SHARP®

RS-232C Interface

MODEL
MZ-1E24

OPERATION MANUAL

INTRODUCTION

Thank you for your purchase of the SHARP RS-232C Interface, MZ-1E24.
Please read this manual carefully for proper use. Also, be sure to keep this manual for later use. This manual should be helpful during use or when a problem arises.

CAUTION

1. This board consists of precision parts, such as LSI circuits, that can be affected by the operating environment. Do not use the board in places subject to direct sunlight, extreme change of temperature or high humidity or dust.
2. Do not bump or drop this board.
3. Do not touch the bottom of this board or the ICs, because static electricity might damage the ICs.
   The cover wrapping this board is used to protect the ICs from static electricity. Do not remove it until immediately before installing it.
4. Turn off power to the main unit or expansion unit before installing or removing this board.
5. Install only one jumper chip on the jumper block for setting the baud rate. Attempting to install more than one chip will damage ICs.
6. When this board is not to be in use for a long period, wrap the board with the cover supplied with the board or a conductive material to protect it from static electricity.

CONTENTS

1 General Information

1. 1 Introduction

There are two methods of data communication between computer and external equipment : 8-bit parallel and bit serial.
The serial interface board MZ-1E24 (hereinafter referred to as " interface board ") permits data communication by the bit serial method.
This interface board is manufactured in accordance with EIA RS-232C (the Electronic Industries Association RS-232C), and used for data communication with other equipment having interface based on RS-232C.

(Examples of use)

1. Data communication between computers on telephone line via acoustic couplers.
2. Connection of the computer to printer, plotter, and digitizer.

1. 2 Functions of this interface board

The interface board has the following functions.

1. One board has two channels, each of which is capable of transmitting/receiving data independently.
2. One of the ten baud rates can be selected by jumper chip on the board. Baud rates can be set independently for the two channels.
3. Output connector signals to external equipment can be in either terminal mode or modem mode through the operation of the jumper chip.

1. 3 Available computers and softwares

Computer	Software		Remarks
	Model name	Description	
MZ-80B	MZ-8BD03	RS-232C, GP-IB DISK BASIC	
MZ-700	MZ-2Z009	DISK BASIC	
MZ-800	(1Z-016)	BASIC	Attached to the MZ-800.
	MZ-2Z046	DISK BASIC	
	(5Z-009)	MZ DISK BASIC	Attached to the MZ-1E19.

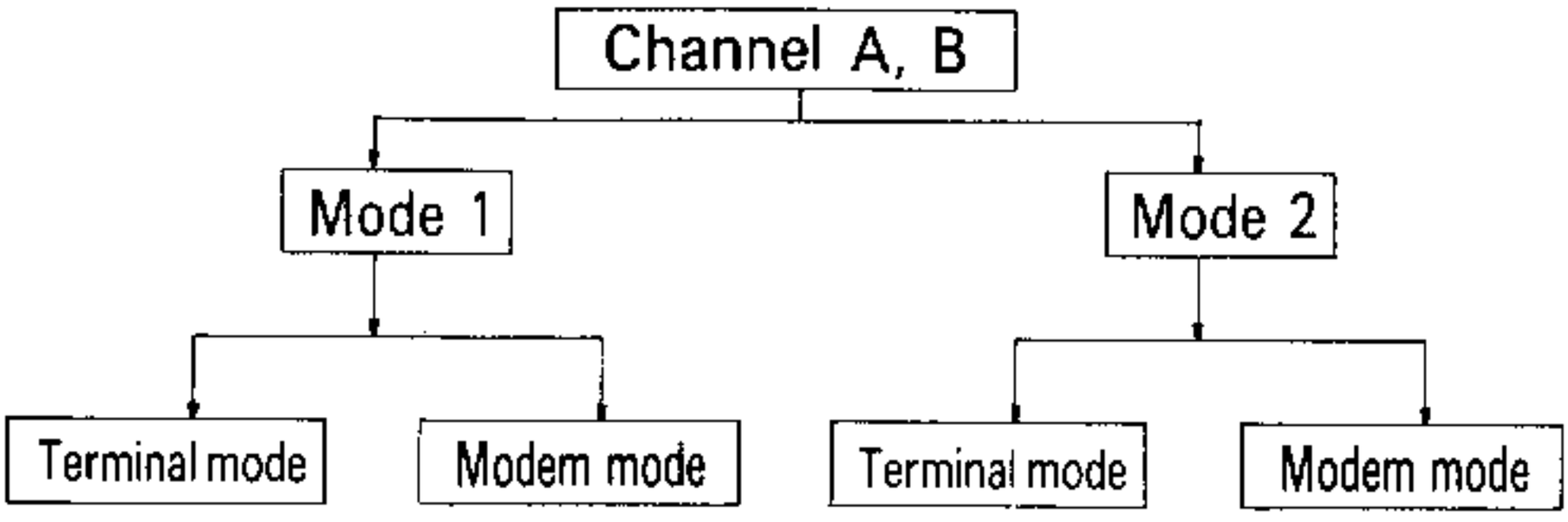
When the MZ-700 or MZ-800 is equipped with this interface and the RS-232C interface is specified in a BASIC command (INIT, WOPEN #, ROPEN#, or DEFAULT), the relationship between channels and the <device name> parameters is as follows.

Model	Channel	<device name>
MZ-700 MZ-800	A	RS1
	B	RS2

2 Method of Operation

2.1 Operating modes

This board can operate in the operating modes illustrated below. You can specify different modes for different channels.



2. 2 Arrangement of switch and jumpers

Before using this board, the switch and jumpers on the board must be set first.

Figure shows the positions of the switch and jumpers.

Switch DIP SW : Used for setting port address

Jumper block JB- A1: Jumper for switching connection to Channel A

Jumper block JB- B1: Jumper for switching connection to Channel B

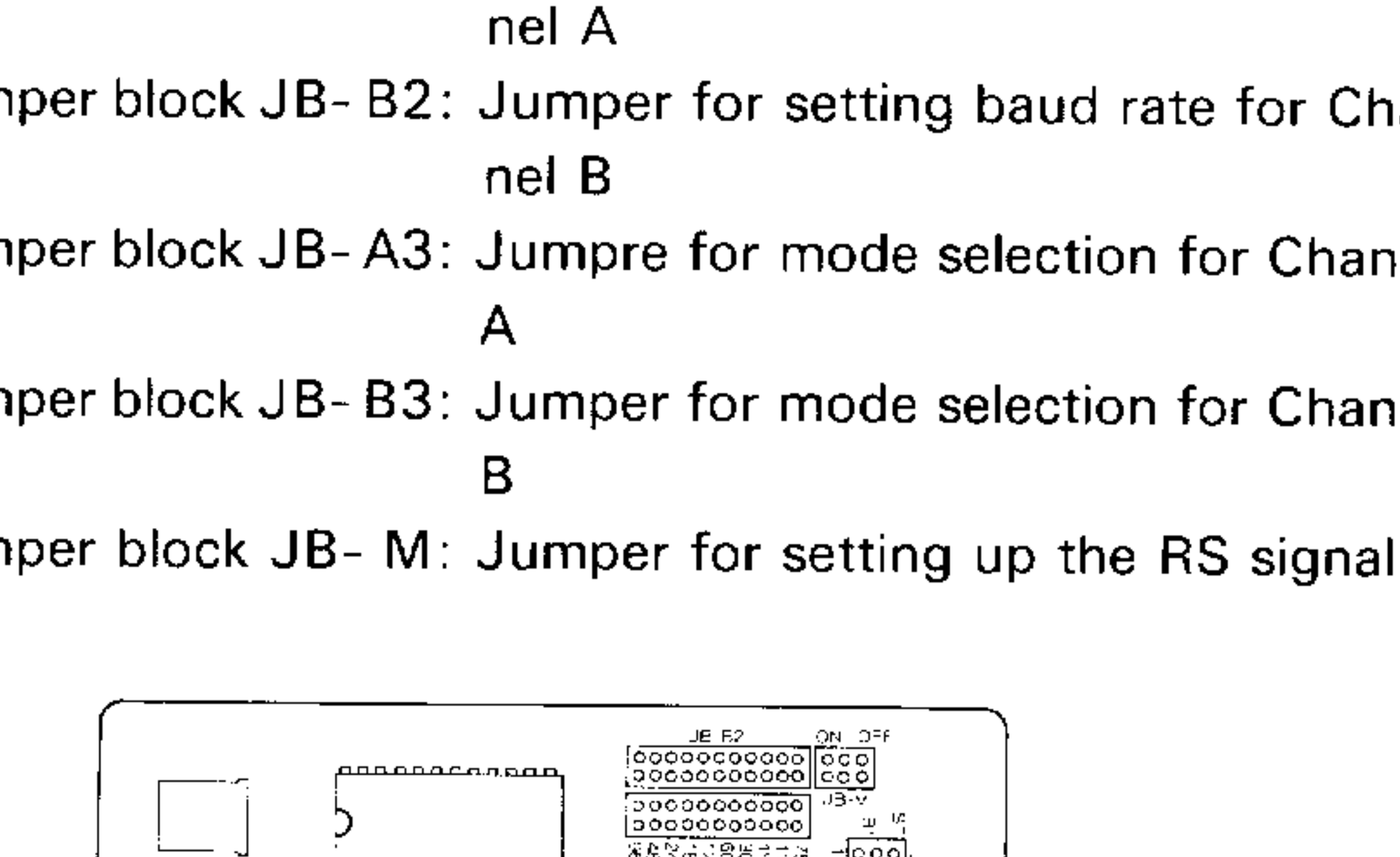
Jumper block JB- A2: Jumper for setting baud rate for Channel A

Jumper block JB- B2: Jumper for setting baud rate for Channel B

Jumper block JB- A3: Jumpre for mode selection for Channel A

Jumper block JB- B3: Jumper for mode selection for Channel B

Jumper block JB- M: Jumper for setting up the RS signal



2. 3 Setting port address

The Z80-CPU outputs 8-bit port address. Since this board uses 4 sequential port addresses, the port address can be set by setting upper 6 bits of the 8-bit address signal using the switch.

