FMUX - 2020

PCM Multiplexer

Operation Manual

Content

1 Summary

Nowadays, optical fiber communication and standard interface E1 are widely used, how to solve audio, low-speed data, ISDN, and computer access with relatively low cost and flexibly have been a bothered problem to special network engineer. Based on widely market investigation and absorb advantages of many manufactures,

FMUX2020 PCM multiplexer(hereinafter shortly refer to FMUX2020) is one of FMUX series transmission network products. It can provide users with the combination of 2-wire loop interface, 4-wire E/M interface, RS-232 asynchronous interface, V.35 (or G.703 synchronous data interface), ISDN-U interface, and 10/100M Ethernet interface etc. with total capacity up to 2.048 Mb/s.

GK FMUX 2020 Intelligent Multiplexer is highly integrated and designed with up-to-date large-scale IC (Integrated Circuit). It features advanced network management system and can be maintained easily. The company owns its self-developed IP(Intelligence Property) rights and therefore can satisfy clients' special requirements. In terms of network configuration, it can be used in point-to-point or chain-like network.

2. Main technical character

a) Providing double E1 port (both east direction and west), supporting 75Ω coaxial or 120Ω balance cable connection and self-connectin when power supply is cut off.

b) Double E1 port (both A and B direction) is designed for the networks requiring the add/drop multiplexing of sub-rate signals. After add/drop multiplexing or insert part of sub-rate signals, the E1 signal from A direction can continue to be transmitted to B direction thus completing the relay function.

c) Inserted board structure can provide abundant voice interface by choose different board:

1) LS（Loop Subscriber）interface, also called primary station interface or 2-wire subscriber loop interface, is connected with telephone set. 4 channels of each board.

2) LE（Loop Exchange）interface, also called slave station interface or 2-wire loop exchange interface, is connected with the exchange；4 channels of each board.

3) E/M 4-wire interface, E/M 2/4-wire audio interface board includes E/M signaling, 4 channels of each board. Switch of 2/4-wire can configured by switch in the board, and level can be modulated by network management, also 4 channels of each board.

4) Magneto interface, used in dedicated line telephone, provides ringer and the test of ringing current, 4 channels of each board.

5) Hotline interface can provide two kinds of voice operation: Hotline mode, realizing point –to –point calls and communication of two terminals. Its loop-circuit function is as the same as LS board, realizing choice of the two mode via jumper in the board, 4channels of each board.

d) Providing abundant data interface:

1) V.35 synchronous data interface with a rate of N 64kb/s, up to a maximum of 1.984Mb/s, providing direct connection with DTE or DCE equipment, 2 channels of each board.

2) G.703 64 kb/s synchronous data interface, 4channels of each board.

3) V.24 synchronous data interface with a rate of 2.4k, 4.8k, 9.6k, 19.2k, 38.4k, 64kb/s. Synchronous or asynchronous mode, X.50 multiplexing protocol or direct sample of sub-rate, supporting direct connection with DTE or DCE equipment. 4 channels of each V.24 board, while 5 channels of each X.50 board.

4) Ethernet interface, providing 10/100M Ethernet bridge function, and 1 channel of each board.

5) U interface (ISDN), maximal data transmission rate up to 128kb/s, 2 channels of each board.

(e) With the connection to the PC through serial interface RS-232, the FMUX 2020 Intelligent Multiplexer can realize the network management. The management functions include alarm and status display, interface type and circuit configuration, as well as loop back test etc. Operating system WIN9X/NT is used in PC and a single PC can management as many as 99 terminals.

3. Hardware Characteristic

3.1 Fundamental

FMUX 2020 2Mb/s Intelligent Multiplexer is a kind of primary group equipment with standard pulse code modulation (PCM), compliant with GB6879-86, "Technical Requirements for 2048Kbit/s 30 Channels PCM Multiplexer Equipment", and supporting the multiplexing of various sub-rate signals. Please refer to figure.1.

