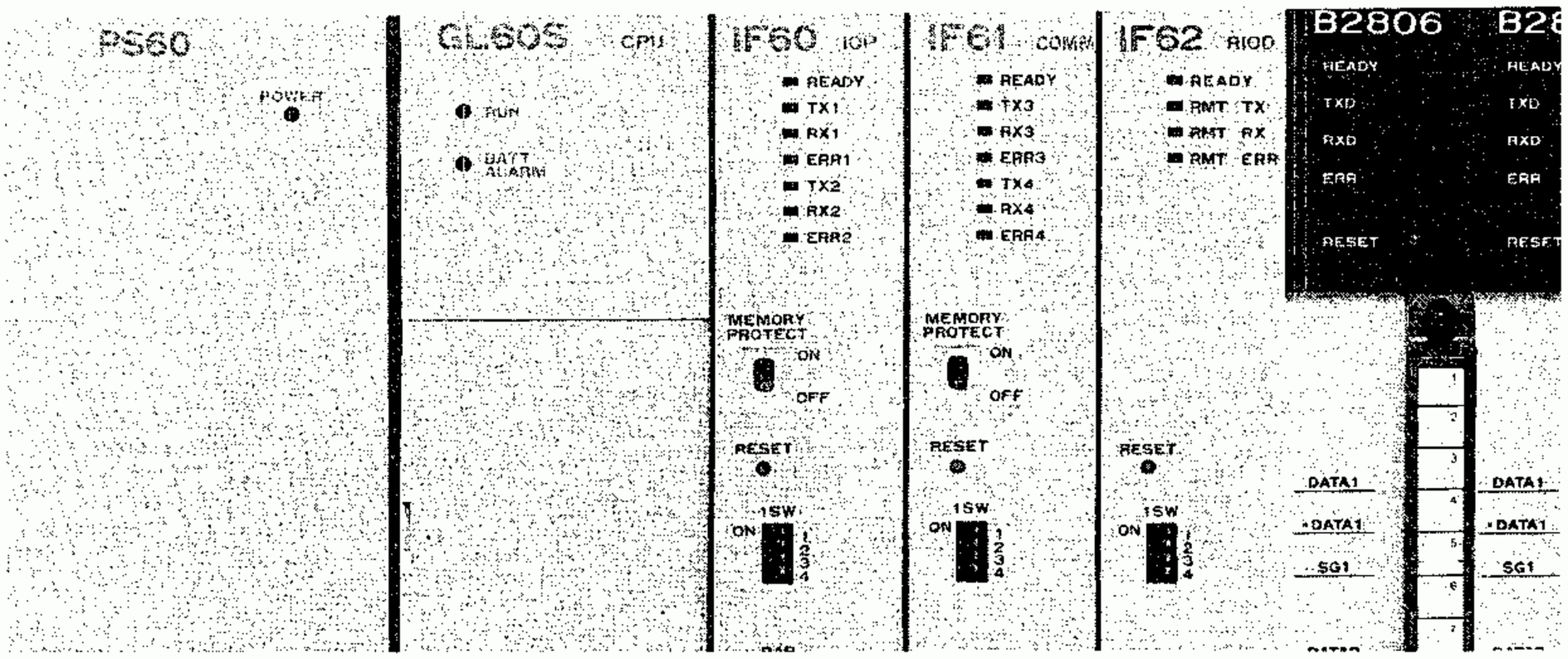
YASKAWA

INTERFACE MODULE
USER'S MANUAL

PROGRAMMABLE CONTROLLER MEMOCON-SC GL20/GL60S

TYPE JAMSC-B2806



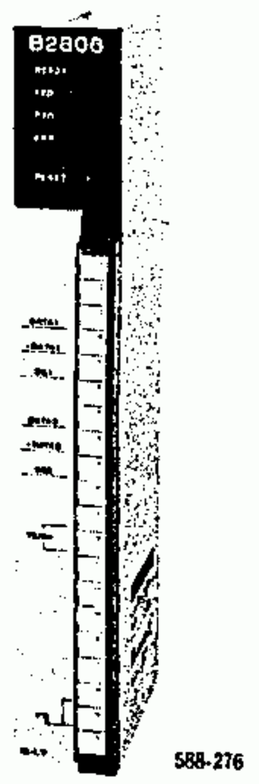
YASKAWA

MANUAL NO. SIE-C815-14.18

This manual describes configuration, specifications, connection, I/O allocation, transmission protocol, wiring etc. of the interface module, Type JAMSC-B2806. It is used as one of 2000 series I/O modules, for Memocon-SC GL20/GL60S (GL20/GL60S). To get the most from your interface module, follow the procedures outlined in this manual at all times.

For more information on GL20/GL60S, refer to the following manuals:

- SIE-C815-13·1: *Memocon-SC* **GL20**
  USER'S MANUAL DESIGN AND MAINTENANCE
- SIE-C815-13·5: *Memocon-SC* **GL20**
  USER'S MANUAL P150 PROGRAMMING PANEL
- SIE-C815-14·1: *Memocon-SC* **GL60S**
  USER'S MANUAL – No. 1 DESIGN AND MAINTENANCE
- SIE-C815-14·2: *Memocon-SC* **GL60S**
  USER'S MANUAL – No. 2 BASIC INFORMATION
- SIE-C815-14·3: *Memocon-SC* **GL60S**
  USER'S MANUAL – No. 3 SFC INFORMATION
- SIE-C815-14·7: *Memocon-SC* **GL60S**
  REMOTE I/O USER'S MANUAL



Inter-module Interface
Module Type JAMSC-B2806

NOTE

1. Inquiries about the information in this manual should be directed to your YASKAWA representative.

2. No part of this manual may be reproduced without permission.

CONTENTS

1 INTRODUCTION

The inter-module interface module JAMSC -B2806 is one of the Memocon-SC Series 2000 I/O devices, and it can be used with Memocon-SC GL20 or GL60S. (Hereinafter, the following abbreviations willl be used: JAMSC-B2806 = B2806; Memocon-SC = PC; Memocon-SC GL20 = GL20; Memocon-SC GL60S = GL60S)

A PC equipped with B2806 can exchange I/O data with other PCs. Data transmission is executed under the master-slave concept, with one master station capable of supporting up to seven slave stations.

Features:

- Enables PC-PC interconnection;
- Requires no special programming;
- Uses the master-slave concept;
- The same B2806 module can be used in either master or slave mode by DIP switch setting;
- Multiple B2806 modules can be connected to one CPU;
- Requires no external power supply;
- Reduces wiring;
- Can be used in the "free-location" manner in the same way as other I/O modules.

2 CONFIGURATION

Fig. 2.1 shows a sample configuration of a system that uses B2806 modules.

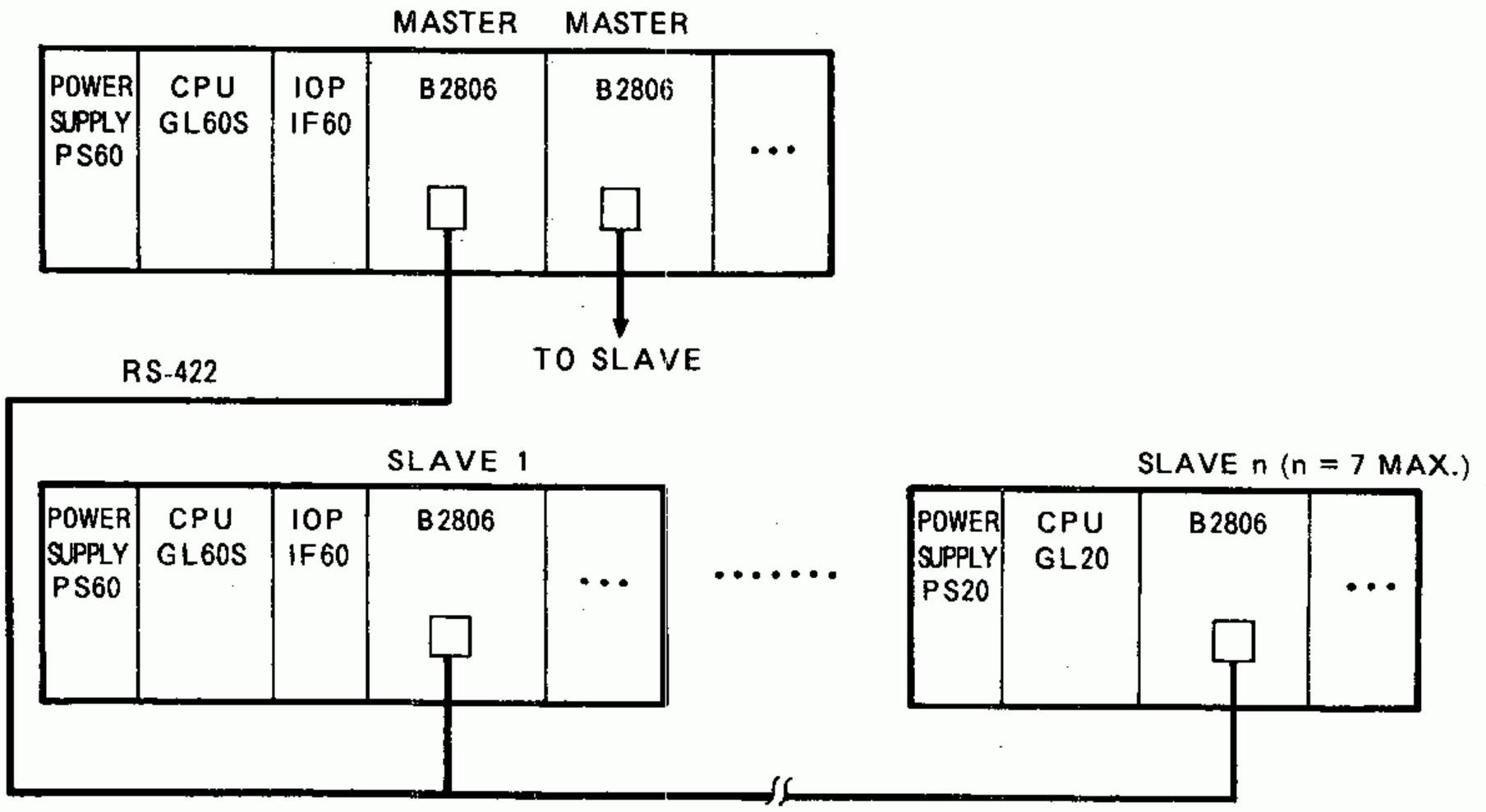


Fig. 2.1 Sample Configuration of System with B2806

3 SPECIFICATIONS

3.1 GENERAL SPECIFICATIONS

Table 3.1 General Specifications

Item	Specifications
Operating Ambient Temperature	0 to 55℃
Storage Temperature	−20 to 85℃
Humidity	10 to 90% RH (Non-condensing)
Vibration-Resistence	In compliance with JIS* C 0911
Shock-Resistance	In compliance with JIS* C 0912 (3 times 10G in X, Y & Z directions)
Environmental Condition	Free of flammable or corrosive gases, and no significant amount of dust

* Japanese Industrial Standard

3.2 PERFORMANCE SPECIFICATIONS

Table 3.2 Performance Specifications

Item	Specifications	
Communication Mode	Half-duplex mode	
Synchronization	Asynchronous	
Transmission Distance	Maximum 100 m (total)	
Bit Configuration	JIS* 7-bit system (Total 10 bits: Start 1 bit, data 7 bits, even parity 1 bit, Stop 1 bit)	
Parity Check	Vertical parity detection (even parity) Horizontal parity detection (even parity)	
Signal Level	In compliance with EIA RS-422	
Transmission Cable†	JKEV-SB 0.75 sq. × 2 p (Polyethylene insulation sheathed cable with double copper braided isolation for instrumentation applications)	
Internal Current Consumption (Vcc)	+5 V/0.3 A per module	
PCs Supported	GL60S, GL20	
Transmission Speed	9.6 kbps, 19.2 kbps, 38.4 kbps	
Number of Stations	Maximum 7 slave stations	
Transmission Mode	T mode	Y mode
Transmission Discrete I/Os	256 I/Os Input : 128 Output: 128	256 I/Os Input : 128 Output: 128
Transmission Registers		14 Registers Input : 7 registers Output: 7 registers
Paralleling Function‡	None	Yes

* Japanese Industrial Standard

† JKEV-SB is the standard set by Japan Electric Wire and Cable Makers' Association, and the following products conform to this standard:

Sumitomo Electric Inc.,Ltd. -DPEV-SB
Fujikura, Ltd. -IPEV-SB
Furukawa Electric Co., Ltd. -KPEV-SB

‡ When the master detects a communication error with a slave, it disconnects the abnormal slave and continues communication with the remaining normal slaves. The master accesses the disconnected slave at an interval of 2 cycles, and reconnects it when it confirms that the slave has been restored to normal operation.