As shown in table, the upper 6 bits ($A_2 \sim A_7$) of the 8-bit address signal can be selected arbitarily.

Address bit	Switch No.	Factory setting	Comment
A_7	6	OFF	These bits can be set arbitarily.
A_6	5	ON	
A_5	4	OFF	
A_4	3	OFF	
A_3	2	ON	
A_2	1	ON	
A_1	—	—	Channel select
A_0	—	—	Control or Data Select

The correspondence between the switching positions of the switch and logic levels is as shown below. The address of this interface board is the port address whose logic level coincides with that of the switch.

Switching position	Logic level
ON	0
OFF	1

Table shows the state of the switch as set by the manufacturer for delivery. In this case, the port addresses are B0H, B1H, B2H, and B3H.

Contiguous I/O addresses are assigned to the board starting at the address selected by the switches.

(Example)

Address bit / Logic level

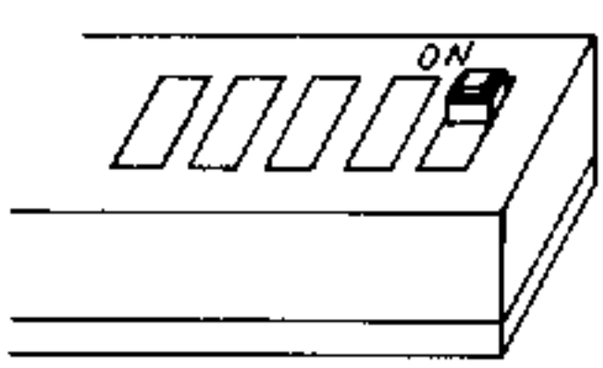
A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0
1	0	1	1	0	0	X	X
B				0			

Address bit A_1 is assigned for selecting channels for Z80-SIO whereas address bit A_0 is assigned for selection of control word or data.

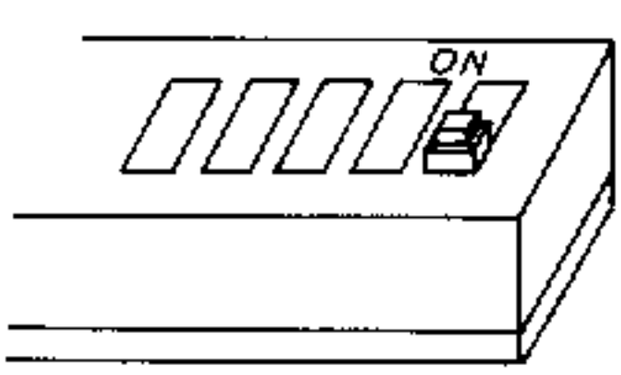
A_1	A_0	Selection
0	0	Channel A/Data
0	1	Channel A/Control word
1	0	Channel B/Data
1	1	Channel B/Control word

Assign the port addresses as follows depending on the type of the computer you are using:

Model	Port address	Comment
MZ-80B	B0H, B1H, B2H, B3H	Factory setting
MZ-700		
MZ-800		



ON condition



OFF condition

Switching condition

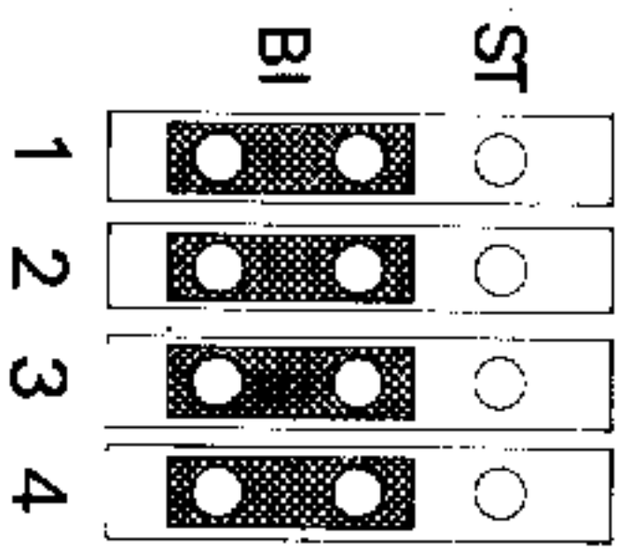
2. 4 Defining connection mode

There are two channel connection modes, mode 1 and mode 2, which can be selected by installing jumper chips on jumper blocks JB-A1 and JB-B1 on the board.

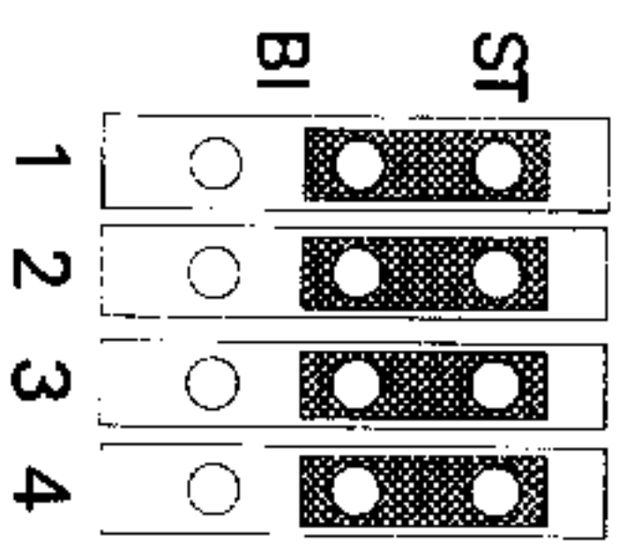
Jumper block JB-A1: For connection mode selection for Channel A

Jumper block JB-B1: For connection mode selection for Channel B

The mode for a channel can be set by installing jumper chips as shown in the figure.



Mode 1

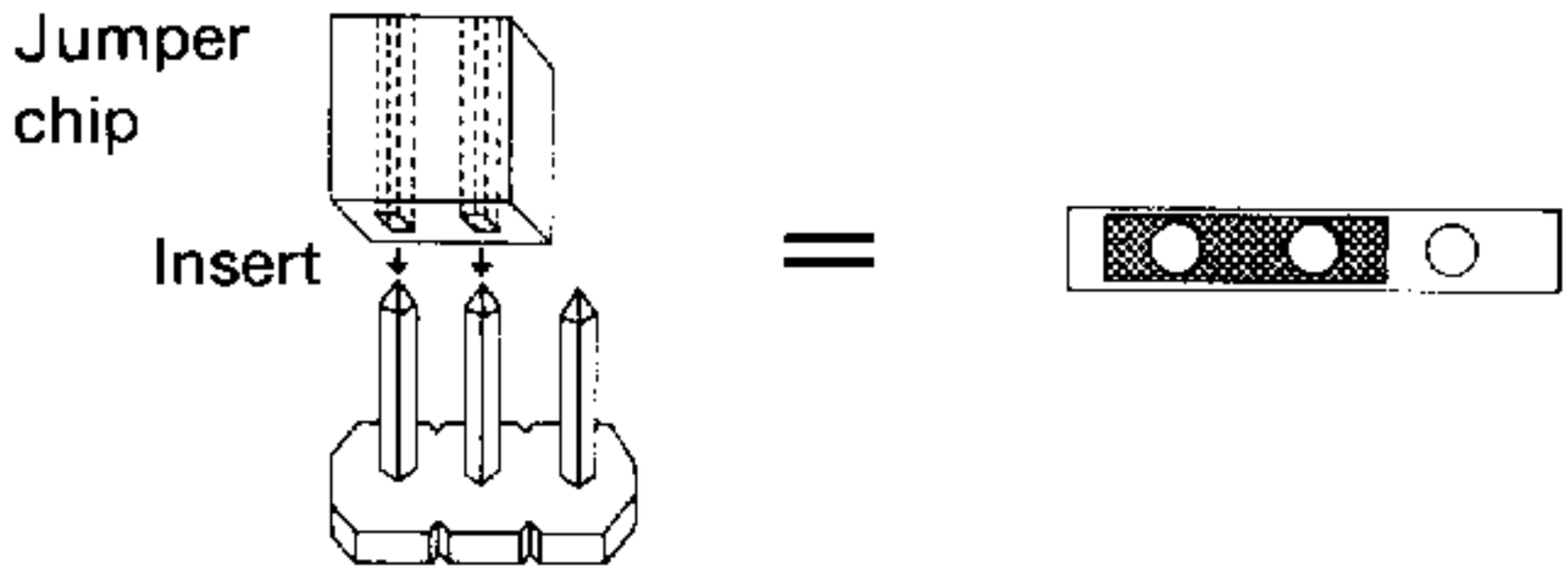


Mode 2
(Factory setting)

Mode 1: This mode is indentical to that for the existing MZ-8BI03 RS-232C interface board. Use this mode when using this board with an MZ-80B computer.

Mode 2: This mode must be selected when using the RS-232C board with an MZ-700 or MZ-800 computer. Select mode 1 if you want to use an MZ-8BC03 cable.