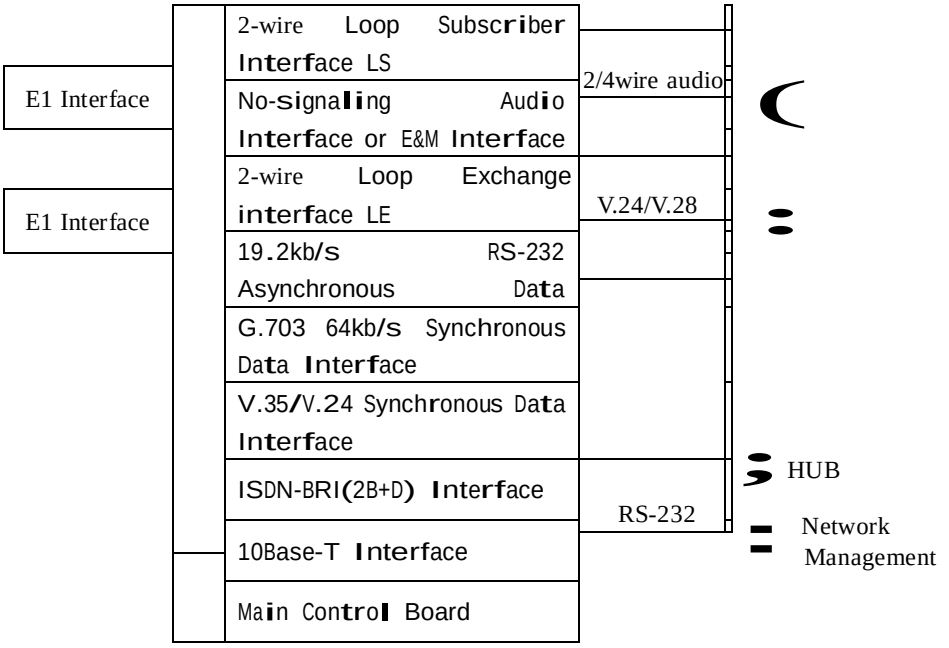


Figure 1 Functional Block Diagram

The collective connection show as figure 2, main control board and interface board connected via PCM high speed bus, within signal PCLK, DR, DX, FS, to complete transmission of voice and data signal. Control of interface board is realized by AD-BUS, this information include: interface board type, running state, CAS, add/drop multiplexing of sub-rate signals etc. The location of interface board LN can be inserted in any type of audio board. Monitor system identify the interface board type automatically and configure standard configuration of time slot.

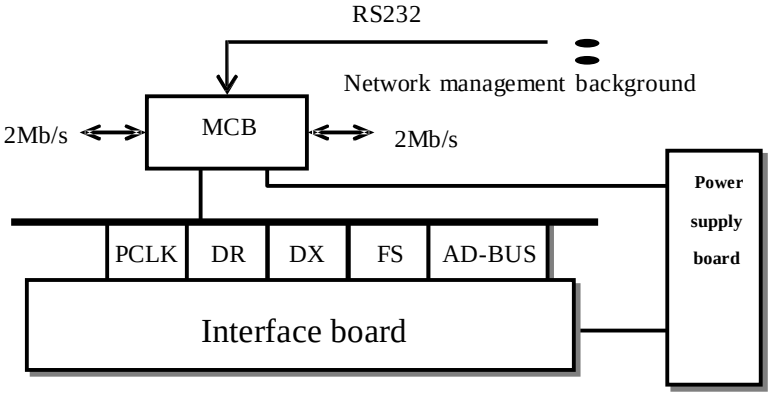


Figure 2 Collective connection diagram

3.2 Mechanical Framework

The box dimension is 345mm×200mm×210mm, and three options for installation are provided :19" frame (hole spacing: 461.5mm), European standard frame (hole spacing: 515mm) and wall mounting. Every unit has 13 circuit boards if fully equipped and all signal lines are connected to the front panel.

MCT	LN	LN	LN	LN	LN	LN	LN	LN	LN	LN	LN	POW

MCT--Main Control Board, LN--Line Interface Board, PWR--Power Supply Board（which can be inserted in the position of LN, used for stand-by）

Figure 3 Mechanical Framework of FMUX2020 multiplexer

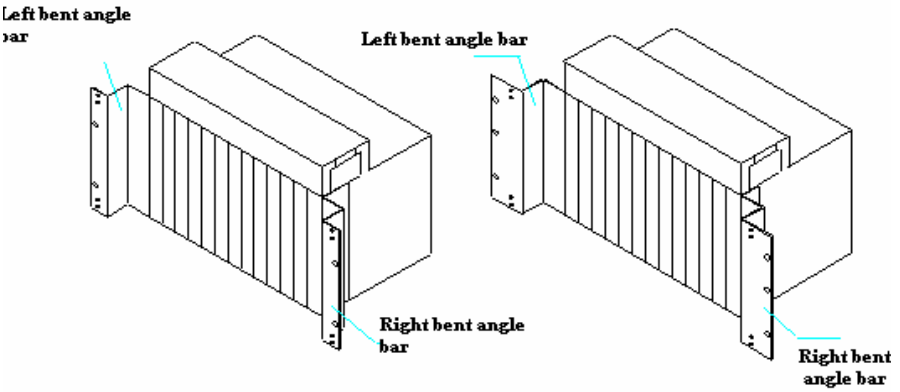


Figure 4a) 19" frame installation diagram

Figure 4b) European standard frame installation diagram

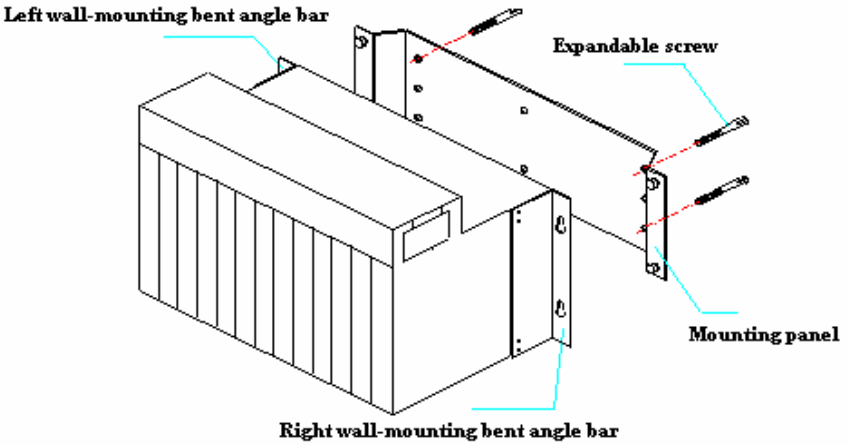


Figure 5 Wall mounting diagram

Figure 4 is the installation diagram on two different width self of the same kind bend angle bar (Installation angle and direction of bend angle bar are different). Figure 5 is wall mounting diagram.

3.3 Main technical Parameter

3.3.1 E1 interface

a) Standard rate: 2048kb/s, capacitance difference ±50 10^{-6}.

b) Interface type: A. 75Ω unbalance, HDB3 code; B. 120Ω balance, HDB3 code.