4 CONNECTION

Before connecting the B2806 modules, the power to each rack must be turned OFF. The transmission cables must be connected serially (Master → Slave 1 → Slave 2 → . . . Slave n) as illustrated in Fig. 3.1. Avoid branching out from an intermediate point as that will result in degradation of transmission characteristics. On the master module and the last slave module, the TERM pins must be jumped. All modules should be grounded to frame at one point.

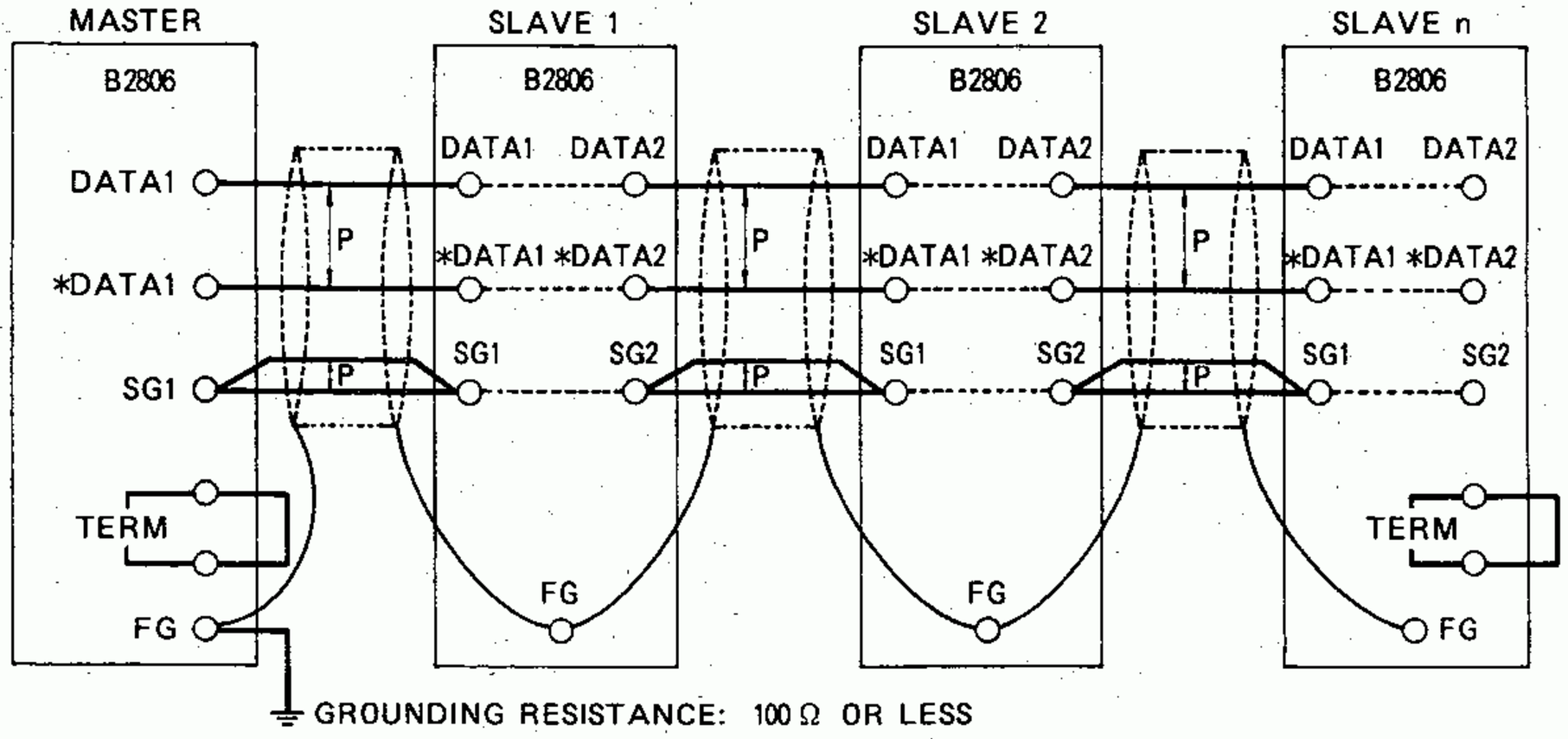


Fig. 4.1 Example of Connecting B2806s

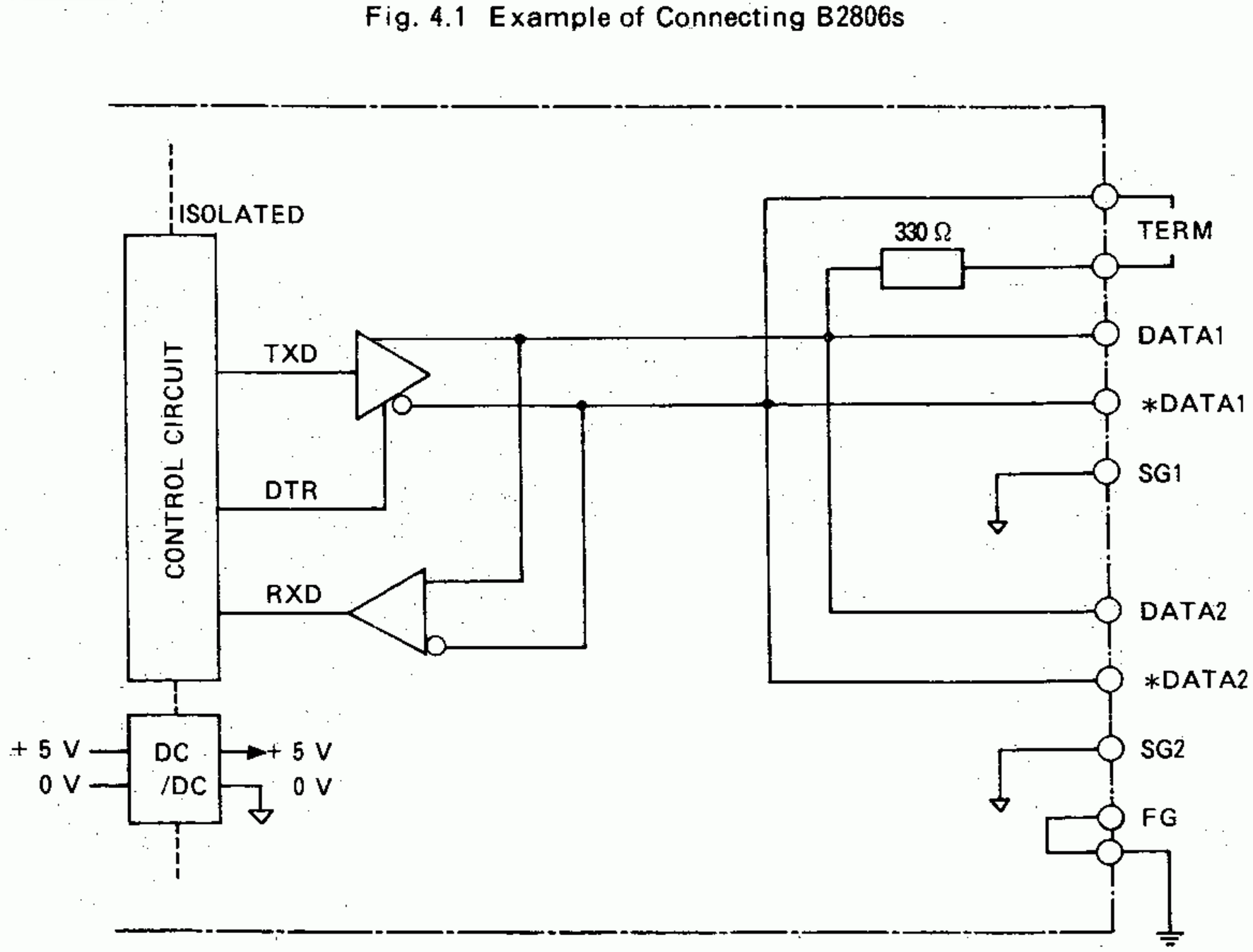


Fig. 4.2 Internal Circuit of Connection Part

5 I/O ALLOCATION

For interfacing the CPU and B2806 modules, the output coil, input relay, output register and input register must be allocated.

The method of allocating reference numbers is the same as that on other 2000 series I/O modules. I/O allocation on the master B2806 must be made for the CPU module in the master station, and I/O allocation on a slave B2806 must be made for the CPU module in the slave station.

I/O allocations for the input and output registers must be specified in binary.

Fig. 5.1 illustrates the flow of data when one master station is connected to one slave station. Tables 5.1 and 5.2 summarize the I/O allocations in the T mode and the Y mode, respectively.

