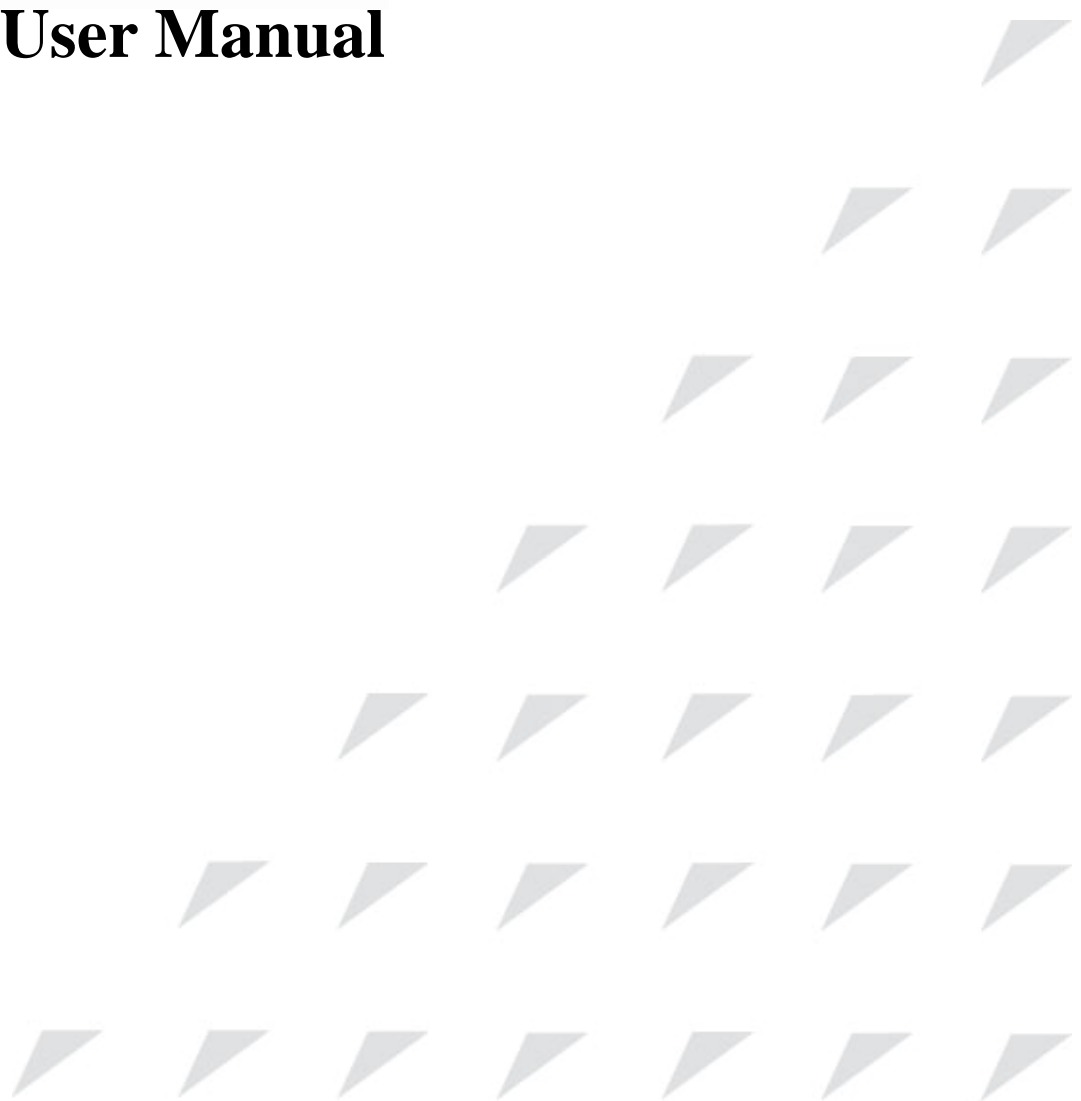# RAISECOM

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# RC702 (C) User Manual

**June, 2006**

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# Chapter 1  Preface

## Revision

This manual is for the latest RC702 Ethernet over SDH equipment, Revision C.

## About This Manual

This manual introduces primary functions of the configuration management software for RC series products.

## Who Should Read This Manual

Sales and marketing engineers, after service staff and telecommunication network design engineers could use this manual as a valuable reference. If you want to get an overview on features, applications, architectures and specifications of Raisecom RC series integrated access devices, you could find useful information in this manual as well.

