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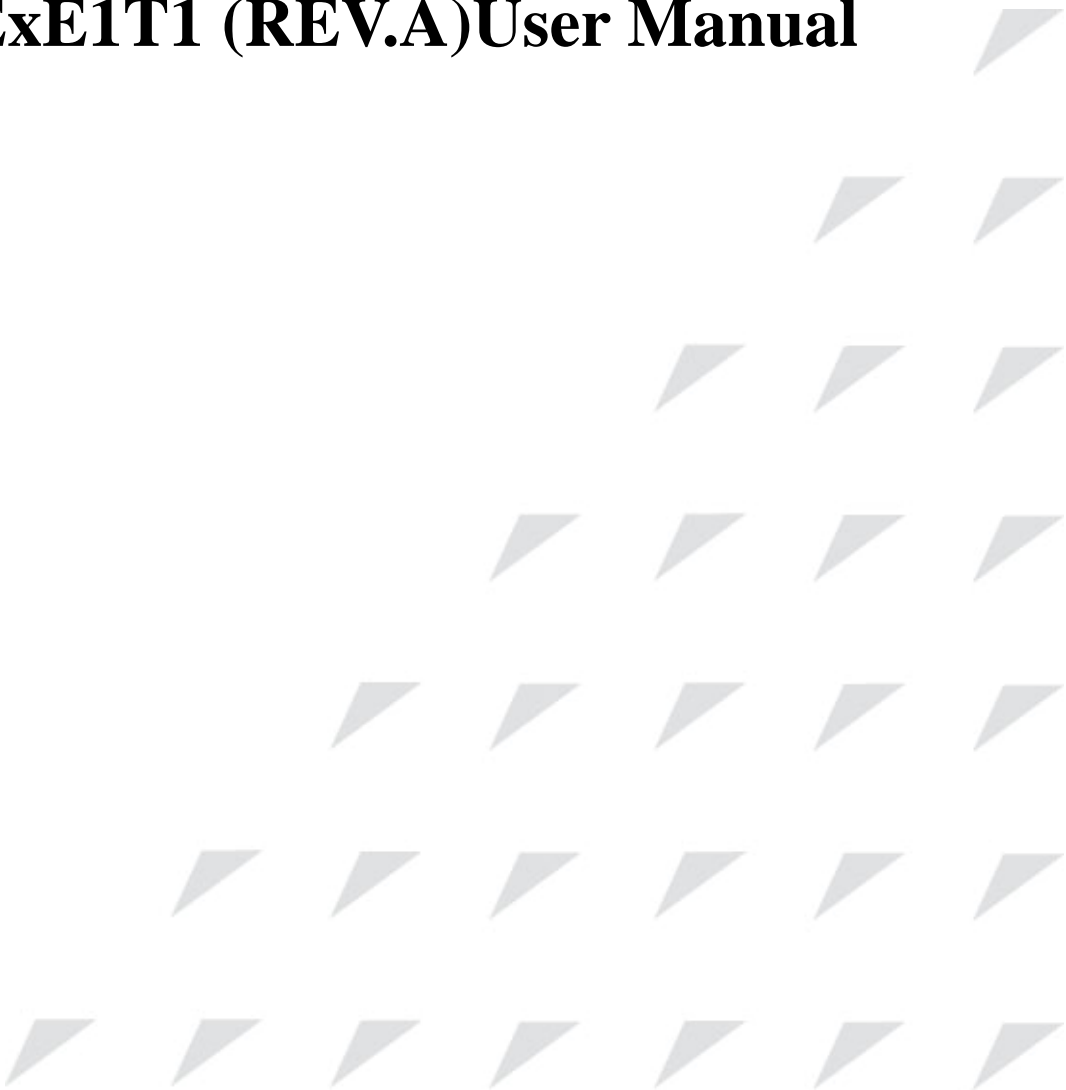
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RC953-4FExE1T1 (REV.A)User Manual

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Technical Assistance Center

The Raisecom TAC is available to all customers who need technical assistance with a Raisecom product, technology, or, solution. You can communicate with us through the following methods:

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If you have comments on the RC953-4FExE1T1 specification, instead of the web page above, please send comments to:

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CONTENTS

General Safety Instructions

The following instructions serve as a general guide for the safe installation and operation of telecommunications products. Additional instructions, if applicable, are included inside the manual.
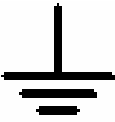
Safety Symbols

⚠️ **Warning**	This symbol may appear on the equipment or in the text. It indicates potential safety hazards regarding product operation or maintenance to operator or service personnel.

⚡	Danger of electric shock! Avoid any contact with the marked surface while the product is energized or connected to outdoor telecommunication lines.

⏚	Protective earth: the marked lug or terminal should be connected to the building protective earth bus. Some products have terminals which are permanently protective earthing conductors. Please be sure well connected to earthing before equipment connected to supply.

⚠️ **Warning**	Some products may be equipped with a laser diode. In such cases, a label with the laser class and other warnings as applicable will be attached near the optical transmitter. The laser warning symbol may be also attached. Please observe the following precautions: • Before turning on the chassis with optic module, make sure that the fiber optic cable is intact and is connected to the transmitter.