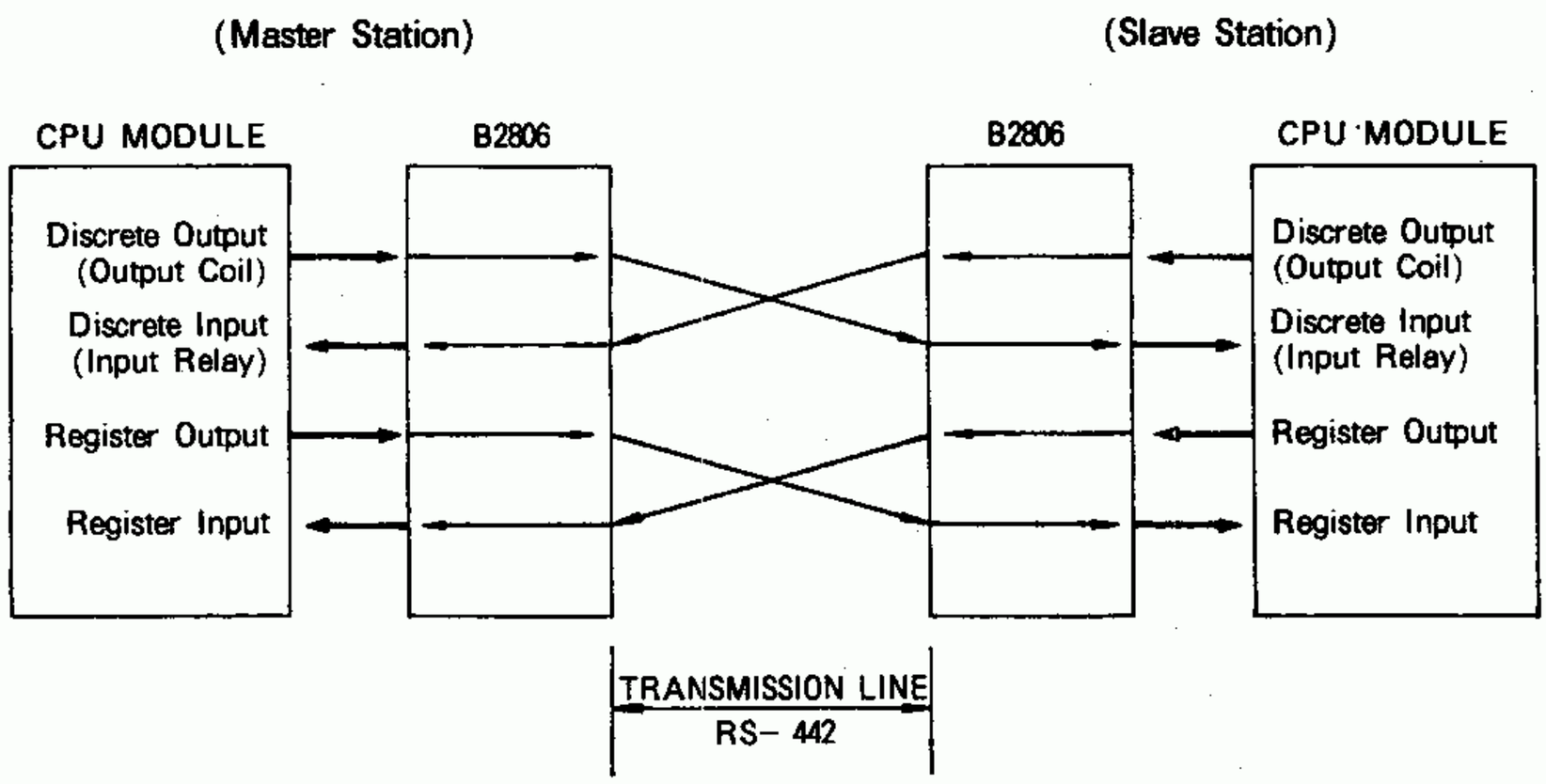


Fig. 5.1 Flow of Data for 1 : 1 Master-Slave Interface

NOTE

The following points must be observed when performing I/O allocation:

Mode	Transmission Points/Registers (Setting by Switch on Back of Module)	I/O Allocation Condition
T Mode	Only discrete data are set.	Discrete output (output coil) must be allocated.
Y Mode	When only discrete data are set	Discrete output (output coil) must be allocated.
	When both discrete data and register data or only register data are set	Register output must be allocated.

For explanation of switch settings, see Section 7.

5 I/O ALLOCATION (Cont'd)

Table 5.1 I/O Allocations for T Mode

Allocation \ CPU	GL20	GL60S	Remarks
Discrete Output (Output Coil)	0001 + $8n_0$ 0128 + $8n_0$	00001 + $8n_0$ 00128 + $8n_0$	Max. 128 points (in groups of 8)
Discrete Input (Input Coil)	1001 + $8n_1$ 1128 + $8n_1$	10001 + $8n_1$ 10128 + $8n_1$	Max. 128 points (in groups of 8)
Register Input	3001 + n_2	30001 + n_2	1 register for monitor (unnecessary if monitor is not required)

n_0, n_1, n_2 = 0, 1, 2 ……

Table 5.2 I/O Allocations for Y Mode

Allocation \ CPU	GL20	GL60S	Remarks
Discrete Output (Output Coil)	0001 + $8n_0$ 0128 + $8n_0$	00001 + $8n_0$ 00128 + $8n_0$	Max. 128 points (in groups of 8)
Discrete Input (Input Coil)	1001 + $8n_1$ 1128 + $8n_1$	10001 + $8n_1$ 10128 + $8n_1$	Max. 128 points (in groups of 8)
Register Output	4001 + n_2 4007 + n_2	40001 + n_2 40007 + n_2	Max. 7 registers
Register Input	3001 + n_3	30001 + n_3	1 register for monitor
	3002 + n_3 3008 + n_3	30002 + n_3 30008 + n_3	Max. 7 registers

n_0, n_1, n_2, n_3 = 0, 1, 2 ……

(Supplemental Information)

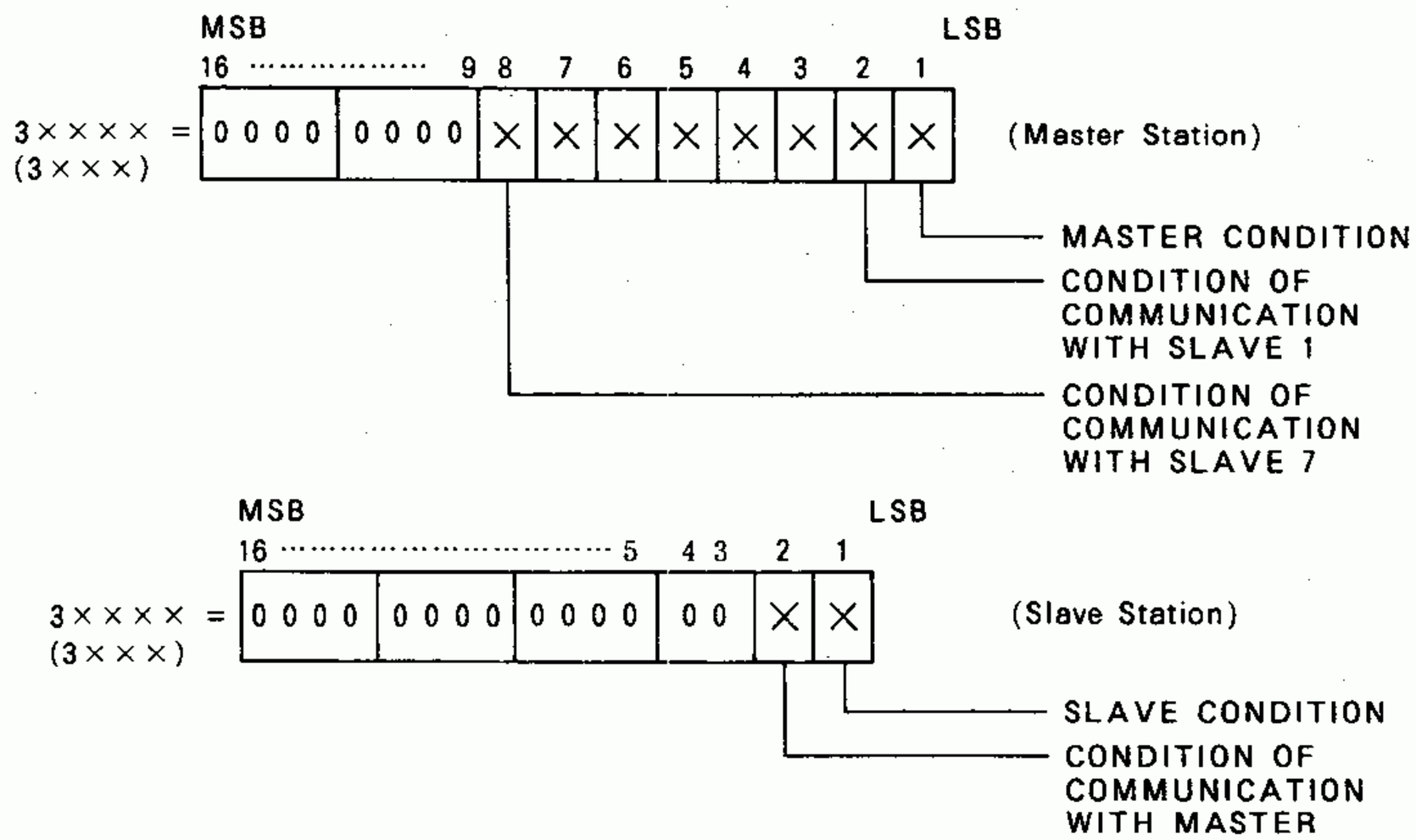
Monitoring the Transmission Condition

By allocating input registers (3×××) in the I/O allocation table, the condition of data transmission between the master and slave stations can be monitored using the first register.

To use this monitoring function, the number of input allocation registers must be set to one more than the number of transmission data registers.

To use the monitoring function when only discrete data are being transmitted, allocate one input register and set the RSW2 swich on the back of B2806 in the F position.

When RSW2 is set in the F position, register input allocation is mandatory. Register input allocation must be specified in the binary mode.



Note: × = 1 Normal; × = 0 Abnormal

6 DATA TRANSMISSION

Figs. 6.1 and 6.2 graphically illustrate the data transmission in a T mode system and a Y mode system, respectively, that use B2806 interface modules.

6.1 T MODE

The T mode is the discrete data transmission mode.

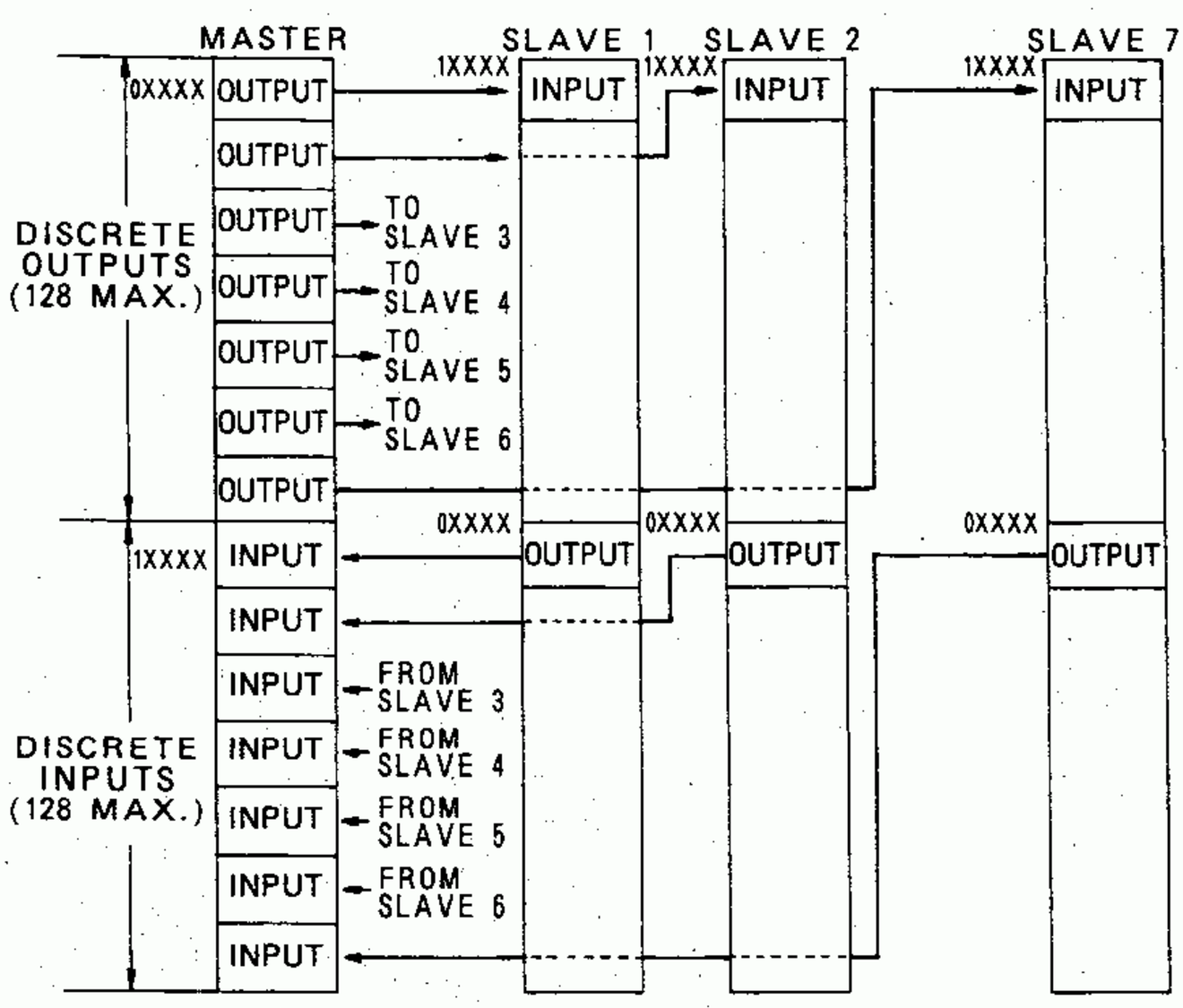


Fig. 6.1 Data Transmission in the T Mode

<Points>

- 0×××× (output coil number) and 1×××× (input relay number) are set by creating an I/O allocation table for the CPU module in which the B2806 is set.
- The minimum setting unit for discrete I/O data transmission volume is 8 I/Os.
- When eight or more slave stations are needed, additional master module(s) must be installed.
- Signals with identical numbers cannot be transmitted to multiple slave stations.
- The master station I/O data transmission volume is equal to the total I/O data transmission volume for the slave stations.
- By allocating one set of register inputs, the transmission condition between the master and slave station can be monitored.