3.3.2 Audio interface

a) Impedance: 600Ω

b) A rule condensed coding;

c) Audio modulation range:

1) Audio 2-wire: Receiving signal level 0 dBr ~ -7.5dBr, sending signal level 0 dBr ~ -7.5dBr

2) Audio 4-wire: Receiving signal level +2 dBr ~ -13dBr, sending signal level +1 dBr ~ -14dBr.

3.3.3 Data interface

a) V.24 data interface, rate below 64kb/s, synchronous or asynchronous, X.50 multiplexing;

b) G.703 64kb/s synchronous data interface;

c) V.35 synchronous interface, rate is N 64kb/s, maximum is up to 1.984Mb/s;

d) Data line ISDN-U interface, rate is 128kb/s;

e) 10Base-T Ethernet interface, rate is 10/100Mb/s.

3.3.4 Working condition

a) Working voltage ：D.C ±48×(1±20%)V or A.C 220×(1±20%)V;

b) Relative humidity： 10%-90%, not condensation;

c) Environmental temperature： 0 C 40 C;

d) Storing temperature： -30 C 60 C;

e) atmospheric pressure： 86kPa ~ 106kPa;

f) power consume：≤40W

4. Network application

Show as figure 6:

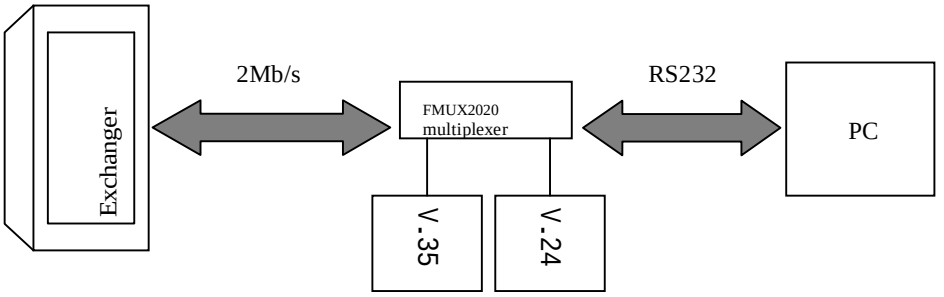


Figure 6 Connection diagram of FMUX2020 multiplexer network configuration

FMUX2020 multiplexer connect with PC via RS232 serial interface to realize network management function. Multiplexer extract 2Mb/s signal which transmitted by base station, providing V.35 and V.24 interface.

5. Installation explain

5.1 Check whether the equipment and spare part are all right

Fixed power supply plug on +48V/+24V or –48V/-24V power supply wire followed as figure 7, and then insert it in power supply jack; AC power supply jack be inserted in directly.

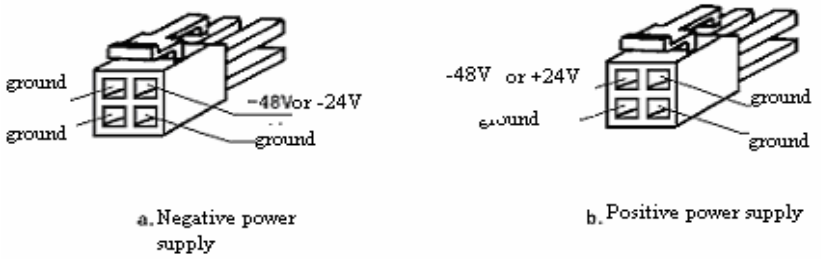
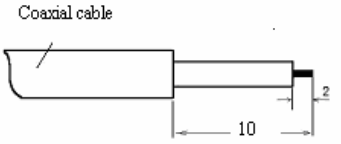


Figure 7 Connection of power supply wire

5.3 Connection of 2M signal

2Mb/s interface connect with the outside via coaxial cable, when exterior wire is 75Ωcoaxial cable, I1 and O1 means input and output of 2Mb/s signal of the first channel(or called A direction),while I2 and O2 means input and output of 2Mb/s signal of the second channel(or called B direction). Coaxial cable configuration is shown as figure 7 and figure 8.



Cut cover of coaxial cable

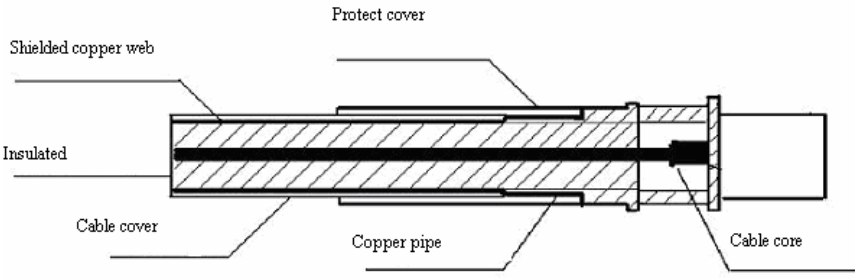


Figure 8 Facture of coaxial cable connector

When exterior wire is 120Ωcoaxial cable, connecting with the outside via DB9 connection jack, show as figure 9.

