

PDH

FOM-120 Serial

FOM-240 Serial

ZHT TELECOM

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V1.4	2006-05
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1. Introduction

1.1 Product Overview

FOM-120 serial and FOM-240 Serial - 4/8E1 PDH is the point to point optical transmission equipment and developed in VLSI basis. This equipment realizes 4/8E1 circuit and one 100M wire speed multiplexing and optical transmission by a concise single board. Perfect alarm monitor function, high integration, low power consumption, stable performance, easy to use.

1.2 Main Features

- ▶ 1+1 optical circuit standby with rate of 150Mbps.
- ▶ HDB3 E1 line code. E1 jitter tolerance, transfer characteristics, output jitter is fully complied with ITU-T G.703, G.823, G.742.
- ▶ 4 Ethernet ports fully support VLAN, auto-negotiation, full/half duplex, auto adapt 10/100M.
- ▶ Perfect alarm function. Be able to supervise the remote equipment status.
- ▶ Order wire phone function by normal phone.
- ▶ Support console RS232 or SNMP&WEB network management (optional)
- ▶ Support 2 RS232 data channel with the rate of 115.2Kbps.
- ▶ Single board design, 1U, 19inch.
- ▶ 1+1 standby power supply. The equipment can be with 2 AC220V, 2 DC-48V or one AC220V and one DC-48V.

2. Technical Parameters

2.1 Optical Port

Table 1: optical interface option

Name	Option	Default
Transmission mode	Single mode/multi mode	Single mode
Module type	Single fiber/dual fiber	Dual fiber
Interface type	FC/SC/ST	FC
Wavelength	850nm/1310nm/1550nm	1310nm
Transmission distance	2Km/40Km/60Km/120Km	40Km

2.2 E1 interface

- ▶ Rate: 2.048Mbps, ± 50 ppm tolerance available
- ▶ Impedance: 75 Ω unbalanced or 120 Ω balanced optional
- ▶ HDB3 coding: comply with ITU-T G.703
- ▶ Jitter output:: (please check table 2)

Table 2: Jitter output

B1(20Hz~100KHz)	<0.08 UI
B2(18kHz~100KHz)	<0.05 UI

- ▶ Jitter input tolerance

Jitter input tolerance comply with ITU-T G. 823. Please check the typical value as table 3 below:

Table 3: Jitter input tolerance

Frequency(Hz)	10	20	63	130	500	1.2k	2.1k	3.7k	6.4k	11k	100k
Jitter (UI)	30.7	30	26.7	14.6	6.04	4.22	3.83	3.7	3.1	2.8	0.7

- ▶ Jitter transfer character

Jitter transfer character complies with ITU-T G.742. The typical value as table 4 below:

Table 4: Jitter transfer character

Frequency (Hz)	20	45	65	130	260	500	1.2k	2.1k	100k
Gain(dB)	-35.97	-42.71	-56.82	-64.43	-57.63	-57.50	-54.37	-55.12	-52.31

2.3. Ethernet interface

Table 5: Ethernet parameters table

Item No.	Content	Parameters or function description	Default
1	MAC address table capability	1024	-
2	MAC address table aging time	Very short	-
3	The minimum frame length	64 bytes	-
4	The maximum frame length	1916 bytes	-
5	Working mode	The rate and full/half duplex can be configurable by network management	Auto-negotiation
6	VLAN	1. Support VLAN based on ports. 2. Support VLAN transparent transmission when the equipment is no in VLAN status.	Not in VLAN status
7	Stream control	support	open
8	Bandwidth	4 ports shared 100Mbps	

Table 6: Throughput test result table

Frame Size	Passed Rate (%)	Port 01 to Port 02 (pkts/sec)	Port 02 to Port 01 (pkts/sec)	Total
		100M -100M	100M -100M	
64	100.00	148810	148810	297620
128	100.00	84459	84459	168918
256	100.00	45290	45290	90580
512	100.00	23496	23496	46992
1024	100.00	11973	11973	23946
1280	100.00	9615	9615	19230
1518	100.00	8127	8127	16254
1536	100.00	8033	8033	16066

