



**RCMS2104-120 Standalone
Fiber-Optic
Ethernet Multiplexer**

User Manual (Rev.B)

1. Cautions



Please read the following notices carefully before installing and using the device, Raisecom does not respond to any loss that caused by violating safety notice.



RCMS2104-120 provides two types of power supply: AC and DC. When using DC power supply, please plug the power supply connectors according to this manual strictly and avoid contrary connecting.



RCMS2104-120 is integrated device that has precise elements, please avoid violent shakes and impacts, and do not disassemble or maintain the device yourself. If it is required, please do it under the guide of our technical staff following in the steps of anti static. Please contact us if there is any need.



There must be grounding protection for the sake of safety; do not disassemble the device yourself, we regard it as you waiver your rights of repair guarantee.

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2. Overview

2.1. Introduction

RCMS2104-120 is an ideal transmission device of optical fiber for point-to-point networks, medium-sized and small capacity networks, such as wireless communication base stations, private communication networks and switching networks. It can be applied to either public networks or various private networks. RCMS2104-120 provides 4 E1 links and 4 Ethernet ports that share 100M full speed.

2.2. Main features

- Low power consumption due to extra large-scale ASIC chips; high reliability due to 4-layer PCB
- Alarm indications of local and remote equipment
- Supporting E1 link loop-back function, easy fault location
- Provide one auxiliary data channel-RS232
- Providing 4 10/100Mbps auto-sensing Ethernet interface
- Supporting the isolation and interconnection between Ethernet ports
- Duplex mode can be configured if auto negotiation failed
- The maximum Ethernet frame size is 1916 bytes
- Support flow control of IEEE802.3x in full duplex mode and back pressure in half duplex mode
- Can be managed and manage remote device, network management interface type is choice between RC232 and RS485

2.3. Dimension

- Dimension: 440mm(W)×43.6mm(H)×235mm(D)

3. Parameters

3.1. E1 interface

Bit rate:	2048Kbps±50ppm
Line code:	HDB3
Impedance of interface:	75Ω (unbalanced BNC interface) or 120Ω (balanced RJ-45 interface)
Electrical characteristics:	complies with ITU-T G.703
Transfer characteristics:	complies with ITU-T G.823
Input jitter tolerance:	complies with ITU-T G.823

3.2. Ethernet interface

Complied with IEEE 802.3, IEEE 802.3u
Complied with IEEE 802.3d Spanning Tree, IEEE 802.1q VLAN
Supports oversize frame transmission up to 1916 Bytes (default packet size is 1536)
Rate: 10/100Mbps auto-negotiation
Support full duplex IEEE802.3x and on half duplex mode back pressure flow control

3.3. Optical Interface

Bit rate:	155Mbps
Signal format:	4B5B
Fiber connector:	SC
Optical transmission:	
	Multimode dual-strand, M = 0 – 2km
	Single mode dual-strand, S1 = 0 – 25km, S2 = 10 – 60km, S3 = 15 – 120km

3.4. Auxiliary data channel

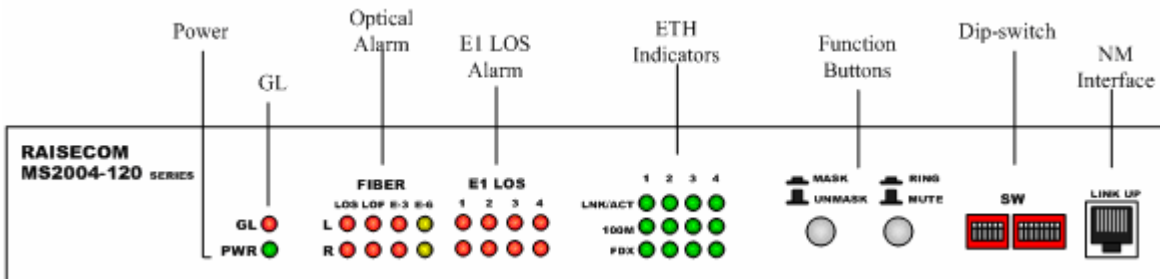
RS232 standard, asynchronous, rate: 0~115.2Kbps