• Do not attempt to adjust the laser drive current.

• Do not use broken or unterminated fiber-optic cables/connectors or look straight at the laser beam.

• The use of optical devices with the equipment will increase eye hazard.

• Use of controls, adjustments or performing procedures other than those specified herein, may result in hazardous radiation exposure.

ATTENTION: The laser beam may be invisible!

Always observe standard safety precautions during installation, operation and maintenance of this product. Only qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this product. No installation, adjustment, maintenance or repairs should be performed by either the operator or the user.

All extension slots are not hot-swappable.

Some products have more than one power supply cord. Disconnect 2 power supply cords before servicing to avoid electric shock.

Before operating modules in the electricity conditions, please be noticed that optical modules shall be connected with optical fiber wires or shield with optical module cover for fear that laser light harms to operator's eyes.

It is suggested to apply optical module CLASS1 as laser.

Handling Energized Products

General Safety Practices

Do not touch or tamper with the power supply when the power cord is connected. Line voltages may be present inside certain products even when the power switch (if installed) is in the OFF position or a fuse is blown. For DC-powered products, although the voltages levels are usually not hazardous, energy hazards may still exist.

Before working on equipment connected to power lines or telecommunication lines, remove jewelry or any other metallic object that may come into contact with energized parts.

Unless otherwise specified, all products are intended to be grounded during normal use. Grounding is provided by connecting the mains plug to a wall socket with a protective earth terminal. If an earth lug is provided on the product, it should be connected to the protective earth at all times, by a wire with a diameter of 18 AWG or wider. Rack-mounted equipment should be mounted only in earthed racks and cabinets.

Always make the ground connection first and disconnect it last. Do not connect telecommunication cables to ungrounded equipment. Make sure that all other cables are disconnected before disconnecting the ground.

Connection of AC Mains

Make sure that the electrical installation complies with local codes.

Always connect the AC plug to a wall socket with a protective ground.

Always connect the power cord first to the equipment and then to the wall socket. If a power switch is provided in the equipment, set it to the OFF position. If the power cord cannot be readily disconnected in case of emergency, make sure that a readily accessible circuit breaker or emergency switch is installed in the building installation.

Connection of DC Mains

Unless otherwise specified in the manual, the DC input to the equipment is floating in reference to the ground. Any single pole can be externally grounded.

Due to the high current capability of DC mains systems, care should be taken when connecting the DC supply to avoid short-circuits and fire hazards.

DC units should be installed in a restricted access area, i.e. an area where access is authorized only to qualified service and maintenance personnel.

Make sure that the DC supply is electrically isolated from any AC source and that the installation complies with the local codes.

Before connecting the DC supply wires, ensure that power is removed from the DC circuit. Locate the circuit breaker of the panel board that services the equipment and switch it to the OFF position. When connecting the DC supply wires, first connect the ground wire to the corresponding terminal, then the positive pole and last the negative pole. Switch the circuit breaker back to the ON position.

A readily accessible disconnect device that is suitably rated and approved should be incorporated in the building installation.

Preventing Electrostatic Discharge Damage

Modules which can be plugged into chassis are sensitive to damage from static electricity. Conversely, static voltages as high as 35,000V can be generated just by handling plastic or foam packing material, or by sliding assemblies across plastic and carpets. Not exercising the proper electrostatic discharge (ESD) precautions can result in intermittent or complete component failures. To minimize the potential for ESD damage, observe the following guidelines:

• Always use an ESD-preventive antistatic wrist strap or ankle strap and ensure that it makes good skin contact.

• When removing or installing a component, make sure the equipment end of your antistatic strap leash is connected to the ESD connection sockets on the front of the chassis or to a bare metal surface on the chassis. Avoid contact between the component and your clothing. The wrist strap only protects the component from ESD voltages on the body; ESD voltages on your clothing can still cause component damage.

• Always place a card component-side-up on an antistatic surface, in an antistatic card rack, or in a static shielding bag. If you are returning the item to the factory, immediately place it in a static shielding bag.

• Handle Modules by the metal card carrier edges only; Avoid touching the board or any connector pins.

Chapter 1 Product Overview

1.1 Overview

RC953-4FExE1T1 series products are EoPDH interface converter with Ethernet Demarcation and powerul Ethernet management function. These devices have 4 Ethernet interfaces and 4/8 E1/T1 interfaces. Ethernet frame encapsulated in HDLC or GFP (customer optional) and mainly used in accessing or delivering Ethernet service with bandwidth lower than 16Mbps.

Basic function of RC953-4FExE1T1 series products: encapsulate ethernet frame from FE port into HDLC or GFP (forming EoPDH signal) and mapping it into VCG (one VCG may contain 1~4 or 1~8 lines of E1); and de-mapping out Ethernet data according to VCG in inverse direction. These type of devices are usually used at remote site, realizing Ethernet data long distance transmission over TDM network (including PDH and SDH) by building network with EoPDH device at central office.

