in 4-wire mode • Idle in 2-wire mode
	4	T/RA_3	No. 3 way • Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode

HDB26 figure	HDB26 PIN	Definition	
		Name	Description
	14	T/RB_3	No. 3 way • Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	5	R_A2	No. 2 way • Audio RX A in 4-wire mode • Idle in 2-wire mode
	15	R_B2	No. 2 way • Audio RX B in 4-wire mode • Idle in 2-wire mode
	6	T/RA_2	No. 2 way • Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	16	T/RB_2	No. 2 way • Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	7	R_A1	No. 1 way • Audio RX A in 4-wire mode • Idle in 2-wire mode
	17	R_B1	No. 1 way • Audio RX B in 4-wire mode • Idle in 2-wire mode
	8	T/RA_1	No. 1 way • Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	18	T/RB_1	No. 1 way • Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	19	E4	No. 4 way E signaling cable
	20	M4	No. 4 way M signaling cable
	21	E3	No. 3 way E signaling cable
	22	M3	No. 3 way M signaling cable
	23	E2	No. 2 way E signaling cable
	24	M2	No. 2 way M signaling cable
	25	E1	No. 1 way E signaling cable
	26	M1	No. 1 way M signaling cable
	9	NC	Idle
	10	NC	Idle

Table 11-9 lists PIN definitions of data interfaces on the 16MULTI card.

Table 11-9 PIN definitions of data interfaces on the 16MULTI card

PIN	RS232 PIN definition		V.24 PIN Definition		RS422 PIN definition		RS485 PIN definition	
	Name	Description	Name	Description	Name	Description	Name	Description
1	TXD_4	No. 4 way of data	TX_4	No. 4 way of data	TX_4+	No. 4 way of sending	T/RX_4+	No. 4 way of receiving/sending
2	–		TC_4		TX_4-		T/RX_4-	
19	GND4	No. 4 way of grounding	GND4	No. 4 way of grounding	GND	Grounding	GND	Grounding
11	RXD_4	Idle	RX_4	No. 4 way of clock	RX_4+	No. 4 way of receiving	–	Idle
12	–		RC_4		RX_4-		–	
20	GND	Grounding	GND4	No. 4 way of grounding	GND	Grounding	GND	Grounding
3	TXD_3	No. 3 way of data	TX_3	No. 3 way of data	TX_3+	No. 2 way of sending	T/RX_3+	No. 3 way of receiving/sending
4	–		TC_3		TX_3-		T/RX_3-	
21	GND3	No. 3 way of grounding	GND3	No. 3 way of grounding	GND	Grounding	GND	Grounding
13	RXD_3	Idle	RX_3	No. 3 way of clock	RX_3+	No. 2 way of receiving	–	Idle
14	–		RC_3		RX_3-		–	
22	GND	Grounding	GND3	No. 3 way of grounding	GND	Grounding	GND	Grounding
5	TXD_2	No. 2 way of data	TX_2	No. 2 way of data	TX_2+	No. 2 way of sending	T/RX_2+	No. 2 way of receiving/sending
6	–		TC_2		TX_2-		T/RX_2-	
23	GND2	No. 2 way of grounding	GND2	No. 2 way of grounding	GND	Grounding	GND	Grounding
15	RXD_2	Idle	RX_2	No. 2 way of clock	RX_2+	No. 2 way of receiving	–	Idle
16	–		RC_2		RX_2-		–	
24	GND	Grounding	GND2	No. 2 way of grounding	GND	Grounding	GND	Grounding

PIN	RS232 PIN definition		V.24 PIN Definition		RS422 PIN definition		RS485 PIN definition	
	Name	Description	Name	Description	Name	Description	Name	Description
7	TXD_1	No. 1 way of data	TX_1	No. 1 way of data	TX_1+	No. 1 way of sending	T/RX –1+	No. 1 way of receiving/sending
8	–		TC_1		TX_1-		T/RX _1-	
25	GND1	No. 1 way of grounding	GND1	No. 1 way of grounding	GND	Grounding	GND	Grounding
17	RXD_ 1	Idle	RX_1	No. 1 way of clock	RX_1+	No. 1 way of receiving	–	Idle
18	–		RC_1		RX_1-		–	
26	GND	Grounding	GND1	No. 1 way of grounding	GND	Grounding	GND	Grounding
9	–	Idle	–	Idle	–	Idle	–	Idle
10	–	Idle	–	Idle	–	Idle	–	Idle

11.1.5 LEDs

Table 11-10 lists LEDs on the 16MULTI card.

Table 11-10 LEDs on the 16MULTI card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Green: the system is working improperly. • Off: the system is working improperly. • Blinking green: the system is working properly.
FXS FXO V24 RS485	Green	• FXS and V24 LEDs being Green: there are MULTI-FXS and MULTI-V24 modules. • All the four LEDs being Green: there are MULTI-FXS, MULTI-FXO, MULTI-V24, and MULTI-RS485 module.
IN-USE (1–8)	Green	Voice channel in-use LED • Green: there is local hook-on (outputting signaling), local ringing (inputting signaling), and calling. It indicates that the channel is in use.
IN-USE (9–12)	Green	E&M channel in-use LED • Green: E signaling is being received or M signaling is being sent. It indicates that the channel is in use.

LED	Color	Description
IN-USE (13–16)	Green	Data channel in-use LED • Blinking green: data is being received or sent. The blinking frequency is related to the volume of data being received.

11.1.6 Internal jumper

The jumper JP1 is used to configure downloading mode of MCU program. Enter ISP mode. In this mode, the RC3000-15 is waiting to be upgraded. You can upgrade MCU program through the serial interface on the backplane.

Table 11-11 lists the internal jumper used by the 16MULTI card.

Table 11-11 Internal jumper used by the 16MULTI card

JP1	Function	Description
Short-circuited	CONN ISP ON	Enter ISP mode.
Disconnected	NARMAL	Enter normal working mode.

Note

After upgrade, JP1 must be disconnected; otherwise, the 16MULTI card will malfunction.

11.1.7 DIP switch

You can configure the default value of the 16 MULTI card through the DIP switch. After you configure the 16MULTI card through software, the DIP switch will not take effect.

Table 11-12 lists configurations of the DIP switch on the 16MULTI card.

Table 11-12 Configurations of the DIP switch on the 16MULTI card

–	BIT No.	Description		
		Function description	ON	OFF (default)
Configuring voice interfaces	1	Configure polarity reverse on the FXS interface (configuring through software is invalid).	Supported	Not supported
Configuring E&M	2	Configure audio 2/4 wire mode	2-wire mode	4-wire mode

–	BIT No.	Description				
		Function description	ON		OFF (default)	
interfaces	3–5	Configure the default gains (providing four common gains)	Configuring gain (A-D/D-A)	SW1.3	SW1.4	SW1.5
			0/0	OFF	OFF	OFF
			0/-3.5	OFF	OFF	ON
			+14/+4	OFF	ON	OFF
			+16/+7	OFF	ON	ON
Configuring data interfaces	6	Configure V24 interface mode.	Synchronous mode (V.24)		Asynchronous mode (RS232)	
	7	Configure RS485 interface mode.	Full duplex (RS422)		Half duplex (RS485)	
	8	Configure bandwidth.	64 kbit/s		128 kbit/s	

11.1.8 Specifications

Table 11-13 lists parameters of the 16MULTI card.

Table 11-13 Parameters of the 16MULTI card

Parameter	Description
Dimensions	25 mm (Width) × 225 mm (Depth) × 240 mm (Height)
Weight	0.5 kg

11.1.9 Cables

Table 11-14 lists cables used by the 16MULTI card.

Table 11-14 Cables used by the 16MULTI card

Card	Recommended cable	Description
16MULTI	CBL-MUL-HDB26M/NC	HDB26 male interface to suspended multifunction cable
	CBL-MUL-HDB26M(40)/NC	(Oblique connector) HDB26 male interface to suspended multifunction cable
	CBL-EM-HDB26M/NC	HDB26 male interface to suspended E&M cable

For colors of the cable, see sections 13.14 MUL cable and 13.15 E&M cable

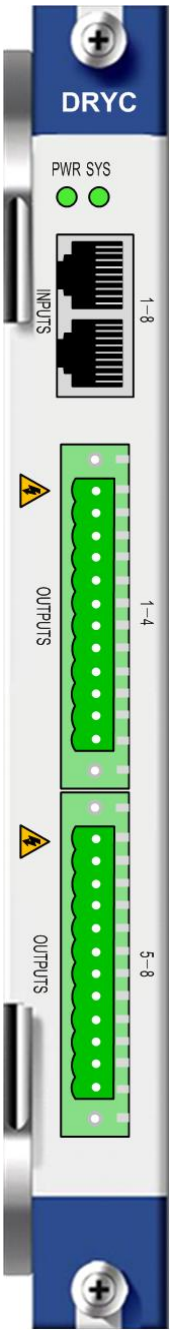
12 Telecontrol service cards

This chapter includes the following sections:

- DRYC
- TP

12.1 DRYC

12.1.1 Functions and appearance

Panel	Function
	The Dry Contact (DRYC) card provides the following functions: • Support 8 ways of on/off value output control and 8 ways of on/off value input detection. • Support 2 on/off value transmission modes. In shared timeslot mode, 8 ways of dry contact input detection or output control share TS0. In independent timeslot mode, each way of dry contact input detection or output control occupies a timeslot, so 8 ways occupy TS0–TS7. • Dry contact input occupies TS0–TS7 of No.1 E1 in uplink bus of the backplane, and dry contact output occupies TS0–TS7 of No.1 E1 in downlink bus. • Dry contact input supports three control sources: peer input control, network management control, and local input control. • The input detection interface adopts an isolated power scheme to avoid impact on system power. • Lightning protection level: 4 kV in common mode and 2 kV in differential mode. • Support online software upgrade, and support querying SN.

12.1.2 Version

Card	Version
RC3000-15-DRYC	A

12.1.3 Slots

Chassis version	Slot
E.30	1–6 and 9–13
E.20	1–13

12.1.4 Interfaces

Interface type

Table 12-1 lists interfaces on the DRYC card.

Table 12-1 Interfaces on the DRYC card

Interface	Name	Type	Quantity	Description
INPUTS	Input interface	RJ45	2	Provide 8 ways of on/off value input channels. Each channel occupies 2 pins.
OUTPUTS	Output interface	12-pin Phoenix terminal connector	2	Provide 8 ways of on/off value output channels. Each channel occupies 3 pins.

Interface parameter

Table 12-2 lists parameters of the input interface.

Table 12-2 Parameters of the input interface

Parameter	Description
Interface type	RJ45
Inner impedance	660 Ω
Activation current	5 mA
Invalid current	2.2 mA
Current tolerance	18 mA

Table 12-3 lists parameters of the output interface.

Table 12-3 Parameters of the output interface

Parameter	Description
Connector type	Phoenix terminal
Insulation resistance	≥ 1000 MΩ (500 VDC)
Maximum current	• AC: 8 A • DC: 5 A
Maximum voltage	• 250 VAC • 30 VDC
Short-circuited current	5 A

Interface PINs

Table 12-4 lists PIN definitions. Wherein, every 2 pins correspond to an input channel.

The input interface supports two modes: external passive on/off value input and external active on/off value input, which can be configured through jumpers J5–J12 on the card. Each input interface corresponds to 4 jumpers (J5–J8 for input interface 1 and J9–J12 for input interface 2). Each jumper has 4 pins.

Take input interface 1 for example. In external passive on/off value input mode, short circuit pin 1 and pin 2, pin 3 and pin 4 of J5–J8. In external active on/off value input mode, short circuit pin 2 and pin 3 of J5–J8. Configurations of input interface 2 are the same. By default, 2 input interfaces are in external passive on/off value input mode.

Note

Passive on/off value refers to that the external input control circuit of the interface is not equipped with power supply and instead the interface uses the internal power supply to form a closed loop. Active on/off value refers to that the external input control circuit of the interface is equipped with power supply and so the interface can form a closed loop without internal power supply.

Table 12-4 PIN definitions of the input interface

Interface	PIN	I/O	PIN definition
1	1	IN	On/Off value input 1+
	2	GND	On/Off value input 1-
	3	IN	On/Off value input 2+
	4	IN	On/Off value input 3+
	5	GND	On/Off value input 3-
	6	GND	On/Off value input 2-
	7	IN	On/Off value input 4+

Interface	PIN	I/O	PIN definition
	8	GND	On/Off value input 4-
2	1	IN	On/Off value input 5+
	2	GND	On/Off value input 5-
	3	IN	On/Off value input 6+
	4	IN	On/Off value input 7+
	5	GND	On/Off value input 7-
	6	GND	On/Off value input 6-
	7	IN	On/Off value input 8+
	8	GND	On/Off value input 8-

Table 12-5 lists PIN definitions of the output interface. Every 3 pins (COM pin, OPEN pin, CLOSE pin) correspond to an output channel, as shown in Figure 12-1.

Figure 12-1 PINs on the output interface

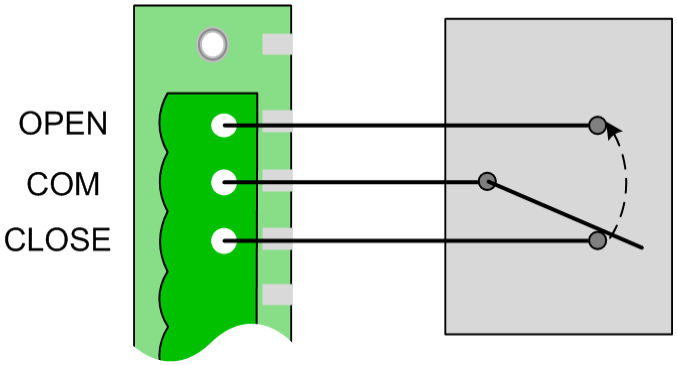


Table 12-5 PIN definitions of the output interface

Interface	PIN	I/O	PIN definition
1	1	OUT	No. 1 channel OPEN pin
	2	OUT	No.1 channel COM pin
	3	OUT	No.1 channel CLOSE pin
	4	OUT	No. 2 channel OPEN pin
	5	OUT	No. 2 channel COM pin
	6	OUT	No. 2 channel CLOSE pin
	7	OUT	No. 3 channel OPEN pin
	8	OUT	No. 3 channel COM pin
	9	OUT	No. 3 channel CLOSE pin

Interface	PIN	I/O	PIN definition
	10	OUT	No. 4 channel OPEN pin
	11	OUT	No. 4 channel COM pin
	12	OUT	No. 4 channel CLOSE pin
2	1	OUT	No. 5 channel OPEN pin
	2	OUT	No. 5 channel COM pin
	3	OUT	No. 5 channel CLOSE pin
	4	OUT	No. 6 channel OPEN pin
	5	OUT	No. 6 channel COM pin
	6	OUT	No. 6 channel CLOSE pin
	7	OUT	No. 7 channel OPEN pin
	8	OUT	No. 7 channel COM pin
	9	OUT	No. 7 channel CLOSE pin
	10	OUT	No. 8 channel OPEN pin
	11	OUT	No. 8 channel COM pin
	12	OUT	No. 8 channel CLOSE pin

Input/Output mapping

The dry contact controls output of on/off values by collecting input of them. When the input switch is OFF, the COM pin and CLOSE pin of the output interface are connected. When the input switch is ON, the COM pin and OPEN pin of the output interface are connected, as listed in Table 12-6.

The NMS displays output status of dry contact. When the dry contact input control mode is network management control, you can control output status of dry contact through the NMS or CLI.

Table 12-6 Dry contact input/output mapping

Input		Output		NMS display
Status	Description	Status	Description	
OFF	The input switch is off, and no alarms are input.	Contact Normal	The COM pin and CLOSE pin of the Phoenix terminal are connected.	Contact Normal
ON	The input switch is on, and some alarm is input.	Contact Operated	The COM pin and OPEN pin of the Phoenix terminal are connected.	Contact Operated

Input		Output		NMS display
Status	**Description**	**Status**	**Description**	
OFF	The input switch is off, and no alarms are input.	Contact Normal	The COM pin and CLOSE pin of the Phoenix terminal are connected.	Contact Normal
ON	The input switch is on, and some alarm is input.	Contact Operated	The COM pin and OPEN pin of the Phoenix terminal are connected.	Contact Operated

12.1.5 LEDs

Table 12-7 lists LEDs on the DRYC card.