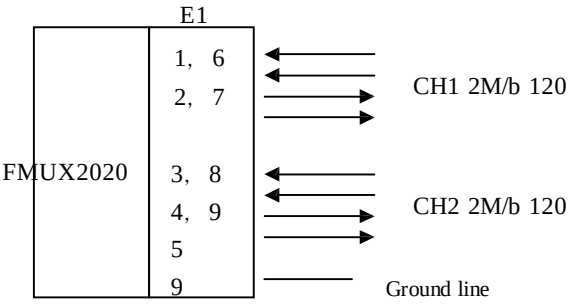


Figure 9 Connection of 2M/b 120Ωcoaxial cable

5.4 Connection of network interface (RS232) cable

Show as figure 10

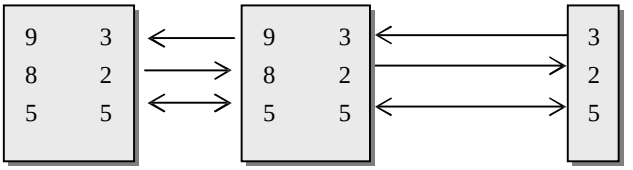


Figure 10 Connection of network interface (RS232) cable

5.5 V.24 data interface

Each V24-RS232 interface board of FMUX2020 multiplexer can provide 4 channels of RS232 data interface at most, connecting with exterior wire via RJ45 connection jack, supporting synchronous and asynchronous interface. Asynchronous data transmitted with sample mode, maximal rate up to 19.2kb/s, and each channel occupy a 64kb/s time slot; Synchronous data rate is 64kb/s. Every kinds of data format is configured by network management software.

Signal connection of RJ45 connection jack show as figure 9:

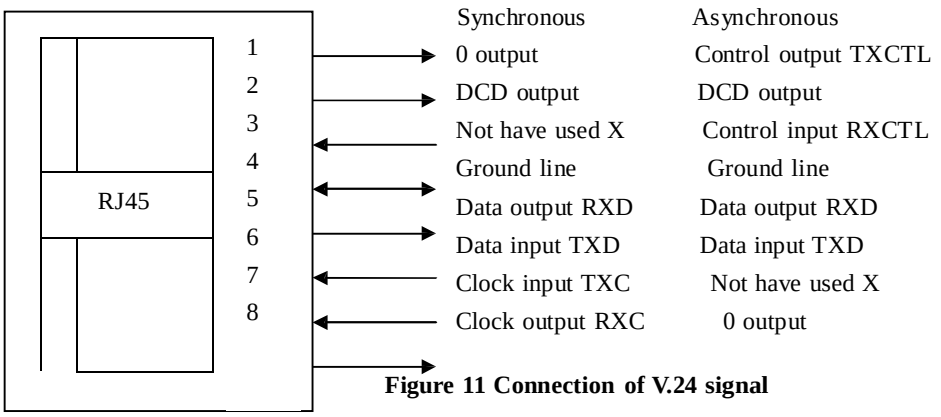


Figure 11 Connection of V.24 signal

V24-RS232 interface can connected with synchronous or asynchronous DTE or DCE port, please refer to table 2 and table 3.

Table 2 Reference of synchronous V24 signal cable connection wire

Signal Name	DTE Equipment V24 port DB25S	Connection mode	FMUX-RJ45		Connection mode	DCE Equipment V24 port DB25P	Signal Name
TXD	2	→	TXD	6	←	3	RXD
RXD	3	←	RXD	5	→	2	TXD
GND	7	↔	Ground	4	↔	7	GND
TTC	24	→	TXC	7	←	17	RC
TC	15	←	RXC	8	→	24	TTC
RC	17	↵					
CTS	5	←	0 output	1	→	20	DTR
DSR	6	←				6	DSR
DTR	20					5	CTS
RTS	4					8	DCD
DCD	8	←	DCD	2	→	4	RTS

Table 3 Reference of asynchronous RS232 signal cable connection wire (DSR/DTR follow control mode)

Signal Name	DTE Equipment		Connection mode	FMUX		Connection mode	DCE Equipment		Signal Name
	DB9S	DB25S		RJ45			DB9P	DB25P	
TXD	3	2	→	TXD	6	←	2	3	RXD
RXD	2	3	←	RXD	5	→	3	2	TXD
GND	5	1, 7	↔	Ground	4	↔	5	1, 7	GND
DTR	4	20	→	TXCTL	3	←	6	6	DSR
DSR	6	6	←	RXCTL	1	→	4	20	DTR
CTS	8	5	←	RXC	8	→	7	4	RTS
RTS	7	4					8	5	CTS
DC D	1	8	←	DCD	2		1	8	DC D

5.6 V.35 data interface

Each V.35 interface board of FMUX2020 multiplexer can provide 2 channels of V.35 synchronous data interface, connecting with exterior wire via DB15 negative jack, supporting N×64kb/s (maximal rate up to 1984kb/s),

and occupying N 64kb/s time slot. Occupied time slot and rate of V.35 interface are configured by NMS.

Table 4 and table 5 is corresponding connect pins. CH1 and CH2 means the first channel and the second channel synchronous data interface.

Table 4 Connection with DTE equipment (DCE port)

15 Pin No.	Name	Direction	Explanation	Corresponding	Level

				V.35 Terminal	
1	GND	Dual direction	Protect ground pin (shield)	A	
2	SDA	To PCM	Send data A	P	V.35
9	SDB	To PCM	Send data B	S	V.35
5	CTS	From PCM	Sending is getting ready	D	V.28
12	DSR	From PCM	PCM is getting ready	E	V.28
12	DCD	From PCM	PCM receiving is normal	F	V.28
8	GND	Dual direction	Protect ground pin (shield)	B	
4	RDA	From PCM	Receive data A	R	V.35
11	RDB	From PCM	Receive data B	T	V.35
14	SCA	From PCM	Transmitting clock A	Y	V.35
15	SCB	From PCM	Transmitting clock B	AA	V.35
6	RCA	From PCM	Receiving clock A	V	V.35
13	RCB	From PCM	Receiving clock B	X	V.35
3	SCEA	To PCM	Exterior synchronization clock A	U	V.35
10	SCEB	To PCM	Exterior synchronization clock B	W	V.35
Note：PCM means FMUX2020 multiplexer and pins not be lined out needn't to be connected.					