Ethernet Demarcation of RC953-4FExE1T1 series products means end-to-end ethernet OAM based on IEEE 802.3ah and 802.1ag, port rate limit and QOS, etc. functions.

At present, RC953-4FExE1T1 series include 4 types: RC953-4FE4E1T1-BL, RC953-4FE8E1T1-BL, RC953-4FE4E1, RC953-4FE8E1.

Note: T1 is not in support of by this series products at present, so there is no related description in this manual.

1.2 Main features

> Provide 4 Ethernet interfaces:
  - Auto-negotiation: AUTO-MDIX, 10M/100M full/half-duplex, in support of 802.3x flow control in full-duplex mode and back pressure in half-duplex mode;
  - MTU: maximum transmission unit up options in 1522 bytes or 1632 bytes, 1632 bytes by default.
> Provide 4/8 lines of E1 interfaces:
  - RC953-4FE4E1T1-BL and RC953-4FE8E1T1-BL support balanced E1 (120Ω);
  - Unbalanced E1 (75Ω) is availabled by both RC953-4FE4E1 and RC953-4FE8E1;
  - E1 frame structure conforms to G.704 criterion;
  - Electrical feature conforms to G.703 criterion;
  - In support of E1 short distance mode, interface receiving sensitivity is -15dB;
  - Jitter conforms to G.823 criterion.
> Abundant system management:
  - CLI configuration;
  - Telnet configuration;
  - Console configuration;
  - Built-in WEB management configuration;
  - SNMP.
> Ethernet functions:
  - Ethernet switching supports VLAN mode in comply with IEEE802.1Q; Q-in-Q (Double-tagged-vlan) mode;
  - MAC address list: 8K MAC address, in support of 100 static MAC address, enable/disable MAC address learning over port, MAC address learning amount limit

  (1~255) over port;
- Frame size: maximum transmission unit up to 1632 bytes;
- Storm control: loop back detection of port, mirror, etc;
- Input/output flow control over port.
➤ Ethernet frame encapsuplation in HDLC or GFP, customer optional:
  In HDLC mode:
- Transmitting Ethernet frame to multi-path of E1 by packet interleaving method;
- Supporting E1 link number auto-sensing, and building or removing E1 link by automation (like LCAS);
- Maximal latency among E1 links is +/- 16ms;
- E1 port only supports framed mode, adopting FAS+CRC4 PCM31 format, CRC auto-negotiation and customized configuration;
- E1 inverse multiplexing (can be only one E1 path, but it needs at least configure 2 E1 paths if interconnect with aggregation device such as RC953E).
  In GFP mode:
- Transmitting Ethernet frame to multi-path of E1 by byte interleaving method;
- Supporting E1 link number auto-sensing, and building or removing E1 link by automation (LCAS);
- Maximal latency among E1 links is +/- 256ms;
- E1 port only supports framed mode, adopting FAS+CRC4 PCM31 format, CRC auto-negotiation and customized configuration;
- E1 inverse multiplexing (VCAT enable mode, can be single VCAT or multiple VCAT mode).
➤ Supporting local external, clock master/slave mode setting for E1 interface;
➤ In support of obtaining E1 interface LOS, LOF, AIS, CRC, GID Error and remote device E1 error alarm;
➤ Fault pass-through from E1 line to Ethernet port and fault pass-through end to end at Ethernet port are in support in GFP mode;
➤ Online upgrade function;
➤ Power supply and temperature monitor functions;
➤ Single power supply, AC, DC or WP are optional;
➤ Power consumption <10W, working reliable;
➤ Working temperature: -5℃- 55℃, reletive humidity: ≤90% (at 35℃);
➤ Certification criterions: EMC Class A, ESD.

1.3 Ordering information

RC953 - A - B - C

RC953: standalone inverse multiplexing interface converter.

A: the type of FE and the number of E1 interface: 4FE4E1T1, 4FE8E1T1, 4FE4E1 and 4FE8E1.

➤ 4FE4E1T1: 4 FE electrical interfaces and there are 4 E1 or T1 interfaces, can be customized.
➤ 4FE8E1T1: 4 FE electrical interfaces and there are 8 E1 or T1 interfaces, can be customized.
➤ 4FE4E1: 4 FE electrical interfaces and there are 4 E1 interfaces.
➤ 4FE8E1: 4 FE electrical interfaces and there are 8 E1 interfaces.

B: type of E1 or T1 interface, can be blank or BL. Balanced or unbalanced connector for E1 interface; only balanced connector for T1 interface.

➤ Blank: unblanced.
➤ BL: balanced.

C: type of power supply for the whole device, AC, DC or WP are optional.

➤ AC indicates AC 220V power supply;
➤ DC indicates DC -48V power supply;
➤ WP indicates wide range port supply.

If users have other power supply requirement, such as DC 24V, please order in additional.