Table 12-7 LEDs on the DRYC card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.
SYS	Green	System status LED • Green: the system is working improperly. • Off: the system is working improperly. • Blinking green: the system is working properly.

12.1.6 Specifications

Table 12-8 lists parameters of the DRYC card.

Table 12-8 Parameters of the DRYC card

Parameter	Description
Dimensions	25 mm (Width) × 232 mm (Depth) × 240 mm (Height)
Weight	0.45 kg
Power consumption	< 2.4 W

12.1.7 Networking applications

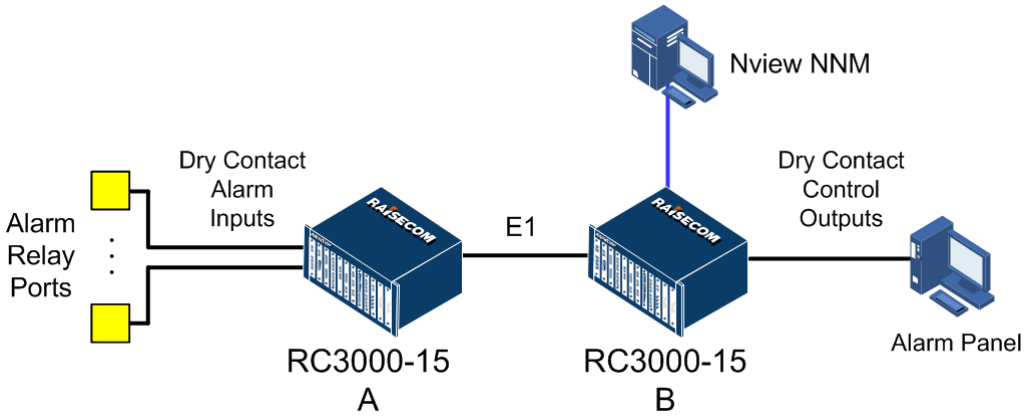
Point-to-point application

As shown in Figure 12-2, two RC3000-15 devices are inserted with a DRYC card respectively.

The dry contact of RC3000-15 A receives on/off values from 8 alarm relay interfaces and its output end is connected to the dry contact of RC3000-15 B. The dry contact of RC3000-15 B has two input control sources: peer input control and network management control. Its output end is connected to an alarm display screen for monitoring input and output status.

In point-to-point transmission mode, the backplane bus of the RC3000-15 transmits on/off values to the transport network through the transmission interface of the RC3000-15 in either shared timeslot mode (TS0) or independent timeslot mode (TS0–TS7).

Figure 12-2 Point-to-point application networking



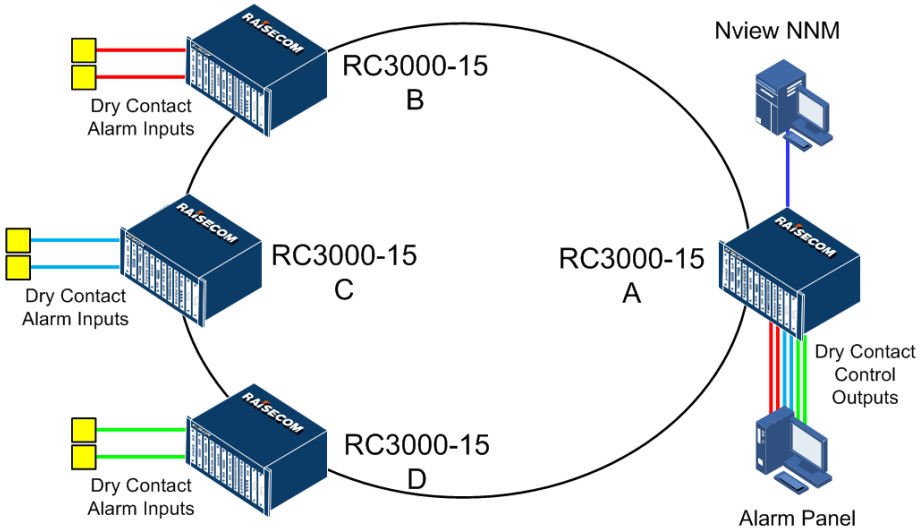
Point-to-multipoint application

As shown in Figure 12-3, each RC3000-15 is inserted with a DRYC card.

The dry contact of RC3000-15 A receives alarm input information from multiple dry contacts. It is also the peer input control source, and can be controlled by the NView NNM. The output end is connected to an alarm display screen for monitoring input and output status.

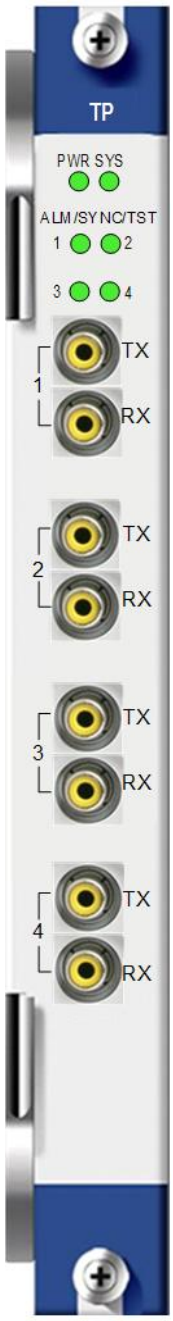
In point-to-multipoint transmission mode, you can choose the independent timeslot transmission mode (TS0–TS7). Other information is similar with point-to-point transmission mode.

Figure 12-3 Point-to-multipoint application networking



12.2 TP

12.2.1 Functions and appearance

Panel	Function
	The TP card is used to access services of Teleprotection devices. It provides the following functions: • Support accessing and transmitting services of teleprotection devices based on C37.94 standard. The services are cross-connected through the backplane, and then are multiplexed to the transmission network through the aggregation card. • Support capacity compression. You can configure cross connection according to the N value of service bandwidth (N×64 kbit/s, with N ranging from 1 to 12 defined by C37.94 standard). Each service occupies only "1+N" 64K timeslot instead of the whole E1 when it is multiplexed. It supports integrating the capacity of data on multiple optical interfaces during transmission. For example, timeslots occupied by 4 optical interfaces are multiplexed to one E1 or one VC12 of the aggregation card through cross connection. • The C37.94 interface support N value auto-negotiation or N value configuration in the Tx direction but only N value auto-negotiation in the Rx direction. • Support 4 C37.94 service optical interfaces. The optical interface supports being used independently or configured into protection pairs. When 64K cross connection is configured, services of optical interfaces 1–4 correspond to No. 1–4 ways of E1 resources on the TP card. • Support 1+1 optical interface protection, support protection switching according to LOS or "All Ones" (optional) alarm status, and support configuring up to 2 protection pairs: No. 1 and No. 2 optical interfaces support mutual protection; No. 3 and No. 4 optical interfaces support mutual protection. • Each optical interface supports clock data recovery and ALS. • Support detecting and processing LOS alarms, Yellow alarms (remote alarm indication), and "All Ones" alarms (service payload is all-1 code). • Support internal and external loopback on the optical interface. • Support 1 embedded BERT. For any way of C37.94 services, it supports inserting bit errors to service payload at the side of optical interface or backplane for test. • Support software online upgrade. • Support being interconnected with devices of other vendors compliant with the C37.94 standard.

Note

- The bandwidth of the C37.94 services of the teleprotection device is fixed as 2.048 Mbit/s. The value of N determines the number of payload bytes used in

each frame. When N is smaller than 12, data of the used bytes are invalid. The capacity compression feature makes the services only occupy "1+N" 64K timeslots. One 64K timeslot transmits the value of N; and N 64K timeslots transmit valid service data.

- When C37.94 services are multiplexed to line-side E1, support PCM30, PCM30&CRC, PCM31, and PCM31&CRC only, instead of unframed E1.
- This card does not provide customers with configurable buttons, DIP switches, or jumpers.

12.2.2 Version

Card	Version
RC3000-15-TP	A

12.2.3 Slots

Chassis version	Slot
E.30	1–6 and 9–13

The software version DXC card should be V3.3.7 or later.

12.2.4 Interfaces

Interface type

Table 12-9 lists interfaces on the TP card.

Table 12-9 Interfaces on the TP card

Interface	Type	Description
1–4 TX/RX	Multi-mode dual-fiber ST (namely, BFOC/2.5) female interface	• 4 C37.94 service input/output interfaces • Each way of services uses 1 Tx interface and 1 Rx interface.

Interface parameter

The ST interface complies with the C37.94 and BFOC/2.5 standards.

Table 12-10 list parameters of the ST interface.

Table 12-10 Parameters of the ST interface

Parameter	Description
Interface type	Multi-mode dual-fiber ST (namely, BFOC/2.5) female interface
Typical loss	0.3 dB
Pluggable times	< 0.3 dB: 1000 times
Temperature stability	-40 to 75 ℃: incremental loss < 0.3 dB
Axial load	35 lb
Service bandwidth	N ×64 kbit/s, N = 1–12
Clock frequency	2048 kbit/s (±100 ppm)
Jitter	• Output: ±50ns (±0.1 UI) • Input tolerance: ±100ns
Wander	±250ns (±0.5 UI)
Output level	• Average optical power of 50 μm fiber: -23.0 to -11.0 dBm • Average optical power of 62.5 μm fiber: -19.0 to -11.0 dBm • Optical signal in ON status indicates logical 1; logical 1 level which is smaller than 10% indicates logical 0.
Center emission wavelength	830 ±40 nm
Rx sensitivity	BER < 1.0E-9 (namely, no bit error): the average optical power is -28 dBm.
Fiber	850 nm MMF, 50 μm or 62.5 μm
Maximum transmission distance (dependent on link signal attenuation)	2–4 km
Lightning protection level	• Contact discharge: ±8 kV • Air discharge: ±15 kV

12.2.5 LEDs

Table 12-11 lists LEDs on the TP card.

Table 12-11 LEDs on the TP card

LED	Color	Description
PWR	Green	Power LED • Green: the power supply is normal. • Off: the power supply is abnormal.

LED	Color	Description
SYS	Green	System status LED • Green: the system is working improperly. • Off: the system is working improperly. • Blinking green: the system is working properly.
ALM/SYNC/TST 1–4	• Red • Green • Yellow	C37.94 optical interfaces 1–4 status LED. In normal operation conditions, the LED is green. • Red: ALM status. Red indicates LOS occurs on the local optical interface or local signals are nor synchronized; blinking red indicates remote LOS. • Green: SNYC status. Green indicates that local signals have been synchronized. • Yellow: TST status. It is reserved.

12.2.6 Specifications

Table 12-12 lists parameters of the TP card.

Table 12-12 Parameters of the TP card

Parameter	Description
Dimensions	25 mm (Width) × 232 mm (Depth) × 240 mm (Height)
Weight	0.75 kg
Power consumption	< 5 W

12.2.7 Ordering information

Table 12-13 lists ordering information about the TP card.

Table 12-13 Ordering information about the TP card

Model	Hardware version	Description	Remarks
RC3000-15-TP	A.00	As the service access card based on C37.94 standard, it supports 4 ST optical interfaces and optical interface 1+1 protection, and supports capacity compression. Services of each interface only occupy "1+N" (N = 1–12) 64K timeslots at the line side when they are multiplexed.	The ST interface 850 nm MMF used by the card should be purchased separately.

12.2.8 Networking applications

Networking application

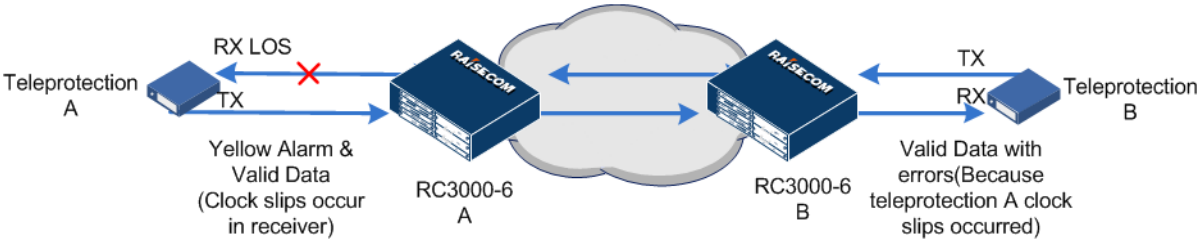
Generally, the teleprotection devices, together with telecontrol devices, relay devices, and circuit breakers, are installed in the telecommunication room of the high-voltage power system and used for power grid protection. To communicate with each other, teleprotection devices should transmit services to the telecommunication room where the multiplexing device is located (the transmission distance ranges from 2 km to 4 km generally), and then services are transmitted by the multiplexing device through the transmission network for long-distance transmission.

The C37.94 standard defines parameters and functions between the teleprotection device and multiplexing device, such as N ×64 kbit/s (N = 1–12), frame format, interfaces, metrics, and alarms, to ensure that teleprotection devices and multiplexing devices from different vendors and compliant with this standard can be interconnected. This standard avoids the problem that teleprotection devices from different vendors cannot cooperate with each other and enhances the fault location and detection performance through standard alarm definitions.

Figure 12-4 shows the TP card networking. Insert one TP card and one STM1 card into the two RC3000-15 devices respectively.

- Services accessed by the TP card are cross-connected to the STM1 aggregation card through the backplane, and then are transmitted uplink to the transmission network through the STM1 card after being multiplexed.
- The TP card of the RC3000-15 at one end accesses services of the teleprotection device based on the C37.94 standard. These services are transmitted to the RC3000-15 at the other end after being crossed and multiplexed. And then the RC3000-15 at the other end demultiplexes the services and sends the C37.94 services to the teleprotection device through the TP card.

Figure 12-4 Networking application of the TP card



Fault location

Services of the teleprotection devices are important, so you need to monitor service transmission faults. Based on the alarm function defined by the C37.94 standard, teleprotection device and multiplexing device cooperate with each other to monitor transmission faults and locate faults according to the alarm status.

Figure 12-5, Figure 12-6, and Figure 12-7 show common faulty points, service status, and alarm status. And corresponding descriptions are listed in Table 12-14, Table 12-15, and Table 12-16.