3.5. Power supply

DC: -48V Voltage: -36V ~ -72V
AC: 220V Voltage: 165~265V
Power consumption: ≤25W

4. How to use

4.1. Introduction of front panel



RCMS2104-120 front panel

4.1.1. Power indicator

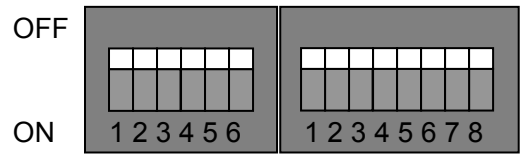
Power indicator (Green): On

4.1.2. Alarm indicator

- GL: general alarm
GL general alarm indicator (red): Any of alarm happened make GL general alarm indicator “on”. Alarm happened on remote site, it is flashing.
- Optical interface
The row (L) indicates “Local”; the row (R) below indicates “Remote”
LOS (red): Optical signal loss, it is on.
LOF (red): optical signal frame loss, it is flashing or on.
E-3 (red): optical receiving signal error bit exceeds 10^{-3} , it is flashing.
E-6 (yellow): optical receiving signal error bit exceeds 10^{-6} , it is flashing.
- E1 loss:
LOS1~4 loss alarm: 1st ~4th E1 LOS alarm. Alarm in local site, E1 LOS is on; alarm on remote site, E1 LOS is flashing; no alarm both on two sides, alarm indicator is off.
- Ethernet indicator: (4 groups of indicators correspond to 4 Ethernet ports)
LNK/ACT (green): receiving or transmitting data, it is flashing.
100M (green): 100Mbps, it is on; 10Mbps, it is off.
FDX/COL (green): full duplex, it is on; half duplex, it is off.

4.1.3. DIP-Switch of front panel:

The dip-switches on the front panel are used to set E1 remote loop-back test, fault-pass-through function, Ethernet frame size, duplex mode, Ethernet port isolation, RS232/485 option for network management interface and remote/local management.



The 6-bit DIP switches on the left:

- 1st on left side: enable/disable loop-back

1 st	Loop-back
OFF	Disable
ON	Enable

- 2nd ~4th: loop-back on remote site

2 nd	3 rd	4 th	Loop-back
OFF	OFF	OFF	1 st E1
OFF	OFF	ON	2 nd E1
OFF	ON	OFF	3 rd E1
OFF	ON	ON	4 th E1

Note: Only one test method can be set: single E1 channel loop-back. When there is loop back test of single E1 tributary, other tributaries are working without disturbance.

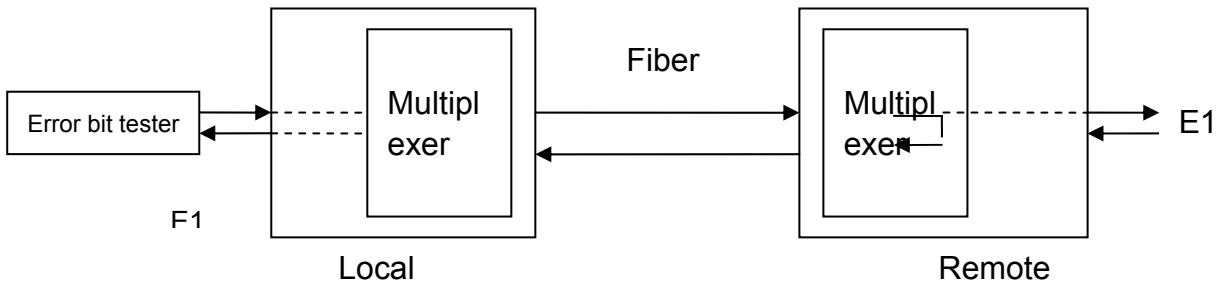


Figure: sketch map of setting remote loop-back on local site

Note : When setting loop-back on local site, DIP-switch of remote site must be all off.

- 5th bit : DIP-switch for FPT

When FPT is disable , it complies with AIS. When E1 signal on remote site is loss , the E1 output of local site is “1” ; when optical signal is loss , all E1 output are “1” on local site.

FPT enable: there is alarm of LOS on any direction of optical interface , both sides E1 output are not HDB3. there is alarm of LOS on E1 terminal device , not AIS alarm.

5 th bit	FPT
OFF	Disable (complies with AIS)
ON	Enable

- 6th bit: set Ethernet frame size

6 th bit	Definition
ON	1916 byte
OFF	1536 byte

8-bit DIP-switch on right side:

- Duplex setting when auto-negotiation fail

Note: supports 10/100Mbps auto-negotiation on Ethernet port

Auto-negotiation fail: according to the table shown as following

Auto-negotiation: working on full duplex

Definition

1 st		2 nd		3 rd		4 th	
OFF	Full duplex (default)	OFF	Full duplex (default)	OFF	Full duplex (default)	OFF	Full duplex (default)
ON	Half duplex	ON	Half duplex	ON	Half duplex	ON	Half duplex

- 5th, 6th bit: Set isolation of Ethernet port

7 th	8 th	Definition
OFF	OFF	1~4 can switch each other, default setting
OFF	ON	1~4 Ethernet port isolated on local site
ON	OFF	1~4 port isolated oppositely both on two sides (with TAG)
ON	ON	1~4 port isolated oppositely both on two sides (without TAG)

“Switch” means all users of local site can communicate with each other and with users of remote site.