Note) This board does not support the current loop mode as the MZ-8BI03 does.



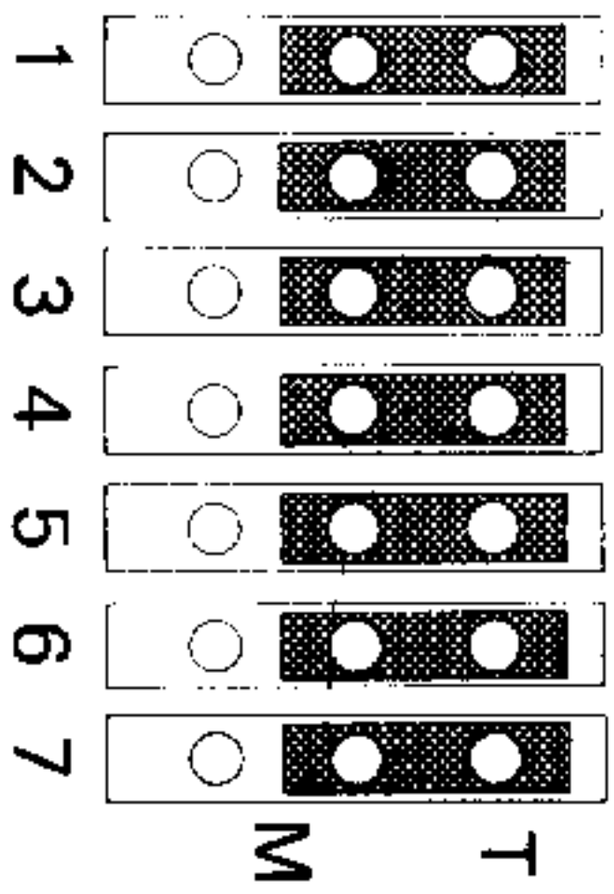
2. 5 Setting the channel mode

To set up the channel mode for channels A and B, install jumper chips on the jumper blocks JB-A3 and JB-B3 on the board.

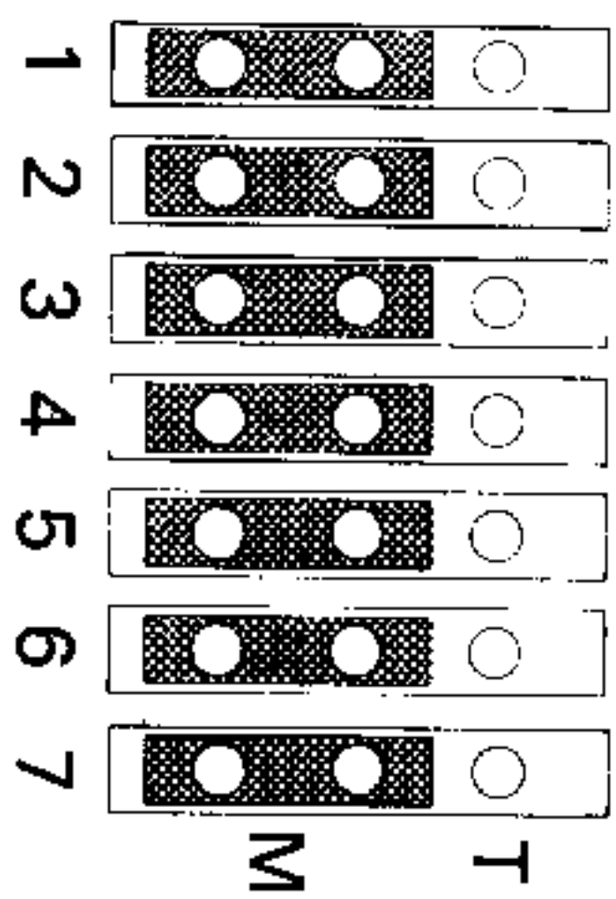
Jumper block JB-A3: For mode selection for Channel A

Jumper block JB-B3: For mode selection for Channel B

Terminal mode can be selected by short-circuiting all pairs of terminals marked "T" by inserting jumper chips between them as shown in the figure below. Modem mode can be selected by doing the same for pairs of terminals marked "M".



Terminal mode



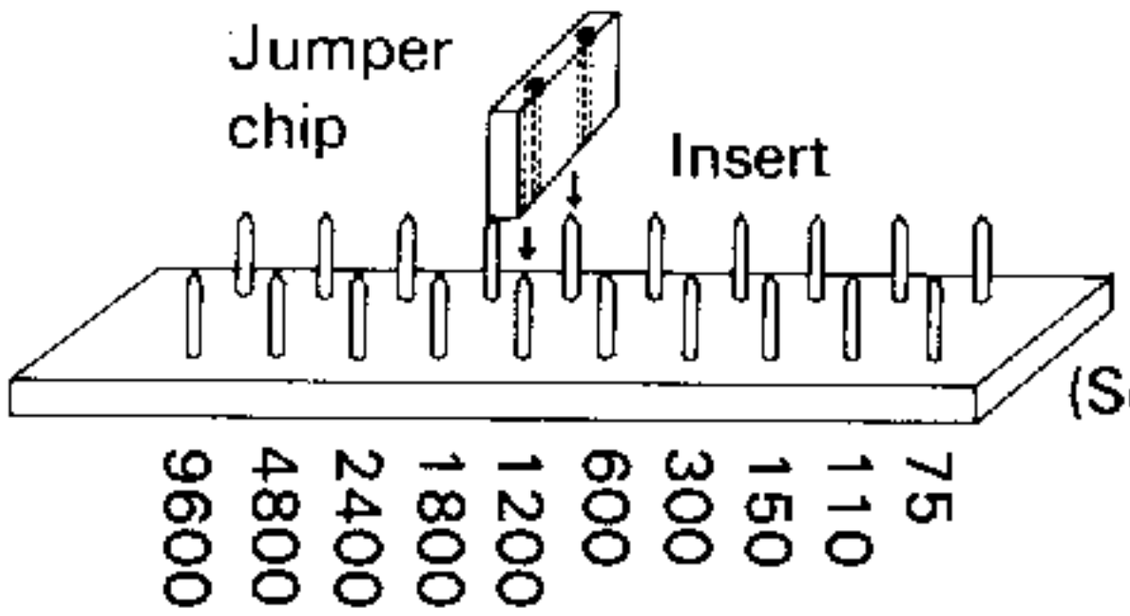
Modem mode

2. 6 Setting baud rate

The interface board has two channels (Channel A and Channel B), for each of which baud rate can be set independently. This operation can be carried out by selecting the jumper blocks JB-A2, JB-B2 on the board. One out of the 10 baud rates can be selected.

Junper block JB-A2: For setting baud rate for Channel A
Jumper block JB-B2: For setting baud rate for Channel B

The setting methods are the same for both channels.
Install a jumper chip in the location corresponding to the desired baud rate.



(Set to 1200 bauds in this example.)

The correspondence between the jumper chip locations and the baud rates is shown in the table below.

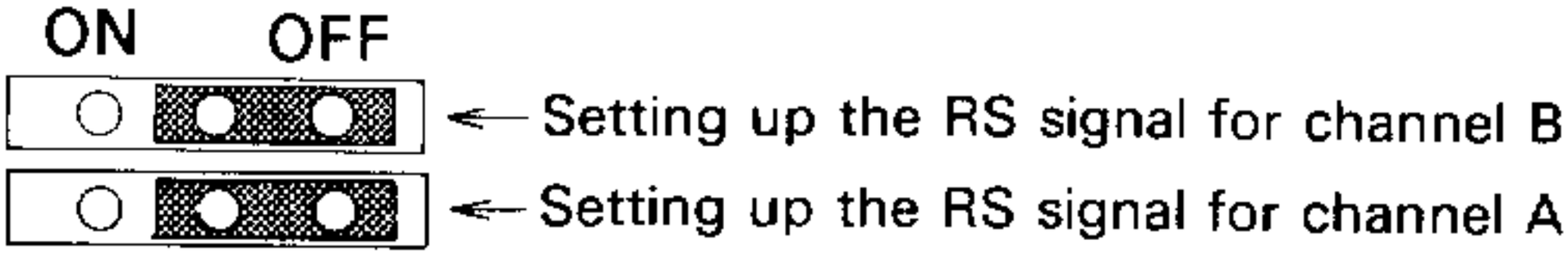
Jumper chip location	9600	4800	2400	1800	1200	600	300	150	110	75
Baud rate	9600	4800	2400	1800	1200	600	300	150	110	75

† (Factory setting)

(Notes) 1. Only one jumper chip need to be installed on jumper block JB-A2 or JB-B2. Installing more than one jumper chip may destroy ICs.
2. Proper communication cannot be guaranteed if the baud rates of the sending and receiving stations do not match.

2. 7 Setting up the RS signal

The RS (Request To Send) signal is set to high by installing a jumper chip on the ON side of jumper block JB-M.