Figure 12-5 Fault 1: RC3000-15 A to Teleprotection A

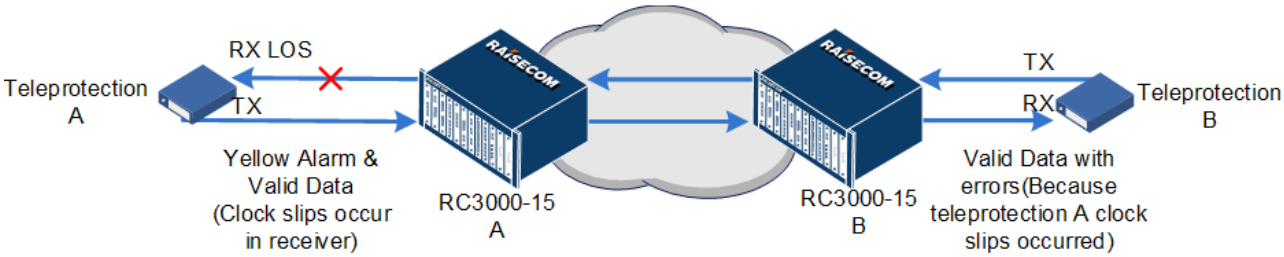


Table 12-14 Fault 1: RC3000-15 A to Teleprotection A

Classification	Teleprotection A	RC3000-15 A	RC3000-15 B	Teleprotection B
Service status	• Be disconnected in the Rx direction. • There is valid data in Tx direction (however, clock slips occur in services received by RC3000-15 A).	There is valid data in Rx direction (with clock slips).	N/A	There is valid data with errors in the Rx direction (due to clock slips of teleprotection device A).
Alarm status	• LOS alarm is generated. • Carry Yellow alarm in the Tx direction (Yellow alarm takes bit 1 in the overhead).	• Yellow alarm is generated. • The Rx direction to teleprotection device A is normal (no LOS alarm is generated while received data clock may in free oscillation status).	N/A	N/A

Figure 12-6 Fault 2: Teleprotection A to RC3000-15 A

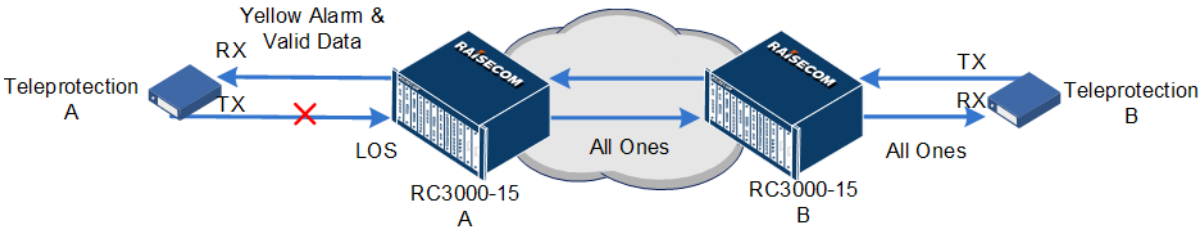


Table 12-15 Fault 2: Teleprotection A to RC3000-15 A

Classification	Teleprotection A	RC3000-15 A	RC3000-15 B	Teleprotection B
Service status	There is valid data in Rx direction.	• The Rx direction to teleprotection device A is disconnected. • There is valid data in the Tx direction to teleprotection device A. • Valid data in the Tx direction to the advanced link is all-1.	Valid data in the Tx direction to teleprotection device B is all-1.	Valid data in the Rx direction is all-1.

Classification	Teleprotection A	RC3000-15 A	RC3000-15 B	Teleprotection B
Alarm status	Yellow alarm is generated.	• LOS alarm is generated. • The Tx direction to teleprotection device A carries Yellow alarm (Yellow alarm takes bit 1 in the overhead).	Not involved	The "All Ones" alarm is generated.

Figure 12-7 Fault 3: advanced link fault (taking RC3000-15 A to RC3000-15 B for example)

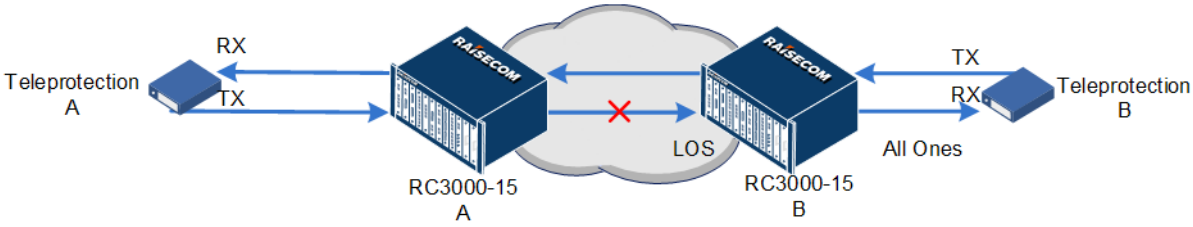


Table 12-16 Fault 3: advanced link fault (taking RC3000-15 A to RC3000-15 B for example)

Classification	Teleprotection A	RC3000-15 A	RC3000-15 B	Teleprotection B
Service status	Not involved	Not involved	• The Rx direction to the advanced link is disconnected. • Valid data in the Tx direction to teleprotection device B is all-1.	Valid data in Rx direction is all-1.
Alarm status	Not involved	Not involved	The LOS alarm is generated.	The "All Ones" alarm is generated.

13 Cables

This chapter includes the following sections:

- DC power cable
- AC power cable
- Ground cable
- Configuration cable
- Clock cable
- Alarm cable
- Fiber
- Ethernet cable
- E1 cable
- V.24/V.24H cable
- V.35 cable
- RS232/RS232H cable
- Audio cable
- MUL cable
- E&M cable

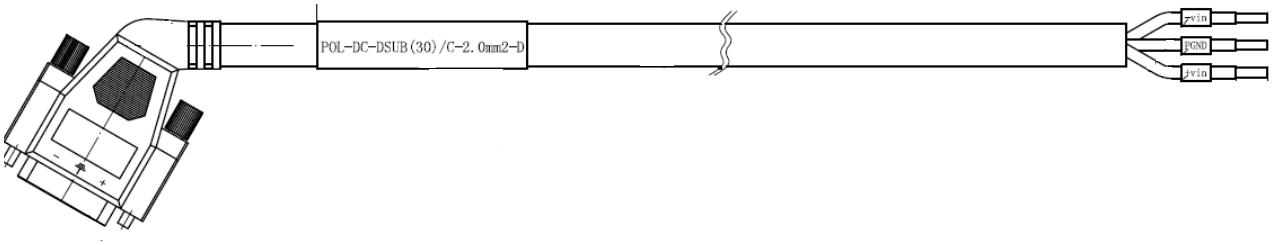
13.1 DC power cable

13.1.1 POL-DC-DSUB(30)/C-2.0mm2-D/RoHS

Appearance

Figure 13-1 shows the appearance of the DC power cable.

Figure 13-1 Appearance of the DC power cable



Technical specifications

Table 13-1 lists technical specifications of the DC power cable.

Table 13-1 Technical specifications of the DC power cable

Parameter	Description
Name	POL-DC-DSUB(30)/C-2.0mm2-D/RoHS
Connector A	DSUB power connector-bonding wire-3-pin (hole+pin+hole)
Positive wire	+vin, red, with diameter of 4 mm
Ground wire	PGND, yellow/green, with diameter of 4 mm
Negative wire	-vin, black, with diameter of 4 mm
Rate voltage	300/500 V
Insulation and voltage resistance	1500 VAC, 5min
Authentication	CCC
RoHS	Compliant
Length customization	Supported, indicated by D in the cable name

13.2 AC power cable

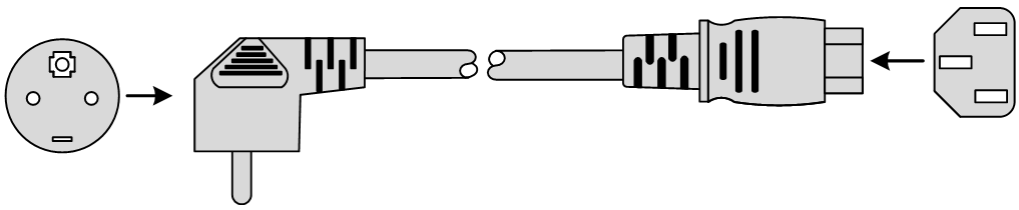
You can order different AC power cables in different countries or regions. The default length of the AC power cable delivered with the RC3000-15 is 1.5 m, and it can be customized.

13.2.1 POL-AC-European 3-pin/C13 connector-0.75mm2-D/RoHS

Appearance

The AC power cable which meets European standard is composed of the European 3-pin plug and C13 connector, as shown in Figure 13-2.

Figure 13-2 European AC cable



Technical specifications

Table 13-2 lists technical specifications of the European AC power cable.

Table 13-2 Technical specifications of the European AC power cable

Parameter		Description
Name		POL-AC-European-3-pin/C13 connector-0.75mm^2-D/RoHS
Connector 1		European 3-pin plug
Connector 2		IEC60320-C13 connector
Color	Outer	Black (PVC insulating layer)
	Inner	Blue (N), brown (L), and yellow/green strip (E)
Type		3×0.75 mm^2
Length		The letter D is the length, indicating that the cable can be customized. For example, if the customer requires a 1.5-m cable, you can name the cable POL-AC-European-3-pin/C13 connector-0.75mm^2-1.5m/RoHS.

13.2.2 POL-AC-American 3-pin/C13 connector-18AGW-D/RoHS

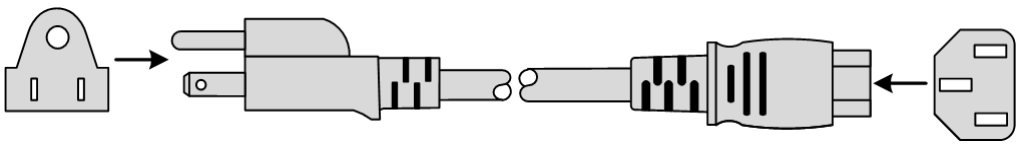
Introduction

The AC power cable transmits AC power to the AC power interface on the RC3000-15, and supplies power to the whole device.

Appearance

The AC power cable which meets American standard is composed of the American 3-pin plug and C13 connector, as shown in Figure 13-3.

Figure 13-3 American AC cable



Technical specifications

Table 13-3 lists technical specifications of the American AC power cable.

Table 13-3 Technical specifications of the American AC power cable

Parameter		Description
Name		POL-AC-American-3-pin/C13 connector-18AWG-D/RoHS
Connector 1		NMEA5-15 American 3-pin plug
Connector 2		IEC60320-C13 connector
Color	Outer	Black (PVC insulating layer)
	Inner	White (N), black (L), and green (E)
Wire gauge		18AWG/3C
Length		The letter D is the length, indicating that the cable can be customized. For example, if the customer requires a 1.5-m cable, you can name it POL-AC-American 3-pin/C13 connector-1.5m/RoHS.

13.3 Ground cable

Warning

- Connecting the ground cable properly is an important guarantee for lightning protection, anti-electric shock, and anti-interference. The RC3000-15 must be connected to the ground cable correctly during installation, which helps avoid bodily injury and device damage.
- The ground cable cannot be longer than 30 m and should be as short as possible; otherwise, a ground bar should be used instead.

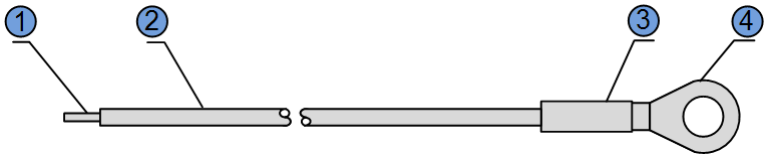
The ground cable is used to connect the RC3000-15 to the ground. The ground screw on the panel of the RC3000-15 is used to fix the OT terminal to the RC3000-15. The other end of the ground cable is connected to the ground. The default length of the ground cable delivered with the RC3000-15 is 1.5 m, and it can be customized.

13.3.1 PIL-ground cable-Φ4-D/RoHS

Appearance

The ground cable is composed of ground lugs and the conducting wire. The ground lug is usually an OT non-insulated terminal. The conducting wire is a yellow/green copper soft flame-retardant conducting wire. Figure 13-4 shows the ground cable.

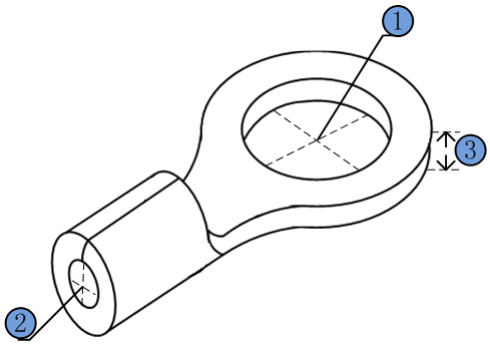
Figure 13-4 Ground cable



1	Stripped end (connected to the OT terminal or ground bar)	2	Conducting wire
3	Insulating sheath	4	OT terminal

Figure 13-5 shows the OT terminal.

Figure 13-5 OT terminal



1	Inner diameter of the soldering lug	2	Inner diameter of the sheath	3	Thickness of the soldering lug

Technical specifications

Table 13-4 lists technical specifications of the ground cable.

Table 13-4 Technical specifications of the ground cable

Parameter	Description
Cable model	PIL-ground cable-Φ4-D/RoHS
Cable standard	Comply with the UL standard and RoHS.
Conducting wire	Yellow/Green multistrand copper 16AWG (1×1.25mm^2) wire Comply with UL1007 or UL1005 standard.
Stripped head	10 mm long and tinning

Parameter	Description
Insulated sheath	70 mm, 105 mm, or customized. The letter D in cable model indicates the length, which can be customized. For example, if the customer requires a 2-m cable, you can name it PIL-ground cable-Φ4-200mm/RoHS.

Table 13-5 lists technical specifications of the OT terminal.

Table 13-5 Technical specifications of the OT terminal

Parameter	Description
Model	Ground pressed round terminal (M4)/RoHS
Specifications	• 4.3 soldering lug • Inner diameter: 4 mm • Outer diameter: ≤ 8 mm • Diameter of the stripped wire: 2.1 mm • Thickness of the soldering lug: ≥ 0.6 mm
Cross-sectional area of the conducting wire	16–15 AWG (1.2–1.5 mm^2)

13.4 Configuration cable

13.4.1 Introduction

The configuration cable is used to connect the Console interface on the RC3000-15 to the RS-232 serial interface on the maintenance console and transmit configuration data. You can debug and maintain the RC3000-15 locally through the maintenance console.

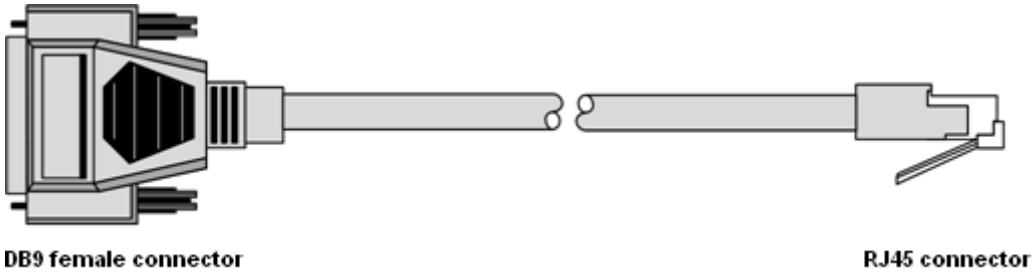
The configuration cable is a 4-wire unshielded cable. Connectors at both ends of the configuration cable are as below:

- RJ45 connector: connected to the Console interface
- DB9 female interface: connected to the serial interface on the maintenance console

Appearance

Figure 13-6 shows the appearance of the configuration cable.

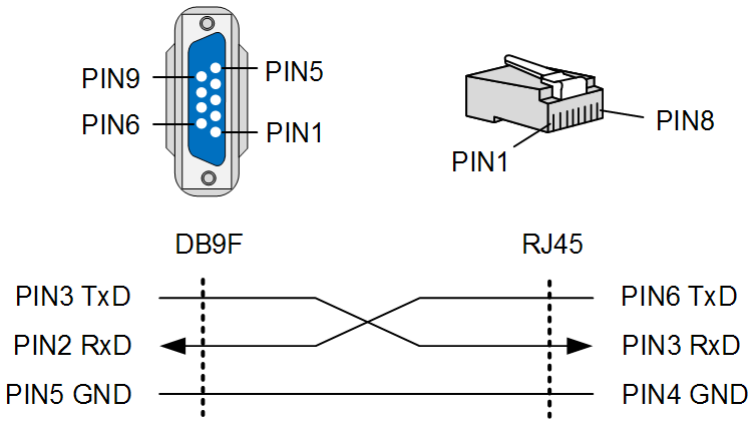
Figure 13-6 Configuration cable



PINs and wiring

Figure 13-7 shows PINs and wiring of the configuration cable.

Figure 13-7 PINs and wiring of the configuration cable



Technical specifications

Table 13-6 lists technical specifications of the configuration cable.

Table 13-6 Technical specifications of the configuration cable

Parameter	Description
Cable name	CBL-RS232-DB9F/RJ45-2m/RoHS
Connector type	Cat 3 UTP cable
Cable type	• RJ45 connector • DB9 female connector
Length	2 m

Wiring

Table 13-7 lists the wiring of the configuration cable.

Table 13-7 Wiring of the configuration cable

RJ45 PIN	Definition	DB9 PIN
1	NC	–
2	NC	6
3	RxD	3
4	GND	5
5	GND	5
6	TxD	2
7	NC	4
8	NC	–

Note

- The previous "–" indicates that the corresponding RJ45 PIN is not connected (NC).
- The DB PINs not listed previously are not connected (NC).