Table 1-1 Ordering information of RC953-4FExE1T1 series products

Device type	Description
RC953-4FE4E1T1-BL-□	Standalone device, 4 FE electrical interface and 4 E1/T1 balanced interfaces.
RC953-4FE8E1T1-BL-□	Standalone device, 4 FE electrical interface and 8 E1/T1 balanced interfaces.
RC953-4FE4E1-□	Standalone device, 4 FE electrical interface and 4 E1 unbalanced interfaces.
RC953-4FE8E1-□	Standalone device, 4 FE electrical interface and 8 E1 unbalanced interfaces.

*□ at the end of device type indicates the option of power supply module.

Chapter 2 Technical Specifications

2.1 E1 interface specification

- Interface type: RJ45 connector for balanced device; BNC connector for unbalanced device;
- Interface impedance: 75Ω for unbalanced E1, or 120Ω for balanced E1, or 100Ω for balanced T1;
- Interface speed: 2048Kbps $\pm$ 50ppm;
- Coding type: HDB3;
- Clock: 2.048MHz, maximum frequency offset is $\pm$ 50ppm;
- Frame structure: conform to ITU-T G.704;
- Jitter: conform to ITU-T G.823;
- Electrical feature: conform to ITU-T G.703.

2.2 Ethernet interface specification

- Compliant criterion: IEEE 802.3 series;
- Interface type: RJ45;
- Interface rate: 10/100M auto-negotiation;
- Duplex mode: full-duplex/half-duplex (FDX/HDX);
- MDI/MDIX: auto-/MDIX, HUB/switch mode if auto-negotiation is disabled;
- Flow control: IEEE802.3x flow control in full-duplex mode, back pressure flow control in half-duplex mode.

2.3 CONSOLE interface specification

- Compliant criterion: RS232;
- Interface type: RJ45 connector;
- Interface rate: baud rate is 9600.

2.4 Power supply

- AC power supply:
  Voltage: 220V
- Tolerance: 180~240 (V)
- Frequency: 50 Hz
- DC power supply: -48V, tolerance: -36V~ -72V
- WP: DC: -36~-370V, AC: 85~264V
- Power consumption: 10W

2.5 Working environment

- Temperature: -5℃-55℃
- Relative Humidity: ≤90% (35℃)

2.6 Storing environment

➢ Temperature: -40℃~80℃
➢ Relative Humidity: 5%~90% (no condensation)

2.7 Outlook structure

➢ Standalone, white, unstandard chassis
➢ Dimensions: 44mm (H)×300mm (W)×135mm (D)
➢ Net weight: 1.425 (Kg)

Chapter 3 Device Appearance and Description

3.1   Device front panel and description of LED

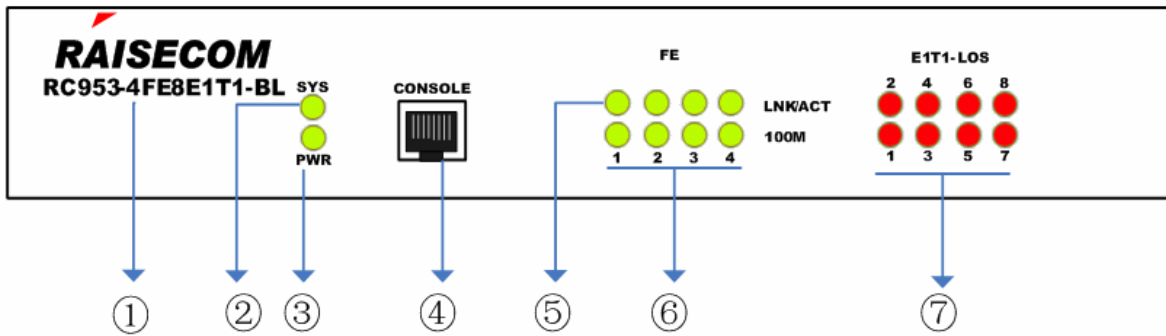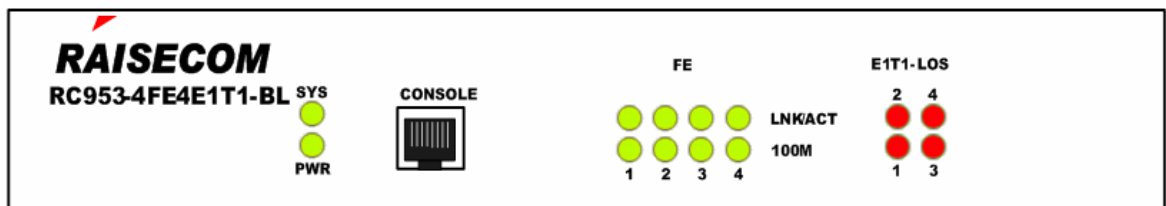**Figure 3-1 Front panel of RC953-4FE8E1T1-BL**