“Isolated on local site” means users of local site isolate each other; but can switch data with remote site.

“Isolated oppositely on two sides” means 1st port local site can switch data with 1st port of remote site. So do others.

- 7th bit: RS232/485 option of the network management port.

7 th bit	Protocol options
OFF	RS232
ON	RS485

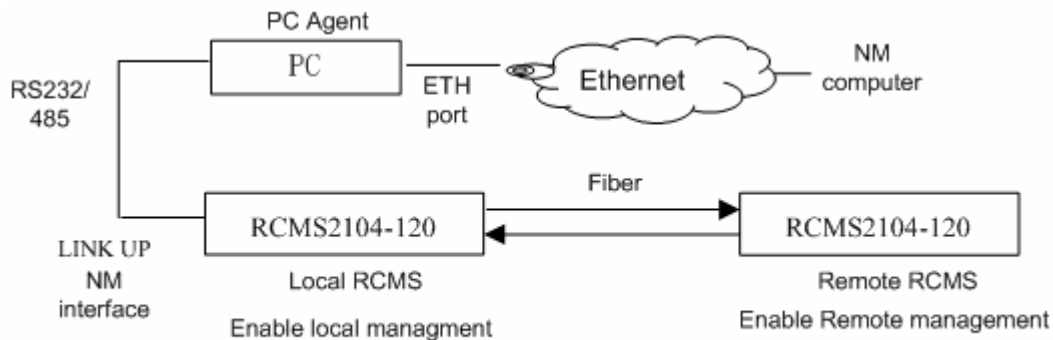
When connecting the LINK UP port with the serial port of PC, it is necessary to adopt the same communication protocol. Or the communication link will not be set up.

- 8th bit: enable/disable of remote management

8 th bit	Remote management
OFF	Disable (default)

ON	Enable
----	--------

NOTE: If use NM function, should configure this bit switch before opening equipment. Ethernet multiplexer, connecting with computer serial port by LINK UP interface (we call local end as Ethernet multiplexer), should be configured to 'valid local end control', otherwise, should be configured to 'valid remote control' for remote end. Therefore, two Ethernet multiplexers can be controlled on both ends simultaneously. NM topologies are illustrated as following.



NOTE: could install PC Agent software on NM computer as per users' requirement.

Management information to Ethernet multiplexers at remote end is transmitted through the overhead of optical signal. It will not take use of bandwidth of each port, the method of which is out-of-band management.

4.1.4. Function button: default settings are all pressed out

- MASK/UNMSAK shield pseudo alarm button
Press it in, shield unused E1 branch indicator (pseudo alarm)
Press it out, do not shield E1 branch indicator
- RING/MUTE button
If press buttons in, alarm indicators are ON and alarm are set off.
If press buttons out, alarm is mute

4.1.5. NM (Network Management) interface

Connect NM interface 'LINK UP' with computer serial port. Could select interface mode between RS232 and RS485.

- 'LINK UP' uplink interface: RJ45 with RS232 or RS485 standard (bit rate: 19.2Kbps). Line order refers to appendix A.

4.2. Introduction of back panel



Figure: RCMS2104-120 of back panel

4.2.1. Power interface and Switch

- AC supply: adopt standard three-phase electric socket with 220V
- DC supply: adopt power interface with $-48V$. Connect left interface with $-48V$, right with $0V$, and middle with protection GND
- Switch can control power supply.

4.2.2. Auxiliary Data Channel

RS232 interface: adopt RJ45. Refer to Appendix A for line orders.

4.2.3. Ethernet interface

- Connect each RJ45 with relevant one Ethernet link. Line order refers to appendix A.
- Each port is 10/100Mbps auto-adaptive.
- Possess auto-learning cross line function. Support parallel line or cross line to connect with Ethernet equipment.

4.2.4. E1 interface

A DB37 male connector on the back panel provides 1st~4th E1 branch ports. The instruction of line connection refers to appendix A.