## Compliance

The RC series products developed by Raisecom are strictly complied with the following standards as well as ITU-T, IEEE, IETF and related standards from other international telecommunication standard organizations:

YD/T900-1997 SDH Equipment Technical Requirements - Clock

YD/T973-1998 SDH 155Mb/s and 622Mb/s Technical conditions of optical transmitter module and receiver module

YD/T1017-1999 Network node interface for the Synchronous Digital Hierarchy (SDH)

YD/T1022-1999 Requirement of synchronous digital hierarchy (SDH) equipment function

YD/T1078-2000 SDH Transmission Network Technique Requirements-Interworking of Network Protection Architectures

YD/T1111.1-2001 Technical Requirements of SDH Optical Transmitter/Optical Receiver Modules——2.488320 Gb/s Optical Receiver Modules

YD/T1111.2- 2001 Technical Requirements of SHD Optical Transmitter/Optical Receiver Modules——2.488320 Gb/s Optical Transmitter Modules

YD/T1179- 2002 Technical Specification of Ethernet over SDH

G.703 Physical/electrical characteristics of hierarchical digital interfaces

G.704 Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels

G.707 Network node interface for the synchronous digital hierarchy (SDH)

G.774 Synchronous digital hierarchy (SDH) - Management information model for the network element view

G.781 Synchronization layer functions

G.783 Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks

G.784 Synchronous digital hierarchy (SDH) management

G.803 Architecture of transport networks based on the synchronous digital hierarchy (SDH)

G.813 Timing characteristics of SDH equipment slave clocks (SEC)

G.823 The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy

G.825 The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)

G.826 End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections

G.828 Error performance parameters and objectives for international, constant bit-rate synchronous digital paths

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G.831 Management capabilities of transport networks based on the synchronous digital hierarchy (SDH)

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G.842 Interworking of SDH network protection architectures

G.957 Optical interfaces for equipments and systems relating to the synchronous digital hierarchy

G.691 Optical interfaces for single channel STM-64 and other SDH systems with optical amplifiers

G.664 Optical safety procedures and requirements for optical transport systems

I.731 ATM Types and general characteristics of ATM equipment

I.732 ATM Functional characteristics of ATM equipment

IEEE 802.1Q Virtual Local Area Networks (LANs)

IEEE 802.1p Traffic Class Expediting and Dynamic Multicast Filtering

IEEE 802.3 CSMA/CD Access Method and Physical Layer Instruction

# Related Manuals

RC702(C) User Manual

RC702(C) Software Configuration Guide

RC702(C) Command Notebook

RC702 EMS User Manual

# Chapter 2  Product Overview

## 2.1 Overview

RC702-FE/RC702-GE devices are Raisecom self-developed Ethernet over SDH equipment. RC702-FE provides a 155M SDH interface (either fiber or copper) and a 100M Ethernet interface (either fiber or copper); RC702-GE provides a 155M SDH interface (either fiber or copper) and a 1000M Ethernet interface (either fiber or copper).

Using RC702 Ethernet over SDH equipment, Ethernet data frames are directly encapsulated into SDH payload and transmitted across the SDH infrastructure. It adopts standardized encapsulation technology and is compliant to relevant SDH standards. Its network manageability has enabled it to be managed conveniently and easily. It has already been widely deployed in carriers' networks.

## 2.2 Main features

> Provide 1 STM-1 interface with optional fiber or copper interface

> Provide 1 100M or 1000M Ethernet interface with optional fiber or copper interface

> Support VC4, VC3, and VC12 concatenation, flexibly allocating service bandwidth

> Support LCAS function under VC3 and VC12 concatenation

> Support GFP and LAPS Ethernet encapsulation

> Configurable local clock or following line clock, compliant to G.813 standard

> Provide console port and SNMP interface and ECC embedded channel. Support local and remote online software upgrade, convenient for maintenance

> Provide complete alarm indication and performance monitoring

> Provide dependable dual power supplies. Power consumption is less than 20 Watts.

> Working temperature: -5 ~ 50℃

**Note: VC3 and VC12 concatenations are not implemented on this version.**

## 2.3 Product Part Number Introduction

RC702 device is composed of main board, expansion card, and power supply card. Expansion cards can be divided into SDH fiber interface card, SDH copper interface card, Fast Ethernet fiber interface card, Fast Ethernet copper interface card, Gigabit Ethernet fiber interface card, and Gigabit Ethernet copper interface card.