Figure 3-2 Front panel of RC953-4FE4E1T1-BL

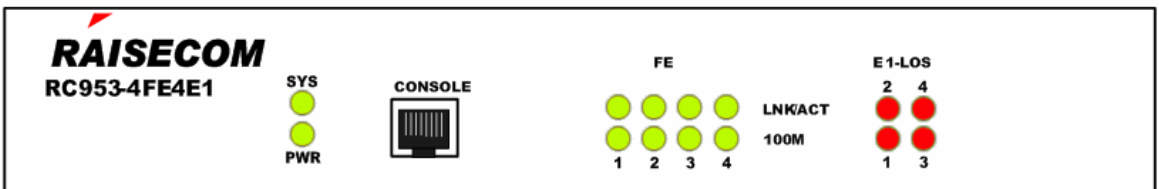**Figure 3-3 Front panel of RC953-4FE8E1**

Figure 3-4 Front panel of RC953-4FE4E1

Description of RC953-4FE4E1T1-BL/8E1T1-BL front panel:

Table 3-1 RC953-4FE4E1T1-BL/8E1T1-BL front panel explanation

No.	Name	Color	Description

1	Device model	-	There are 4 models in RC953-4FE4E1T1 series products.
2	SYS	Green	ON: during power supplying process; Flickering: the device is working normally (ON 0.5 seconds and OFF 0.5 seconds by turns)
3	PWR	Green	ON: the device has been powered on
4	CONSOLE	-	RJ45 connector
5	LNK/ACT	Green	ON: link up, but no data receiving or transmitting; Flickering: link up and there is data received or transmitted; OFF: link down. One LNK/ACT LED for every Ethernet interface.
6	100M	Green	ON: link up, working in 100M speed; OFF: link up and working in 10M speed. One 100M LED for every ethernet interface.
7	E1T1-LOS	Red	E1 LOS indicator when customer configures in E1 mode; T1 LOS indicator when customer configures in T1 mode. One LOS LED for each E1/T1 link. LOS: loss of signal alarm. ON: LOS; OFF: normal.

Note: Front panel of RC953-4FE4E1/8E1 and RC953-4FE4E1T1-BL/8E1T1-BL are almost consistent. But RC953-4FE4E1/8E1 doesn't have T1 LOS indication.

3.2 Rear panel description
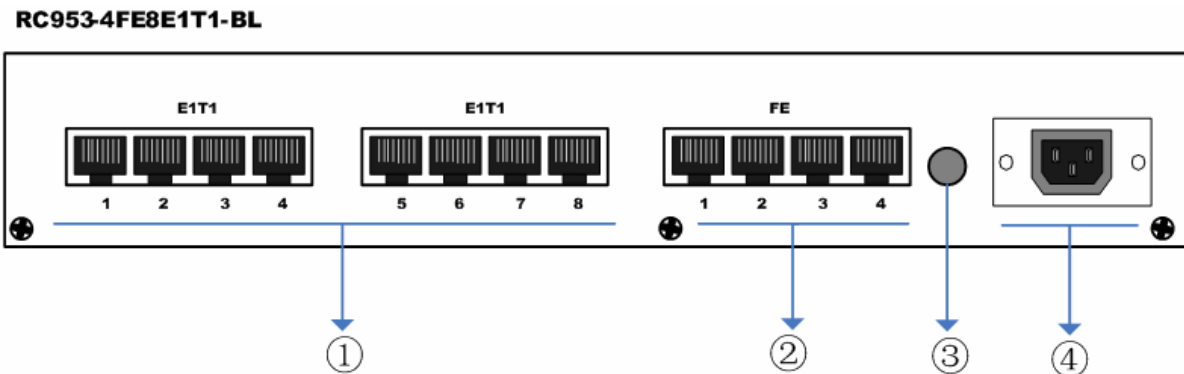
The rear panel of RC953-4FE4E1T1-BL/8E1T1-BL:
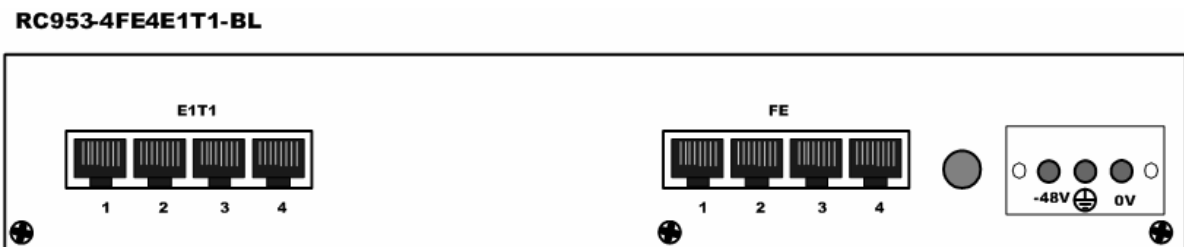

Figure 3-5 Rear panel of RC953-4FE8E1T1-BL

Figure 3-6 Rear panel of RC953-4FE4E1T1-BL

Table 3-2 RC953-4FE4E1T1-BL/8E1T1-BL rear panel explanation

No.	Name	Description
1	E1T1	This interface is used as E1 interface. This interface has two 4xRJ45 interfaces (only one 4xRJ45 interface for RC953-4FE4E1T1-BL), each RJ45 includes one

		E1 line, interface pin arrangement please see appendix A.
2	FE	4xRJ45 interface, each RJ45 contains 1 Ethernet interface. Use common CAT-5 twisted pair, straight-through or cross-over both ok.
3	Grounding	Safe grounding connection.
4	Power supply	Power supply interface of device, AC (220V)/DC (-48V)/WP. Refer to product ordering information of Raisecom for detailed power supply information.