13.5 Clock cable

13.5.1 Model

Table 13-8 lists the model of the clock cable.

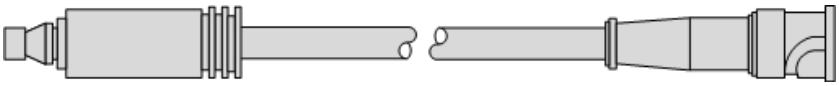
Table 13-8 Model of the clock cable

Model	Description
CBL-E1-CC3/BNCF-1m	Connected to the clock interface, used to transmit clock signals

13.5.2 Appearance

Figure 13-8 shows the appearance of the clock cable.

Figure 13-8 Appearance of the clock cable



13.6 Alarm cable

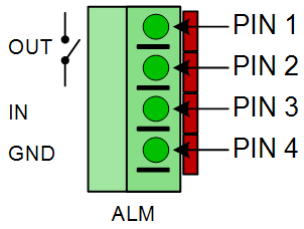
13.6.1 Introduction

The alarm cable is used to connect alarm terminal and other devices to input/output alarm signals. The RC3000-15 uses a 4-hole spring terminal block.

13.6.2 PIN definitions

Connect the alarm cable according to PIN definitions as described in Table 13-9.

Table 13-9 PIN definitions of the alarm terminal

PIN	Definition	Description	
1	OUT	PIN 1 and PIN 2 are used together for one way of alarm signals. • When alarm signals are to be output, PIN 1 and PIN 2 are short connected by an internal relay. • When no alarm signals are output, PIN 1 and PIN 2 are disconnected.	

13.7 Fiber

13.7.1 Connector

Table 13-10 lists fiber connectors.

Table 13-10 Fiber connectors

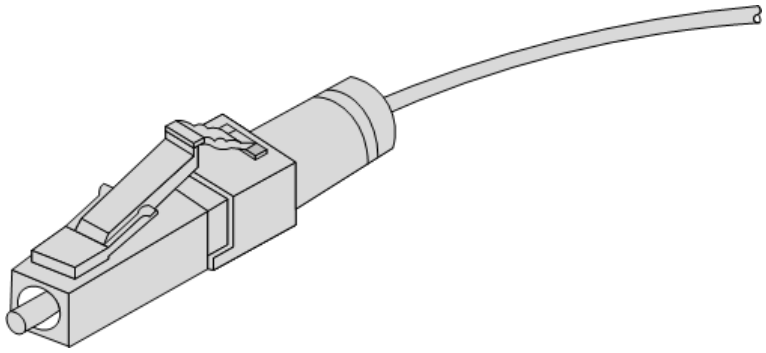
Local connector	Remote connector	Fiber
LC/PC	LC/PC	2 mm SMF
		2 mm MMF
	FC/PC	2 mm SMF
		2 mm MMF
	SC/PC	2 mm SMF
		2 mm MMF
SC/PC	LC/PC	2 mm SMF
		2 mm MMF
	FC/PC	2 mm SMF

Local connector	Remote connector	Fiber
		2 mm MMF
	SC/PC	2 mm SMF
		2 mm MMF

13.7.2 Appearance

Figure 13-9 shows the LC/PC fiber connector.

Figure 13-9 LC/PC fiber connector

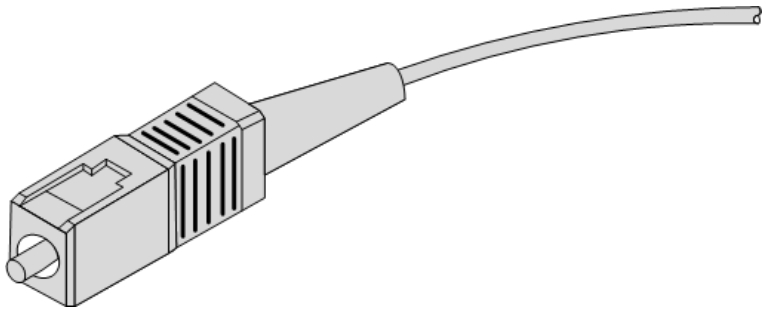


When connecting or removing the LC/PC optical connector, align the connector with the optical interface, and do not rotate the fiber. Operate the fiber as below:

- Align the head of the fiber jumper with the optical interface and insert the optical fiber into the interface gently.
- To remove the fiber, press the latch on the connector and pull the fiber out.

Figure 13-10 shows the SC/PC fiber connector.

Figure 13-10 SC/PC fiber connector

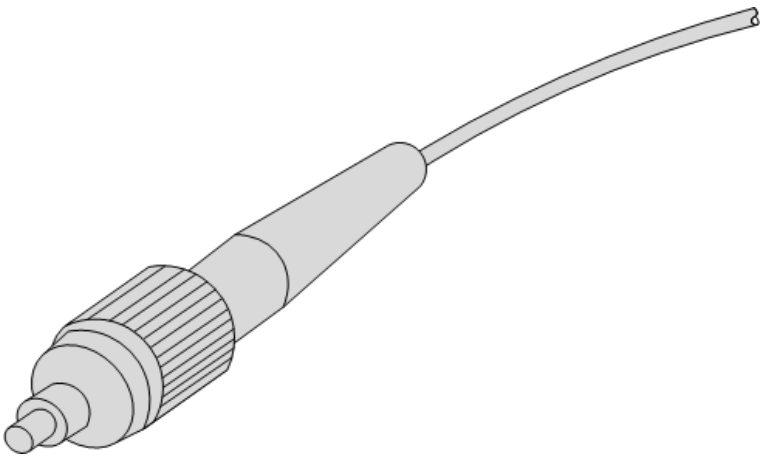


When connecting or removing the SC/PC optical connector, align the connector with the optical interface, and do not rotate the fiber. Operate the fiber as below:

- Align the head of the fiber jumper with the optical interface and insert the optical fiber into the interface gently.
- To remove the fiber, press the latch on the connector and pull the fiber out.

Figure 13-11 shows the FC/PC fiber connector.

Figure 13-11 FC/PC fiber connector



When connecting or removing the FC/PC optical connector, operate the fiber as below:

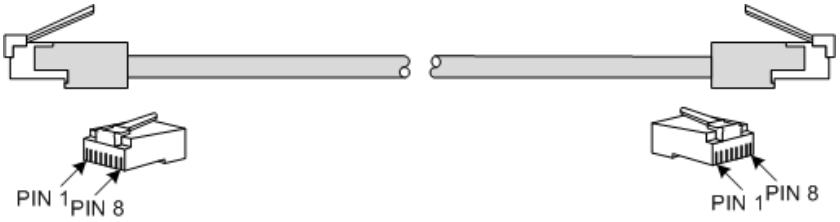
- Align the head of the fiber jumper with the optical interface to avoid damaging the ceramic inner tube, and insert the optical fiber into the interface gently to the bottom. Then, rotate the screw set clockwise tightly.
- To remove the fiber, rotate the screw set anticlockwise. When the screw set is loose, pull the fiber out.

13.8 Ethernet cable

13.8.1 Appearance

Figure 13-12 shows the Ethernet cable.

Figure 13-12 Ethernet cable



13.8.2 Wiring

Table 13-11 lists wiring of the 100/1000 Mbit/s straight-through cable.

Table 13-11 Wiring of the 100/1000 Mbit/s straight-through cable

Connector 1 (RJ45)	Connector 2 (RJ45)	Color	Remarks
PIN 1	PIN 1	White/Orange	Twisted pair
PIN 2	PIN 2	Orange	
PIN 3	PIN 3	White/Green	Twisted pair

Connector 1 (RJ45)	Connector 2 (RJ45)	Color	Remarks
PIN 4	PIN 4	Blue	
PIN 5	PIN 5	White/Blue	Twisted pair
PIN 6	PIN 6	Green	
PIN 7	PIN 7	White/Brown	Twisted pair
PIN 8	PIN 8	Brown	

Table 13-12 lists wiring of the 100 Mbit/s crossover cable.

Table 13-12 Wiring of the 100 Mbit/s crossover cable

Connector 1 (RJ45)	Connector 2 (RJ45)	Color	Remarks
PIN 1	PIN 3	White/Orange	Twisted pair
PIN 2	PIN 6	Orange	
PIN 3	PIN 1	White/Green	Twisted pair
PIN 6	PIN 2	Green	
PIN 4	PIN 4	Blue	Twisted pair
PIN 5	PIN 5	White/Blue	
PIN 7	PIN 7	White/Brown	Twisted pair
PIN 8	PIN 8	Brown	

Table 13-13 lists wiring of the 1000 Mbit/s crossover cable.

Table 13-13 Wiring of the 1000 Mbit/s crossover cable

Connector 1 (RJ45)	Connector 2 (RJ45)	Color	Remarks
PIN 1	PIN 3	White/Orange	Twisted pair
PIN 2	PIN 6	Orange	
PIN 3	PIN 1	White/Green	Twisted pair
PIN 6	PIN 2	Green	
PIN 4	PIN 7	Blue	Twisted pair
PIN 5	PIN 8	White/Blue	
PIN 7	PIN 4	White/Brown	Twisted pair
PIN 8	PIN 5	Brown	

13.9 E1 cable

13.9.1 Model

Figure 13-14 lists models of the E1 cable.

Table 13-14 Models of the E1 cable

Model	Description
CBL-E1-DB37F(40)/16NC-D	(Oblique head) dB37 female interface to 16-way suspended E1 cable. The length can be customized to 2.5 m, 5 m, 10 m, 15 m, and 25 m.
CBL-E1-DB37F/16BNCM-D	DB37 female interface to 8 pair BNC male interface. The length can be customized to 2.5 m, 5 m, 10 m, 15 m, and 25 m.
CBL-E1-DB37F/8RJ45	DB37 female interface to 8 way RJ45 interface. The cable is used to transmit 120 Ω balanced signals.

13.9.2 Appearance

Figure 13-13, Figure 13-14, and Figure 13-15 show the appearance of E1 cables.

Figure 13-13 Appearance of the CBL-E1-DB37F(40)/16NC cable and connector

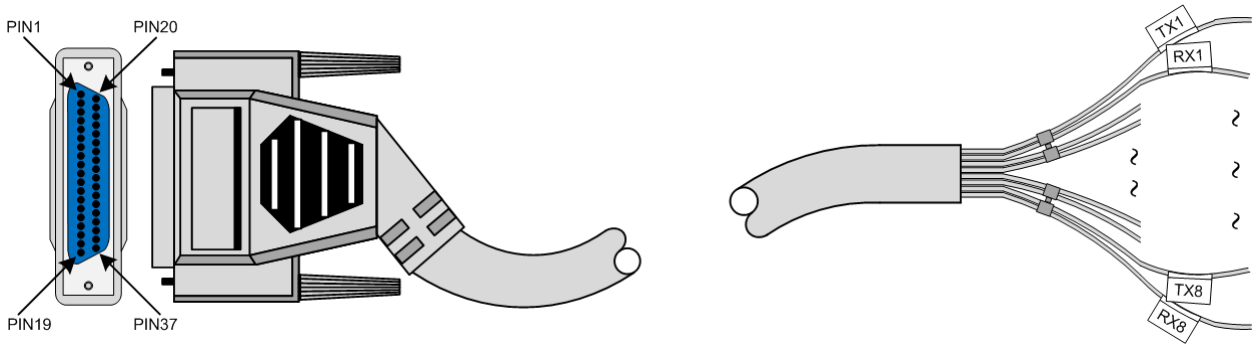


Figure 13-14 Appearance of the CBL-E1-DB37F/16BNCM cable and connector

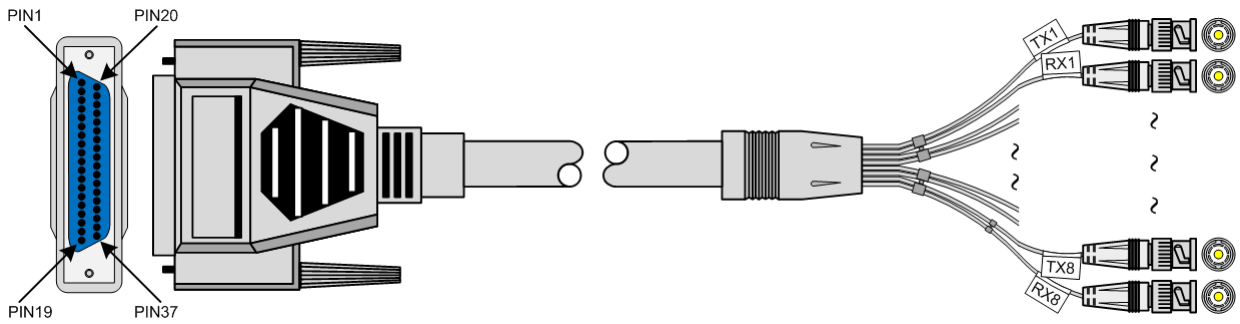
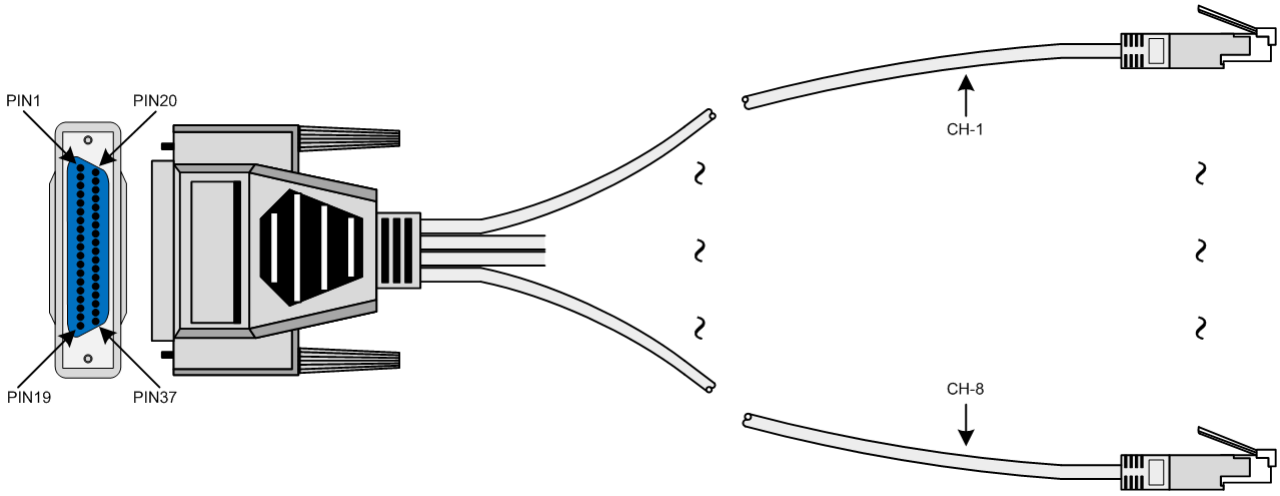


Figure 13-15 Appearance of the CBL-E1-DB37F/8RJ45 cable and connector



13.10 V.24/V.24H cable

13.10.1 Model

Table 13-15 lists models of the V.24/V.24H cable.