► Overload package loss rate

Table 7: Overload package loss rate test result table

Frame Size	Rate Tested (%)	Port 01 to Port 02 (%)	Port 02 to Port 01 (%)	Average
		100M -100M	100M -100M	
64	100.00	0.000	0.000	0.000
128	100.00	0.000	0.000	0.000
256	100.00	0.000	0.000	0.000
512	100.00	0.000	0.000	0.000
1024	100.00	0.000	0.000	0.000
1280	100.00	0.000	0.000	0.000
1518	100.00	0.000	0.000	0.000
1536	100.00	0.000	0.000	0.000

► Forward delay(please refer to table 8)

Table 8: forward delay test result table

Frame Size	Rate Tested (%)	Port 01 to Port 02(us)-CT	Average (CT)	Port 02 to Port 01 (us)-S&F	Average (S&F)
		100M -100M		100M -100M	
64	100.00	100.3	100.3	95.1	95.1
128	100.00	110.6	110.6	100.4	100.4
256	100.00	131.1	131.1	110.6	110.6
512	100.00	172.0	172.0	131.1	131.1
1024	100.00	253.5	253.5	171.6	171.6
1280	100.00	294.8	294.8	192.3	192.3
1518	100.00	332.9	332.9	211.5	211.5
1536	100.00	335.7	335.7	212.9	212.9

► Back to back test (please refer to table 9)

Table 9: back to back test result table

Frame Size	Rate Tested (%)	Port 01 to Port 02 Burst Size (frames)	Port 02 to Port 01 Burst Size (frames)	Total
		100M -100M	100M -100M	
64	100.00	297620	297620	595240
128	100.00	168918	168918	337836
256	100.00	90580	90580	181160
512	100.00	46992	46992	93984
1024	100.00	23946	23946	47892
1280	100.00	19230	19230	38460
1518	100.00	16254	16254	32508
1536	100.00	16066	16066	32132

2.4 Power

- ▶ Input power voltage: DC-48V, -36V ~ -72V (DC) tolerance
 Input power voltage: AC220V, ~165V ~ ~264V tolerance
- ▶ Power consumption: less than 10W

2.5 Working environment

- ▶ Temperature: -10°C— 60 °C
- ▶ Humidity: 95%, noncondensing

2.6 Dimension and weight

- ▶ LengthxHeightxWidth : 483mmx44mmx200mm
- ▶ Weight: 2.5kg

3. Operation Illumination

3.1 Front panel illumination

The front panel of 4/8E1 PDH multiplexer is as figure 1 below:

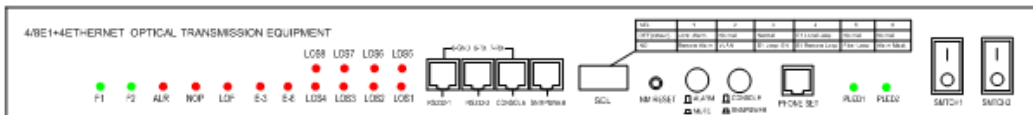


Figure 1 front panel of 4/8E1 PDH

Table 10 Front panel indicator light illumination

Indicator light	Color	Status	Function description
F1	green	ON	The light in on status indicates the first fiber channel is in use
F2	green	ON	The light in on status indicates the second fiber channel is in use

ALR	red	ON/FLICKER	<p>General alarm indicator light</p> <p>The ALR will keep on when the local equipment has alarm. The indicator lights in the panel shows the local alarm.</p> <p>When DIP SEL:1=ON(please refer to the later chapter), the indicator lights in the panel shows the remote alarm.</p> <p>When local equipment is normal and the remote equipment has alarm, this light will flicker. When DIP SEL:1=ON(please refer to the later chapter), the indicator lights in the panel shows the remote alarm.</p>
NOP	red	ON	<p>No optical indicator light. This alarm masks LOF、IE-3、IE-6 alarm.</p> <p>When there is no optical input, this light will be in on status.</p> <p>When there is optical input, this light will be in off status.</p> <p>NOP indicator light will indicates the remote alarm when pushing the alarm choice switch.</p>
LOF	red	ON	<p>Loss optical synchronous alarm. This alarm will mask IE-3、IE-6.</p> <p>This alarm will be masked in no optical status. The error code alarm will be masked if this alarm takes effect.</p> <p>LOF alarm will be for remote equipment when pushing the alarm choice switch.</p>
IE-3	red	ON	<p>The error code rate is more than 10⁻³.</p> <p>This alarm will mask IE-6.</p>