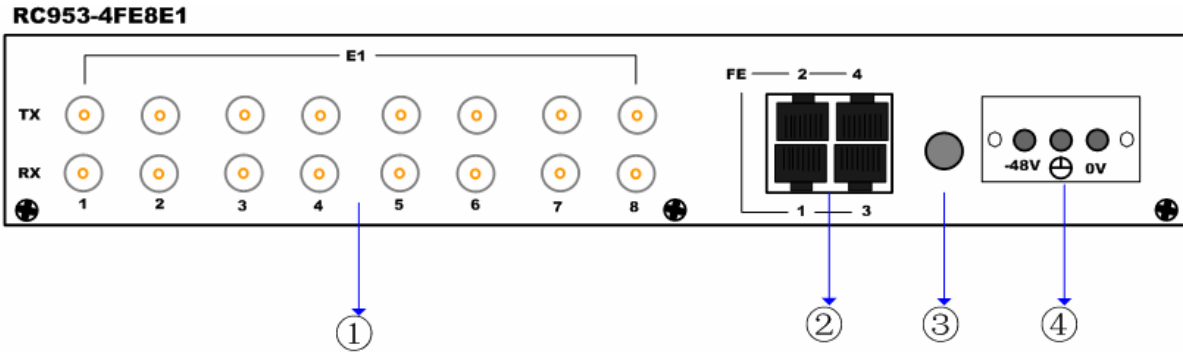The rear panel of RC953-4FE4E1 /8E1:
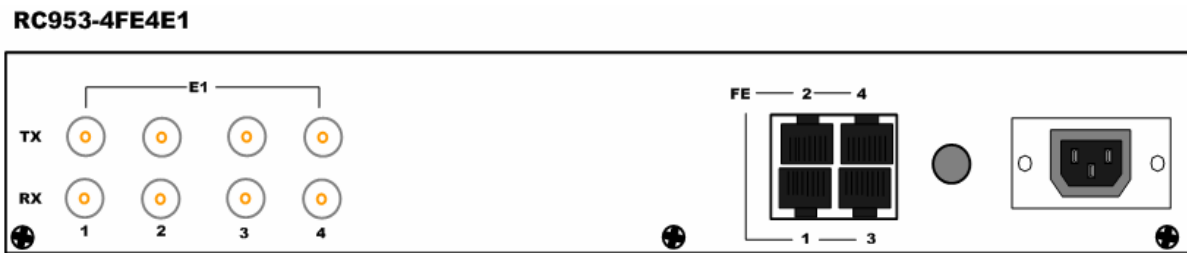

Figure 3-7 Rear panel of RC953-4FE8E1

Figure 3-8 Rear panel of RC953-4FE4E1

Table 3-3 RC953-4FE4E1/8E1 rear panel explanation

No.	Name	Description
1	E1	E1 interface only; composed by 8 BNC interfaces in two lines (only 4 BNC interfaces for RC953-4FE4E1), every BNC contains 1 E1 line. The upper line is for transmitting and the lower line is for receiving.
2	FE	2x2 RJ45 interface, each RJ45 contains 1 Ethernet interface. Use common CAT-5 twisted pair, straight-through or cross-over both ok.
3	Grounding	Safe grounding connection.
4	Power supply	Power supply interface of device, AC (220V)/DC (-48V)/WP. Refer to product ordering information of Raisecom for detailed power supply information.(Attention that RC953-4FE4E1/8E1 does not support WP at present)

Chapter 4 Basic Principle and Typical Application
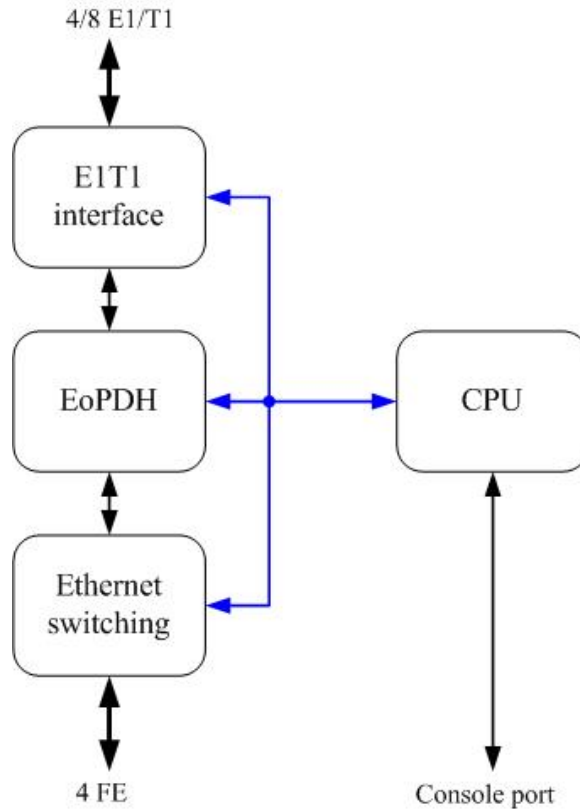
4.1 Basic principle

Figure 4-1 Basic principle of device

Ethernet switch unit accomplishes users' ethernet data switches in ethernet interface; EoPDH unit generates EoPDH signal by using ethernet frame that comes from ethernet switch unit and then, mapping the signal to 4/8 E1/T1 and deliver to service line via E1/T1 interface.