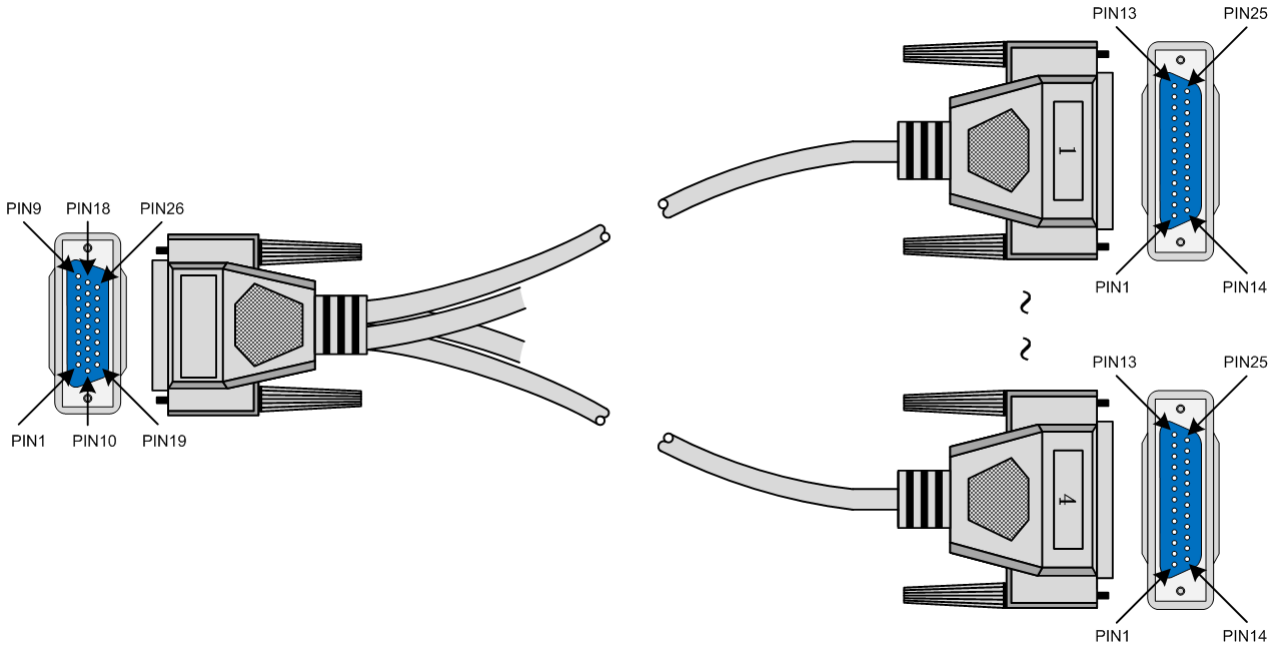
Table 13-15 Models of the V.24/V.24H cable

Model	Description
CBL-V24-HDB26M/4DB25M-D	HDB26 male interface to 4 DB25 male interfaces
CBL-V24-HDB26M/4DB25F-D	HDB26 male interface to 4 DB25 female interfaces
CBL-V24H-HDB26M/2DB25F-D	HDB-2 male interface to 2 DB-25 female interfaces
CBL-V24H-HDB26M/2DB25M-D	HDB-26 male interface to 2 DB-25 male interfaces

13.10.2 Appearance

Figure 13-16 shows the appearance of the V.24 cable.

Figure 13-16 Appearance of the CBL-V24-HDB26M/4DB25M-D cable



13.10.3 PIN definitions

CBL-V24-HDB26M/4DB25F (DCE cable)

The CBL-V24-HDB26M/4DB25F cable is a DB26 male connector-to-4-way DB25 female connector cable. It is used to connect the DTE (male connector).

Table 13-16 CBL-V24-HDB26M/4DB25F

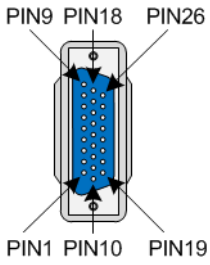
Figure	HDB26M PIN	DB25F PIN		Definition	Channel	Direction	
						DTE→DCE	DCE→DTE
HDB26M  DB25F	Connected to the shell	1		PG	Channel 1		
	7	3		RXD			√
	17	2		TXD		√	
	8	15		TXC			√
		17		RXC			
	18	24		SCTE		√	
	25, 26	7		SG			
		4	Short connected	RTS		√	
		5		CTS			√
		6	Short connected	DSR			√
		8		DCD			√

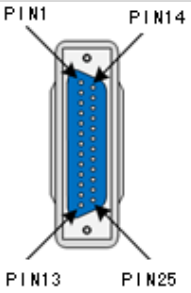
Figure	HDB26M PIN	DB25F PIN		Definition	Channel	Direction	
						DTE→DCE	DCE→DTE
		20		DTR		√	
	Connected to the shell	1		PG	Channel 2		
	5	3		RXD			√
	15	2		TXD		√	
	6	15		TXC			√
		17		RXC			
	16	24		SCTE		√	
	23, 24	7		SG			
		4	Short connected	RTS		√	
		5		CTS			√
		6	Short connected	DSR			√
		8		DCD			√
		20		DTR		√	
	Connected to the shell	1		PG	Channel 3		
	3	3		RXD			√
	13	2		TXD		√	
	4	15		TXC			√
		17		RXC			
	14	24		SCTE		√	
	21, 22	7		SG			
		4	Short connected	RTS		√	
		5		CTS			√
		6	Short connected	DSR			√
		8		DCD			√
		20		DTR		√	
	Connected to the shell	1		PG	Channel 4		
	1	3		RXD			√
	11	2		TXD		√	

Figure	HDB26M PIN	DB25F PIN		Definition	Channel	Direction	
						DTE→DCE	DCE→DTE
	2	15, 17 (two PINs are short connected)		RXC			√
	12	24		TXC		√	
	19, 20	7		SG			
		4	Short connected	RTS		√	
		5		CTS			√
		6	Short connected	DSR			√
		8		DCD			√
		20		DTR		√	

CBL-V24-HDB26M/4DB25M (DTE cable)

The CBL-V24-HDB26M/4DB25M cable is a DB26 male connector-to-4-way DB25 male connector cable. It is used to connect the DCE (female connector).

Table 13-17 CBL-V24-HDB26M/4DB25M

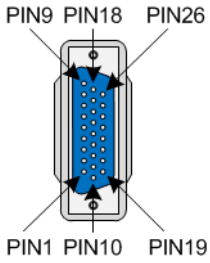
Figure	HDB26M PIN	DB25F PIN		Definition	Channel	Direction	
						DTE→DCE	DCE→DTE
HDB26M  DB25M	Connected to the shell	1		PG	Channel 1		
	17	3		RXD			√
	7	2		TXD		√	
	18	15		TXC			√
		17		RXC			
	8	24		SCTE		√	
	25, 26	7		SG			
		4	Short connected	RTS		√	
		5		CTS			√
		6	Short connected	DSR			√
		8		DCD			√
		20		DTR		√	

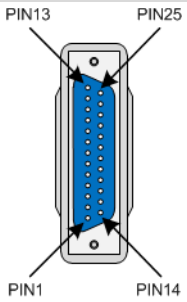
Figure	HDB26M PIN	DB25F PIN		Definition	Channel	Direction	
						DTE→DCE	DCE→DTE
	Connected to the shell	1		PG	Channel 2		
	15	3		RXD			√
	5	2		TXD		√	
	16	15		TXC			√
		17		RXC			
	6	24		SCTE		√	
	23, 24	7		SG			
		4	Short connected	RTS		√	
		5		CTS			√
		6	Short connected	DSR			√
		8		DCD			√
		20		DTR		√	
	Connected to the shell	1		PG	Channel 3		
	13	3		RXD			√
	3	2		TXD		√	
	14	15		TXC			√
		17		RXC			
	4	24		SCTE		√	
	21, 22	7		SG			
		4	Short connected	RTS		√	
		5		CTS			√
		6	Short connected	DSR			√
		8		DCD			√
		20		DTR		√	
	Connected to the shell	1		PG	Channel 4		
	11	3		RXD			√
	1	2		TXD		√	

Figure	HDB26M PIN	DB25F PIN		Definition	Channel	Direction	
						DTE→DCE	DCE→DTE
	12	15, 17 (two PINs are short connected)		RXC			√
	2	24		TXC		√	
	19, 20	7		SG			
		4	Short connected	RTS		√	
		5		CTS			√
		6	Short connected	DSR			√
		8		DCD			√
		20		DTR		√	

CBL-V24H-HDB26M/2DB25F-D

Table 13-18 list PIN definitions of the CBL-V24H-HDB26M/2DB25F-D cable.

Table 13-18 PIN definitions of the CBL-V24H-HDB26M/2DB25F-D cable

	DB25 female interface			HDB26 male interface	
	Definition	PIN		PIN	Remarks
No. 1 way	FGND	1, connected to the shell	——	Connected to the shell	
	RD_1	3	<——	8	
	TD_1	2	——>	18	
	RC_1	17	<——	23	
	TC_1	24	——>	15	
	DTR_1	20	——>	17	PINs 8 and 20 are short-circuited at DB25 female connector side.
	GND	7	——	20	PINs 20, 21, and 22 are short-circuited at DB26 male connector side.
	DSR_1	6	<——	7	
	RTS_1	4	——>	16	

	DB25 female interface			HDB26 male interface	
	Definition	PIN		PIN	Remarks
	CTS_1	5	<——	6	
No. 2 way	FGND	1, connected to the shell	——	Connected to the shell	
	RD_2	3	<——	3	
	TD_2	2	——>	14	
	RC_2	17	<——	19	
	TC_2	24	——>	11	
	DTR_2	20	——>	13	PINs 8 and 20 are short-circuited at DB25 female connector side.
	GND	7	——	21	PINs 20, 21, and 22 are short-circuited at DB26 male connector side.
	DSR_2	6	<——	2	
	RTS_2	4	——>	12	
	CTS_2	5	<——	1	
	PINs 24 and 25 are short-circuited at DB26 male connector side. They are not connected to external devices.				

CBL-V24H-HDB26M/2DB25M-D

Table 13-19 lists PIN definitions of the CBL-V24H-HDB26M/2DB25M-D cable.

Table 13-19 PIN definitions of the CBL-V24H-HDB26M/2DB25M-D cable

	DB25 male interface			HDB26 male interface	
	Definition	PIN		PIN	Remarks
No. 1 way	FGND	1, connected to the shell	——	Connected to the shell	
	RD_1	3	——>	18	
	TD_1	2	<——	8	
	RC_1	17	——>	15	
	TC_1	24	<——	23	

	DB25 male interface			HDB26 male interface	
	Definition	**PIN**		**PIN**	**Remarks**
	DTR_1	20	<——	7	
	GND	7	——	20	PINs 20, 21, and 22 are short-circuited at DB26 male connector side.
	DSR_1	6	——>	17	
	RTS_1	4	<——	6	
	CTS_1	5	——>	16	
No. 2 way	FGND	1, connected to the shell	——	Connected to the shell	
	RD_2	3	——>	14	
	TD_2	2	<——	3	
	RC_2	17	——>	11	
	TC_2	24	<——	19	
	DTR_2	20	<——	2	
	GND	7	——	21	PINs 20, 21, and 22 are short-circuited at DB26 male connector side.
	DSR_2	6	——>	13	
	RTS_2	4	<——	1	
	CTS_2	5	——>	12	
	PINs 24 and 26 are short-circuited at DB26 male connector side. They are not connected to external devices.				

13.11 V.35 cable

13.11.1 Model

Table 13-20 lists models of the V.25 cable.

Table 13-20 Models of the V.25 cable

Model	Description
CBL-V35-HDB26M/2M34F-D	HDB26 male interface to 2-way M34 female interface DCE cable
CBL-V35-HDB26M/2M34M-D	HDB26 male interface to 2-way M34 male interface DTE cable
CBL-V35-HDB26M/M34F-2m/RoHS	HDB26 male interface to 1-way M34 male interface DCE cable

13.11.2 Appearance

Figure 13-17, Figure 13-18, and Figure 13-19 show the appearance of V.35 cables.

Figure 13-17 Appearance of the CBL-V35-HDB26M/2M34F cable and connector

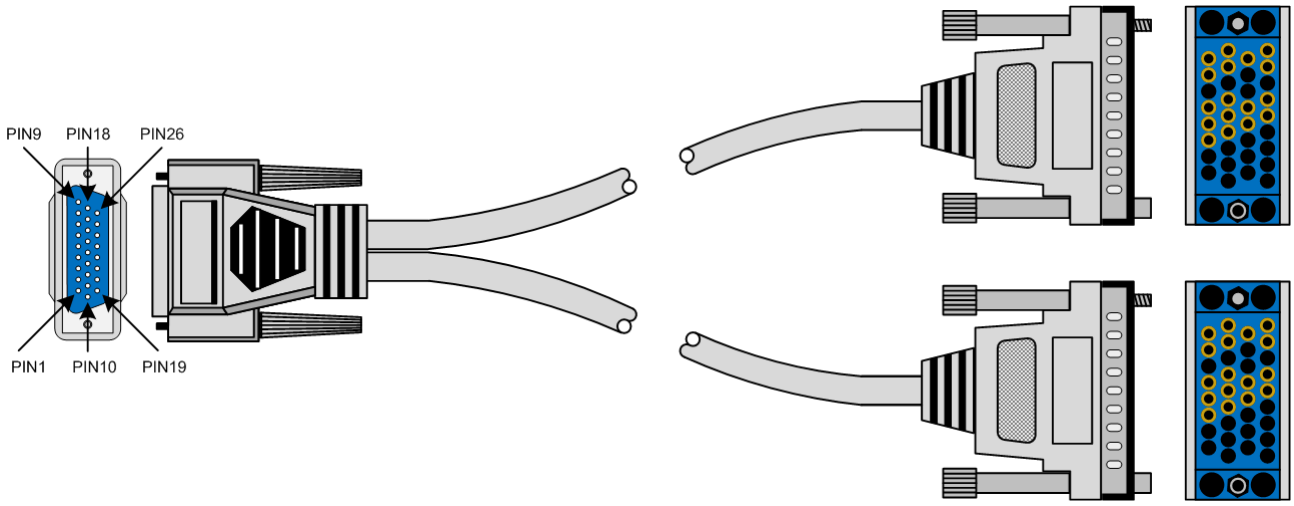


Figure 13-18 Appearance of the CBL-V35-HDB26M/2M34M cable and connector

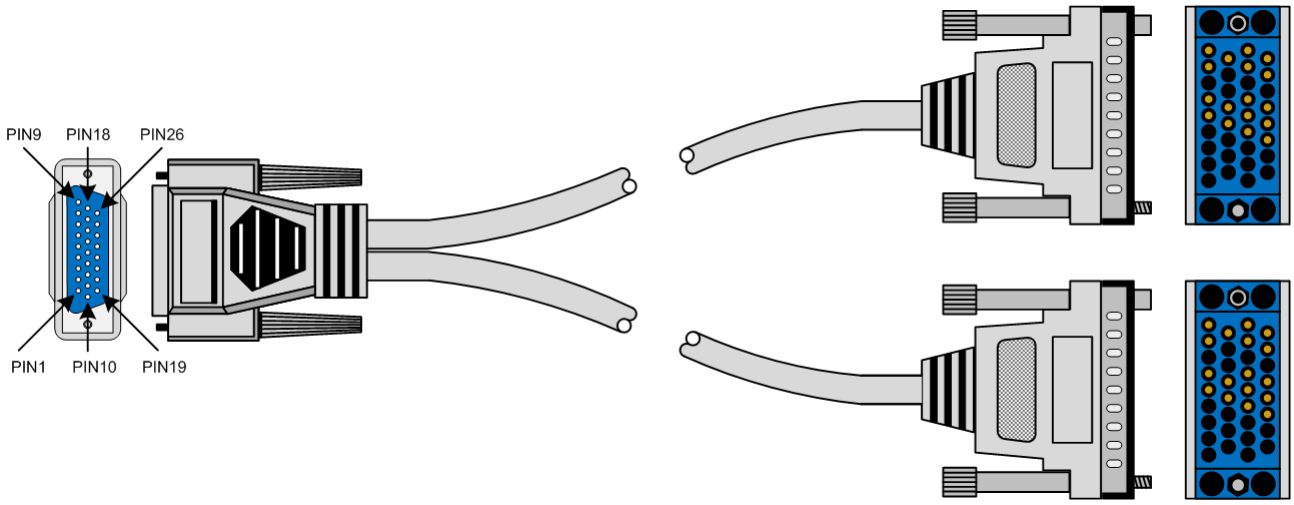
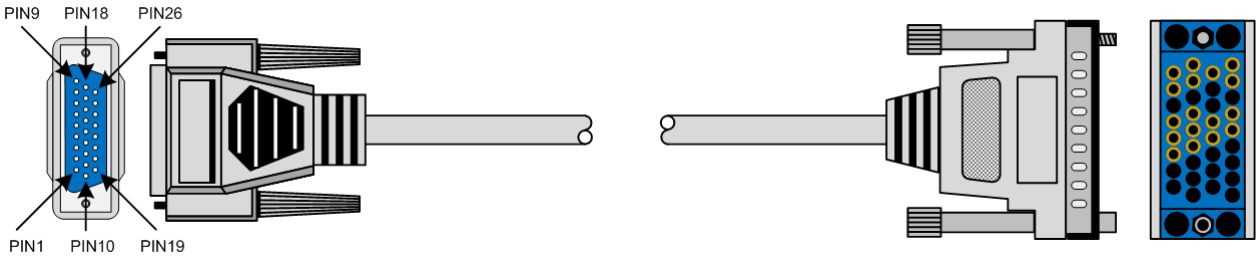


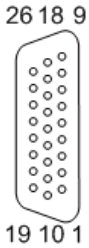
Figure 13-19 Appearance of the CBL-V35-HDB26M/M34F-2m/RoHS and connector



13.11.3 PIN definitions of CBL-V35-HDB26M/2M34F and CBL-V35-HDB26M/2M34M

Table 13-21 lists PIN definitions of CBL-V35-HDB26M/2M34F and CBL-V35-HDB26M/2M34M.