- If adapt 75Ω connection mode, require to connect DB37 with eight adaptors of CC3 coaxial interfaces which type is CC4B-8G. After connection, there are 4 E1 branches from left to right, where the above row is signal output 'OUT' and bottom row is signal input 'IN'.
- Do not require adapter for using 120Ω connection mode.

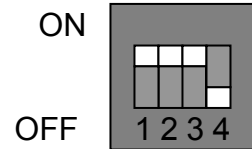
4.2.5. Optical interface

Single strand fiber and SC/PC optical interface

4.3. Bottom DIP-Switch

There are two 8-bit switches, each of which is corresponding to 2 E1 branch links configuration nearby the E1 interface at the bottom of equipment

The dip-switch can be set by using small sharp pen or tools. Each set of dip-switch is in correspondence with E1 port.



Definition as following :

1 st	2 nd	3 rd	4 th
ON	ON	ON	OFF
75Ω unbalanced signals are valid			
5 th	6 th	7 th	8 th
ON	ON	ON	OFF
75Ω unbalanced signals are valid			

Or

1 st	2 nd	3 rd	4 th
OFF	OFF	OFF	ON
120Ω balanced signals are valid			
5 th	6 th	7 th	8 th
OFF	OFF	OFF	ON
120Ω balanced signals are valid			

Or

As shown in above figure, the default status is set as '75Ω unbalanced signal BNC interface are valid'.

Note: Suggest using adapter for 75Ω unbalanced signal and using DB37 connection for 120Ω balanced signal.

5. Installation and test

5.1. Installation

According to equipment list, check types and amount of equipment and their fittings. Check the appearance of equipment whether are damaged or not. If it is affected with damp, should dry it before use.

5.2. Preparation before installation

- Carefully read this user manual
- Prepare all kinds of cable, which will be used. Assure no short or open circuit. The method of making cable refers to appendix A.
- Assure that voltage is within work condition.
- Prepare bit error tester and optical power meter used for testing cable quality.
- If use 120Ω balanced signal interface, please modify the switch setting at the bottom of equipment.
- Lay the equipment on steady and safe place and note environment demands.

5.3. Installation process

5.3.1. Method of cable connection

- E1 interface
Suggest connecting coaxial adapter with SYV 75-2-2 coaxial cable, or connecting DB37 interface with twisted pair.
- Ethernet interface
Use CAT5 straight or cross over twisted pair
- Optical interface
Plug SC patch fiber into optical interface (push hard until to end). If not sure about transmission direction, please plug the fiber before turning on the power of device
- Auxiliary data channel
If need to use auxiliary data channel, connect it with RS232 cable. Please avoid plugging hot swap.
- NM (network management) function
Connect LINK UP interface with PC serial port under the condition of turning off electricity.
- Switch setting of front panel
Configure switches of front panel as per user requirements under the condition of turning off electricity. Please do not modify other switches except for loopback test switch after turning on electricity.

5.3.2. Electrify

Implement above operations before turning on electricity.

If supply power with DC -48V, please connect 'GND' terminal with protection GND, 'OV' terminal with high potential cable, and -48V terminal with low potential cable. Make sure you follow above statement, and assure firm installation and no open circuit.

If supply power with AC 220V, please use power cord.

Power indicator 'PWR' is ON after turning on electricity

5.3.3. Button usages and switch configurations

Assure there are no alarms for optical interface after turning on electricity. If correctly connect optical interface, alarm of LOS LOF and E-3 will not occur. E-6 might be yellow after first turning on electricity. Because ultrashort jitter of electricity will cause slight bit errors.

- Test bit error

Use 2M Tester to test every E1 error bit level tested through tying in loopback control switch of front panel (please refer to chapter two).

- Shield unused E1 alarm

If there is no any alarm in connected E1 links, but still have unused E1 branches, LOS alarm indicator of unused E1 links called as 'unused E1 alarm' is ON. Press MASK button in to clear all the unused E1 alarm and all the LOS alarm indicator of E1 tributaries are OFF.

If disconnection occurs in linked E1 branch, the LOS indicator of this branch will be still on after shielding unused E1 alarm.

If recover power supply after turning off it, the shield function is disabled. Should press button out and then press it in again.

- Set off or mute alarm

Press RING/MUTE button in to set off alarm. Meanwhile, if any alarm indicator is ON, alarm will make a harsh sound.

6. Troubleshooting

If you have any problems during installation and using, try to solve them by the following proposals. If there is no solution, please contact with distributors for technical support.