Table 5 Connection with DCE equipment (DTE port)

15 Pin No.	Name	Direction	Explanation	Corresponding V.35 Terminal	Level
1	GND	Dual direction	Protect ground pin (shield)	A	
2	RDA	To PCM	Receive data A	R	V.35
9	RDB	To PCM	Receive data B	T	V.35
4	SDA	From PCM	Send data A	P	V.35
11	SDB	From PCM	Send data A	S	V.35
5	DTR	From PCM	Data terminal is getting ready	H	V.28
12	RTS	From PCM	Requiring sending	C	V.28
8	GND	Dual direction	Signal ground Loop-circuit	B	

6	SCEA	From PCM	Exterior synchronization clock A	U	V.35
13	SCEB	From PCM	Exterior synchronization clock A	W	V.35
3	RCA	To PCM	Receiving clock A	V	V.35
10	RCB	To PCM	Receiving clock B	X	V.35
Note：PCM means FMUX2020 multiplexer and pins not be lined out needn't to be connected.					

5.7 10Base-T Ethernet data interface

The main Ethernet interface function is completed by FMUX2020-BRGS board as model, insert it in the extending slot of FMUX2020-ET board. 10Base-T Ethernet interface, occupying N 64Kb/s time slot,
connecting to LAN with twisted-pair lines, and conforming to IEEE802.3 standard. It is composed of Ethernet interface processing unit (EIF), memory unit (RAM), multiplexing and demultiplexing unit (MUX&DEMUX) and control unit MCU.

The 3rd and 6th pins of RJ45 connector are used for data input of the Ethernet interface, the 1st and 2nd pins for data output. Ethernet interface of V2040A is configured as DTE port. Cable should be crossed (3 and 6 cross with 1 and 2) when connected with DTE equipment (such as PC), while direct communicating cable can be used when connected with DCE equipment (such as HUB port). Show as figure12.

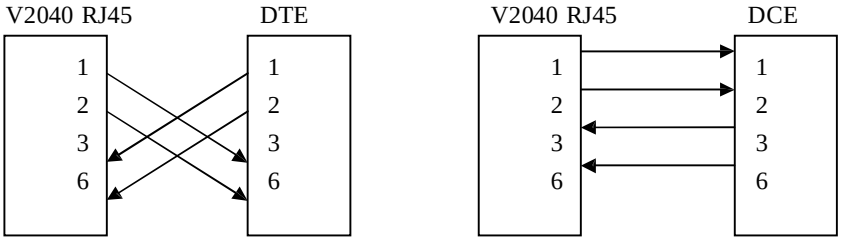


Figure 12 10Base-T Ethernet interface connection wire diagram

5.8 X.50 data interface

Each X.50 interface board provides 5 channels of V.24 synchronous X.50 data interfaces, all of which are connected with outside line through DB37 male and female connectors or RJ45 jack, and the supported data rates include 2.4kb/s, 4.8kb/s, 9.6k kb/s, 19.2k kb/s, 38.4k kb/s. The occupied time slot varies with bandwidth. The time slot and interface rate is controlled by the network management system. Default configured as asynchronous 9.6k, and each channel occupy a time slot phase.

X.50 interface is V.24 interface, and connection method is as the same as V.24 interface board. Please reference to figure 9, table 2 and table 3.

5.9 64kb/s G703 data interface

Each 64kb/s G.703 data interface board can provides as many as 4 channels of 64 kb/s data interface, all connected with outside lines through DB25 female connector. Each channel occupies a 64 kb/s time slot. The indicator CH1 ~ Ch4 indicates the data input status of the corresponding 64kb/s channel. The signal terminals are shown in Table 6.

Table 6 Signal connection of 64kb/s G703 data interface board

	CH1	CH2	CH3	CH4
Input	12,24	9,21	6,18	3,15
Output	13,25	10,22	7,19	4,16

5.10 UIF data interface

Each UIF data interface board can provide two U interfaces of 2B+D data, which is connected to network termination (NT) and line termination (LT). U interface of the two terminals is communicated, one terminal should be configured as LT, and another should be configured as NT. LT interface synchronize on clock of PCM system; NT port can be sub-rate clock to synchronize U interface line of PCM system.

U interface connect with exterior wire via 2-wire metal wire, and tie-in is middle two-core wire (3 and 4) of RJ12 jack, as the same as standard telephone wire tie-in. Reference to figure 13.