6.2 Y MODE

The Y mode is the discrete/register data transmission mode.

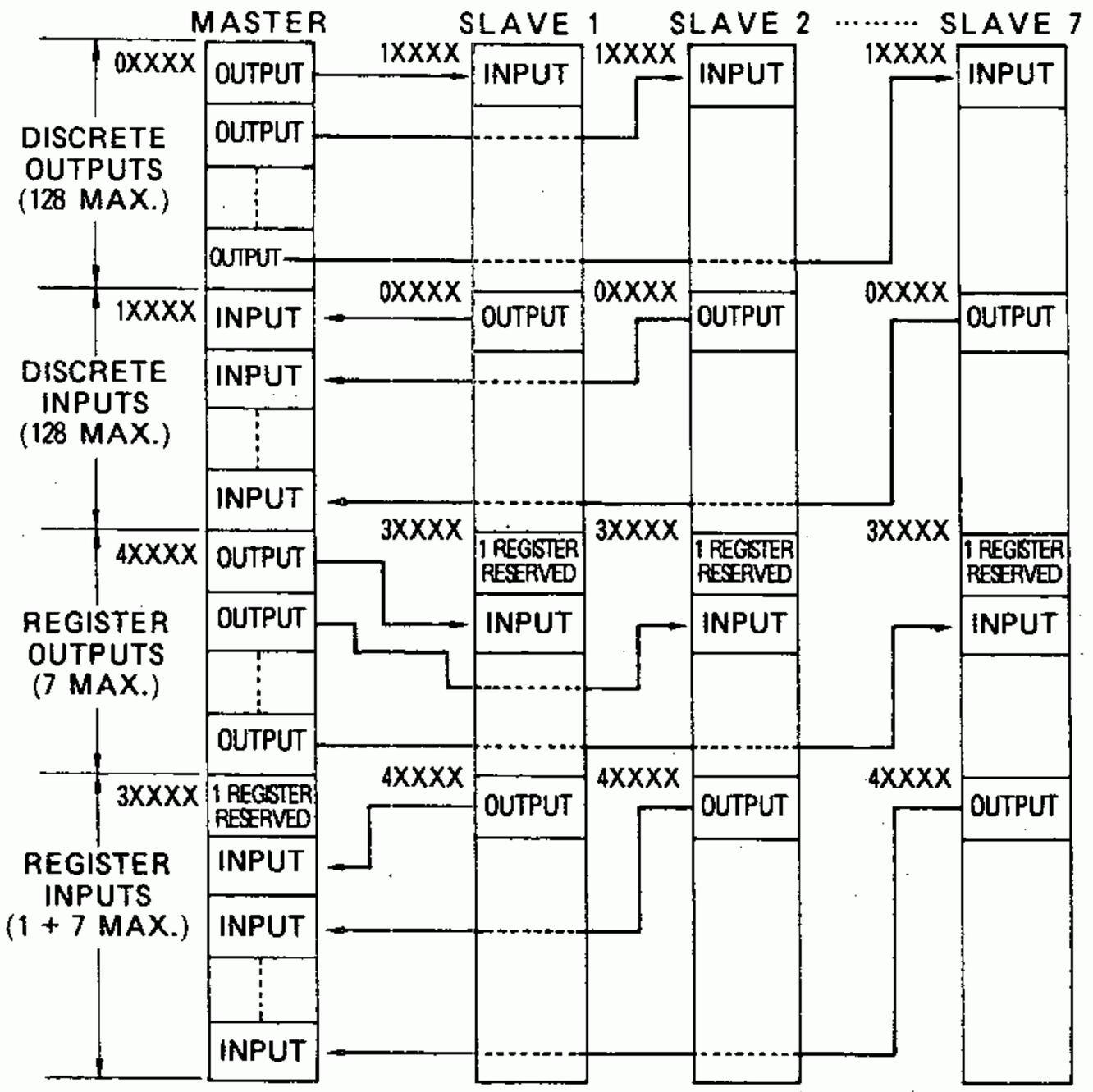


Fig. 6.2 Concept of Data Transmission in the Y Mode

<Points>

- 0×××× (output coil number), 1×××× (input relay number), 4×××× (output register number) and 3×××× (input register number) are specified by creating an I/O allocation table for the CPU module in which the B2806 is set.
- The minimum setting unit for discrete I/O data transmission volume is 8 I/Os.
- Setting of discrete data only or register data only is permitted.
- When eight or more slave stations are needed, additional master module(s) must be installed.
- Signals with identical numbers cannot be transmitted to multiple slave stations.
- The master station I/O data transmission volume is equal to the total I/O data transmission volume for the slave stations.
- The first input register allocated is automatically used for monitoring of master-slave transmission condition. Therefore, one register more than the number of input registers necessary for data input must be allocated.

7 TRANSMISSION CONDITION SETTINGS

7.1 SWITCH SETTINGS

Transmission conditions are set with the SW1 DIP switch and the RSW1 and RSW2 rotary switches.

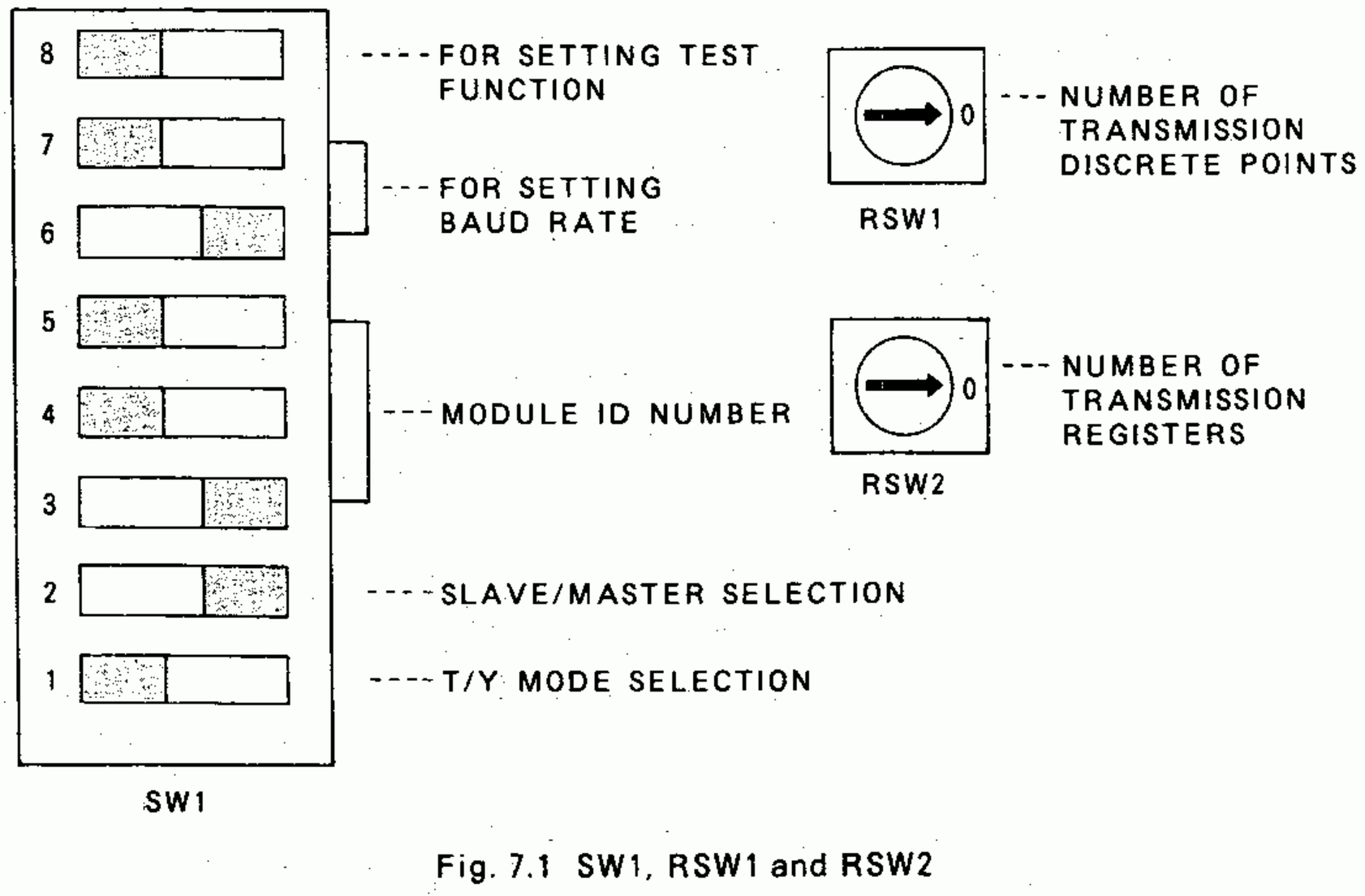


Fig. 7.1 SW1, RSW1 and RSW2

7.1.1 Setting SW1 DIP Switch

(1) T/Y Mode Selection (SW1–1)

The T or Y transmission mode selection is set with SW1–1.

Table 7.1 T/Y Mode Selection

SW1–1	Transmission Mode
ON	Y mode
OFF	T mode

(2) Slave/Master Selection (SW1–2)

The Slave or Master function selection is set with SW1–2.

Table 7.2 Slave/Master Function Selection

SW1–2	Function
ON	Master station
OFF	Slave station

(3) Module ID Number Setting (SW1–3, 4, 5)

The module ID number switch setting differs depending on whether the B2806 is set for the master or slave station function.

- Master station: The switch setting specifies the number of slave stations connected to it.
- Slave station: The switch setting specifies the slave station address.

Table 7.3 Master Function Selection

SW1–3	SW1–4	SW1–5	Number of Slave Stations Connected
1	0	0	1
0	1	0	2
1	1	0	3
0	0	1	4
1	0	1	5
0	1	1	6
1	1	1	7

1: ON 0: OFF
SW1–3, 4, 5 = 0, 0, 0 results in a setting error.

Table 7.4 Slave Function Selection

SW1–3	SW1–4	SW1–5	Slave Station Address
1	0	0	1
0	1	0	2
1	1	0	3
0	0	1	4
1	0	1	5
0	1	1	6
1	1	1	7

1: ON 0: OFF
Make sure that the same slave station address is not allocated more than once.
SW1–3, 4, 5 = 0, 0, 0 results in a setting error.

(4) Baud Rate Setting (SW1–6, 7)

RS-423 transmission line transmission speed (baud rate) is set with SW1–6 and SW1–7.

Table 7.5 Baud Rate Setting

SW1–6	SW1–7	Baud Rate
0	0	9.6 kbps
1	0	19.2 kbps
0	1	38.4 kbps
1	1	

1: ON 0: OFF

(5) TEST Function Setting (SW1–8)

The TEST switch (SW1–8) must be set to OFF at all times. This function is used only for pre-shipment factory testing work.