4.2 Typical application
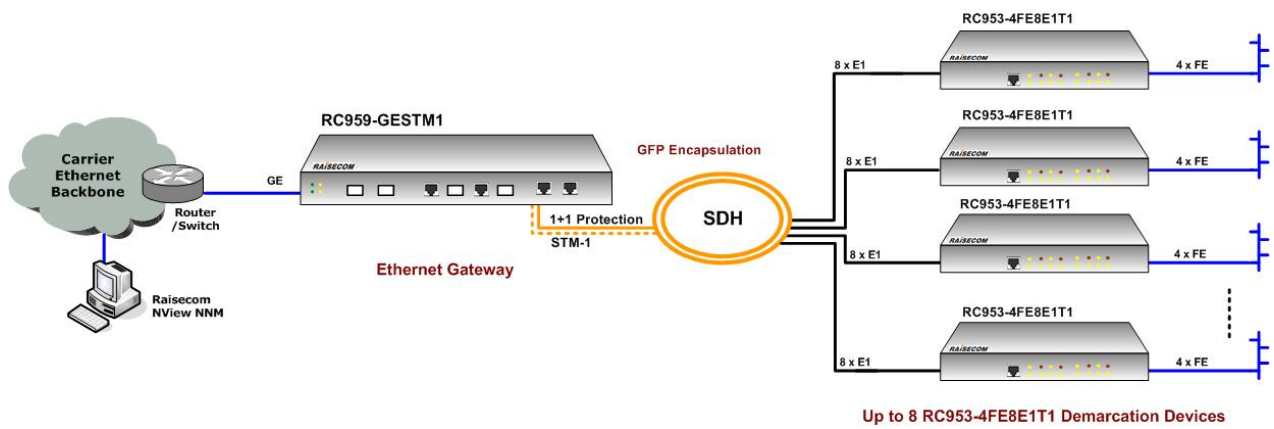
Figure 4-2 Typical application

RC953-4FExE1T1 is a kind of Ethernet Demarcation device uplinking as E1 or T1. Users realize effective network monitor and management by setting demarcation node between carrier network and subscriber network.

Chapter 5 Device Installation Preparation and Connection

5.1 Preparation before installation

Please check if the models and part numbers are in consistence first, and also check if the equipments are damaged. There must be drying process if the equipment is damped.

Please follow the following steps when install and use this equipment:

- ➢ Carefully read this manual
- ➢ Prepare cables for connection and ensure there is no short-circuit and open-circuit
- ➢ Make sure the power voltage is in working condition range and the device is connecting to grounding very well
- ➢ Prepare BERT for line quality detection
- ➢ Fix the standalone device inside device shelf or place it in a safe and flat place, pay attention to meet environment requirement

5.1.1 Cable preparation

The following cables need to prepared by user:

Specifications of RC953-4FExE1T1 series products interface connecting cable

Interface	Cable specifications
Ethernet interface (RJ45)	Common CAT-5 twisted pair, 4 pcs, straight-through or cross over. (User prepare)
E1/T1 balanced interface (RJ45)	120Ω E1 balanced cables, 4/8 pcs, or 100Ω T1balanced cables, 4/8 pcs. (User prepare)
E1unbalanced interface (BNC)	75Ω unbalanced (BNC male connector) cables, 4/8 pcs. (User prepare)

Please make sure the type, pin arrangement, and interface impedance of E1/T1 on connected device match to each other when interconnecting with other devices.

5.1.2 Ethernet cable and connection requirements

Connecting FE port of RC953-4FExE1T1 series products by CAT-5 twisted pair and the length of twisted pair should not over 100 meters.

(1). Auto-MDI/MDIX function (crossover and straight-through auto-negotiation) can be enabled when electrical interface is auto-negotiation. Use straight-through or crossover cable to connect with other devices:

This device	Other devices	Connecting mode of RJ45 port
FE interface of this device	Switch	Straight-through crossover
	HUB	Straight-through crossover
	Router	Straight-through crossover

	NIC	Straight-through crossover

(2). Auto-MDI/MDIX function is disabled when electrical interface is in force mode. Connecting as following table:

This device	**Other devices**	**Connecting mode of RJ45 port**
FE interface of this device	Switch	crossover
	HUB	crossover
	Router	Straight-through
	NIC	Straight-through

5.2 Installation

Following the steps to installation and setting:

5.2.1   Device installation

Paste the foot-pad at the bottom of the chassis.

Installing the chassis onto device shelf by machinery accessories (bend corner, bolts, etc.).