1. Part number: RC702-X

   RC702-GE-X

Introduction:

RC702: stands for Raisecom EOS equipment series

GE: stands for Gigabit Ethernet interface

X: stands for the power supply type. Could be AC (220V) or DC (-48V)

2.  Expansion card part number introduction

| Part number | Introduction |
|---|---|
| RC702-SC-OP-X | SDH fiber interface card, providing 1 STM-1 SDH fiber interface.<br>X stands for fiber interface type, could be M, S1, S2, S3, SS13, SS15, SS23, SS25<br>Refer to Table 2-1 for details. |
| RC702-SC-EP | SDH copper interface card, providing 1 STM-1 SDH copper interface, BNC connector |
| RC702-SC-FE | Fast Ethernet card, providing 1 10/100M Ethernet copper interface |
| RC702-SC-FX-X | Fast Ethernet card, providing 1 100M full duplex Ethernet fiber interface.<br>X stands for fiber interface type, could be M, S1, S2, S3, SS13, SS15, SS23, SS25<br>Refer to Table 2-1 for details. |
| SC200-GE-X | Gigabit Ethernet card, providing 1 1000M full duplex Ethernet fiber interface.<br>X stands for fiber interface type, could be M, S1, S2, S3, SS13, SS15, SS23, SS25<br>Refer to Table 2-1 for details. |
| SC200-GE-T | Gigabit Ethernet card, providing 1 1000M full duplex Ethernet copper interface. |

3.  Power supply card part number introduction

| Part number | Introduction |
|---|---|
| RC702-PWR-AC | AC 220V |
| RC702-PWR-DC | DC -48V |

Table 2-1 Fiber Interface Specification

| Part number | Connector type | Data speed (Mbps) | Line code | Wavelength (nm) | Launch power (dBm) | RX sensitivity (dB) | Extinction ratio (dB) | Minimum saturation (dbm) | Estimated TX distance (km) |
|---|---|---|---|---|---|---|---|---|---|
| M | SC/ Multimode | 155.52 | NRZ | 1310 | -18 ~ -14 | <-29 | >8.2 | >-14 | 0~2 |
| S1 | SC/Single mode | 155.52 | NRZ | 1310 | -15 ~ -8 | <-34 | >8.2 | >-8 | 0~25 |
| S2 | SC/Single mode | 155.52 | NRZ | 1310 | -5~0 | <-34 | >8.2 | >-8 | 10~60 |
| S3 | SC/Single mode | 155.52 | NRZ | 1550/DFB | -5~0 | <-36 | >10 | >-10 | 15~120 |
| SS13 | SC/Single strand/ single mode | 155.52 | NRZ | TX 1310 RX 1550 | -12 ~ -3 | <-30 | >8.2 | >-8 | 0~25 |
| SS15 | SC/single strand/ single mode | 155.52 | NRZ | TX 1550 RX 1310 | -12 ~ -3 | <-30 | >8.2 | >-8 | 0~25 |
| SS23 | SC/Single strand/ single mode | 155.52 | NRZ | TX 1310 RX 1550 | -5 ~ 0 | <-32 | >8.2 | >-8 | 10~50 |
| SS25 | SC/single strand/ single mode | 155.52 | NRZ | TX 1550 RX 1310 | -5 ~ 0 | <-32 | >8.2 | >-8 | 10~50 |

**Note: Single-strand devices must be deployed in pairs**

## 2.4 Dimensions

RC702 adopts standard 19" chassis, in a compact metal enclosure.

Dimensions: 440mm(width) x 43.6mm (height) x 235mm (depth)

# Chapter 3  Technical Specification

## 3.1 Basic Configuration

➢ RC702: 1 SDH 155M interface (optional fiber/copper), 1 Fast Ethernet interface (optional fiber/copper)

➢ RC702-GE: 1 SDH 155M interface (optional fiber/copper), 1 Gigabit Ethernet interface (optional fiber/copper)