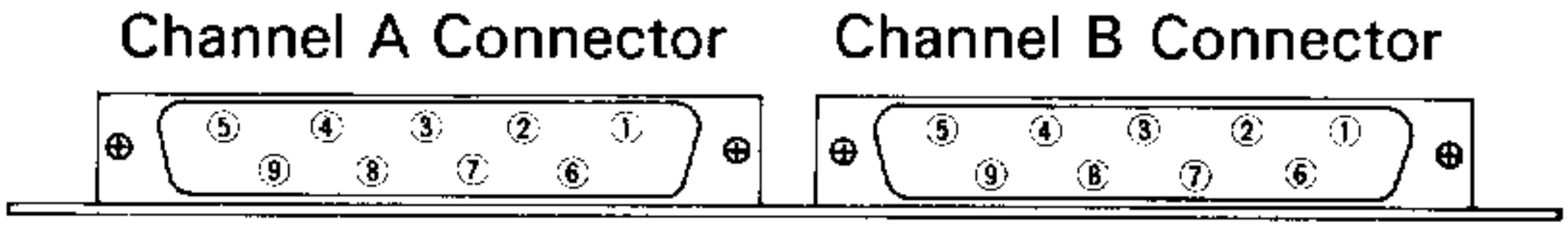


(Factory setting)

Jumper chips should normally be installed in the OFF position.

2. 8 Connector signals

This interface board has two 9-pin connectors.
Numbers in the figure below denote pin numbers of the connector.



By changing the wiring of the jumper blocks JB-A3, JB-B3 on the board signals for each connector pin can be changed. Through this operation, the channels can be set in two different states: terminal mode and modem mode.

The correspondence between connector pins and signals in different modes is shown in Table.

	Mode 1		Mode 2	
Connector pin No.	Terminal mode	Modem mode	Terminal mode	Modem mode
1	FG	FG	FG	FG
2	SD	RD	SD	RD
3	RD	SD	RD	SD
4	RS	CS	RS	NC
5	CS	RS	CS	RR
6	ER	DR	ER	DR
7	DR	ER	DR	ER
8	SG	SG	SG	SG
9	NC	NC	RR	CS

("NC" indicates not connected.)

In the terminal mode, send data are connected to pin No.2. However, in the modem mode, receive data are connected to pin No.2, thus creating a reverse flow of signals. The directions of each connector pin are opposite in the terminal and modem modes. This feature can be utilized in the following way.

- Terminal mode is selected for connection with acoustic coupler.
- Modem mode is selected for connection with printers, plotters, etc. equipped with RS-232C interface.

Of course, there are some exceptions. Therefore, read the operation manual of individual equipment.

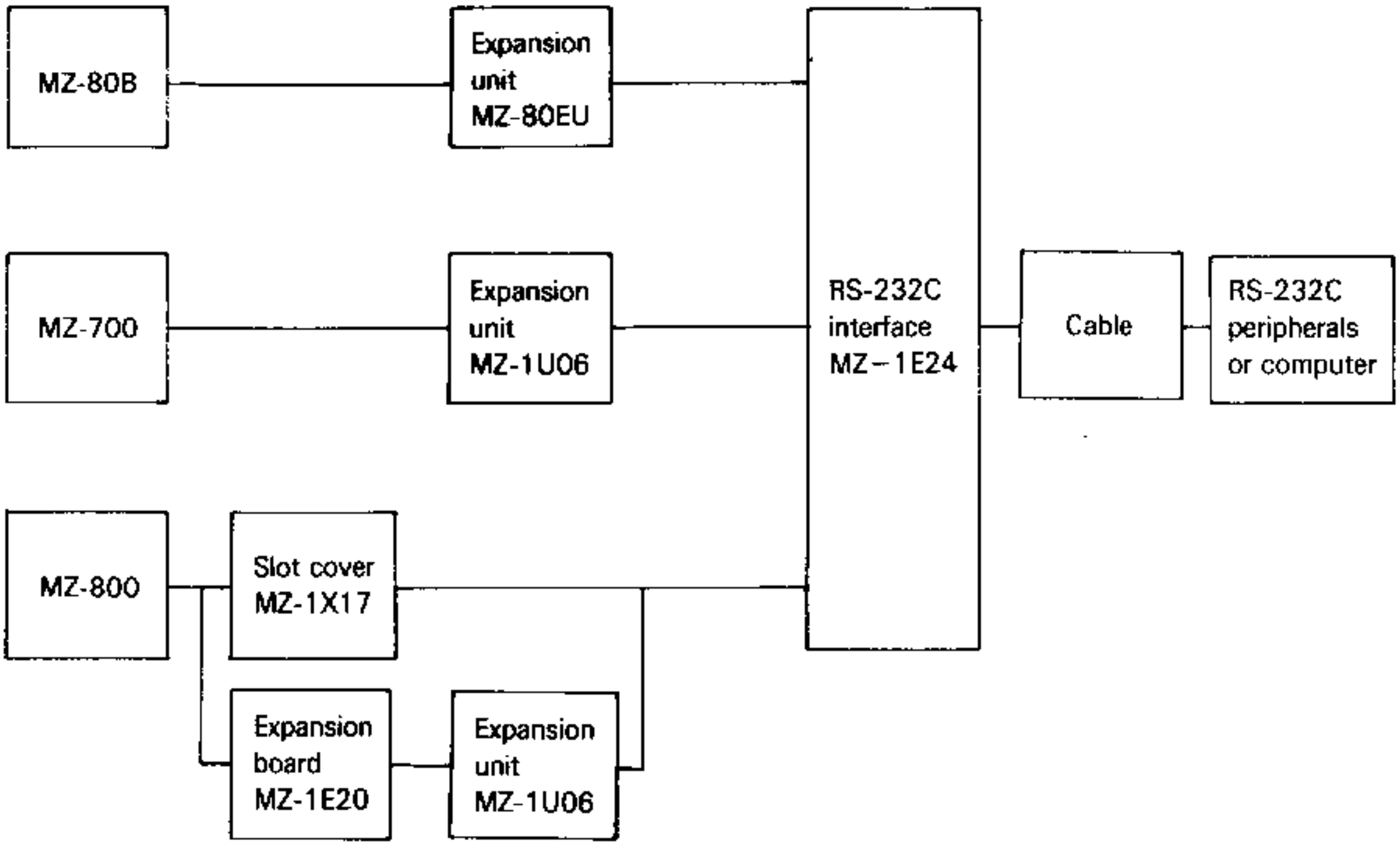
Signal Definition (All are high active.)

Item	Symbol	In/Out	Function
Frame ground	FG		
Send data	SD	Out	Send data signal
Receive data	RD	In	Receive data signal
Request to send	RS	Out	Output signal to the counterpart station for requesting data transmission.
Receive ready	RR	Out	Indicates to the counterpart station that the RS-232C interface is ready for receiving data.
Clear to send	CS	In	Data transmission control. ON : Data transmission from this board is enabled. OFF : Data transmission from this board is disabled.
Data terminal ready	ER	Out	Indicates the power status of this board. ON : Power to this board is on. OFF : Power to this board is off.
Data set ready	DR	In	Indicates the power status of the counterpart station. ON : Power to the counterpart station is on. OFF : Power to the counterpart station is off.
Signal ground	SG		

3 Installing and Cabling this Board

3. 1 Installing the board

System configuration



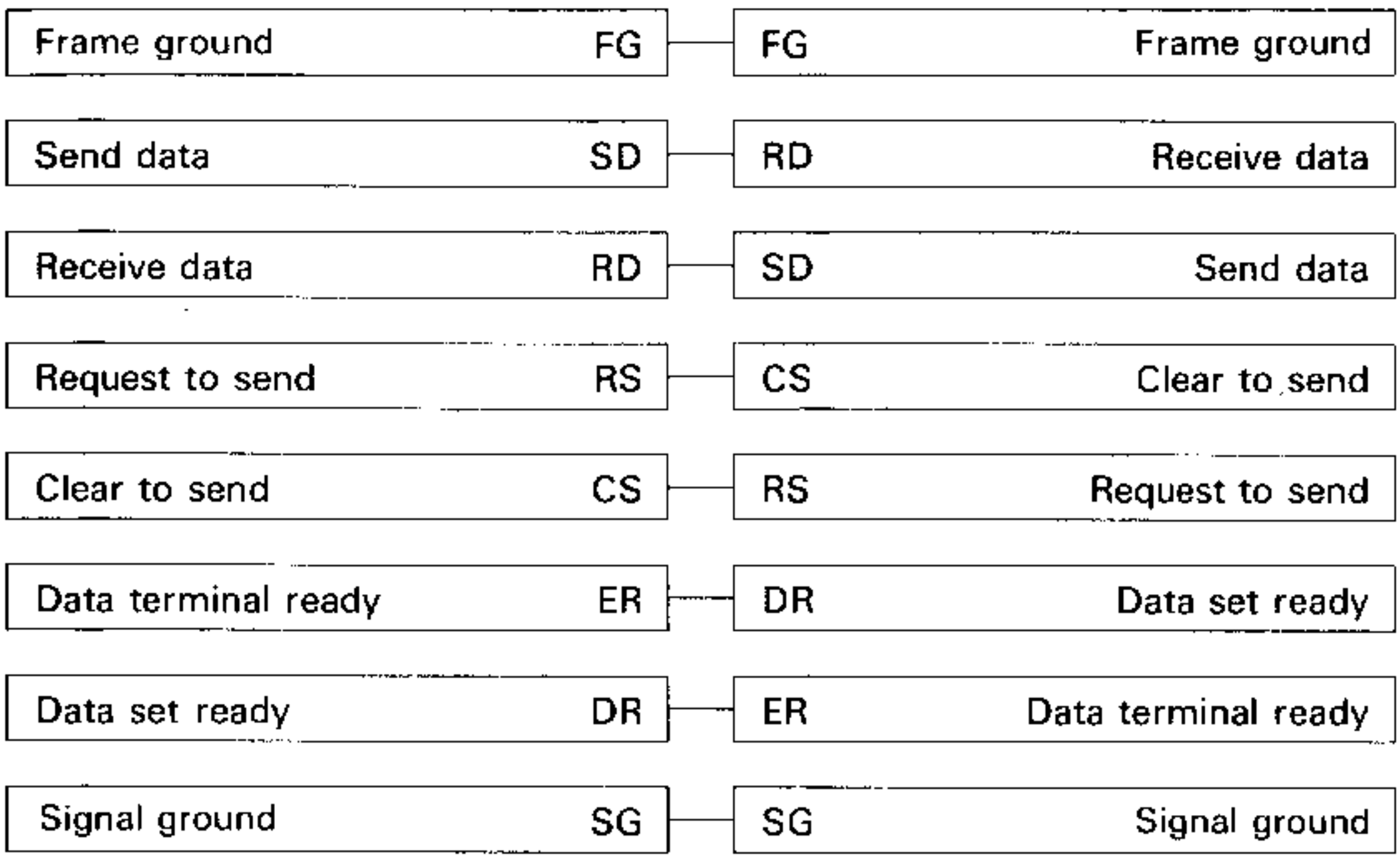
This board is designed for installation in personal computer or expansion unit. Install the board in the following procedure.