			This alarm will be for remote equipment on 10-3 alarm when pushing the alarm choice switch.
IE-6	red	ON	The error code rate is more than 10 ⁻⁶ . This alarm will be for remote equipment on 10-6 alarm when pushing the alarm choice switch.
LOS8-LOS1	red	ON	Alarm for loss 4/8 channel E1 spur track When E1 spur track loss, the reference spur track LOS light will be in on status. This alarm will be for remote equipment when pushing the alarm choice switch.
PLED1	green	ON	The 1st power indicator light. The 1st power can be in use when this power is on.
PLED2	green	ON	The 2nd power indicator light. The 2nd power can be in use when this power is on.

Table 11: Ports and button illumination

Appellation	Illumination
RS232-1	The 1 st channel RS232 with maximum rate of 115.2Kbps. PIN5-GND,PIN6-TX,PIN7-RX
RS232-2	The 2 nd channel RS232 with maximum rate of 115.2Kbps. PIN5-GND,PIN6-TX,PIN7-RX
CONSOLE	Network management port with rate of 9.6Kbps. PIN5-GND,PIN6-TX,PIN7-RX
SNMP&WEB	SNMP or WEB network management interface
NM RESET	Reset switch for SNMP or WEB network management. When





	users forget the manage password or the IP address of the device, press this button and keep 5 seconds. It will recover the default setting when out of the factory.
ALARM/MUTE	Mask alarm sound switch. When the button is in pop status (), the alarm sound will be exist. When the button is in press down status (), the alarm sound will be masked. The phone can ring as normal.
CONSOLE/SN MP&WEB	Network management method choice switch. When in pop status (), the device can use CONSOLE management. When in press down status (), SNMP and WEB management can be in use(optional).
PHONE SET	Order wire phone port. After connecting the phone, there is no need to dial the number to call the remote phone.
SMTCH1	The 1 st power switch
SMTCH2	The 2 nd power switch

Table 12: SEL switch illumination

SEL	Function	Default
SEL:1	OFF: the indicator lights for local equipment ON: the indicator lights for remote equipment	OFF
SEL:2	OFF: 4 Ethernet ports can be intercommunicated ON: 4 Ethernet ports are with VLAN status and isolated (the remote side of SEL:2 should also be in ON status). That's to say, the local 1 st port can only communicate with the remote 1 st port. The local 2 nd port can only communicate with the remote 2 nd port and so on.	OFF
SEL:3	ALS control switch	OFF

	OFF: not with ALS control switch ON: with ALS control switch	
SEL:4	Indicator alarm mask switch OFF: not masked ON: masked	OFF
SEL:5	OFF: in normal work ON: E1 is in loopback status. SEL:4 can be in use.	OFF
SEL:6	This switch can be in use when SEL:3=ON OFF: E1 ports local loopback ON: E1 ports remote loopback	OFF
SEL:7	OFF: in normal work ON: loop from optical port to equipment	OFF
SEL:8	standby	OFF