Table 13-21 PIN definitions of the CBL-V35-HDB26M/2M34F and CBL-V35-HDB26M/2M34M

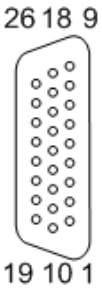
HDB26	HDB26 PIN	Definition of No. 1 way of V.35 data	Definition of No. 2 way of V.35 data
	1	PGND	–
	2	TD(A)	–
	3	RD(A)	–
	4	–	–
	5	–	RD(A)
	6	–	RD(B)
	7	GND	–
	8	–	RCP(A)
	9	–	RCP(B)
	10	–	TD(A)
	11	TD(B)	–
	12	–	SCTE(A)
	13	–	SCTE(B)
	14	–	TCP(A)
	15	TCP(A)	–
	16	SCTE(B)	–
	17	RCP(A)	–
	18	–	PGND
	19	–	TD(B)

HDB26	HDB26 PIN	Definition of No. 1 way of V.35 data	Definition of No. 2 way of V.35 data
	20	–	–
	21	RD(B)	–
	22	–	TCP(B)
	23	TCP(B)	–
	24	SCTE(A)	–
	25	RCP(B)	–
	26	–	GND

13.11.4 PIN definitions of CBL-V35-HDB26M/M34F-2m/RoHS

Table 13-22 lists PIN definitions of the CBL-V35-HDB26M/M34F-2m/RoHS

Table 13-22 PIN definitions of the CBL-V35-HDB26M/M34F-2m/RoHS

HDB26	HDB26 PIN	Definition of V.35 data	Definition of ISO2593 (M34 female)
	1	PGND	A
	2	TD(A)	P
	3	RD(A)	R
	4	RTS	C
	5	CTS	D
	6	DSR	E
	7	GND	B
	8	DCD	F
	9	–	–
	10	–	–
	11	TD(B)	S
	12	–	–
	13	–	–
	14	–	–
	15	TCP(A)	Y
	16	SCTE(B)	W
	17	RCP(A)	V

HDB26	HDB26 PIN	Definition of V.35 data	Definition of ISO2593 (M34 female)
	18	–	–
	19	–	–
	20	DTR	H
	21	RD(B)	T
	22	–	–
	23	TCP(B)	AA
	24	SCTE(A)	U
	25	RCP(B)	X
	26	–	–

13.12 RS232/RS232H cable

13.12.1 Model

The maximum length of the cable used for the RS232 interface is 15 m based on RS232 standard.

Table 13-23 lists models of the RS232/RS232H cable.

Table 13-23 Models of the RS232/RS232H cable

Model	Description
CBL-RS232-HDB26M/8DB9M	HDB26 male interface to 8 DB9 male interfaces
CBL-RS232-HDB26M/8DB9F	HDB26 male interface to 8 DB9 female interfaces
CBL-RS232H-HDB26M/2DB9F-D	HDB-26 male interface to 2 DB9 female interfaces. The length is customized.
CBL-RS232H-HDB26M/2DB9M-D	HDB-26 male interface to 2 DB9 male interfaces. The length is customized.

13.12.2 Appearance

Figure 13-20 Appearance of the CBL-RS232H-HDB26M/2DB9F cable and connector

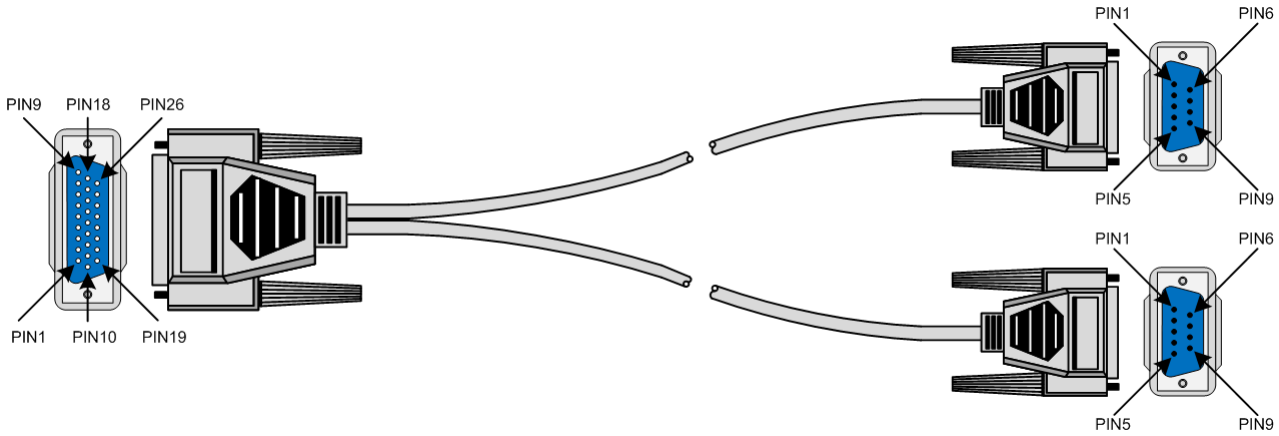
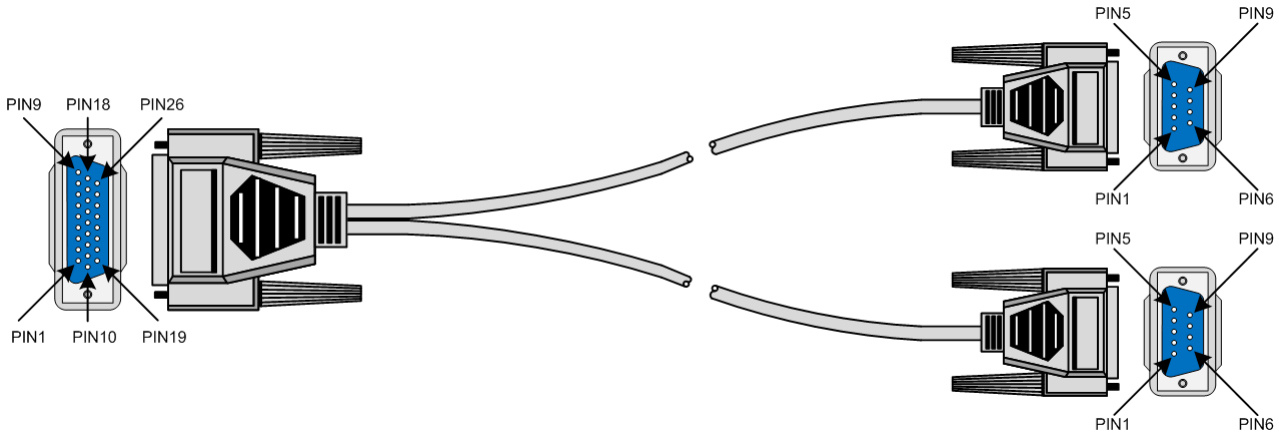


Figure 13-21 Appearance of the CBL-RS232H-HDB26M/2 DB9M cable and connector



13.12.3 PIN definitions

CBL-RS232H-HDB26M/2DB9F

Table 13-24 lists PIN definitions of the CBL-RS232H-HDB26M/2DB9F cable.

Table 13-24 PIN definitions of the CBL-RS232H-HDB26M/2DB9F cable

	DB9 female interface			HDB26 male interface	
	Definition	**PIN**		**PIN**	**Remarks**
No. 1 way	FGND	Connected to the shell	——	Connected to the shell	–
	CD_1	1	<——	5	–
	RD_1	2	<——	8	–
	TD_1	3	——>	18	–

	DB9 female interface			HDB26 male interface	
	Definition	PIN		PIN	Remarks
	DTR_1	4	——>	17	–
	GND	5	——	20	PINs 20, 21, and 22 are short-circuited at DB26 male connector side.
	DSR_1	6	<——	7	–
	RTS_1	7	——>	16	–
	CTS_1	8	<——	6	–
	RI_1	9	<——	9	–
No. 2 way	FGND	Connected to the shell	——	Connected to the shell	–
	CD_2	1	<——	10	–
	RD_2	2	<——	3	–
	TD_2	3	——>	14	–
	DTR_2	4	——>	13	–
	GND	5	——	21	PINs 20, 21, and 22 are short-circuited at DB26 male connector side.
	DSR_2	6	<——	2	–
	RTS_2	7	——>	12	–
	CTS_2	8	<——	1	–
	RI_2	9	<——	4	–
–	–	–	–	–	PINs 24 and 25 are short-circuited at DB26 male connector side, and they are not connected to external devices.
	–	–	–	–	PINs 11, 15, 19, 23, and 26 are suspended and not connected to external devices.

CBL-RS232H-HDB26M/2DB9M

Table 13-25 lists PIN definitions of the CBL-RS232H-HDB26M/2DB9M cable.

Table 13-25 PIN definitions of the CBL-RS232H-HDB26M/2DB9M cable

	DB9 male interface			HDB26 male interface	
	Definition	**PIN**		**PIN**	**Remarks**
No. 1 way	FGND	Connected to the shell	——	Connected to the shell	–
	CD_1	1	——>	15	–
	RD_1	2	——>	18	–
	TD_1	3	<——	8	–
	DTR_1	4	<——	7	–
	GND	5	——	20	PINs 20, 21, and 22 are short-circuited at DB26 male connector side.
	DSR_1	6	——>	17	–
	RTS_1	7	<——	6	–
	CTS_1	8	——>	16	–
	RI_1	9	——>	23	–
No. 2 way	FGND	Connected to the shell	——	Connected to the shell	–
	CD_2	1	——>	11	–
	RD_2	2	——>	14	–
	TD_2	3	<——	3	–
	DTR_2	4	<——	2	–
	GND	5	——	21	PINs 20, 21, and 22 are short-circuited at DB26 male connector side.
	DSR_2	6	——>	13	–
	RTS_2	7	<——	1	–
	CTS_2	8	——>	12	–
	RI_2	9	——>	19	–
–	–	–	–	–	PINs 24 and 26 are short-circuited at DB26 male connector side, and they are not connected to external devices.

	DB9 male interface			HDB26 male interface	
	Definition	PIN		PIN	Remarks
	–	–	–	–	PINs 4, 5, 9, 10, and 25 are suspended and not connected to external devices.

13.13 Audio cable

13.13.1 Model

Table 13-26 lists models of the audio cable.

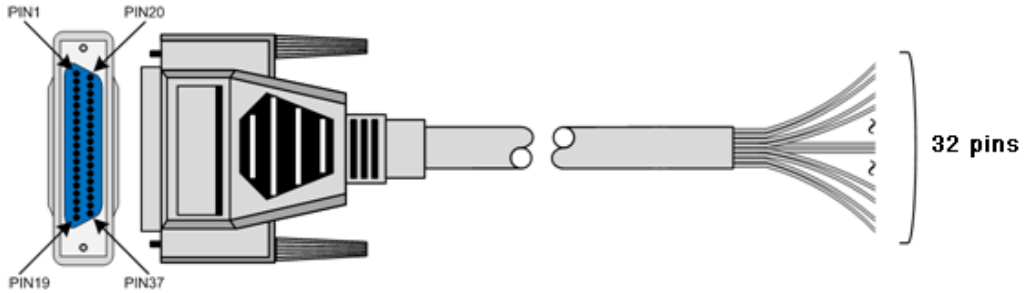
Table 13-26 Models of the audio cable

Model	Description
CBL-VOICE-DB37F(40)/NC-2.5m	(Oblique head) M37 female interface to suspended audio cable
CBL-VOICE-DB37F/NC-D	M37 female interface to suspended audio cable. The length can be customized.

13.13.2 Appearance

Figure 13-22 shows the appearance of the audio cable.

Figure 13-22 Appearance of the CBL-VOICE-DB37F/NC-D cable and connector

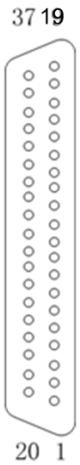


13.13.3 Cable colors

CBL-VOICE-DB37F/NC-D

Table 13-27 lists colors of the CBL-VOICE-DB37F/NC-D cable.

Table 13-27 Colors of the CBL-VOICE-DB37F/NC-D cable

DB37F figure	DB37F	PIN definition	Cable color	Group color
	3	CHANN1+	Blue/White	White
	21	CHANN1-	White/Blue	
	4	CHANN2+	Green/White	
	22	CHANN2-	White/Green	
	5	CHANN3+	Orange/White	
	23	CHANN3-	White/Orange	
	6	CHANN4+	Brown/White	
	24	CHANN4-	White/Brown	
	7	CHANN5+	Gray/White	
	25	CHANN5-	White/Gray	
	8	CHANN6+	Blue/Red	Red
	26	CHANN6-	Red/Blue	
	9	CHANN7+	Green/Red	
	27	CHANN7-	Red/Green	
	10	CHANN8+	Orange/Red	
	28	CHANN8-	Red/Orange	
	11	CHANN9+	Brown/Red	
	29	CHANN9-	Red/Brown	
	12	CHANN10+	Gray/Red	
	30	CHANN10-	Red/Gray	
	13	CHANN11+	Blue/Black	Black
	31	CHANN11-	Black/Blue	
	14	CHANN12+	Green/Black	
	32	CHANN12-	Black/Green	
	15	CHANN13+	Orange/Black	
	33	CHANN13-	Black/Orange	
	16	CHANN14+	Brown/Black	
	34	CHANN14-	Black/Brown	

DB37F figure	DB37F	PIN definition	Cable color	Group color
	17	CHANN15+	Gray/Black	
	35	CHANN15-	Black/Gray	
	18	CHANN16+	Blue/Yellow	Yellow
	36	CHANN16-	Yellow/Blue	
	1	–	–	–
	2	–	–	–
	19	–	–	–
	20	–	–	–
	37	–	–	–

13.14 MUL cable

13.14.1 Model

Table 13-28 lists models of the MUL cable.

Table 13-28 Models of the MUL cable

Model	Description
CBL-MUL-HDB26M/NC-D	HDB26 male interface to 4-way suspended multifunction cable. The length can be customized to 2.5 m, 5 m, 10 m, 15 m, and 25 m.