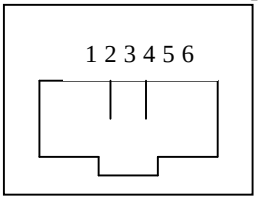


Figure 13 U interface

5.11 2-wire audio interface

2-wire audio interface include LS, HOT, LE and magneto interface, each board having 4 channels and connected with outside lines through DB25-pin female connector. The 4 indicators indicate the signaling status of the channel 1 to channel 4 respectively.

a) LS/HOT interface board: 2-wire Loop Subscriber interface, or hotline interface, directly connected to telephone set to complete D/A and A/D conversion, 2-wire/4-wire conversion, ringing, generating ringing signal and test of hook state etc. Indicator light of LS board lighting means picking state, and channel is being occupied.

b) LE interface board: 2-wire Loop Exchange interface, directly connected to exchange to complete D/A and A/D conversion, 2-wire/4-wire conversion, ringing test, polarity detecting and generating hook state etc. Indicator light of LE board lighting means hooking on state of remote terminal, and channel is being occupied.

c) Magneto interface board: connected to magneto telephone set to complete D/A and A/D conversion, 2-wire/4-wire conversion, generating ringing, test of ringing current, etc. Signaling can be configured as CAS or audio 2100Hz signaling, and configured by

J1 switch in the board. CAS means convert ringing signal (16~25Hz) to digital CAS A to transmit. 2100Hz signaling means convert ringing signal (16~25Hz) to audio 2100Hz to transmit. Indicator light of MS board lighting represent ringing state.

Connection of 2-wire audio interface reference to table 7.

Table 7 2-wire loop audio interface connection terminal

CH1	CH2	CH3	CH4
13, 25	10, 22	7, 19	4, 16

5.12 EM audio interface

E&M 2-wire/4-wire audio interface board contains E&M signaling. Each board has 4 channels of interface connected with outside lines through DB25-pin connector. The 4 indicators lights indicate the signaling status of the channel 1 to channel 4 respectively. E represents input line while M represents output line. ALL ground lines are connected to terminal 1. Connecting with the other transmission equipment should note definition of E and M line, please reference to table 8.

Table 8 connection Terminals of E&M 2-wire/4-wire Audio Interface

		CH1	CH2	CH3	CH4
4-wire	Input	12,24	9,21	6,18	3,15
	Output	13,25	10,22	7,19	4,16
2-wire		13,25	10,22	7,19	4,16
E line		11	8	5	2
M line		23	20	17	14
Ground lines		1			

5.13 2/4-wire magneto interface

Having the same function of MS interface board in 2-wire mode. Completing D/A, A/D conversion, 2-wire/4-wire conversion, generating ringing, test of ringing current. J1 switch in the board configure signaling mode, indictor light lighting means ringing state. Function of 4-wire mode is as the same as EM audio interface board without E/M signaling. 2/4-wire switch configuration, level modulation, and audio terminal connection (reference to table 8) are completely as the same as EM audio interface board.

5.14 2Mb/s interface

2M/S interface board use for extracting time slot between mobile base station and exchange and providing data transmission. Each board has two 2Mb/s interface, can complete base station time slot extracting of one direction, and can extract two time slot of 2Mb/s interface beside of base station, then concentrate them in 2Mb/s interface of MCT board. These two time slot be called as channel 1 and channel 2, and can reach different 2Mb/s interface (A direction or B direction) of MCT board. FMUX2020 multiplexer which use 2Mb/s interface usually choose a 2Mb/s from exchange as exterior synchronizing clock. Reference to figure 13.

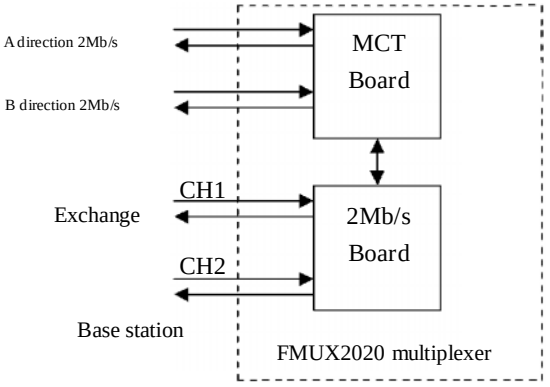


Figure 13 2Mb/s interface board used for extracting time slot

6. Malfunction diagnosis and operation

6.1 Panel indicator light

FMUX2020 multiplexer has consummate malfunction alarm function, and indicate working state through indicator lights of front panel.

Table 9 Panel indicator lights of FMUX2020 multiplexer

Symbol			Color	Meaning	Remark
PWR	+5V		Green	Flashing means working is normal	
	RING		Green	Flashing means ringing current output is normal	
	ALM		Red	Lighting means power supply board is alarming	
V.35	CH1 ~ CH2	TD	Green	V.35 interface receiving/transmitting data(DTE port output or DCE port input)	Flashing averagely in 1 second means looping
		RD	Green	V.35 interface transmitting data (DTE port input or DCE port output)	
V.24	CH1 ~ CH4		Green	Lighting means channel has V24 signal inputting. Indicator light flash averagely in 1 second means V24 port is looping. And indicator light flash 3 times in succession within 4 seconds means X.50 frame lose synchronism.	
X.50	CH1 ~ CH5		Green	Lighting means channel has V24 signal inputting. Indicator light flash averagely in 1 second means V24 port is looping. And indicator light flash 3 times in succession within 4 seconds means X.50 frame lose synchronism.	

G.703		CH1 ~ CH4	Green	Lighting means having data input and channel CH1 ~ CH4 are being occupied	
ETHER		COL	Red	Lighting means collision of network.	
		LINK	Green	Lighting means Ethernet interface connection is normal.	
		TXD	Green	Lighting means Ethernet port is transmitting data.	
		RXD	Green	Lighting means Ethernet port is receiving data.	
LN audio	LS	CH1 ~ CH4	Green	Lighting means local terminal is in pick state, and channel CH1 ~ CH4 are being occupied.	
	LE	CH1 ~ CH4	Green	Lighting means remote LS is in pick state, and channel CH1 ~ CH4 are being occupied.	
	E&M	CH1 ~ CH4	Green	Lighting means signaling state of M line(output) of E/M port is occupying(output is 0)	
	MS	CH1 ~ CH4	Green	Lighting means ringing state, and channel CH1 ~ CH4 are being occupied.	
	HOT	CH1 ~ CH4	Green	Lighting means local terminal is in pick state, and channel CH1 ~ CH4 are being occupied.	
UIF		CH1 ~ CH2 ACT	Green	Lighting means U interface is normal.	