1. Set port address, baud rate,and mode of each channel. For this purpose, set the switches and jumper blocks on the board.
2. Insert this board with the component side facing up into the slot of the computer or expansion unit. For the method of insertion refer to the manual for computer or expansion unit.
3. Connect the board with other equipment, using signal cable.

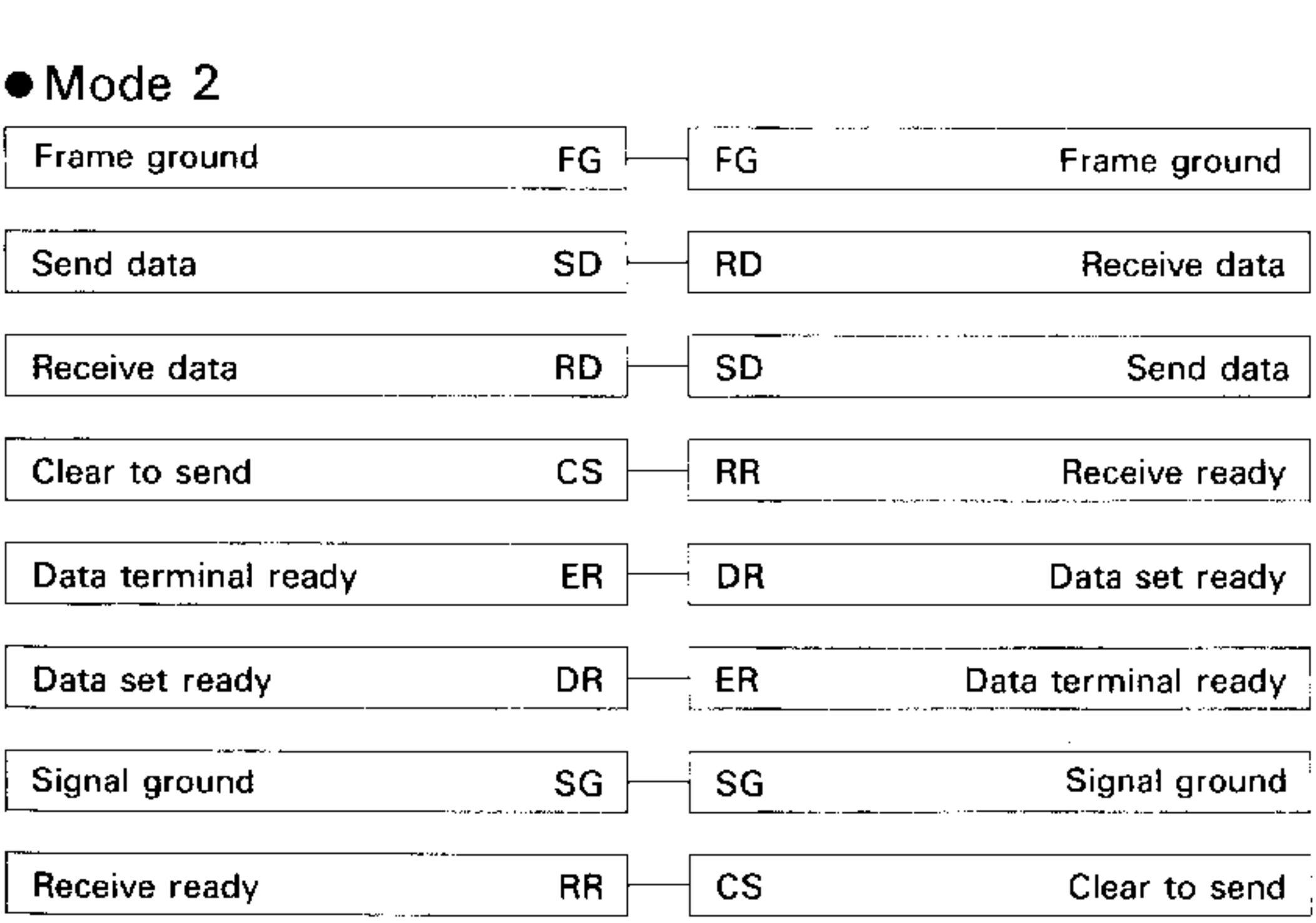
3. 2 Basic connection

The basic connection diagram for the RS-232C interface is shown below.

● Mode 1



● Mode 2

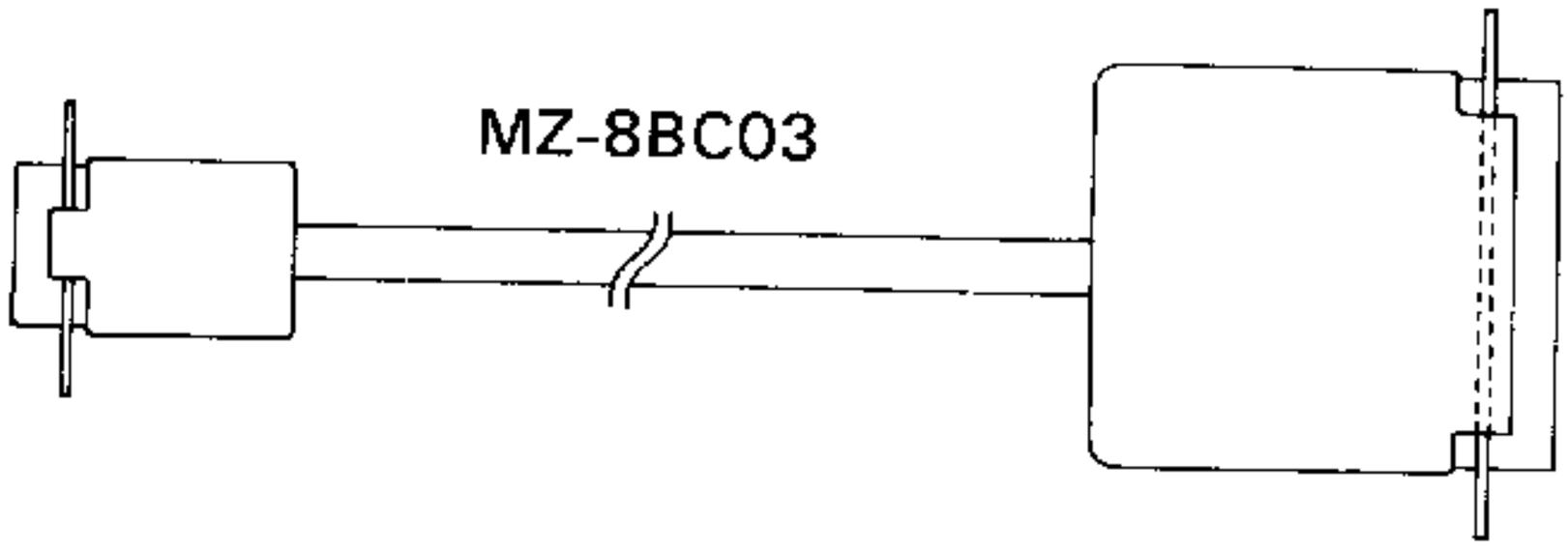


Connect your RS-232C board according to the above diagrams.

3. 3 Cabling the MZ-8BI03

Note) Select mode 1 if you want to use an MZ-8BC03 cable.

The MZ-8BC03 RS-232C cable is shown below. 25-pin connector pins whose numbers are not listed in the pin assignment diagram shown below are not used (no connection).