7.1.2 Setting RSW1 and RSW2 Rotary Switches

The RSW1 and RSW2 rotary switches are used to set the data transmission volume.

- RSW1: Number of transmission discrete points
- RSW2: Number of transmission registers

Table 7.6 RSW1 Setting

NO	DI Points	DO Points	Number of Slaves Connectable 1 2 3 4 5 6 7
0	0	0	
1	8	8	
2	16	16	
3	24	24	
4	32	32	
5	40	40	
6	48	48	
7	56	56	
8	64	64	
9	72	72	
A	80	80	
B	88	88	
C	96	96	
D	104	104	
E	120	120	
F	128	128	

Table 7.7 RSW2 Setting

NO	RI Registers	RO Registers	Number of Slaves Connectable 1 2 3 4 5 6 7
0	0	0	
1	1	1	
2	2	2	
3	3	3	
4	4	4	
5	5	5	
6	6	6	
7	7	7	
8 ⋮ E	Setting error		
F	Specifies discrete data transmission + monitor mode		

<Points>

- Tables 7.6 and 7.7 show how RSW1 and RSW2 rotary switches are to be set and the number of slave stations that can be connected to a master for each RSW1/RSW2 switch setting.
- RSW1 sets the number of transmission discrete points and RSW2 sets the number of transmission registers, for input and output at the same time in both cases.
- The maximum number of transmission discrete points is 256 (128 inputs and 128 outputs), and the maximum number of transmission registers is 14 (7 input registers and 7 output registers). Make sure that the master station allocations (transmission points, registers × number of slaves) do not exceed the transmission data limit.
- RSW1 and RSW2 are set in the same manner regardless of whether the B2806 is set for master or slave function.
- For the T mode, RSW1 setting of 0 will result in a setting error.

- For the Y mode, setting of 0 on both RSW1 and RSW2 will result in a setting error. It is permitted to allocate only discrete data or only register data, but setting of 8 or higher on RSW2 will result in a setting error.
- If any setting error occurs, LED shows the error. The interface module does not receive a service from the master.

7.1.3 Setting at the Time of Shipment from Factory

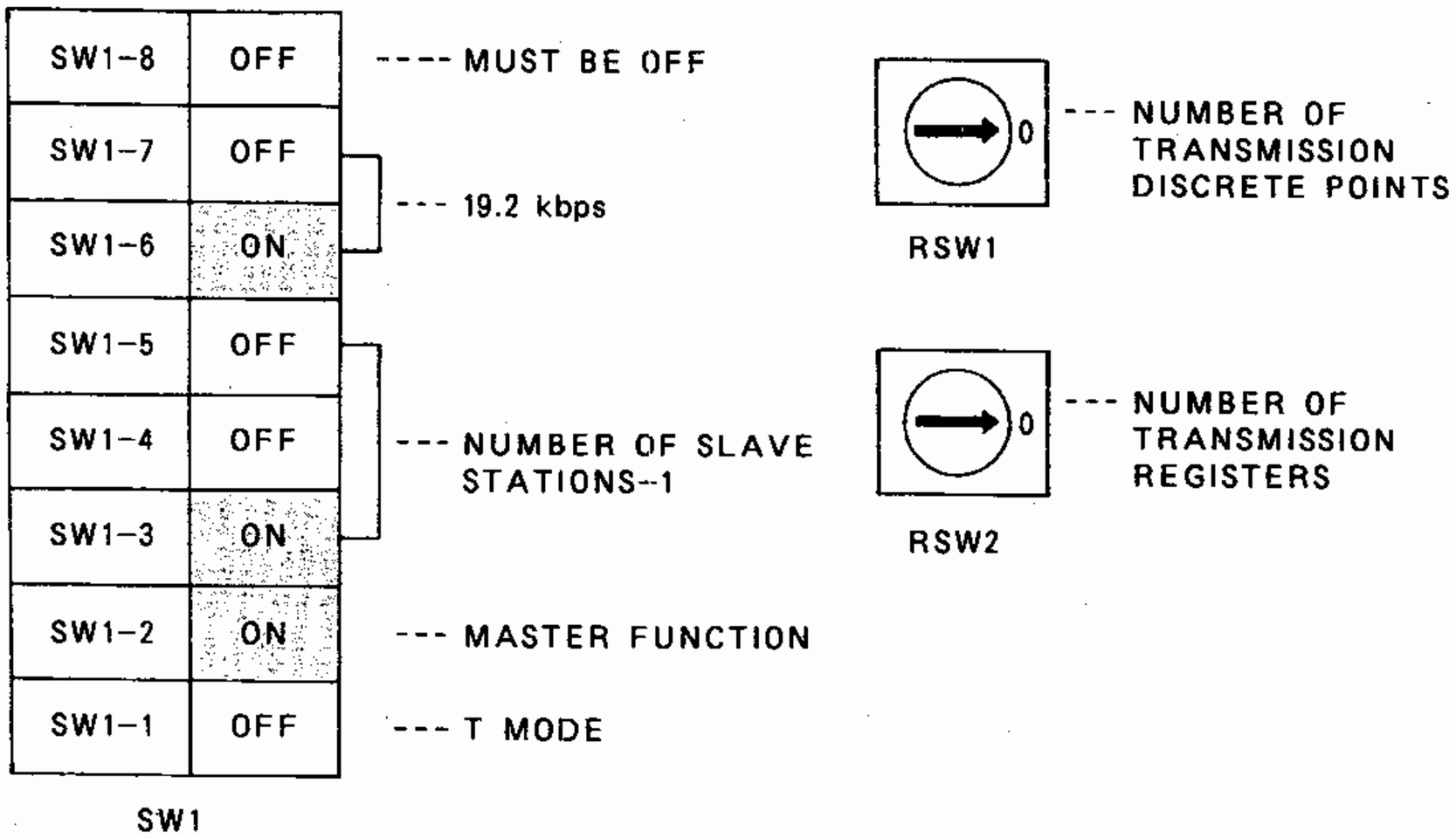
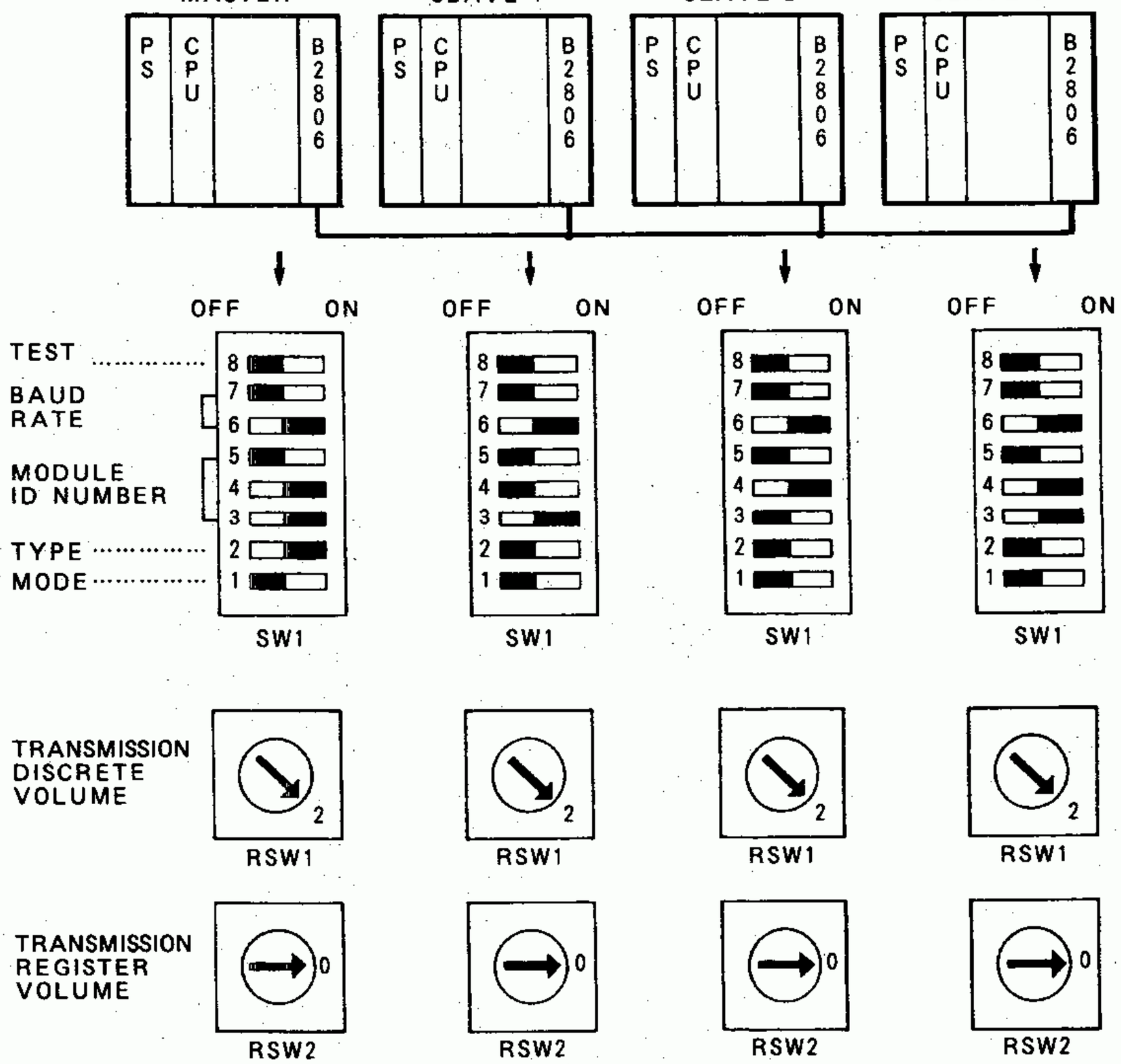


Fig. 7.2 Factory Switch Setting

7.2 SWITCH SETTING EXAMPLES

7.2.1 T Mode

Assumptions:
(a) T mode with master: slave ratio of 1 : 3
(b) Data transmission volume of 16 discrete inputs and 16 discrete outputs
(c) Baud rate of 19.2 kbps



(Allocations on CPU module)				
Discrete outputs (DO)	48 points	16 points	16 points	16 points
Discrete inputs (DI)	48 points	16 points	16 points	16 points