3.2 Rear panel illumination

The rear panel of 4/8E1 PDH multiplexer is as figure 3 below

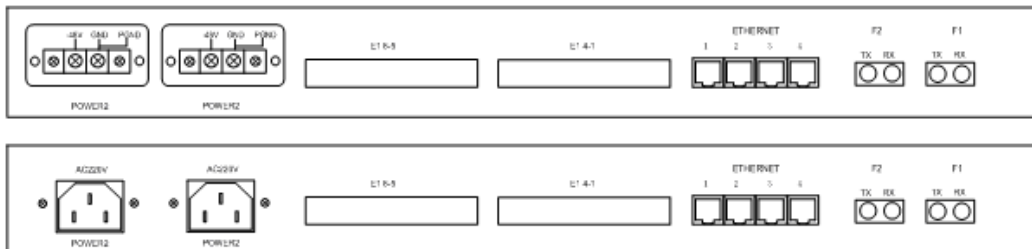


Figure 3 rear panel of 4/8E1 PDH

Rear panel illumination

- ▶ AC220V : AC220V power input
- ▶ -48V GND PGND : DC-48V power input
- ▶ E1 8-5 : 5-8 channel E1 port
- ▶ E1 4-1 : 1-4 channel E1 port
- ▶ ETHERNET : Ethernet port

- ▶ F1 : the 1st fiber port
- ▶ F2 : the 2nd fiber port

3.3 Network management operation

4/8E1 PDH supports the network management function based on PC. The local and remote equipments can be managed by RS232 console or SNMP and WEB optional.

4. Installation and maintenance

4.1 Installation

Open the package and check whether there is any missing accessory. Please contact supplier if there is any problem.

Open the power, the power indicator light will be in on status. Configure accordingly to different requirements.

4.2 Maintenance

The equipment is concise optical device. Please cautious when in delivery and moving. Please protect from moisture and impact.

The equipment has configured to the best status when out of the factory. All the function interfaces are in the front or rear panel. Please don't open the device if not our technical staff.

If the device is in failure, please contact the supplier.

5. RS232 hyper terminal network management

5.1 Features

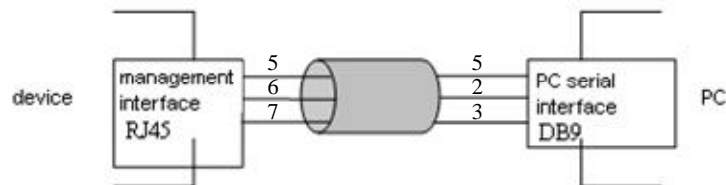
Use Human-Computer Interface. Operation is easy and convenient without

installing any other software. When the hardware is in normal connection, open the hyper terminal in the computer operation system and the management is able to use after configuration. The network management window is able to overall supervise the status of local and terminal device, find the malfunction easily, configure the working mode easily and support memory when power off, no need to reconfigure when power up.

5.2 Connection and configuration

Use serial asynchronous transmission mode for the intercommunication between computer and network management card. Baud rate: 115200bps, no parity mode, data bit number: 8, stop bit number: 1

Management interface uses the simplified RS232 interface to connect with serial interface of computer. Only need to connect three signal wires: RXD, TXD, GND as below figure connection.



Open the hyper terminal of operation system after confirming the right hardware connection between PC and network management card as steps below.

- a. **【Start】 - 【Program】 - 【Accessories】 - 【communication】 - 【hyper terminal】** , input any appellation in the popping **【Connection description】** window, then click **【OK】**



b. Choose “COM1” from the drop-down menu for **【Connect to】** (choose according to the practice COM number in hardware connection) and click **【OK】**



c. Choose” 115200” from the drop-down menu in **【Bits per second】** , choose “8” from the drop-down menu in **【Data bits】** , choose “none” from the drop-down menu in **【Parity】** , choose “1” from the drop menu in **【stop bit】** , choose “none” in **【Flow control】** and click **【OK】** after all the configuration.



5.3 Operation instructions

After the above steps, we will come to the hyper terminal window used for the management. When the device connects to the power, it will come to the management window as below:



Please press "help" before using, press "enter" key and we can check the command and reference descriptions.


```

-->>help
Command          Description
=====
?/help           To get a list of the commands for the system.
showversion      View the IC,hardware and software version.
showeth          To get EthPort status.
seteth           To set EthPort status.
showvlan         To get vlan.
setvlanpriority  To set vlan priority.
setvlanenable    To set vlan enable.
setvlangroup     To set vlan group.
showalarm        To show alarm information.
setloop          To set loop.
recoverdefault   To recover default value for system.
reset            Reset the system.
-->>

```

Some commands are with parameters while some others are not. We can press “help” command to check first for this and the meanings. For example, input “help setloop”, then press enter, it comes below result:

```

-->>help setloop
<FORMAT>:setloop
<EXPLAIN>:To set loop
<PARAMETER>:
    tpye:[dec] 0:E1 1:Optical
    mode:[dec] 0:noloop 1:loop
-->>

```

“Setloop” has two parameters. The first one is for loop back type and the second is for whether loop or not. If configure E1 loop back is required, we need input the command “setloop 0 1” and enter. If optical loop is required, we need input the command “setloop 1 1”, enter. If configure optical without loop back, we need input the command “setloop 1 0” and enter.