9-pin

Lead colour (Mark colour)		Pin No.
Orange	(Red)	1
Orange	(Black)	2
Gray	(Red)	3
Gray	(Black)	4
White	(Red)	5
White	(Black)	6
Yellow	(Red)	7
Yellow	(Black)	8
Pink	(Red)	9

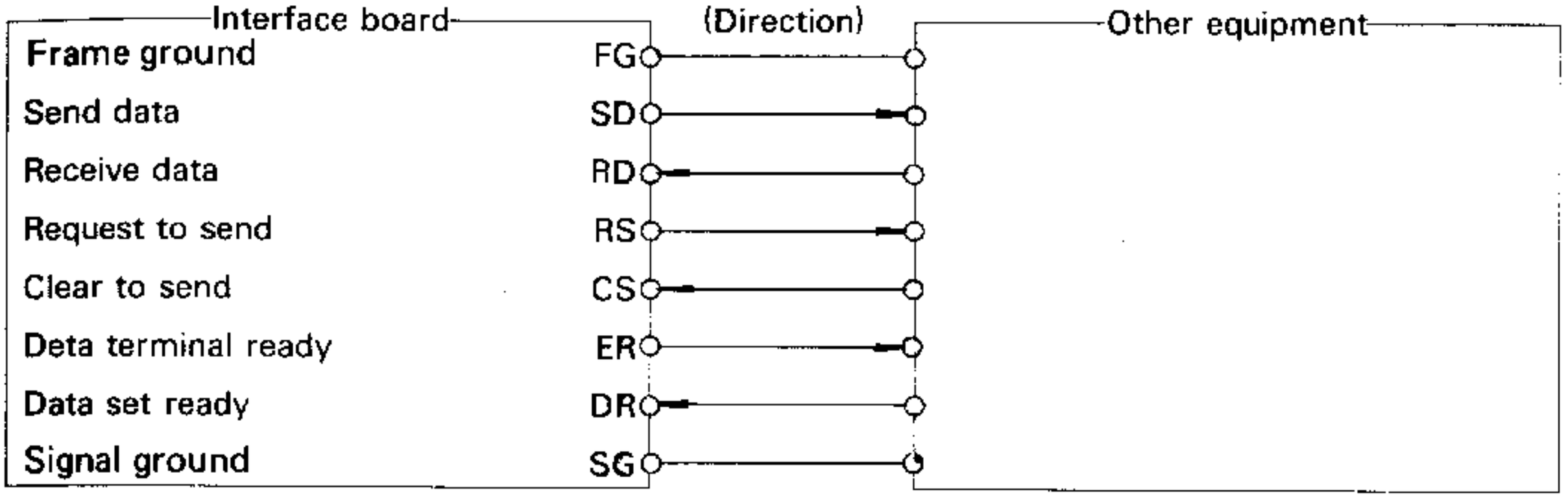
25-pin

Pin No.
1
2
3
4
5
20
6
7
8

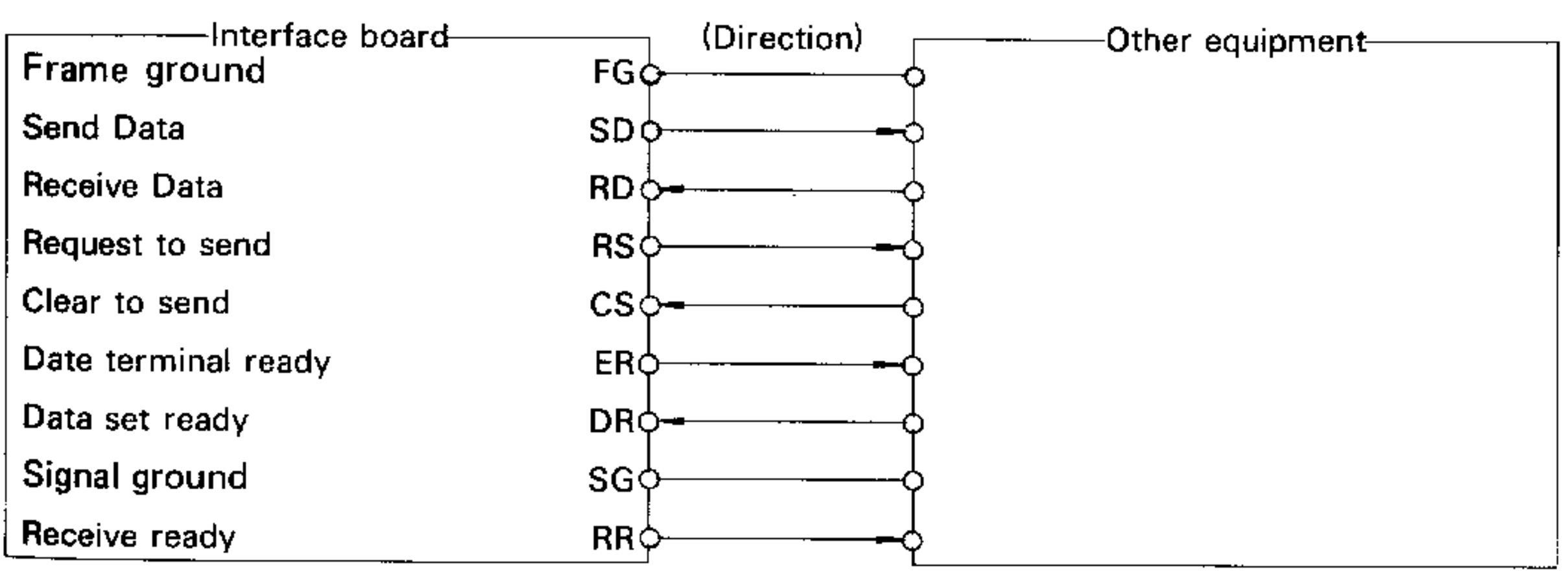
4 Electrical Characteristics of Signals

4. 1 Direction of signals

● Mode 1 (Terminal mode)

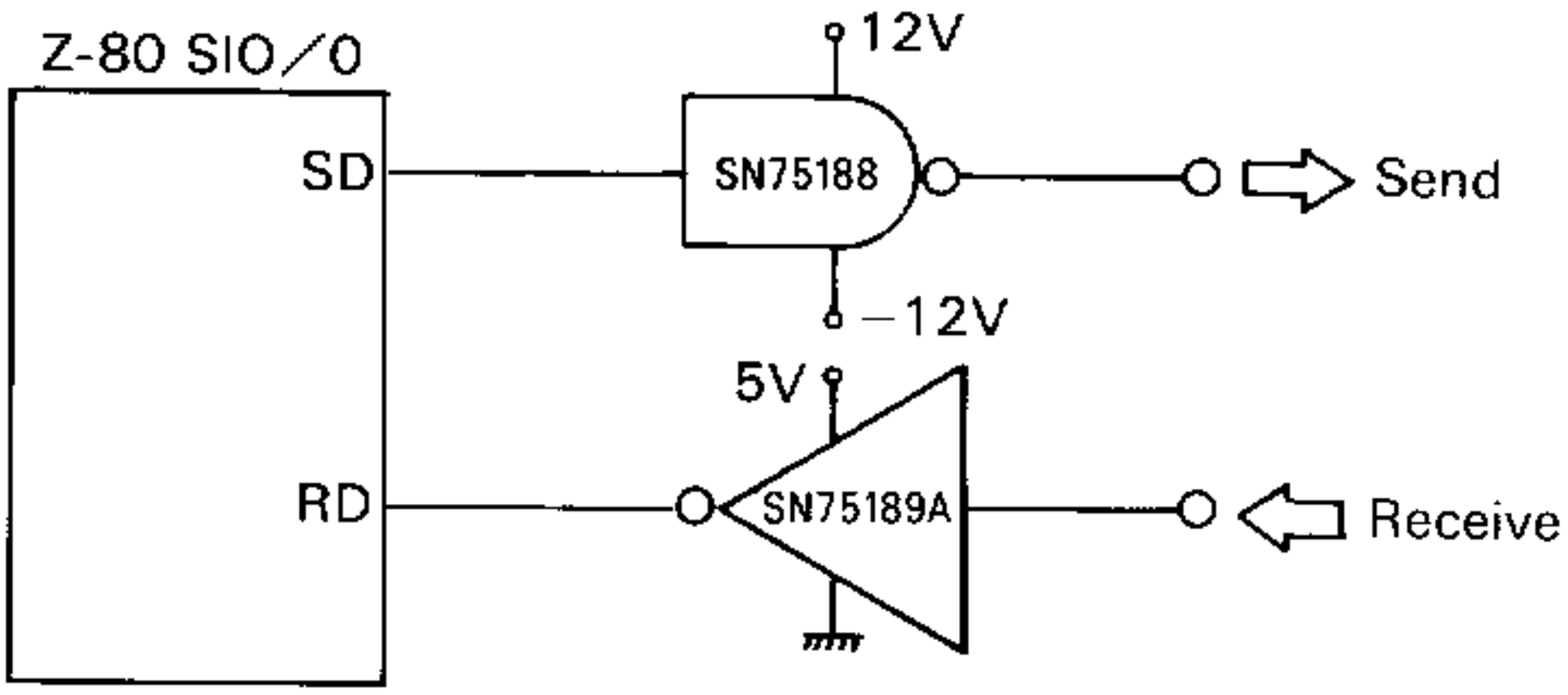


● Mode 2 (Terminal mode)



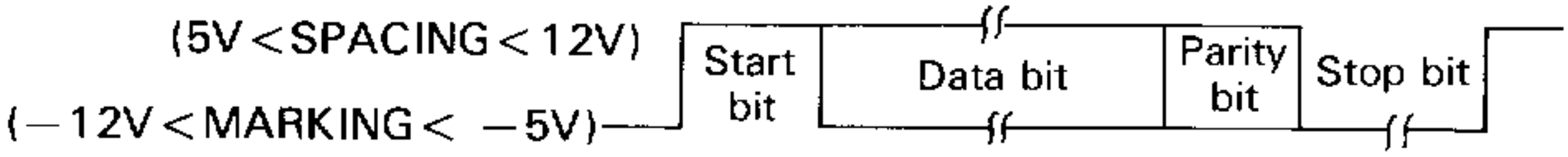
4. 2 Signal level

The signal levels(voltage levels) and polarities of send data(SD) and receive data(RD) are as follows.