Fig. 7.3 T Mode System with 1 : 3 Master-Slave Configuration

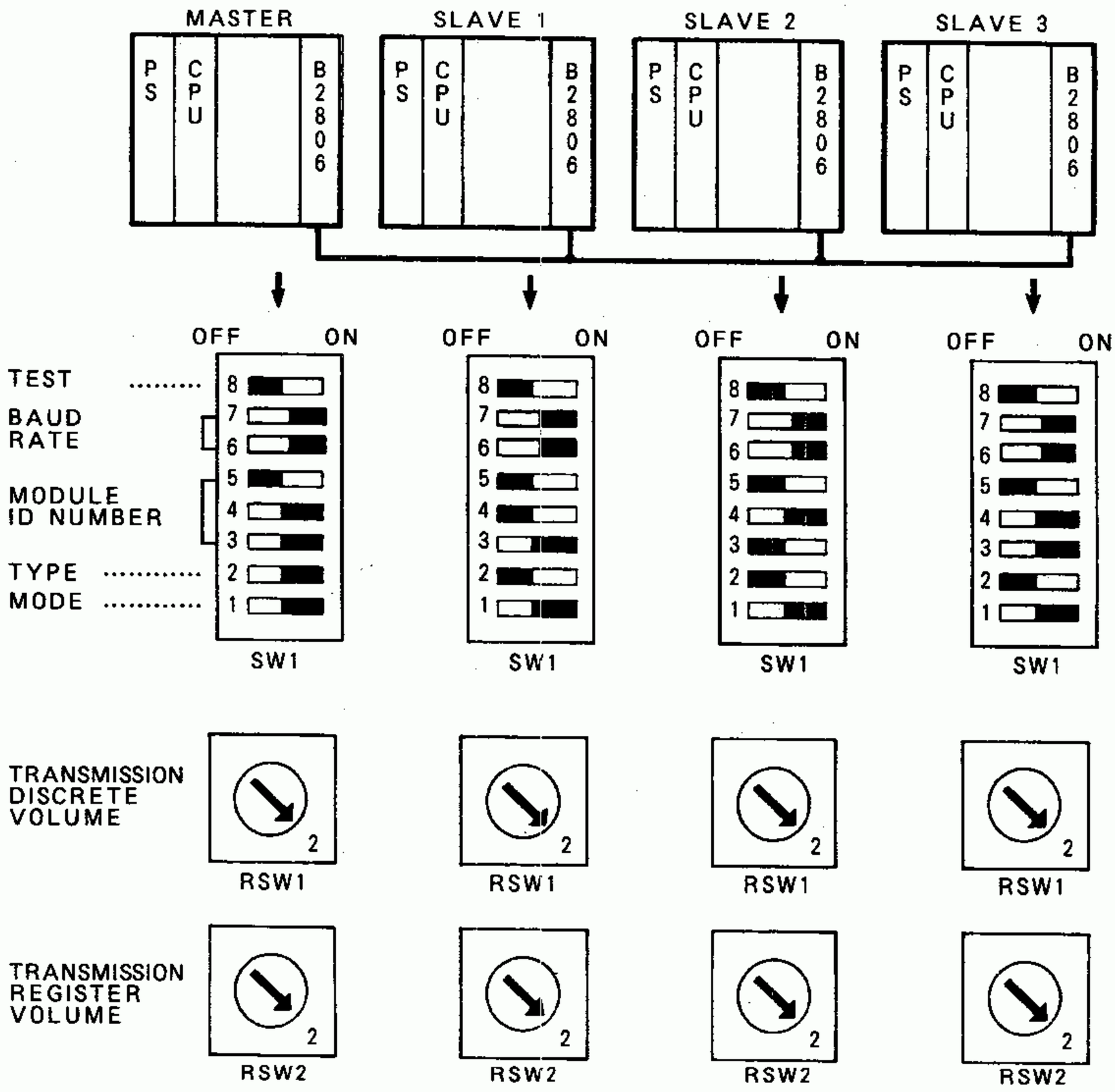
7.2.2 Y Mode

Assumptions:

(a) Y mode with master: slave ratio of 1 : 3

(b) Data transmission volume of 16 discrete inputs, 16 discrete outputs, 2 register inputs and 2 register outputs

(c) Baud rate of 38.4 kbps



(Allocations on CPU module)	MASTER	SLAVE 1	SLAVE 2	SLAVE 3
Discrete outputs (DO)	48 points	16 points	16 points	16 points
Discrete inputs (DI)	48 points	16 points	16 points	16 points
Register outputs (RO)	6 registers	2 registers	2 registers	2 registers
Register inputs (RI)	7 registers (1 register for monitor function)	3 registers	3 registers	3 registers

Fig. 7.4 Y Mode System with 1 : 3 Master-Slave

8 TRANSMISSION PROTOCOL

8.1 INFORMATION TRANSMISSION PROCEDURES

Fig. 8.1 shows the timing information when the power is turned ON, and Figs. 8.2 and 8.3 show the procedures for master-slave information transmission.

Fig. 8.2 shows the connection-ready sequence which is used to confirm module allocation information, and Fig. 8.3 shows the normal sequence in which I/O data is transmitted in accordance with the I/O allocation information.

8.1.1 Timing at Power ON

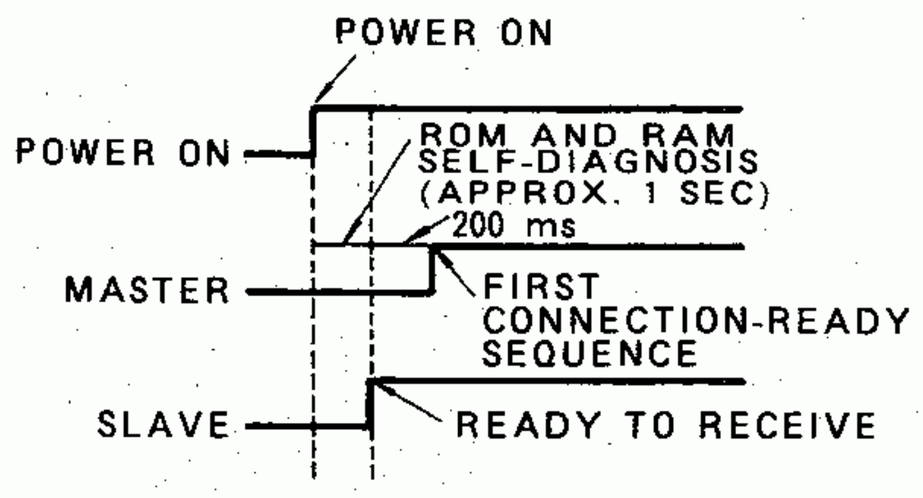


Fig. 8.1 Timing When Power is Turned ON

8.1.2 Connection-ready Sequence for Confirming Each Module I/O Allocation Information

The master retries accessing the same slave when the monitor timer runs down or the NAK signal is received. The number of retries is 2 for T mode and 5 for Y mode.

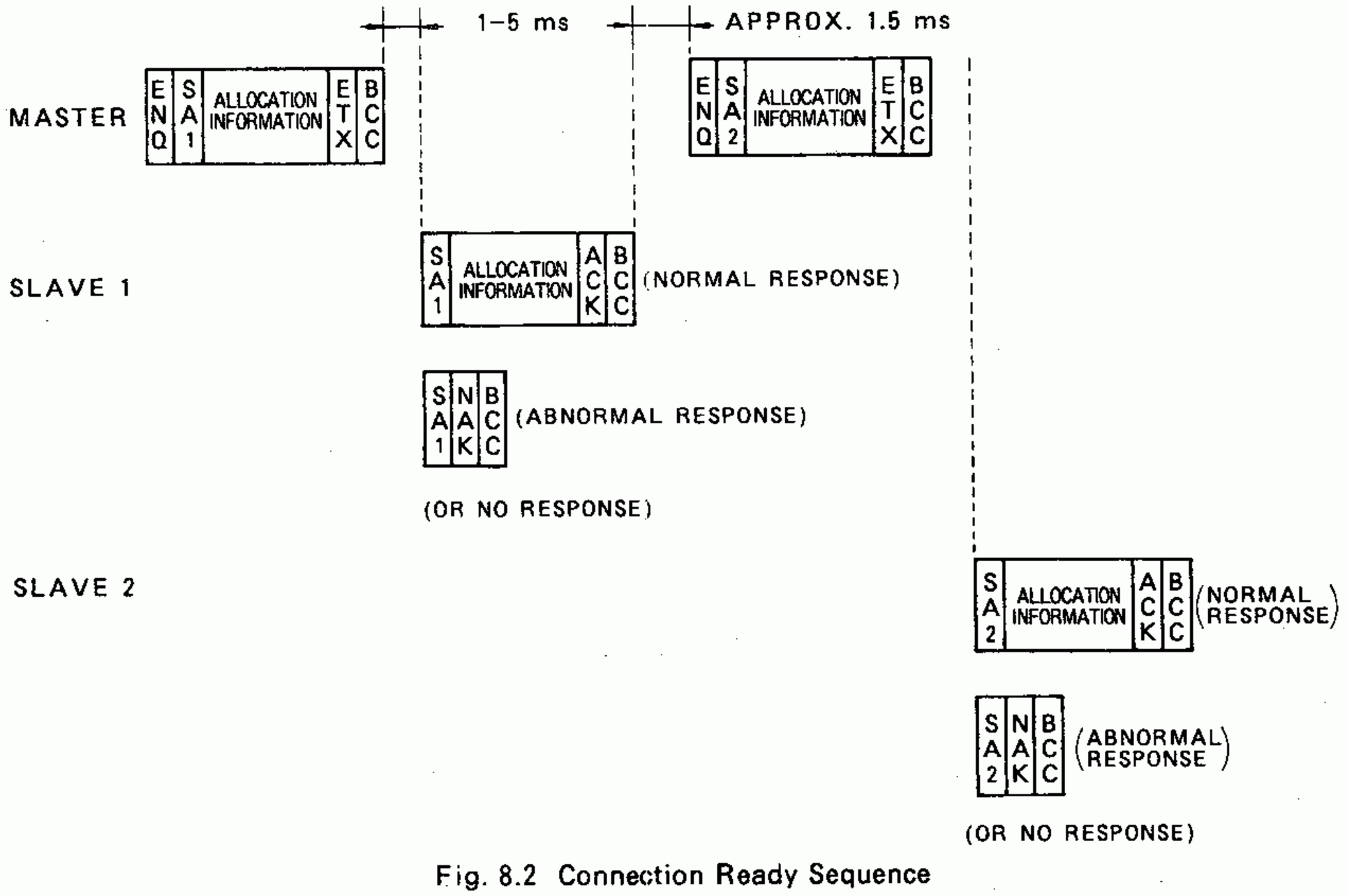


Fig. 8.2 Connection Ready Sequence

8.1.3 Normal Sequence by which Each Module Transmits I/O Data in Accordance with I/O Allocation

The master station cyclically transmits information only to the slaves defined in the order prescribed for the normal sequence which is illustrated in Fig. 8.3.

The master retries accessing the same slave when the monitor timer runs down or the NAK signal is received. The number of retries is the same as for the ready sequence, namely 3 for T mode and 6 for Y mode.