Continuous table 9

Symbol			Color	Meaning	Remark
UIF		CH1 ~ CH2 LFA	Red	Lighting means U interface alarm of losing synchronism, and wire interface connection is abnormal.	
MCT/2M	A direction 2M (I1, O1)	LIS	Red	Lighting means 2M signal input losing.	
		LFA	Red	Lighting means 2M signal receiving frame lose synchronism.	
		RMA	Yellow	Lighting means local E1 interface receiving is normal, while the corresponding terminal is not.	
		BER3	Red	Lighting means 2M interface has error code.	
		MLFA	Red	Lighting means multi-frame lose synchronism.	
	B direction 2M (I2, O2)	LIS	Red	Lighting means 2M signal input disappeared.	
		LFA	Red	Lighting means receiving frame of 2M interface lose synchronism.	
		RMA	Yellow	Lighting means local E1 interface receiving is normal, while the corresponding terminal is not.	
		BER3	Red	Lighting means 2M port has error code.	

		MLFA	Red	Lighting means multi-frame lose synchronism.	

6.2 Halting ring operation

Buzzer ring when there is alarm, and press SBL halting ring button can end the ring.

6.3 System configuration

6.3.1 NMS address configuration

Station number of network management realized by switch SA1, bit 1, 2, 3 and 4 use binary system to represent tens digit of station number, bit 5, 6, 7 and 8 use binary system to represent digit of station number. Switch ON=1, OFF=0, e.g. station NO.36 dialed as 00110110, the four bit in the front represent 3 and the last four bit represent 6.

6.3.2 System configuration

6.3.2.1 Configuration of MCT board

Configuration of switch SA2 which is in MCT board show as table 10.

Table 10 MCT board configuration (ON=1, OFF=0)

Switch	Meaning			
SA2-1	NMI network channel choice, NMI=ON choose TS31 as network channel, NMI=OFF TS31 use for common function.			
SA2-2	DEF=OFF default configuration, DEF=ON CPU write in 64kb/s time slot of each channel in turns after power supply is on.			
SA2-3	CH2 The second 2Mb/s interface choice: CH2=OFF, The second channel used normally;CH2=ON, The second channel is off.			
SA2-4	ZDL trunk terminal equipment choice, ZDL=OFF terminal equipment, ZDL=ON trunk equipment.			
SA2-5	CAS multi-frame choice, CAS=OFF including multi-frame(CAS), CAS=ON Not including multi-frame (no signaling)			
SA2-6	System clock choice：	SA2-6	SA2-7	SA2-8
		1	1	1	2Mb/s exterior clock
SA2-7		1	1	0	64kb/s exterior clock
		1	0	1	Receiving A direction signal (1 bit of 2Mb/s port) clock
SA2-8		1	0	0	Receiving A direction signal (2 bit of 2Mb/s port) clock
		0	0	0	Master clock

6.3.2.2 Configuration of 10Base-T Ethernet board

FMUX2020-BRGS board inserted in 10Base-T Ethernet board has two 4 bit switch SW1 and SW2. These switch used to configure interface mode and working mode of subscriber port.

Interface mode configuration of subscriber port show as table 11:

Table 11 Configuration of SW1 switch (ON=0, OFF=1)

Switch	Meaning				
SW-1	SW-1	SW-2	SW-3	SW-4	
	1	1	1	1	Port adaption（recommend）;
SW-2	0	1	0	0	10M half duplex;
	0	x	1	0	100M half duplex;
SW-3	0	1	0	1	10M full duplex;
	0	x	1	1	100M full duplex;
SW-4					

Working mode configuration of UTP Ethernet interface show as table 12:

Table 12 SW2 switch configuration (ON=0, OFF=1)

Switch	Meaning
SW-1	Self-negotiation choice: 1=Self-negotiation, 0=Not self-negotiation (recommend);
SW-2	Fixation is 1
SW-3	Fixation is 1
SW-4	Fixation is 1

6.3.2.3 Configuration of 2M board

Switch J in the board use for configuring network management channel opening of FMUX multiplexer connected with 2Mb/s interface of 2Mb/s interface board. TS31 would be network management channel when switch is ON, and close network management channel when switch is OFF.

6.3.2.4 Configuration of UTF board

Pin J1 and J2 in the board control NT/LT character of the first U1 channel and the second U2 channel. J=ON, configured as LT; J=OFF, configured as NT. As to the two terminals which U interface is connected, one of them should be configured as LT, and another should be configured as NT.

J3-J6 used for configuration of wire interface feedback.;

J3=ON, J5=ON: The first U interface is supplied with –48V feedback;

J4=ON, J6=ON: The second U interface is supplied with –48V feedback.

6.3.2.5 Configuration of EM board

Configure its working mode via switch in EM board. Show as table 13.