Send/Receive Line

Send/Receive data(SD, RD)

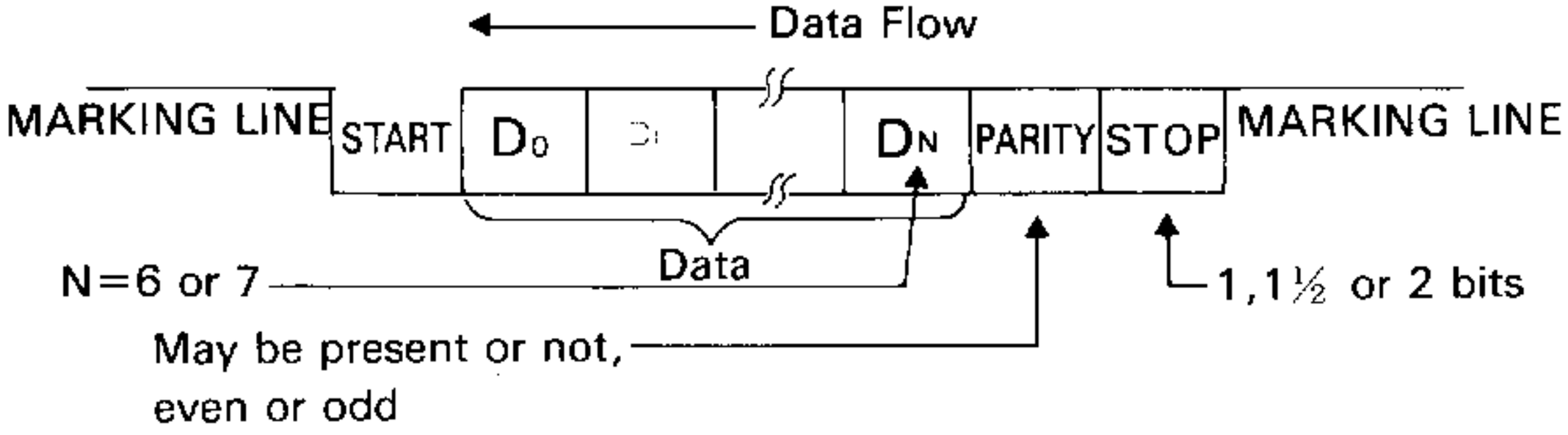


The input/output signals that are present at the RS-232C connector on the main unit are listed below.

Input signal High level (SPACE or ON state of signal) : +5V to +12V Low leavel (MARK or OFF state of signal) : −5V to −12V
Output signal High level : +5V to +12V Low level : −5V to −12V

4. 3 Data format

The interface board transmits data by the asynchronous transmission method. In the asynchronous data communication, a datum is composed of 4 parts: start bit, data, parity bit, and stop bit, as shown below.



○ Start bit and Stop bits

One start bit precedes the data bits and one to two stop bits follow the data bits and optional parity bit.

○ Parity bit

The parity bit is used to check the validity of the data bits preceding it. Its state is determined by the number of 1 data bits.

Even parity: The total number of 1 data bits and the parity bit is even.

Odd parity: The total number of 1 data bits and the parity bit is odd.

When even parity is used, for example, the parity bit is set to 1 if the number of data bits in the 1 state is odd.

The receiving station can then check to see whether the total number of 1 data bits in the received data and the parity bit is even.

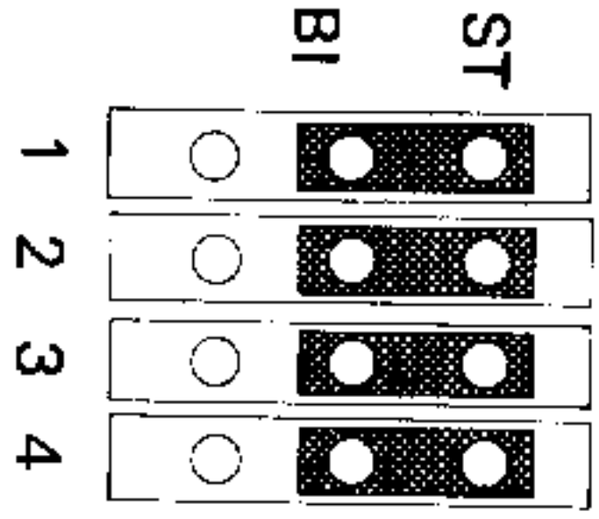
Note) When communicating through the RS-232C interface, be sure to set up the data transfer rate (baud rate) and data format (i.e., data length and the numbers of parity bits and stop bits). Make sure that the values of these parameters are the same for both sending and receiving stations.

5 Setting the board for delivery

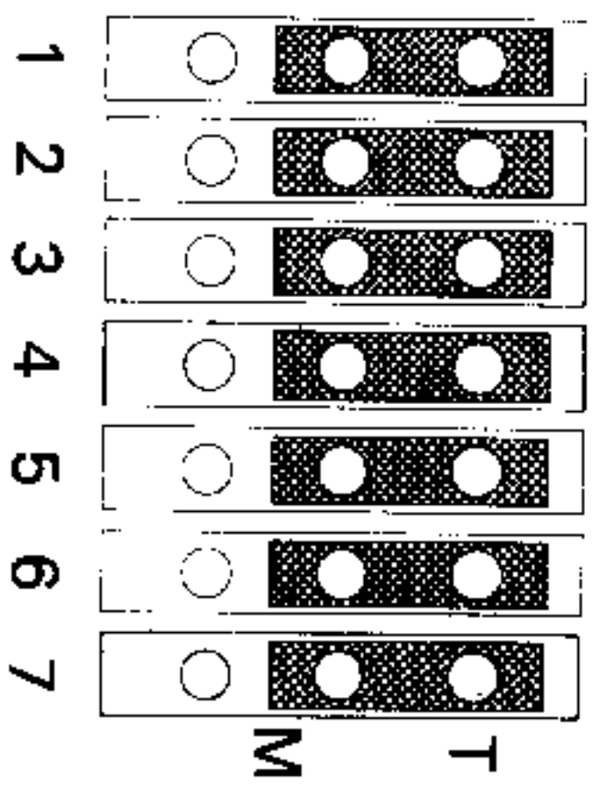
- Port address (switch) : B0H, B1H, B2H, B3H

Switch No.	1	2	3	4	5	6
Switch position	ON	ON	OFF	OFF	ON	OFF

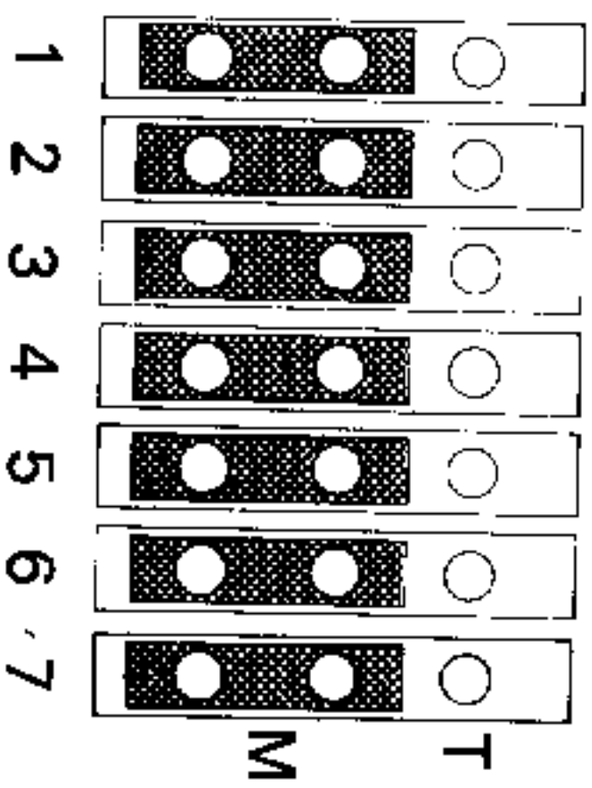
- Connection mode (JB-A1, JB-B1) : Mode 2



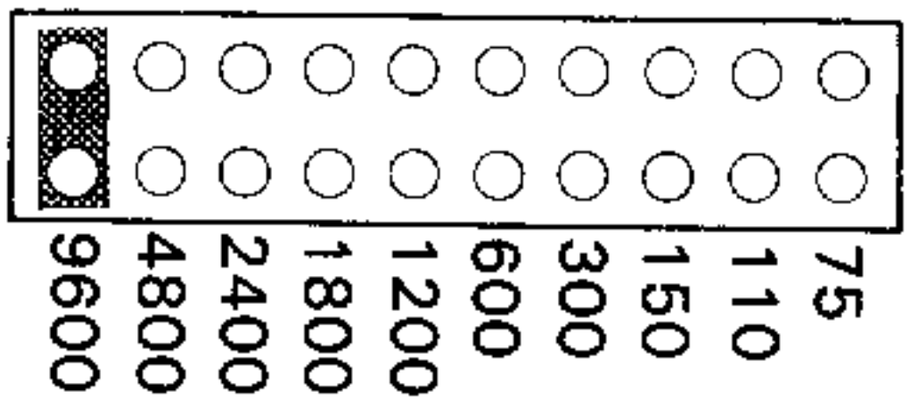
- Mode of channel A (JB-A3) : Terminal mode



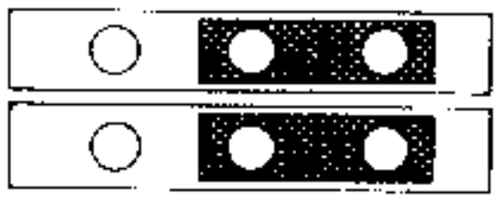
- Mode of channel B (JB-B3) : Modem mode



- Baud rate (JB-A2, JB-B2)
  : 9600 baud



- RS signal setup (JB-M)
  : Normal setting (OFF)



6 Connection Example

6. 1 MZ-800↔MZ-800

(Connection diagram)

MZ-800

Mode 2 Terminal mode	
Signal Name	Pin No.
FG	1
SD	2
RD	3
RS	4
CS	5
ER	6
DR	7
SG	8
RR	9

MZ-800

Mode 2 Terminal mode	
Pin No.	Signal Name
1	FG
2	SD
3	RD
4	RS
5	CS
6	ER
7	DR
8	SG
9	RR

(An MZ-700 may be used instead of the MZ-800)

When connecting a terminal mode unit to a modem mode unit, connect pins having the same pin number (e.g.,1↔1,2↔2,···). The two MZ-800 computers will handshake perfectly.