Connecting the the device to earth by the round grounding terminal and customized grounding cable.

5.2.2   Connect the cables

Connecting power supply interface of the device by AC/DC wire in accessories, and the other end connecting to machine room power supply.

Use Console cable in the accessories to connect Console port of local device and serial interface of user's PC.

One end of network cable connects to ethernet electrical interface of the device and the other end connects to switch or other devices.

For device with balanced E1/T1 interface, the two ends are RJ45 and contain 1 E1/T1 calbe connection.

For device with unbalanced E1 interface, use BNC cable for connection.

5.2.3   Power on

The device can be powered on after installing and fixing. PWR indicator will turn ON after electrifying to indicat the device is power on and working; after the system finishes starting in a few seconds, SYS indicator starts flickeing to show device is working normally. FE port related LED is OFF if it has not been connected to correct network cable; E1/T1 port related LOS LED is ON (red) if the interface has not been connected to correct network cable. Refer to indicator description in Chapter 3.
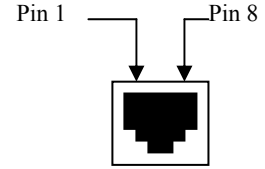
5.2.4 Normal working status

PWR indicator is ON after power on the device to show the device is electrified. SYS indicator starts to flickering later to show the device is working normally.

Appendix A Cable Making

E1 balanced signal cable making:

The interface pin arrangement of 120Ω balanced E1 as following:
(1-8 means RJ45 pin number)

Pin 1 ⎯⎯ Pin 8

Pin No.	1	2	3	4	5	6	7	8
Signal	TD+	TD-		RD+	RD-			
Meaning	Output+	Output-		Input+	Input-			

Make sure of the pin definition of other device when use 120Ω balanced interface to connect other devices. The pin connection at two ends of twisted pair:

RC953-4FExE1T1
BALANCE-RJ45   E1 balanced interface

TD+   output+

TD-   output-

RD+   input+

RD-   input-
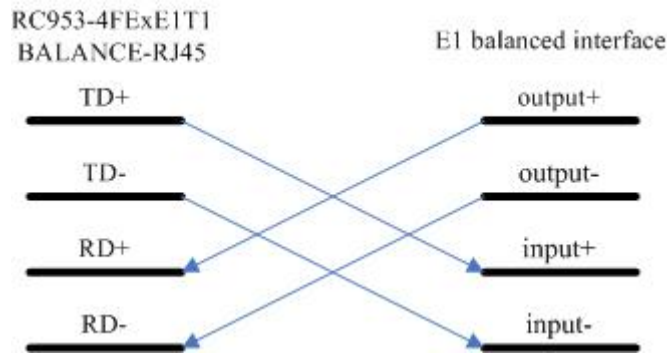
TD+ and TD- is a pair in the cable to twisted together; RD+ and RD- is a pair in the cable to twisted together.

RC953-4FExE1T1-BL adopts 4/8 RJ-45 to provide 4/8 E1 lines (as path A E1 line in the above figure), strand 1, 2 for outputting, strand 4, 5 for inputting, strand 3, 6, 7 and 8 are unused.

Appendix B Acronyms

Acronyms	Full spelling
EoPDH	Ethernet over PDH
PWR	Power
SYS	System
LOS	Loss Of Signal
LOF	Loss Of Frame
AIS	Alarm Indication Signal：
CRC	Cyclic Redundancy Check：
HDLC	High Data Link Control
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector
IEEE	Institute of Electrical and Electronic Engineers
PDH	Pseudo-synchronous Digital Hierarchy
SDH	Synchronous Digital Hierarchy
PCM31	Pulse Code Modulation
MAC	Media Access Control
VLAN	Virtual Local Area Network
Console	--
Q-in-Q	--
QOS	Quality of Service
VCAT	Virtual Concatenation
LCAS	Link Capacity Adjustment Scheme

Appendix C FAQ

If there are any problems during installation and using, try the following proposals. If the problems still can not be solved, please contact distributors/agents for help.

➢ PWR is OFF

Please check if power supply cable is connected and then check if the Power Supply Board works normally.

➢ E1/T1 LOS indicator is ON

Please check if the inputting link of E1/T1 signal is connected correctly and if the device connected by E1/T1 interface is power off; or see if E1/T1 interface is lossen; using BER tester to detect if E1/T1 output line is open circuit and see if error bit ratio reaches the standard.

➢ Ethernet LINK indicator is OFF

Please check if the UTP cable is broken off first and then check if the equipment that connects with RC953-8FE16E1 works normally. Please make sure that the correct Ethernet cable is used.

➢ No alarm indication and LNK indicator is flickering, 100M indicator ON, but the device can not connecting by ping

Make sure the devices at two ends of the network have built a link successfully. Use command show to view relevant E1 port link status and alarm status; if link up successfully, the status will be "OK", otherwise it displays reason of NotLinkWhy, please locating alarm resource (local LOS, LOF or remote LOS, LOF) according to alarm status; and meanwhile, make sure relevant E1 port doesn't have local loopback.