13.14.2 Appearance

Figure 13-23 Appearance of the CBL-MUL-HDB26M/NC-D cable and connector

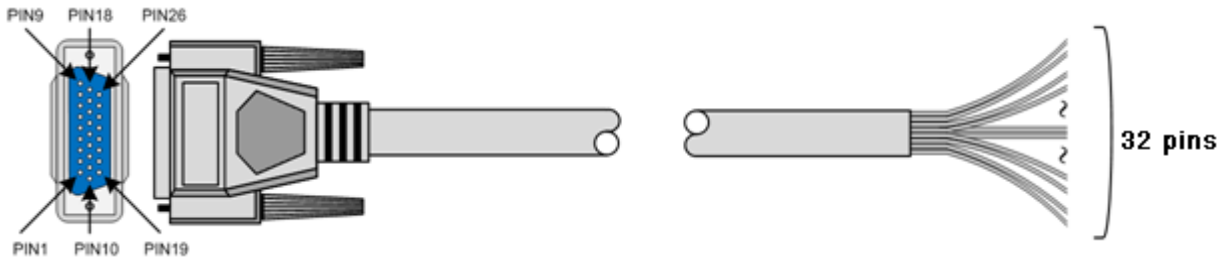
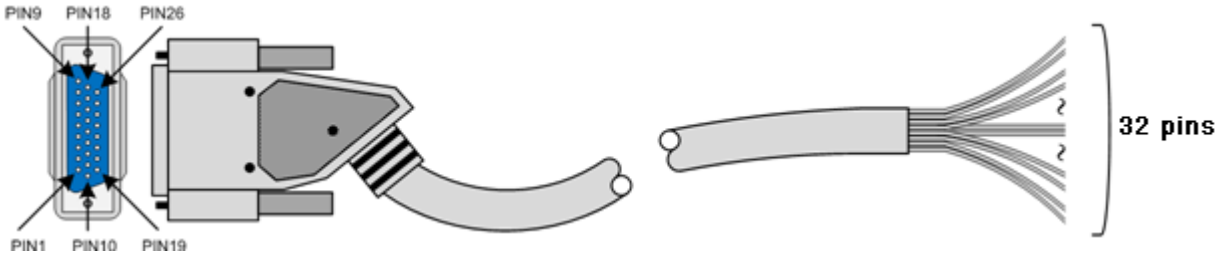


Figure 13-24 Appearance of the CBL-MUL-HDB26M(40)/NC-D cable and connector

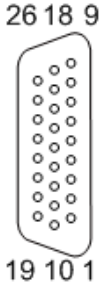


13.14.3 Cable colors

You can use the CBL-MUL-HDB26M/NC cable to make the RS232 cable. It has 4 independent channels which can respectively be made into the V24, RS232, RS422, and RS485 cable according to the wiring of the corresponding cable.

CBL-MUL-HDB26M/NC (V24 wiring)

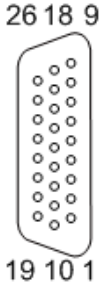
Table 13-29 Color patterns of the CBL-MUL-HDB26M/NC cable (V24 wiring)

HDB26M figure	HDB26M	PIN definition	Color	Direction		Channel
				DTE→DCE	DCE→DTE	
26 18 9  19 10 1	7	RXD	Green/Red		√	Channel 1
	17	TXD	Red/Green	√		
	8	TXC	Blue/Red		√	
		RXC				
	18	SCTE	Green/Red	√		
	25	SG	Green/Black			
			Black/Green			
	26	SG	Blue/Black			
			Black/Blue			
	5	RXD	Brown/Red		√	Channel 2
	15	TXD	Red/Brown	√		
	6	TXC	Orange/Red		√	
		RXC				
	16	SCTE	Brown/Red	√		
	23	SG	Brown/Black			
			Black/Brown			
	24	SG	Orange/Black			

			Black/Orange			
	3	RXD	Green/White		√	Channel 3
	13	TXD	White/Green	√		
	4	TXC	Grey/Red		√	
		RXC				
	14	SCTE	Green/White	√		
	21	SG	Grey/White			
			White/Grey			
	22	SG	Grey/Black			
			Black/Grey			
	1	RXD	Blue/White		√	Channel 4
	11	TXD	White/Blue	√		
	2	TXC	Orange/White		√	
		RXC				
	12	SCTE	Blue/White	√		
	19	SG	Blue/Yellow			
			Yellow/Blue			
	20	SG	Brown/White			
			White/Brown			
	Note To use handshake signals, short connect PIN 4 and PIN5, PIN 6, PIN 8, and PIN 20 at the DB25 side.					

CBL-MUL-HDB26M/NC (RS422 wiring)

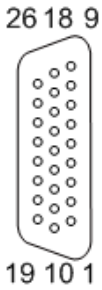
Table 13-30 Color patterns of the CBL-MUL-HDB26M/NC cable (RS422 wiring)

HDB26M figure	HDB26M	PIN definition	Color	Direction		Channel
				DTE→DCE	DCE→DTE	
	7	RXD+	Green/Red		√	Channel 1
	17	TXD+	Red/Green	√		
	8	RXD-	Blue/Red		√	
	18	TXD-	Red/Blue	√		
	5	RXD+	Brown/Red		√	Channel 2
	15	TXD+	Red/Brown	√		
	6	RXD-	Orange/Red		√	
	16	TXD-	Red/Orange	√		
	3	RXD+	Green/White		√	Channel 3
	13	TXD+	White/Green	√		
	4	RXD-	Grey/Red		√	
	14	TXD-	Red/Grey	√		
	1	RXD+	Blue/White		√	Channel 4
	11	TXD+	White/Blue	√		
	2	RXD-	Orange/White		√	
	12	TXD-	White/Orange	√		
	22	GND5	Grey/Black			
			Black/Grey			
	23	GND4	Brown/Black			
			Black/Brown			
	24	GND3	Orange/Black			
			Black/Orange			
	25	GND2	Green/Black			
			Black/Green			

	26	GND1	Blue/Black			
			Black/Blue			
	20	GND7	Brown/White			
			White/Brown			
	21	GND6	Grey/White			
			White/Grey			
	19	GND6	Blue/Yellow			
			Yellow/Blue			

CBL-MUL-HDB26M/NC (RS485 wiring)

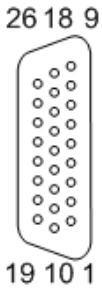
Table 13-31 Color patterns of the CBL-MUL-HDB26M/NC cable (RS485 wiring)

HDB26M figure	HDB26M	PIN definition	Color	Direction		Channel
				DTE→DCE	DCE→DTE	
	7	485+	Green/Red		√	Channel 1
	17	–	Red/Green	√		
	8	485-	Blue/Red		√	
	18	–	Red/Blue	√		
	5	485+	Brown/Red		√	Channel 2
	15	–	Red/Brown	√		
	6	485-	Orange/Red		√	
	16	–	Red/Orange	√		
	3	485+	Green/White		√	Channel 3
	13	–	White/Green	√		
	4	485-	Grey/Red		√	
	14	–	Red/Grey	√		
	1	485+	Blue/White		√	Channel 4
	11	–	White/Blue	√		
	2	485-	Orange/White		√	
	12	–	White/Orange	√		
	22	GND5	Grey/Black			
			Black/Grey			

	23	GND4	Brown/Black			
			Black/Brown			
	24	GND3	Orange/Black			
			Black/Orange			
	25	GND2	Green/Black			
			Black/Green			
	26	GND1	Blue/Black			
			Black/Blue			
	20	GND7	Brown/White			
			White/Brown			
	21	GND6	Grey/White			
			White/Grey			
	19	GND6	Blue/Yellow			
			Yellow/Blue			

CBL-MUL-HDB26M/NC (RS232 wiring)

Table 13-32 Color patterns of the CBL-MUL-HDB26M/NC cable (RS232 wiring)

HDB26M figure	HDB26M	PIN definition	Color	Direction		Channel
				DTE→DCE	DCE→DTE	
	7	RXD	Green/Red		√	Channel 1
	17	TXD	Red/Green	√		
	8	–	Blue/Red		√	
	18	–	Red/Blue	√		
	5	RXD	Brown/Red		√	Channel 2
	15	TXD	Red/Brown	√		
	6	–	Orange/Red		√	
	16	–	Red/Orange	√		
	3	RXD	Green/White		√	Channel 3
	13	TXD	White/Green	√		
	4	–	Grey/Red		√	
	14	–	Red/Grey	√		
	1	RXD	Blue/White		√	Channel 4
	11	TXD	White/Blue	√		
	2	–	Orange/White		√	

	12	–	White/Orange	√		
	22	GND5	Grey/Black			
			Black/Grey			
	23	GND4	Brown/Black			
			Black/Brown			
	24	GND3	Orange/Black			
			Black/Orange			
	25	GND2	Green/Black			
			Black/Green			
	26	GND1	Blue/Black			
			Black/Blue			
	20	GND7	Brown/White			
			White/Brown			
	21	GND6	Grey/White			
			White/Grey			
	19	GND6	Blue/Yellow			
			Yellow/Blue			

13.15 E&M cable

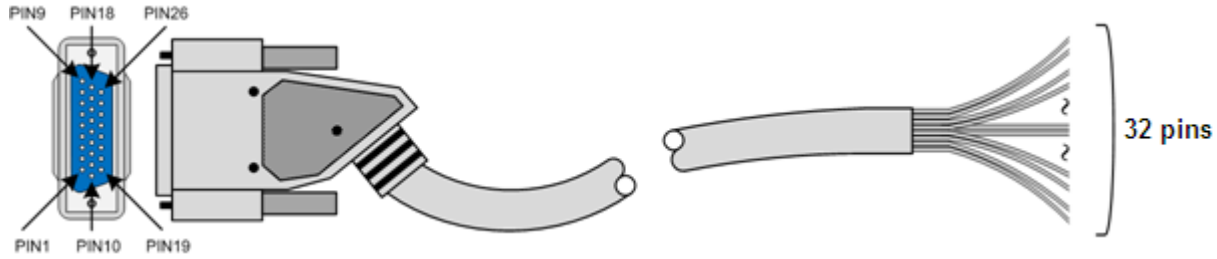
13.15.1 Model

Model	Description
CBL-EM-HDB26M/NC	HDB26 male interface to 4-way suspended E&M cable, supporting customizing length to 2.5/5/10/15/25 m

13.15.2 Appearance

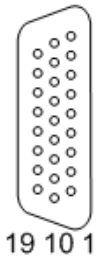
Figure 13-25 shows the appearance of the E&M cable.

Figure 13-25 Appearance of the CBL-EM-HDB26M/NC and connector



13.15.3 Cable colors

CBL-EM-HDB26M/NC

HDB26F figure	HDB26M	PIN definition	E&M channel	Description	Cable color	Group color	Major color
	7	R_A1	No.1 way	• Audio RX A in 4-wire mode • Idle in 2-wire mode	White background with blue loop	Blue	White
	17	R_B1		• Audio RX B in 4-wire mode • Idle in 2-wire mode	Blue background with white loop		
	8	T/RA_1		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode	White background with orange loop	Orange	
	18	T/RB_1		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode	Orange background with white loop		

HDB26F figure	HDB26M	PIN definition	E&M channel	Description	Cable color	Group color	Major color
	25	E1		E signaling cable	White background with green loop	Green	
	26	M1		M signaling cable	Green background with white loop		
	5	R_A2	No.2 way	• Audio RX A in 4-wire mode • Idle in 2-wire mode	White background with brown loop	Brown	
	15	R_B2		• Audio RX B in 4-wire mode • Idle in 2-wire mode	Brown background with white loop		
	6	T/RA_2		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode	White background with grey loop	Grey	
	16	T/RB_2		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode	Grey background with white loop		
	23	E2		E signaling cable	Red background with blue loop	Blue	Red
	24	M2		M signaling cable	Blue background with red loop		

HDB26F figure	HDB26M	PIN definition	E&M channel	Description	Cable color	Group color	Major color
	3	R_A3	No.3 way	• Audio RX A in 4-wire mode • Idle in 2-wire mode	Red background with orange loop	Orange	
	13	R_B3		• Audio RX B in 4-wire mode • Idle in 2-wire mode	Orange background with red loop		
	4	T/RA_3		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode	Red background with green loop	Green	
	14	T/RB_3		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode	Green background with red loop		
	21	E3		E signaling cable	Red background with brown loop	Brown	
	22	M3		M signaling cable	Brown background with red loop		
	1	R_A4	No.4 way	• Audio RX A in 4-wire mode • Idle in 2-wire mode	Red background with grey loop	Grey	

HDB26F figure	HDB26M	PIN definition	E&M channel	Description	Cable color	Group color	Major color
	11	R_B4		• Audio RX B in 4-wire mode • Idle in 2-wire mode	Grey background with red loop		
	2	T/RA_4		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode	Black background with blue loop	Blue	Black
	12	T/RB_4		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode	Blue background with black loop		
	19	E4		E signaling cable	Black background with orange loop	Orange	
	20	M4		M signaling cable	Orange background with black loop		
	9	NC	–	Idle	Black background with green loop	Green	
	10	NC	–	Idle	Green background with black loop		

14 Appendix

This chapter lists wiring, terms, acronyms, and abbreviations involved in this document, including the following sections:

- Wiring
- Terms
- Acronyms and abbreviations

14.1 Wiring

When you order the device, we recommend ordering corresponding cables together. When you need to make cables by yourself due to cable faults, follow this section.

14.1.1 CBL-E1-DB37F/16BNCF

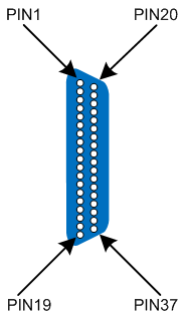
Figure	PIN	Signal	Definition	Chanel
DB37F 	3	OUT1-	TX1	Channel 1
	4	OUT1+		
	21	IN1+	RX1	
	22	IN1-		
	5	OUT2-	TX2	Channel 2
	6	OUT2+		
	23	IN2+	RX2	
	24	IN2-		
	7	OUT3-	TX3	Channel 3
	8	OUT3+		
	25	IN3+	RX3	
	26	IN3-		

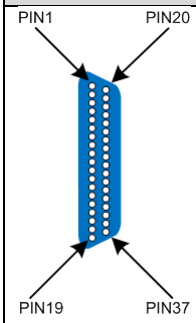
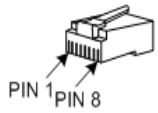
Figure	PIN	Signal	Definition	Chanel
	9	OUT4-	TX4	Channel 4
	10	OUT4+		
	27	IN4+	RX4	
	28	IN4-		
	11	OUT5-	TX5	Channel 5
	12	OUT5+		
	29	IN5+	RX5	
	30	IN5-		
	13	OUT6-	TX6	Channel 6
	14	OUT6+		
	31	IN6+	RX6	
	32	IN6-		
	15	OUT7-	TX7	Channel 7
	16	OUT7+		
	33	IN7+	RX7	
	34	IN7-		
	17	OUT8-	TX8	Channel 8
	18	OUT8+		
	35	IN8+	RX8	
	36	IN8-		

Note

- The PIN marked with "+" is connected to the core of the coaxial cable; namely, it is welded with the core of the coaxial cable.
- The PIN marked with "-" is connected to the shielding layer of the coaxial cable; namely, it is welded with the shielding layer of the coaxial cable.
- The wiring is also applicable to the CBL-E1-DB37F/16BNCM.

14.1.2 CBL-E1-DB37F/8RJ45

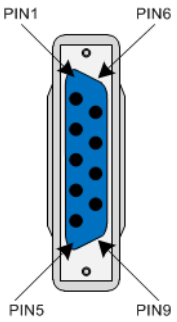
Figure	DB37F PIN	RJ45 PIN	Signal	Definition	Channel
DB37F	3	5	OUT1-	TX1	Channel 1
	4	4	OUT1+		

Figure	DB37F PIN	RJ45 PIN	Signal	Definition	Channel
 RJ45 	21	2	IN1+	RX1	
	22	1	IN1-		
	5	5	OUT2-	TX2	Channel 2
	6	4	OUT2+		
	23	2	IN2+	RX2	
	24	1	IN2-		
	7	5	OUT3-	TX3	Channel 3
	8	4	OUT3+		
	25	2	IN3+	RX3	
	26	1	IN3-		
	9	5	OUT4-	TX4	Channel 4
	10	4	OUT4+		
	27	2	IN4+	RX4	
	28	1	IN4-		
	11	5	OUT5-	TX5	Channel 5
	12	4	OUT5+		
	29	2	IN5+	RX5	
	30	1	IN5-		
	13	5	OUT6-	TX6	Channel 6
	14	4	OUT6+		
	31	2	IN6+	RX6	
	32	1	IN6-		
	15	5	OUT7-	TX7	Channel 7
	16	4	OUT7+		
	33	2	IN7+	RX7	
	34	1	IN7-		
	17	5	OUT8-	TX8	Channel 8
	18	4	OUT8+		
	35	2	IN8+	RX8	
	36	1	IN8-		

Note

RJ45 PIN 5 and PIN 4 are in twisted pair mode. RJ45 PIN 2 and PIN 1 are in twisted pair mode.