➢ Power supply cards: 220V AC or -48V DC; dual power supply redundant

➢ Management port: console port, and SNMP port

## 3.2 SDH Fiber Interface Specification

➢ Speed: 155.52Mbps

➢ Line code: NRZ

➢ Connector type: SC

➢ Refer to Table 2-1 for other parameters

## 3.3 SDH Copper Interface Specification

➢ Speed: 155.52Mbps

➢ Line code: CMI, compliant to G.703 standard

➢ Connector type: BNC

## 3.4 100M/1000M Ethernet Copper Interface Specification

➢ Fast Ethernet: 10/100M auto-negotiation; Gigabit Ethernet: 1000M full duplex

➢ Connector type: RJ45

➢ Compliant to IEEE802.3 standard

➢ Support VC4, VC3, and VC12 concatenation

➢ Support LCAS under VC3 and VC12 virtual concatenation

➢ Support GFP and LAPS encapsulation

**Note: VC3 and VC12 concatenations are not implemented on this version**

## 3.5 100M/1000M Ethernet Fiber Interface Specification

➢ Fast Ethernet: 100M full duplex; Gigabit Ethernet: 1000M full duplex

➢ Connector type: SC

➢ Refer to Table 2-1 for other parameters

- ➢ Support VC4, VC3, and VC12 concatenation

- ➢ Support LCAS under VC3 and VC12 virtual concatenation

- ➢ Support GFP and LAPS encapsulation

- ➢ **Note: VC3 and VC12 concatenations are not implemented on this version**

## 3.6 Console Port Properties

- ➢ Connector type: RJ45

- ➢ Compliant to RS-232 standard

- ➢ Speed: 9600bps

## 3.7 SNMP Port Properties

- ➢ Connector type: RJ45

- ➢ Compliant to IEEE802.3 standard

- ➢ 10/100M auto-negotiation

- ➢ Host mode pin order, supporting auto-MDI/MDIX

## 3.8 Power Supply

- ➢ Power voltage: DC -48V, tolerance -72 ~ -36V

  AC 220V, tolerance 180 ~ 260V

- ➢ Power consumption: less than 20W

## 3.9 Working Environment

- ➢ Temperature: -5 ~ 50℃

- ➢ Relative humidity: ≤ 90% (35℃）

# Chapter 4  Construction and Indicators

## 4.1 Front Panel



Figure 4-1 RC702 SDH copper interface + Fast Ethernet fiber interface front panel
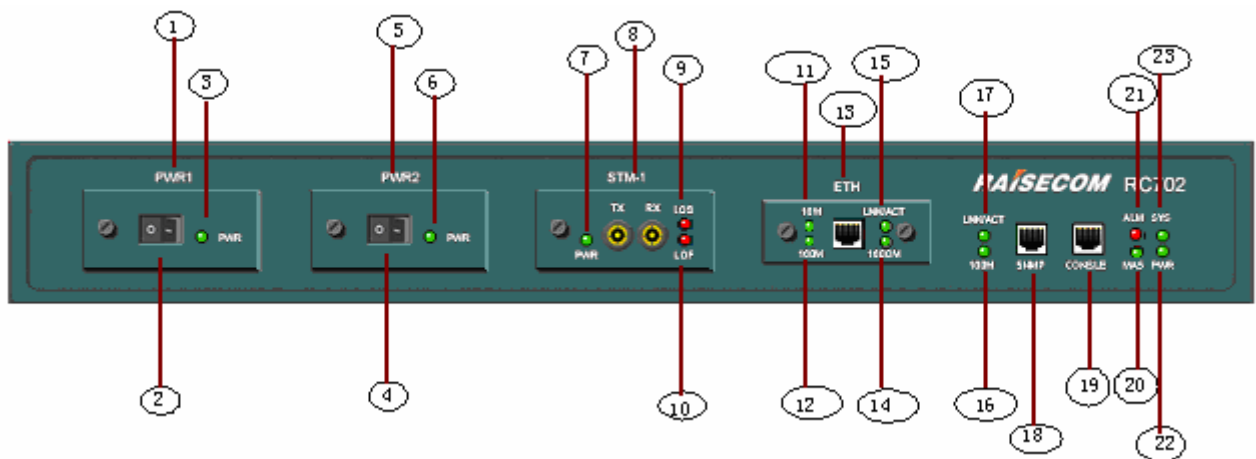


Figure 4-2 RC702 SDH fiber interface + Fast Ethernet copper interface front panel



Figure 4-3 RC702-GE SDH fiber interface + Gigabit Ethernet fiber interface front panel



Figure 4-4 RC702-GE SDH copper interface + Gigabit Ethernet copper interface front panel