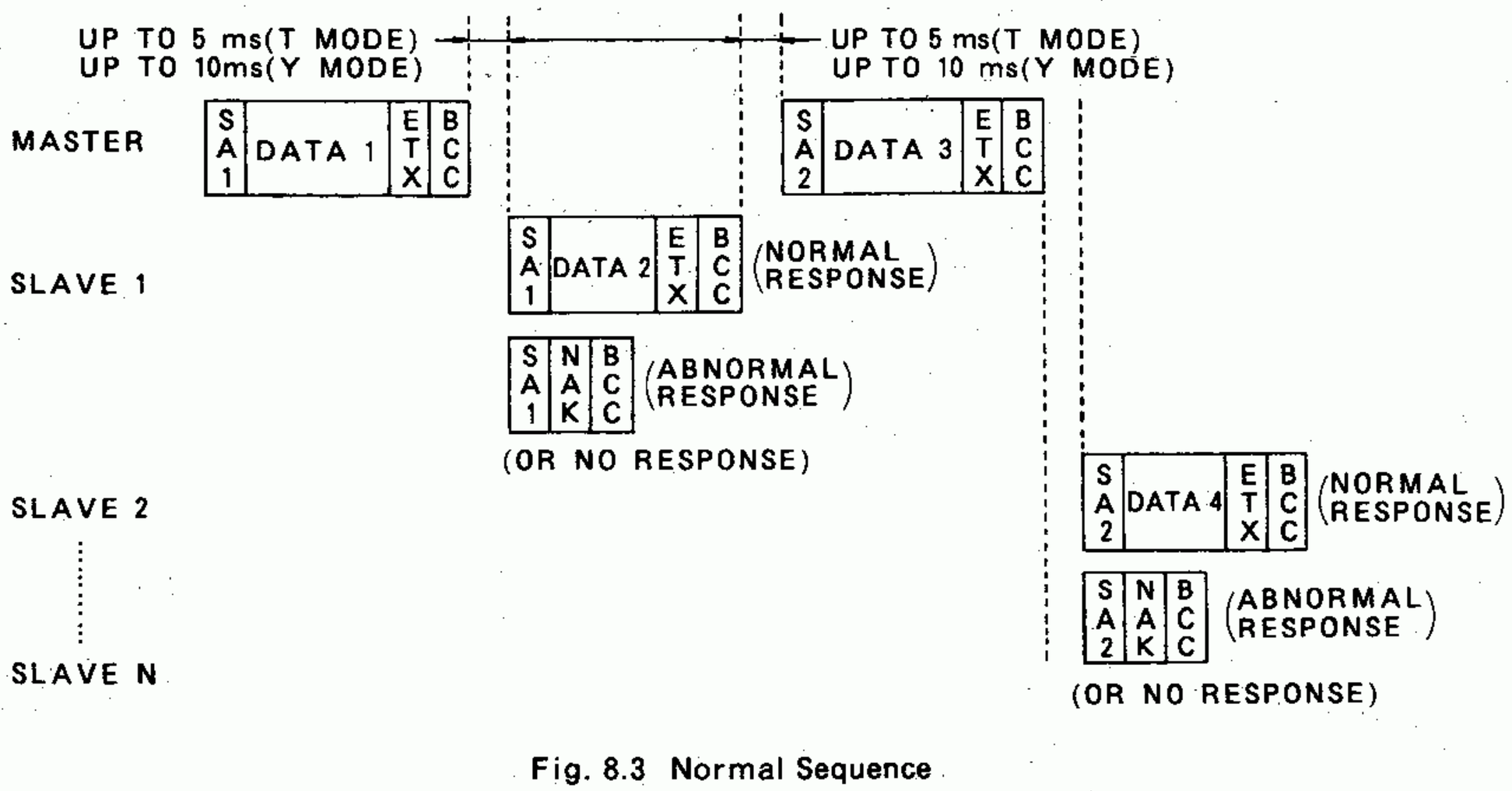
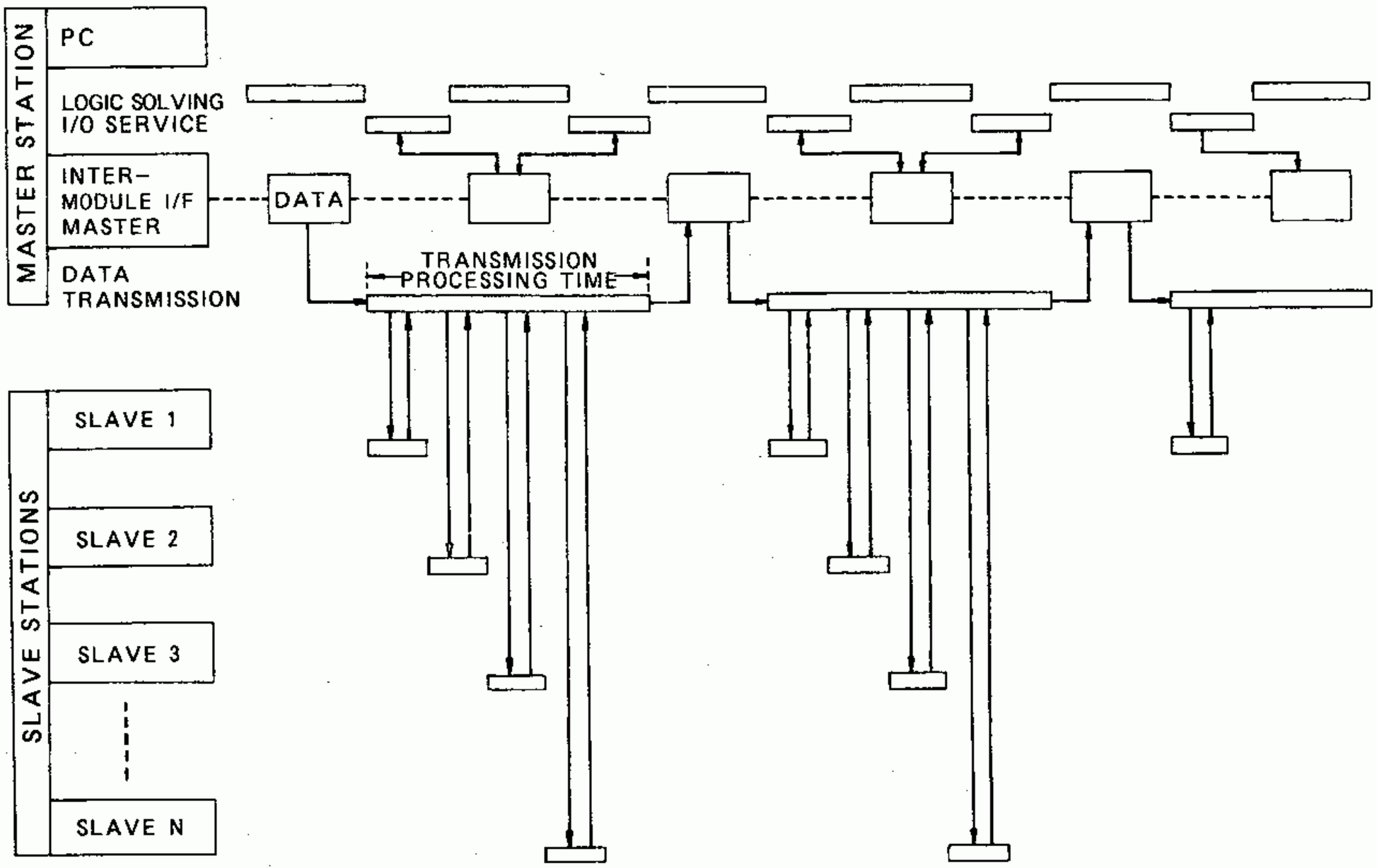


Fig. 8.3 Normal Sequence

8.2 DATA FLOW AND TRANSMISSION PROCESSING TIME

Fig. 8.4 illustrates the flow of data between a PC and a master station and between a master station and slave stations.



Note: Transmission processing time refers to the length of one cycle to transmit and receive data to and from all allocated slaves.

Fig. 8.4 Flow of Data

8.2.1 Transmission Processing Time for T Mode

(1) When there are no transmission errors between master and slaves

Transmission processing time = $\{(4 \times A + 6)\ N \times T1 + 0.2 \times A \times N + N + 8\}$ 1.4 ms

(2) When transmission errors occur and 3 tries (original try + 2 retries) are made on all slaves

Transmission processing time = $3 \times N \times T2 + N + 8$ ms

A = Number of discrete setting bytes (Number of setting points ÷ 8, allocations on the master)

N = Number of slave stations (Max. 7)

Baud Rate (kbps)	T1 (ms)	T2 (ms)
38.4	0.26	22
31.2	0.32	22
19.2	0.52	22
9.6	1.04	40

8.2.2 Transmission Processing Time for Y Mode

(1) When there are no transmission errors between master and slaves
Transmission processing time = {(4 × B + 8) N × T1 + 0.2 × B × N + 1.2 × N} 1.5 ms

(2) When transmission errors occur and 6 tries (original try + 5 retries) are made on all slaves
Transmission processing time = 6 × N × T2 + 1. 5 × N ms
B = (Number of discrete setting bytes + Number of register settings) × 2 (allocations on the master)
N = Number of slave stations

Baud Rate (kbps)	T1 (ms)	T2 (ms)
38.4	0.26	45
31.2	0.32	45
19.2	0.52	45
9.6	1.04	90

8.2.3 Function Character Codes

Table 8.1 lists the function character codes that are exchanged between the master and the slaves.

Table 8.1 Function Character Codes

Classification	Character Code	HEX Code	Function
Transmission Control Characters	ETX	03	End of text
	STX	02	Start of text
	ACK	06	Acknowledge
	ENQ	05	Inquiry
	NAK	15	Negative acknowledgement
Address Characters	SA 0 SA 1 SA 2 〳 SA 7	61 62 63 〳 68	Master's address Slave 1 address Slave 2 address 〳 Slave 7 address
Data Characters	DATL	30 – 39 41 – 46	HEX JIS code for the least significant 4 bits of transmission data
	DATH	30 – 39 41 – 46	HEX JIS code for the most significant 4 bits of transmission data
Error Control Characters	BCC	00 〳 7F	Transmission message horizontal parity (BBC is included from the beginning). This is an even parity.

9 LED INDICATIONS

9.1 LED INDICATIONS FOR MODULE STATUS

Table 9.1 LED Indications

Name	Description
READY	Indicates that module has completed self diagnosis and is ready.
TXD	Indicates data transmission is in progress.
RXD	Indicates data reception is in progress.
ERR	Indicates that an abnormal condition has occurred.

9.2 LED INDICATIONS IN ABNORMAL CONDITION

If an abnormal condition occurs, the READY and ERR LEDs are used to indicate the nature of trouble. (TXD and RXD indications cannot be determined in such a condition.)

Table 9.2 LED Indications in Abnormal Condition

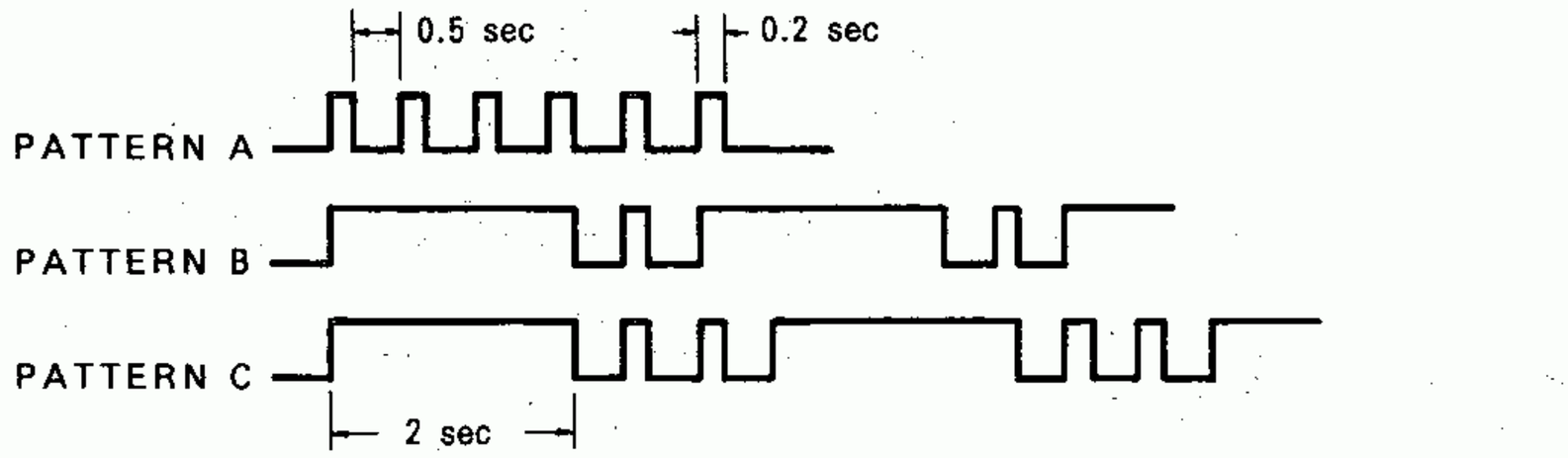
	LED Indication				Description	Action
	Master		Slave			
	READY	ERR	READY	ERR		
	0	1	0	1	Watchdog timer is abnormal.	Replace module.
	0	A	0	A	ROM/RAM error detected in self-diagnosis	Replace module.
	1	A	1	A	Switch setting error	Reset switch(es)
T	1	B	1	1	Connection ready sequence error (a) Master and slave allocations are in conflict (b) Communication line error (overrun, parity or framing error) (c) Retries counter exceeded (d) Receive timer exceeded	Reset switch(es). Reset module. Turn the power OFF and then ON again. Replace module. Check wiring.
Y	1	0				
T	1	C	1	1	Normal sequence error (a) Communication line error (overrun, parity or framing error) (b) Retries counter exceeded (c) Receive timer exceeded	
Y	1	0				

Note: LED indications A, B and C refer, respectively, to the blinking patterns presented below.