These following explanations and solutions of alarm for optical port and LOS alarm for E1 tributaries are analyses of local alarm. Please handle it at remote site if there is remote alarm.

- Green PWR indicator not on

Answer: PS faults. Check if PS working properly and -48 PS connection is not reverse.

- GL is on

Answer: GL is on when alarm happen in local site (L row); GL is flashing when alarm happen in remote site (R row).

Deal with them as following:

1. Besides GL there are some other alarm indicators red or yellow, please deal with these alarm at first.
2. Except GL, no alarm happens in L row. But GL is still on in local site (L row). The reason maybe is that CV alarm exists. It is arose by much longer E1 line or much disturbance or attenuating more than -6dB.
3. Except GL, no alarm happens in R row. But GL is still on in remote site (R row). The reason is that HDB3 CV alarm happened in remote site.

- LOS red indicator of optical port is on

Answer: Loss of receiving signal occurs at optical port. Check if the input fiber is connected well and if there is reverse in connection. Check the received optical power using optical power meter, it should be greater than receiving sensitivity.

- LOF red indicator of optical port is on

Answer: Loss of frame of receiving signal at optical port. In this case, optical signal has received, but the optical power may be about critical value of sensitivity. Check RX optical power to ensure if it connects well at remote optical TX port.

- E-3 red indicator is on at optical port

Answer: The bit error of optical RX signal is greater than 10^{-3} . Check if optical RX port connects well and RX optical power.

- E-6 yellow indicator of optical port is on

Answer: The bit error of optical RX signal is greater than 10^{-6} . It is normal that there is E-6 alarm just after turning on the power, after about 10 seconds, the E-6 indicator will be off. If there is E-6 alarm during operation, then check if optical RX port connects well and RX optical power.

- LOS red indicator of E1 channel is on

Answer: Loss alarm of RX signal at E1 channel, there is no HDB3 signal received. Check if it connects well at E1 port; if the connection of 75 Ω cable reverse and if the string of 75 Ω

cable in right order. If there is LOS alarm of unused E1 tributary, can press “mask” button to “on” to make alarm after configuration of device.

7. Appendix Introduction of making cable

A.1 E1 interface

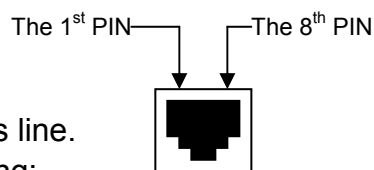
- 75ohm adopt DB37 external hanging coaxial adapter:
Suggest using SYV 75-2-2 coaxial cable. The longest distance is less than 200 meters.
Take CC3-K3 plug out fittings and screw off protecting sheath. Split the core and shielded layer of coaxial cable. Protecting sheath, iron collar and cannulation ($\Phi 3$) cover onto cable. Firmly weld core and CC3-K3. Wrap CC3-K3 plug in protecting sheath of cable. Hold and press iron collar by press pincher. Wrap CC3-K3 and line in cannulation, which is contracted and fastened by heat. Fix protecting sheath.
- 120ohm DB37 male connector is defined as following:

DB37 pin definition	1st Branch	2nd Branch	3rd Branch	4th Branch
OUT	3、 4	7、 8	11、 12	15、 16
IN	21、 22	25、 26	29、 30	33、 34

Other pin: GND

A.2 Cable of Ethernet

Use Cat 5 twisted pair to connect the equipment. Please note the twisted pair is less than 100 meters.



Can choose parallel or cross line.
RJ45 line order is as following:

Pin number	1	2	3	4	5	6	7	8
Definition	TX+	TX-	RX+	Not Used	Not Used	RX-	Not Used	Not Used

A.3 RS232 cable of data channel

Auxiliary data channel adopts RJ45 connector whose pins definition are as following:

- 3 —RXD 232 signal input
- 6 —TXD 232 signal output
- 4, 5 —GND

Others — Unassigned

Line orders between RS232 (RJ45) and PC serial port (DB9 female connector) are as following:

RJ45		DB9F
3	←	3
6	→	2
4, 5	—	5

A.4 LINK UP cable of NM interface

Connect LINK UP interface with console interface

LINK UP interface adapts RJ45 whose pins definition are as following,

RS232 Part:

3	—RXD	232signal input
7	—TXD	232 signal output
4, 8	—GND	

RS485 Part,

1	—RXD+	485 signal input
2	—RXD-	485 signal input
5	—TXD-	485 signal output
6	—TXD+	485 signal output

NOTE: output and input of signal is as far as equipment itself.

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