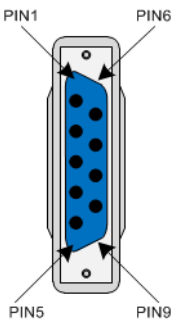
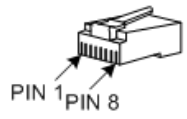
14.1.3 CBL-E1-DB9M/4BNCF

Figure	PIN	Signal	Definition	Channel
DB9M 	1	IN1+	RX1	Channel 1
	6	IN1-		
	2	OUT1+	TX1	
	7	OUT1-		
	3	IN2+	RX2	Channel 2
	8	IN2-		
	4	OUT2+	TX2	
	9	OUT2-		

Note

- The PIN marked with "+" is connected to the core of the coaxial cable; namely, it is welded with the core of the coaxial cable.
- The PIN marked with "-" is connected to the shielding layer of the coaxial cable; namely, it is welded with the shielding layer of the coaxial cable.
- The wiring is also applicable to the CBL-E1-DB9M/4BNCM.

14.1.4 CBL-E1-DB9M/2RJ45

Figure	DB9M PIN	RJ45 PIN	Signal	Definition	Channel
DB9M 	7	5	OUT1-	TX1	Channel 1
	2	4	OUT1+		
	1	2	IN1+	RX1	
	6	1	IN1-		
	9	5	OUT2-	TX2	Channel 2
	4	4	OUT2+		
	3	2	IN2+	RX2	
	8	1	IN2-		
RJ45 					

Note

RJ45 PIN 5 and PIN 4 are in twisted pair mode. RJ45 PIN 2 and PIN 1 are in twisted pair mode.

14.1.5 CBL-VOICE-SCSI50M(40)/NC

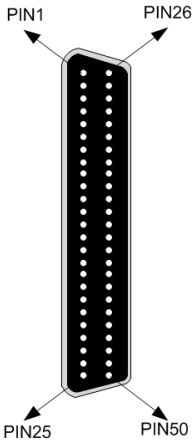
Figure	PIN	Cable color	E&M Channel	Description
SCSI50M 	1	White background with blue loop	Channel 1	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	2	Blue background with white loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	26	White background with orange loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	27	Orange background with white loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	3	White background with green loop		E signaling cable
	4	Green background with white loop		M signaling cable
	28	White background with brown loop	Channel 2	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	29	Brown background with white loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	5	White background with grey loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	6	Grey background with white loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	30	Red background with blue loop		E signaling cable
	31	Blue background with red loop		M signaling cable
	7	Red background with orange loop	Channel 3	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	8	Orange background with red loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	32	Red background with green loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	33	Green background with red loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode

Figure	PIN	Cable color	E&M Channel	Description
	9	Red background with brown loop		E signaling cable
	10	Brown background with red loop		M signaling cable
	34	Red background with grey loop	Channel 4	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	35	Grey background with red loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	11	Black background with blue loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	12	Blue background with black loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	36	Black background with orange loop		E signaling cable
	37	Orange background with black loop		M signaling cable
	13	Black background with green loop	Channel 5	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	14	Green background with black loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	38	Black background with brown loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	39	Brown background with black loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	15	Black background with grey loop		E signaling cable
	16	Grey background with black loop		M signaling cable
	40	Yellow background with blue loop	Channel 6	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	41	Blue background with yellow loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	17	Yellow background with orange loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	18	Orange background with yellow loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	42	Yellow background with green loop		E signaling cable

Figure	PIN	Cable color	E&M Channel	Description
	43	Green background with yellow loop		M signaling cable
	19	Yellow background with brown loop	Channel 7	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	20	Brown background with yellow loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	44	Yellow background with grey loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	45	Grey background with yellow loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	21	Purple background with blue loop		E signaling cable
	22	Blue background with purple loop		M signaling cable
	46	Purple background with orange loop	Channel 8	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	47	Orange background with purple loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	23	Purple background with green loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	24	Green background with purple loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	48	Purple background with brown loop		E signaling cable
	49	Brown background with purple loop		M signaling cable
	25	Purple background with grey loop	–	Idle
	50	Grey background with purple loop	–	Idle

Note

The cable supports up to 8 E&M channels.

14.1.6 CBL-EM-HDB26M/NC

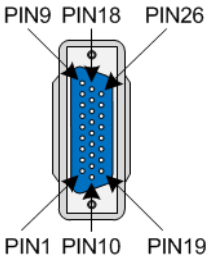
Figure	PIN	Cable color	E&M Channel	Description
HDB26M 	7	White background with blue loop	Channel 1	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	17	Blue background with white loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	8	White background with orange loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	18	Orange background with white loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	25	White background with green loop		E signaling cable
	26	Green background with white loop		M signaling cable
	5	White background with brown loop	Channel 2	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	15	Brown background with white loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	6	White background with grey loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	16	Grey background with white loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	23	Red background with blue loop		E signaling cable
	24	Blue background with red loop		M signaling cable
	3	Red background with orange loop	Channel 3	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	13	Orange background with red loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	4	Red background with green loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	14	Green background with red loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	21	Red background with brown loop		E signaling cable
	22	Brown background with red loop		M signaling cable

Figure	PIN	Cable color	E&M Channel	Description
	1	Red background with grey loop	Channel 4	• Audio RX A in 4-wire mode • Idle in 2-wire mode
	11	Grey background with red loop		• Audio RX B in 4-wire mode • Idle in 2-wire mode
	2	Black background with blue loop		• Audio TX A in 4-wire mode • Audio TX/RX A in 2-wire mode
	12	Blue background with black loop		• Audio TX B in 4-wire mode • Audio TX/RX B in 2-wire mode
	19	Black background with orange loop		E signaling cable
	20	Orange background with black loop		M signaling cable
	9	Black background with green loop	–	Idle
	10	Green background with black loop	–	Idle

14.1.7 CBL-V35-HDB26M/2M34F

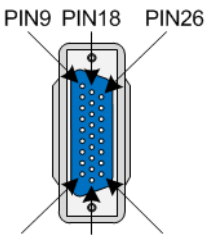
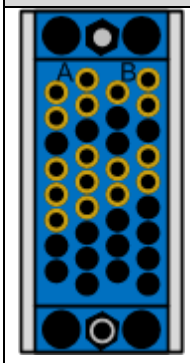
Figure	HDB26 PIN	M34 PIN (Channel 1)	Definition (Channel 1)	M34 PIN (Channel 2)	Definition (Channel 2)
HDB26M  M34F	1	A	PGND	–	–
	2	P	TD (A)	–	–
	3	R	RD (A)	–	–
	4	–	–	–	–
	5	–	–	R	RD (A)
	6	–	–	T	RD (B)
	7	B	GND	–	–
	8	–	–	V	RCP (A)
	9	–	–	X	RCP (B)
	10	–	–	P	TD (A)
	11	S	TD (B)	–	–
	12	–	–	U	SCTE (A)
	13	–	–	W	SCTE (B)

Figure	HDB26 PIN	M34 PIN (Channel 1)	Definition (Channel 1)	M34 PIN (Channel 2)	Definition (Channel 2)
	14	–	–	Y	TCP (A)
	15	Y	TCP (A)	–	–
	16	W	SCTE (B)	–	–
	17	V	RCP (A)	–	–
	18	–	–	A	PGND
	19	–	–	S	TD (B)
	20	–	–	–	–
	21	T	RD (B)	–	–
	22	–	–	AA	TCP (B)
	23	AA	TCP (B)	–	–
	24	U	SCTE (A)	–	–
	25	X	RCP (B)	–	–
	26	–	–	B	GND

Note

- The M34 PIN complies with ISO 2593 standard.
- The cable belongs to the V.35 service cable which does not support hot swapping.
- The wiring is also applicable to the CBL-V35-HDB26M/2M34M.

14.1.8 CBL-V35-HDB26M/M34F

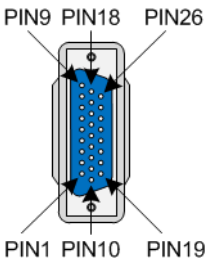
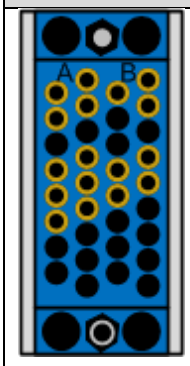
Figure	HDB26 PIN	M34 PIN	Definition
HDB26M  M34F	1	A	PGND
	2	P	TD (A)
	3	R	RD (A)
	4	C	RTS
	5	D	CTS
	6	E	DSR
	7	B	GND
	8	F	DCD
	9	–	–
	10	–	–

Figure	HDB26 PIN	M34 PIN	Definition
	11	S	TD (B)
	12	–	–
	13	–	–
	14	–	–
	15	Y	TCP (A)
	16	W	SCTE (B)
	17	V	RCP (A)
	18	–	–
	19	–	–
	20	H	DTR
	21	T	RD (B)
	22	–	–
	23	AA	TCP (B)
	24	U	SCTE (A)
	25	X	RCP (B)
	26	–	–

Note

- The M34 PIN complies with ISO 2593 standard.
- The cable belongs to the V.35 service cable which does not support hot swapping.
- The wiring is also applicable to the CBL-V35-HDB26M/M34M.

14.1.9 CBL-V24-HDB26M/4DB25F

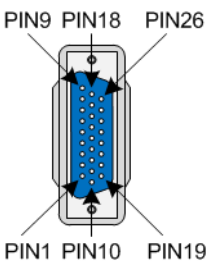
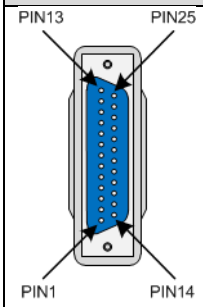
Figure	HDB26M PIN	DB25F PIN	Definition	Channel
HDB26M  DB25F	Connected to the shell	1	–	Channel 1
	7	3	TX1	
	17	2	RX1	
	8	15, 17 (two pins are short connected)	TC1	
	18	24	RC1	
	25, 26	7 (two pins share PIN 7)	GND1	

Figure	HDB26M PIN	DB25F PIN	Definition	Channel
	Connected to the shell	1	–	Channel 2
	5	3	TX2	
	15	2	RX2	
	6	15, 17 (two pins are short connected)	TC2	
	16	24	RC2	
	23, 24	7 (two pins share PIN 7)	GND2	
	Connected to the shell	1	–	Channel 3
	3	3	TX3	
	13	2	RX3	
	4	15, 17 (two pins are short connected)	TC3	
	14	24	RC3	
	21, 22	7 (two pins share PIN 7)	GND3	
	Connected to the shell	1	–	Channel 4
	1	3	TX4	
	11	2	RX4	
	2	15, 17 (two pins are short connected)	TC4	
	12	24	RC4	
	19, 20	7 (two pins share PIN 7)	GND4	

Note

The wiring is also applicable to the CBL-V24-HDB26M/4DB25M.

14.2 Terms

Numerics

1+1 protection	A 1+1 protection architecture has one normal traffic signal, one working transport entity, one protection transport entity, and a permanent bridge. At the source end, the normal traffic signal is permanently bridged to both the working and the protection transport entities. At the sink end, the normal traffic signal is selected from the better of the two transport entities. Due to the permanent bridging, the 1+1 protection architecture does not allow an unprotected extra traffic signal to be provided.

A

Automatic Laser Shutdown (ALS)	The technology that is used for automatically shutting down the laser to avoid the maintenance and operation risks when the fiber is pulled out or the output power is over great.
Auto-negotiation	The interface automatically chooses the rate and duplex mode according to the result of negotiation. The auto-negotiation process is: the interface adapts its rate and duplex mode to the highest performance according to the peer interface, namely, both ends of the link adopt the highest rate and duplex mode they both support after auto-negotiation.

B

Bracket	Small parts at both sides of the chassis, used to install the chassis into the cabinet

E

ETSI 600 cabinet	Cabinet with width of 600 mm, depth of 600 mm, compliant with the ETSI standard

F

Frame	It is a data transmission unit, composed of several parts, each of which has different functions.
Full duplex	In a communication link, both parties can receive and send data concurrently.

G

Ground cable	The cable to connect the device to ground, usually a yellow/green coaxial cable. Connecting the ground cable properly is an important guarantee to lightning protection, anti-electric shock, and anti-interference.

H

Half duplex	In a communication link, both parties can receive or send data at a time.

I

Institute of Electrical and Electronics Engineers (IEEE)	A professional society serving electrical engineers through its publications, conferences, and standards development activities. The body responsible for the Ethernet 802.3 and wireless LAN 802.11 specifications.
ITU-T	International Telecommunication Union-Telecommunication Standardization Sector

L

Label	Symbols for cable, chassis, and warnings
Loopback	It is the process that a signal is sent out and then sent back to the sender. It is used to detect and analyze potential faults in a ring network.

M

Multi-Mode Fiber (MMF)	In this fiber, multi-mode optical signals are transmitted.
Multiplexer	The device to multiplex multiple tributary signals to several bearing channels
Multiplex Section Protection (MSP)	MSP is based on multiplex sections. Whether to perform switching depends on the quality of multiplex section signals. Switching is initiated by the APS protocol carried by the Multiplex Section Overhead (MSOH). If a multiplex section fails, service signals of the whole STM-N are switched to the backup channel.

R

RS232	It is an Asynchronous Transfer Mode (ATM), which does not contain hand-shaking signals. It can carry on point-to-point communication with RS232 and RS422 of other stations, featuring transparent transmission, with a maximum rate of 19.2 kbit/s. Generally, the form of RS232 interface is DB9 or DB25.

S

Single-Mode Fiber (SMF)	In this fiber, single-mode optical signals are transmitted.

Subnetwork Connection Protection (SNCP)	Transport entity protection for the case where the transport entity is a subnetwork connection. The serial compound link connection within the subnetwork connection is protected by adding bridges and selectors in the connection functions at the edges of the protected domain and an additional serial compound link connection between these connection functions.

T

Timeslot	Time is divided into periodical frames. Each frame is divided into multiple timeslots. Each timeslot is a communication channel which can be assigned to a user.

U

U	Unit of dimensions, short for unit. It takes 44.45 mm as a basic unit, namely, 1 U = 44.45 mm

14.3 Acronyms and abbreviations

A

A/D	Analog/Digital
ACL	Access Control List
ALS	Automatic Laser Shutdown
AWG	American wire gauge

B

BITS	Building Integrated Timing Supply System
BPDU	Bridge Protocol Data Unit

D

D/A	Digital/Analog
DCE	Data Connection Equipment
DTE	Data Terminal Equipment

E

EMC	Electromagnetic Compatibility

ESD	Electro Static Discharge
ETSI	European Telecommunications Standards Institute

F

FE	Fast Ethernet

G

GE	Gigabit Ethernet

H

HDB3	High Density Bipolar of Order 3 Code

I

IEC	International Electrotechnical Commission

L

LACP	Link Aggregation Control Protocol
LCAS	Link capacity adjustment scheme

N

NRZ	Non Return to Zero

O

OAM	Operation, Maintenance and Management

P

PPM	Parts Per Million
PDH	Plesiochronous Digital Hierarchy
PSTN	Public Switched Telephone Network

Q

QoS	Quality of Service

R

RH	Relative Humidity

S

SDH	Synchronous Digital Hierarchy
SerDes	SERializer/DESerializer
SFP	Small Form-factor Pluggable
SGMII	Serial Gigabit Media Independent Interface
SNCP	Sub-Network Connection Protection
SNMP	Simple Network Management Protocol
STM-N	Synchronous Transport Module Level-N

U

UI	Unit Interval

V

VC	Virtual Container
VCXO	Voltage Controled X-tal Oscillator
VLAN	Virtual LAN

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