**Note: RC702 and RC702-GE adopt the same hardware structure, except for Ethernet expansion card.**

| Number | Item | Indicator color | Description |
|---|---|---|---|
| 1, 5 | Power supply card slot | | Number 1 and 2 swappable power supply, optional AC220V and DC-48V |
| 8 | SDH card slot | | SDH interface, fiber/copper interface optional |
| 15 | Ethernet card slot | | RC702: optional fiber/copper 100M interface card; RC702-GE: optional fiber/copper 1000M interface card |
| 2, 4 | Power supply switch button | | Number 1 and 2 power supply buttons |
| 3, 6, 7, 22 | PWR indicator | Green | ON: power up; OFF: power down 3 and 6 indicates power supply cards power up; 7 indicates SDH interface card power up; 22 indicates the whole device power up |
| 9 | LOS indicator | Red | ON: SDH interface signal loss; OFF: SDH interface normal |
| 10 | LOF indicator | Red | ON: SDH interface frame loss; OFF: SDH interface normal |
| 11,12,14 | Ethernet 10M, 100M, and 1000M indicator | Green | Indicates corresponding working speed respectively Note: RC702-GE only supports 1000M full duplex |
| 15, 24 | Ethernet LNK/ACT indicator | Green | ON: Ethernet interface status up, link normal Flashing: transmitting/receiving data |
| 16 | SNMP port 100M indicator | Green | ON: SNMP port works at 100M; OFF: SNMP port works at 10M |
| 17 | SNMP port LNK/ACT indicator | Green | ON: SNMP port status up, link normal; Flashing: transmitting/receiving data at SNMP port |
| 18 | SNMP | | SNMP Ethernet port |
| 19 | CONSOLE | | Local console port, connecting to PC COM port |
| 20 | MAS | Green | ON: Master station; OFF: Slave station |
| 21 | ALM | Red | General alarm indicator. Any alarm will generate ALM indicator |
| 23 | SYS | Green | System indicator. Flashing indicates CPU normal |
| 25 | SD indicator | Green | Fast Ethernet fiber interface indicator. ON indicates fiber interface is properly connected. |

Table 4-1 RC702/RC702-GE front panel introduction
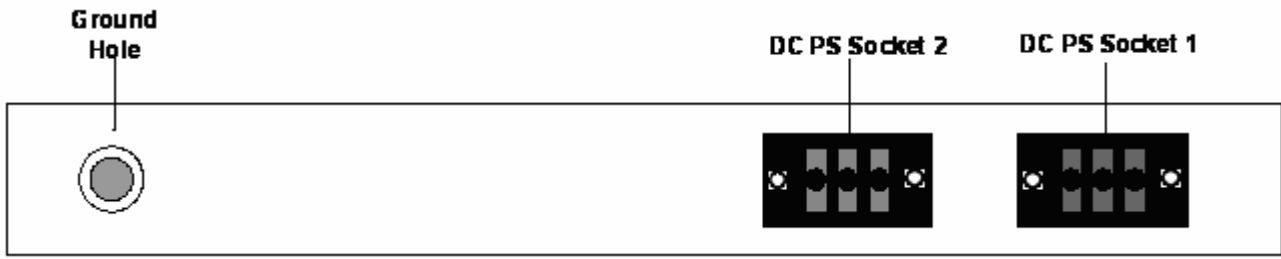
## 4.2 Rear Panel Introduction
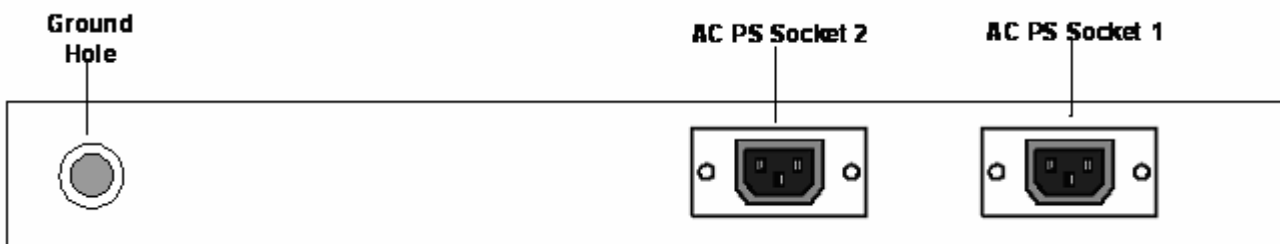
Figure 4-5 RC702 rear panel

# Chapter 5  Function and Application

## 5.1 Basic Principle of RC702

The basic principle of RC702 is: Ethernet interface received frames will be GFP/LAPS encapsulated and mapped into corresponding VCG (1*VC4/N*VC3/N*VC12), and transmitted through SDH/MSTP network to the other end. At the other end, RC702 will extract original Ethernet frames from GFP/LAPS encapsulation and output them to Ethernet interface.