(Sample program)

- Send program

```
10 INIT "RS1:$07,$8C"
20 A$="RS-232C CHECK OK!"
30 WOPEN #1,"RS1:"
40 PRINT #1,A$
50 CLOSE #1
60 END
```

- Receive program

```
10 INIT"RS1:$07,$8C"
20 ROPEN #2,"RS1:"
30 INPUT #2,A$
40 PRINT A$
50 CLOSE #2
60 END
```

6. 2 MZ-800↔MZ-5600

(Connection diagram)

MZ-800

Mode 2 Terminal mode	
Signal Name	Pin No.
FG	1
SD	2
RD	3
RS	4
CS	5
ER	6
DR	7
SG	8
RR	9

(An MZ-700 may be used instead of the MZ-800.)

MZ-5600

BASIC	
Pin No.	Signal Name
1	SG
2	SD
3	RD
5	CS
6	READY
8	DR
12	ER
7, 9	SG

(An MZ-5500 may be used instead of the MZ-5600.)

The MZ-800 and MZ-5600 computers will communicate together while monitoring the status of the counterpart computer under software control. The MZ-800 will set its RR signal active when a WOPEN or ROPEN statement is executed. On the MZ-5600, its channel is open and the READY signal is made active when correct parameters are set with a CHANNEL statement. The READY signal is set inactive when the MZ-5600 buffer becomes full or an error occurs in the MZ-5600.

〔Sample program 〕

- MZ-800 send program

```
10 INIT "RS1:$07,$8C,10"
20 A$="RS-232C CHECK OK!"
30 WOPEN #1,"RS1:"
40 PRINT #1,A$
50 CLOSE #1
60 END
```

- MZ-5600 receive program

```
10 CHANNEL 0,9600,"8N2"
20 DIM A@*20
30 RCV A@,0,CHR$10
40 DISP A@
50 END
```

- MZ-800 receive program

```
10 INIT"RS1:$07,$8C"
20 ROPEN #2,"RS1:"
30 INPUT #2,A$
40 PRINT A$
50 CLOSE #2
60 END
```

- MZ-5600 send program

```
10 CHANNEL 0,9600,"8N2"
20 SEND "RS-232C CHECK OK!"
30 END
```

6. 3 MZ-800↔MZ-80B

〔Connection diagram 〕

MZ-800

Mode 2 Terminal mode	
Signal Name	Pin No.
FG	1
SD	2
RD	3
RS	4
CS	5
ER	6
DR	7
SG	8
RR	9

MZ-80B

Mode 1 Terminal mode	
Pin No.	Signal Name
1	FG
2	SD
3	RD
4	RS
5	CS
6	ER
7	DR
8	SG
9	NC

(An MZ-700 may be used instead of the MZ-800.)

MZ-80B DISK BASIC does not monitor the status of the counterpart station (no handshake), while MZ-80B FDOS monitors the DR signal to handshake with the counterpart station. To stop the program, press the SHIFT and BREAK keys at the same time.

〔Sample program〕

● MZ-800 send/receive program

```
10 INIT "RS1:$04,$8C"
20 ROPEN #2,"RS1:"
30 WOPEN #1,"RS1:"
40 INPUT #2,A$
50 PRINT A$
60 PRINT #1,A$+"ECHO"
70 GOTO 40
```

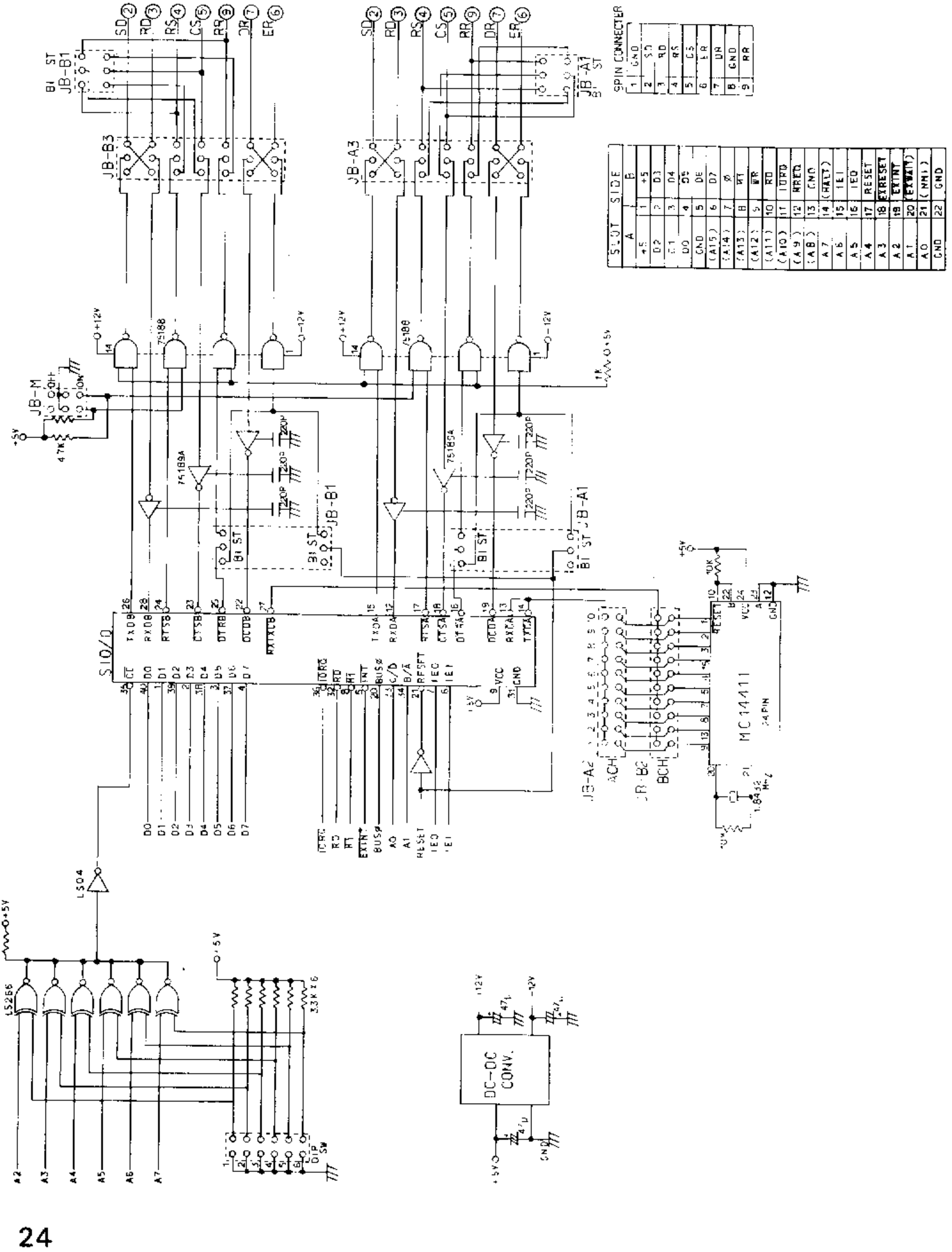
● MZ-80B send/receive program

```
10 RSMODE A,R8,T8,M78,RX1
20 A$="RS-232C":GOTO 40
30 RSI A A$
40 RSO A A$
50 PRINT A$
60 GOTO 30
```

7 Specifications

Communication method:	Asynchronous
Standard:	In compliance with EIA RS-232C
Control LSI:	Z-80 SIO/O
Number of channels:	2(Channel A and Channel B)
Baud rate:	Can be set independently for the two channels. (Manual setting using jumper chip)
Number of baud rates:	10(75, 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600 baud)
Character length:	7 or 8 bits (Selection by software)
Parity bit:	Odd, Even, or None
Stop bit:	1, 1½, or 2
Mode:	Either terminal mode or modem mode can be selected for each channel (through the use of jumper chip).
Interrupt:	Z-80 vector interrupt can be used.
Port address:	Manual setting with switch
Operating temperature:	10℃ to 35℃
Accessory:	Operation manual (this manual)

8 Circuit Diagram



SLOT SIDE																							
A	B																						
+5	+5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
D2	D3																						
D1	D4																						
D0	D5																						
GND	D6																						
(A15)	D7																						
(A14)	Ø																						
(A13)	RT																						
(A12)	WR																						
(A11)	RD																						
(A10)	IORQ																						
(A9)	MREQ																						
(A8)	GND																						
A7	(HALT)																						
A6	IEI																						
A5	IEO																						
A4	RESET																						
A3	EXRESET																						
A2	EXINT																						
A1	(EXWAIT)																						
A0	(NMI)																						
GND	GND																						

MEMO

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