Table 13 2/4-wire switch configuration and level modulation

Application	Configuration
2-wire	2, 3, 4, 6 of switch SA n （n = 1 ~ 4） configured as ON;
Audio 2- wire	Receiving level 0 ~ -7.5dBr, Transmitting level 0 ~ -7.5dBr
4-wire	1, 5, 7, 8 of switch San configured as ON;
Audio 4-wire	Receiving level +2 ~ -13dBr, Transmitting level +1 ~ -14dBr.
Note: Transmitting level can be modulated by network management software.	

6.3.2.6 Configuration of magneto interface board

Magneto interface board has two types: MS magneto interface board, 2/4-wire magneto interface board. J1

switch in the board configure two kinds of choice, J1=OFF choose 2100Hz signaling, J1=ON choose CAS.

6.3.2.7 Configuration of V.35 board

V.35 interface is synchronous data interface; differ from the direction of clock connected with DCE and DTE equipment, and configured via switch J1 and J2 in the board. ON means connected with DCE equipment, while OFF means connected with DTE equipment. Switch J3 use for configuring polarity of data interface signal (+ or – polarity), J3=ON means normal phase, J3=OFF means opposite phase.

6.3.2.8 Configuration of HOT board

HOT interface provide two kinds of voice service, and it's configured by switch J1 in the board. ON means hotline mode, while OFF means LS (LOOP SUBSCRIBER).

7 Network management system

7.1 Connection mode

Network management message is transmitted through RS-232 serial interface connecting the computer to the equipment. For remote FMUX 2020, network management message can be transmitted through the asynchronous data channel of other equipment (such as optical transmission equipment) or TS31 channel of 2Mb/s primary PCM group. The occupation of TS31 channel should be set with local-end's software. Figure 14 shows the networking mode using GK-G04 type SPDH155 optical transmission equipment. These two FMUX 2020 can share the same monitor platform. Connection with PC show as figure 14.

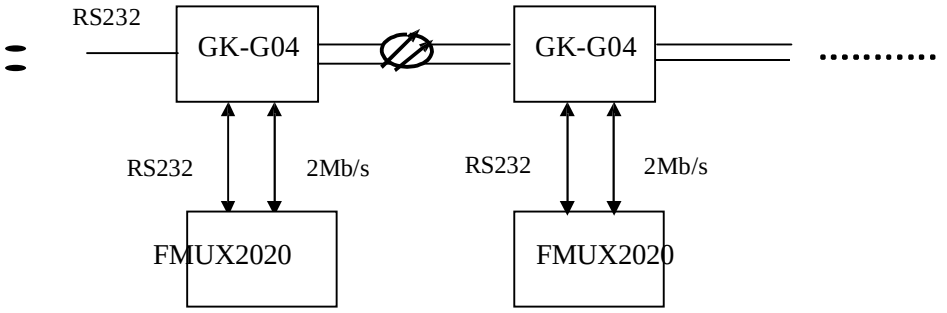


Figure 12 FMUX2020 integrated network management

7.2 System installation

Operating system: Chinese Window9x/NT.

Computer: IBM PC compatible computer.

Installation of accessory software can reference the following steps:

a) Installing management system software

1) Inserting CD in CD-driver, executing...\install\disk1\Setup.exe, following the clue, install it at the right location (usually is default).

2) Recording catalogue installed.

b) Establish SPDH management information data base (Needn't to be modify if it is installed as default catalogue)

1) "Start" menu, executing BDECFG32.EXE in "FMUX network management system" of "process" menu, then, configuration dialog window will appear.

2) Configuring data base language driver process, choosing 'PARADOX' data base in 'Driver Name' list frame. Then, single click 'LANGDRIVE' in 'Parameters', and draw list frame appear at the left side, choose it's 'Borland ENG Latin-1' language driver process. At this time, you complete the data base language driver process configuration.

c) Choosing 'SPDH' in the main window 'Aliases Name:' list, then writing path of SPDH network management system installation in 'PATH' of 'Parameters' at right. Such as 'C:\ SPDH'.

d) Closing ('x' at the right-upside) 'BDE Configuration Utility', 'Close configuration File' dialog frame appear at this time, and choose 'YES' to complete data base configuration.

Operation of SVNMS network management system is introduced in details in HELP file of software.

7.3 Main function and operation introduction

Network management function of FMUX system mainly includes alarm management, configuration management and performance management.

Alarm information include equipment monitor alarm performance requirement of GB6879 "Technical Requirements for 2048Kbit/s 30 Channels PCM Multiplexer Equipment", power supply malfunction, receiving PCM signal halting (LIS), losing frame address (LFA), error code ratio equal to or exceed 10^{-3}, remote monitoring alarm （RMA）, 64kb/s input signal halting etc. System can display current equipment alarm state and record historical alarm. State monitor can display real-time signaling state of audio channel, such as hooking on/hooking off, ringing and so on. As to data interface, state means pass-through and break off state of data.

Configuration means configure composing mode of FMUX2020 via network management background. Configuration parameter store in E^2PROM chip of MCT board, and parameter stored after FMUX2020 cut off power supply. After hardware resetting, it load configuration as the state before power supply cut off. Main configuration
management includes:

a) Configuration of board type, configured as the board type in practice when apply FMUX2020.

b) Time slot configuration, each sub-rate can be configured in anyone of time slot TS1~TS31, and add/drop or directly communication of branch channel can be configured at double port trunk station.

c) Remote terminal loop-back, remote 2Mb/s, audio and data signal all can be configured as loop-back state to make testing conveniently.

Network management operation of FMUX system enter in FMUX network management window after finishing software installation, and its' detailed use introduction in 'HELP' menu. Also you can find detailed use introduction in network management software CD.