Other command is same as above.

Appendix A Cable making introduction

A.1 E1 cable making

Unbalanced 75Ω use DB37-BNC port. We suggest using SYV 75-2-2 type coaxial cable and the maximum length should be no more than 200 meters.

120Ω is the balanced E1 port with the form of DB37-RJ45. The destination as below:

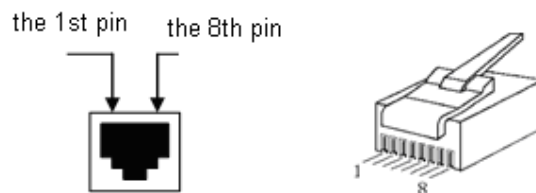
20Ω RJ45 PIN DEFINITION

Pin NO.	Function	Signal direction
1	TX+(data transmitting-forwarded)	output
2	TX-(data transmitting-reversed)	output
3	NC(null)	
4	RX+ (data receiving-forwarded)	Input
5	RX- (data receiving-reversed)	input
6	NC (null)	
7	NC (null)	
8	NC (null)	

A.2 Ethernet cable making

Using RJ45 Cat.5 twisted pair to make the connector and ensure the length is no more than 100 meters.

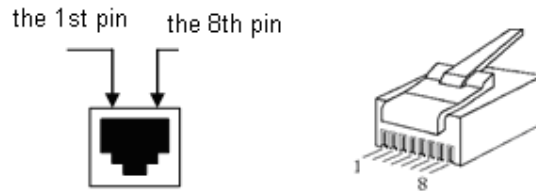
Both MDI and MDIX are workable.



RJ45 connector as figure above and pin definition as below:

Pin No.	1	2	3	4	5	6	7	8
Definition	TX+	TX-	RX+	Not Used	Not Used	RX-	Not Used	Not Used

A.3 CONSOLE cable making



CONSOLE pin definition as below:

- 5 — GND ground
- 6 — TX 232 signal output
- 7 — RX 232 signal input

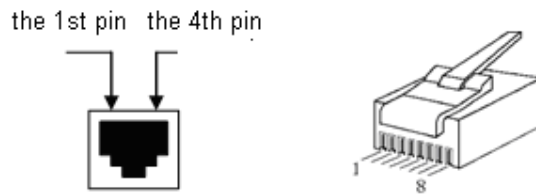
CONSOLE port (RJ45) connect to the computer serial port (DB9 female connector). The pin definition as below:

RJ45 plug		DB9F
5	—	5
6	→	2
7	←	3

Note: The signal input and output is for the equipment.

A.4 Order wire phone cable making

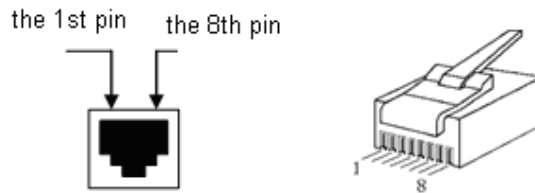
Using RJ11 and ensure the twisted pair should be less than 500 meters.



The phone pin uses a, b cable making. RJ11 picture as above and pin definition as below:

PIN NO.	1	2	3	4
Definition		Phone a	Phone b	

A.5 RS232 cable making



Using RJ45 Cat.5 twisted pair and ensure the length should be less than 15 meters.

Each RJ45 is for one channel RS232, total 2 channels RS232 available.

RJ45 is same as above and pin definition is as below:

PIN NO.	1	2	3	4	5	6	7	8
Definition					ground	RS232 signal output	RS232s ignal input	