## 5.2 Basic Applications
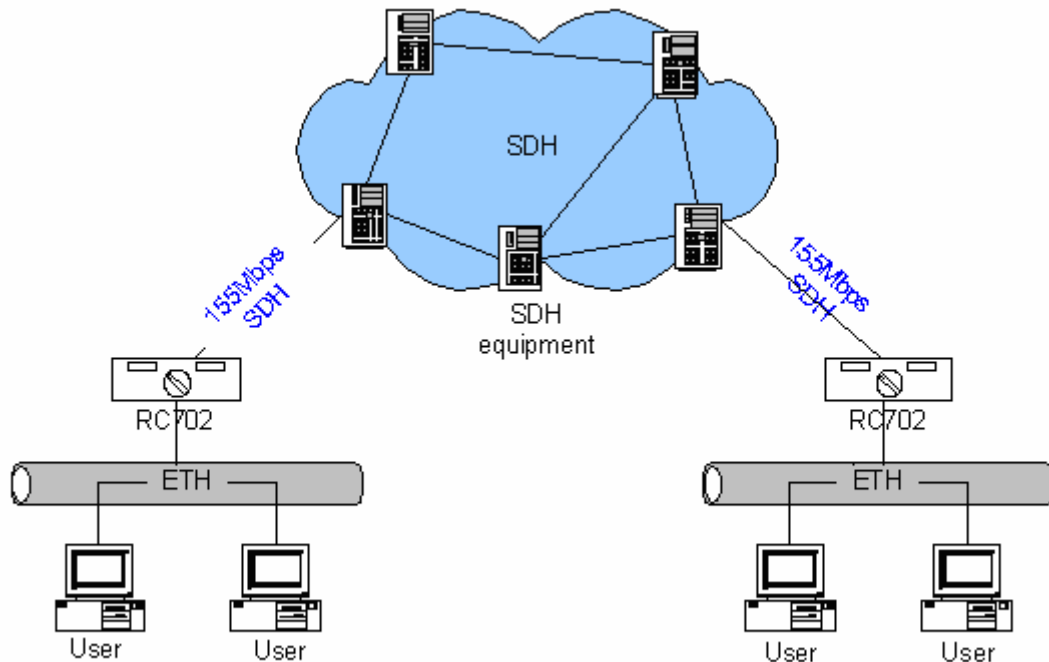
RC702 basic application is depicted in Figure 5-1.



Figure 5-1 RC702 typical application

# Chapter 6  Installation and Inspection

## 6.1 Preparation

First check the type and amount of the device with packing list, and the appearance. There must be drying process if the device is affected by damp environment.

To make sure the device will work normally, please follow the steps:

- ➢ Read the user manual carefully
- ➢ Prepare fiber optic and Ethernet cable
- ➢ Fix and install access device
- ➢ Connect fiber and cable
- ➢ Configure the device. For configuring details, refer to software configuration guide.
- ➢ Use normally

## 6.2 Installation Process

### 6.2.1 Preparing cables

Necessary cables are listed below:

| Interface | Cable specifications |
|---|---|
| 10/100/1000Mbps Ethernet interface and SNMP port | 100BaseTX CAT5 UTP cable, max 100m. User prepares. |
| Console cable | Refer to Annex for console cable making. One console cable is provided with accessory. |
| 155M SDH copper interface | BNC connector, 75Ohm coaxial cable, and max 100m. User prepares. |
| 155M SDH fiber interface and Ethernet fiber interface | SC/SC or SC/FC connector single mode or multimode patch cord, depending on user's requirement. |
| Power supply socket | AC: 200V/10A power cord<br>DC -48V: -48V/10A power cord |

Table 5-1 RC702 interface cable specification

### 6.2.2 Connect 155M SDH fiber interface

- ➢ Connect the prepared fiber patch cord to SDH interface
- ➢ LOS indicator shall be OFF if connecting correctly

### 6.2.3 Connect 155M SDH copper interface

- ➢ Connect the prepared 75Ohm coaxial cable to SDH interface
- ➢ LOS indicator shall be OFF if connecting correctly

### 6.2.4 Connect Ethernet fiber interface

- ➢ Connect prepared fiber patch cord to Ethernet fiber interface

> LNK/ACT indicator shall be ON if connecting correctly *(Note 1)

## 6.2.5 Connect Ethernet copper interface

One end of Ethernet cable shall be connected to Router or Ethernet Switch, and the other end shall be connected to Ethernet copper interface. LNK/ACT indicator shall be ON if connecting correctly. (*Note 1)

## 6.2.6 Connect SNMP port

Connect SNMP port and relevant management station with Ethernet cable. LNK/ACT indicator shall be ON if connecting correctly.

## 6.2.7 Connect console port

> Connect the console cable's RJ45 head to the console port of RC702

> Connect the console cable's DB8 head to the COM port of management station

> Start Hyper Terminal software on management station and configure the interface property as below.
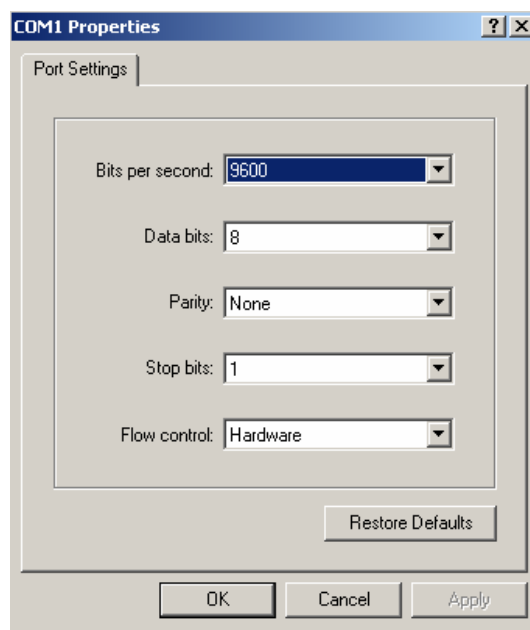


> Configure RC702 management information. Refer to RC702 Software Configuration Guide and RC702 Command Notebook for details.

## 6.2.8 Applying power supply

If using DC -48V power supply, connect the 'ground' pin to protecting ground PGND. Before turning on the power supply, connect '-48V' pin to the low voltage cord, and 'BGND' pin to the high voltage cord. Firmly connected and ensure there is no short circuit, then turn on the power supply.

If using AC 220V power supply, directly use the power cord shipped with the device.

After connecting power supply, PWR indicator shall be ON. When SYS indicator on the front panel begins to flash, the device has finished initialization.

**\*Note 1: RC702-GE Ethernet interface (fiber/copper) only supports 1000M full duplex mode. If connected with another 10/100M device, it will not be able to LINK and will not work.**

# Appendix A. Abbreviations

STM-1:   Synchronous Transport Module (-N)

SDH:     Synchronous Digital Hierarchy

GFP:     Generic Framing Protocol

LAPS:    Link Access Procedure SDH

LACS:    Link Capacity Adjustment Scheme

EOS:     Ethernet over SDH

# Appendix B. FAQ

If you encounter problems during installation and deployment, please try the following solutions. However, if problems persist, please contact your local distributors or Raisecom for technical support.

1. The green PWR indicator is OFF?

Answer: the device is not properly connected with power supply or power supply fails.

2. There is LOS alarm at SDH fiber/copper interface.

Answer: it indicates SDH fiber/copper signal loss. First, check if fiber/copper cable is properly connected; second, use fiber optic (attenuator may be needed)/coaxial to loopback; third, change a new fiber optic/copper. If the problem persists, it is likely that the device is faulty.

3. Ethernet interface or SNMP port LNK/ACT indicator is OFF.

Answer: first check if the cable is disconnected. Then check if Ethernet interface or SNMP port connected device is working properly, speed matching. Confirm if the wire order is correct.

# Appendix C. Console Cable Making

One end of console cable is RJ45 connector, connected to RC702 device; the other end is DB9 connector, connected to management station. The pin configuration is listed in below table.

| RJ45 pin number | Definition | DB9 pin number |
|---|---|---|
| 1 | NC | - |
| 2 | DSR# | 6 |
| 3 | RxD | 3 |
| 4 | GND | 5 |
| 5 | GND | 5 |
| 6 | TxD | 2 |
| 7 | DTR# | 4 |
| 8 | NC | - |

'-' means RJ45 pin is not connected;

DB9 pin that not listed is not connected.

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