In the Y mode, the ERR LED will not be activated even when a normal sequence error occurs because the master station automatically executes recovery inquiry to the failed slave station by its paralleling function.

9.3 BLINKING PATTERNS

If an error occurs, its nature can be learned from the ERR LED blinking pattern. There are three patterns, A, B and C:



10 WIRING

Inside the panel, the transmission cable must be laid out by itself or run in a duct separate from the power and control cables. Analog signal lines and other transmission cables may be run in the same duct.

Outside the panel, the transmission cable should be run in a pit or other protective structure .

When running in a pit, power and control cables should not be put in the same pit, if possible. Otherwise, the transmission cable should be run in a separate conduit.

Both ends of the transmission cable conduit must be grounded. When the transmission cable must be run in the same pit with power cables, keep the transmission cable conduit as far away from the power cables as possible, by using separate trays, for example.

Analog signal lines and other transmission cables may be run in the same pit.

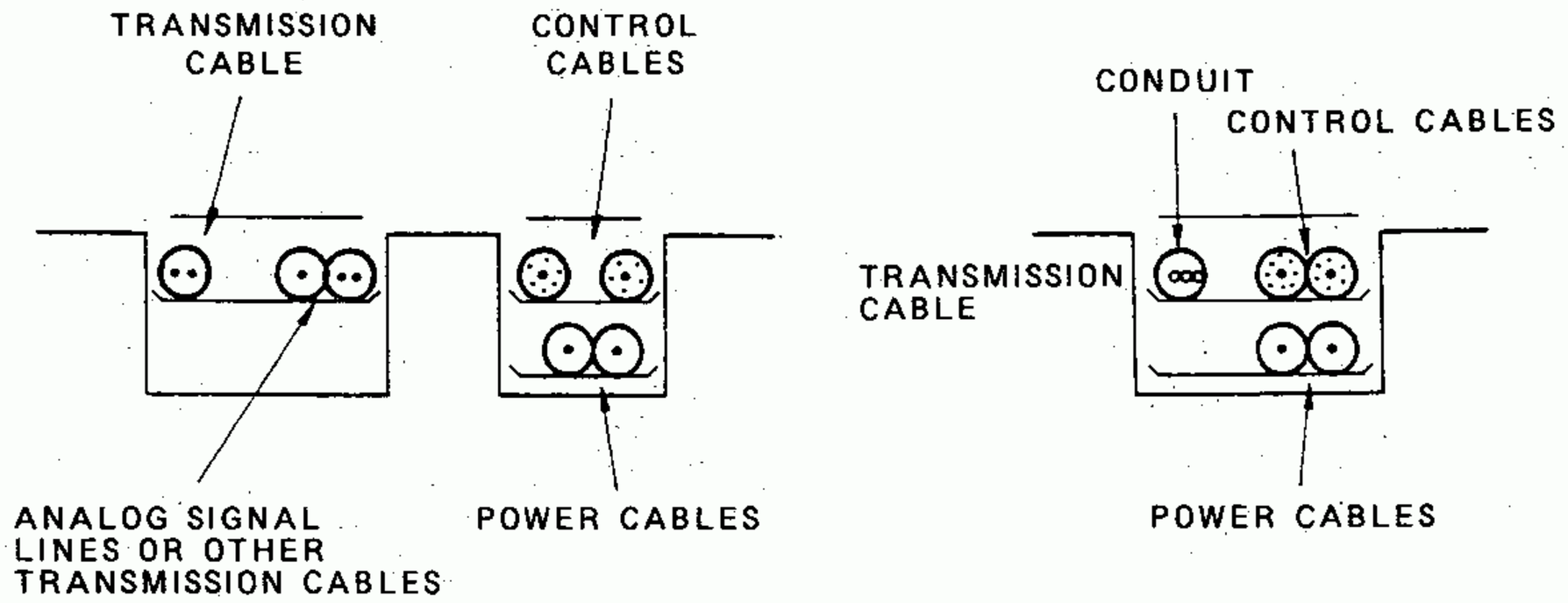
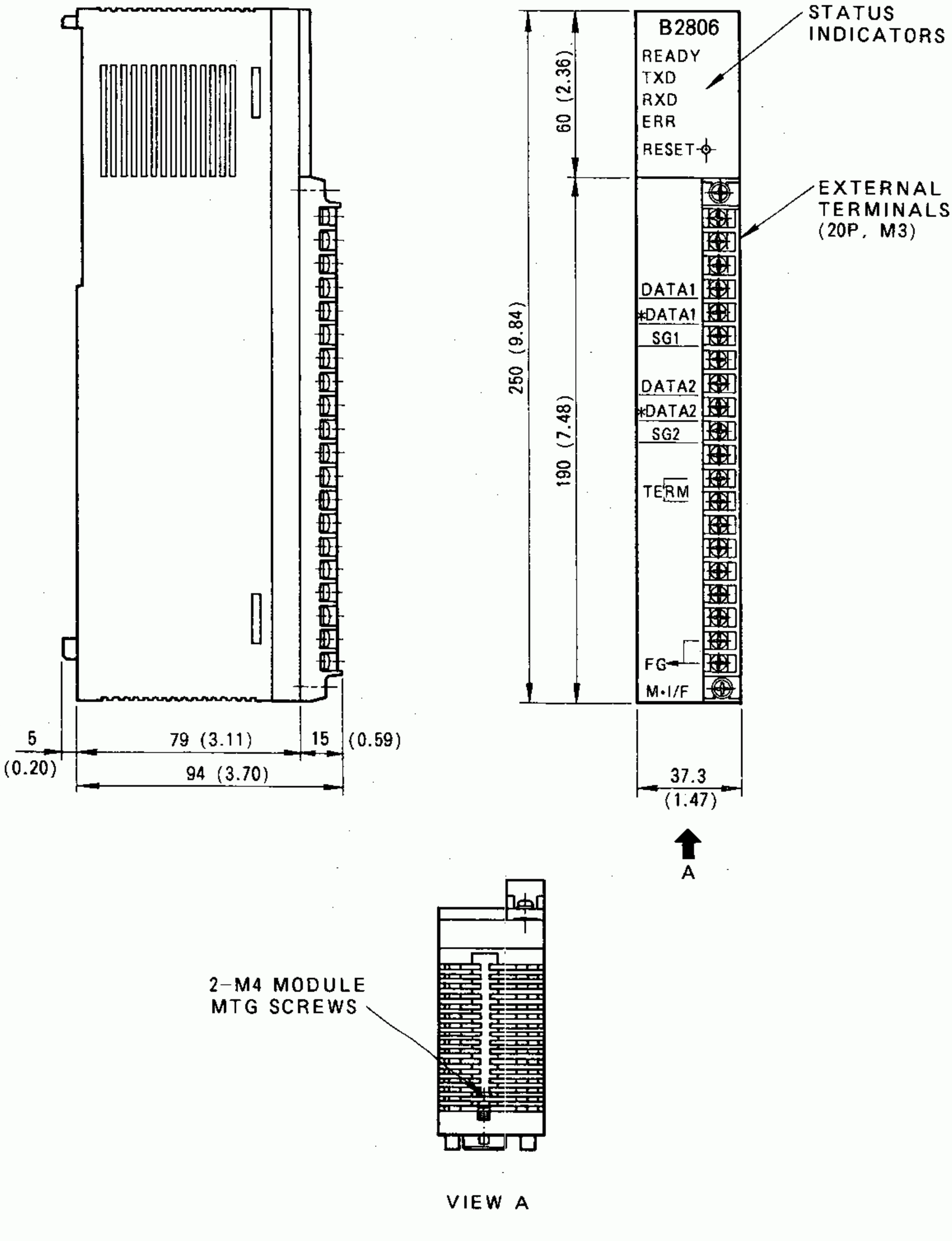


Fig. 10.1 Transmission Cable Laying

11 DIMENSIONS in mm (inches)



INTERFACE MODULE
USER'S MANUAL

TOKYO OFFICE
New Pier Takeshiba South Tower, 1-16-1, Kaigan, Minatoku, Tokyo 105-6891 Japan
Phone 81-3-5402-4511 Fax 81-3-5402-4580

YASKAWA ELECTRIC AMERICA, INC.
2121 Norman Drive South, Waukegan, IL 60085, U.S.A.
Phone 1-847-887-7000 Fax 1-847-887-7370

MOTOMAN INC. HEADQUARTERS
805 Liberty Lane West Carrollton, OH 45449, U.S.A.
Phone 1-937-847-6200 Fax 1-937-847-6277

YASKAWA ELÉTRICO DO BRASIL COMÉRCIO LTDA.
Avenida Fagundes Filho, 620 Bairro Saude-Sao Pãulo-SP, Brazil CEP: 04304-000
Phone 55-11-5071-2552 Fax 55-11-5581-8795

YASKAWA ELECTRIC EUROPE GmbH
Am Kronberger Hang 2, 65824 Schwalbach, Germany
Phone 49-6196-569-300 Fax 49-6196-888-301

Motoman Robotics Europe AB
Box 504 S38525 Torsås, Sweden
Phone 46-486-48800 Fax 46-486-41410

Motoman Robotec GmbH
Kammerfeldstraβe 1, 85391 Allershausen, Germany
Phone 49-8166-900 Fax 49-8166-9039

YASKAWA ELECTRIC UK LTD.
1 Hunt Hill Orchardton Woods Cumbernauld, G68 9LF, United Kingdom
Phone 44-1236-735000 Fax 44-1236-458182

YASKAWA ELECTRIC KOREA CORPORATION
Kfpa Bldg #1201, 35-4 Youido-dong, Yeongdungpo-Ku, Seoul 150-010, Korea
Phone 82-2-784-7844 Fax 82-2-784-8495

YASKAWA ELECTRIC (SINGAPORE) PTE. LTD.
151 Lorong Chuan, #04-01, New Tech Park Singapore 556741, Singapore
Phone 65-282-3003 Fax 65-289-3003

YASKAWA ELECTRIC (SHANGHAI) CO., LTD.
4F No.18 Aona Road, Waigaoqiao Free Trade Zone, Pudong New Area, Shanghai 200131, China
Phone 86-21-5866-3470 Fax 86-21-5866-3869

YATEC ENGINEERING CORPORATION
Shen Hsiang Tang Sung Chiang Building 10F 146 Sung Chiang Road, Taipei, Taiwan
Phone 886-2-2563-0010 Fax 886-2-2567-4677

YASKAWA ELECTRIC (HK) COMPANY LIMITED
Rm. 2909-10, Hong Kong Plaza, 186-191 Connaught Road West, Hong Kong
Phone 852-2803-2385 Fax 852-2547-5773

BEIJING OFFICE
Room No. 301 Office Building of Beijing International Club, 21
Jianguomenwai Avenue, Beijing 100020, China
Phone 86-10-6532-1850 Fax 86-10-6532-1851

TAIPEI OFFICE
Shen Hsiang Tang Sung Chiang Building 10F 146 Sung Chiang Road, Taipei, Taiwan
Phone 886-2-2563-0010 Fax 886-2-2567-4677

SHANGHAI YASKAWA-TONGJI M & E CO., LTD.
27 Hui He Road Shanghai China 200437
Phone 86-21-6531-4242 Fax 86-21-6553-6060

BEIJING YASKAWA BEIKE AUTOMATION ENGINEERING CO., LTD.
30 Xue Yuan Road, Haidian, Beijing P.R. China Post Code: 100083
Phone 86-10-6233-2782 Fax 86-10-6232-1536

SHOUGANG MOTOMAN ROBOT CO., LTD.
7, Yongchang-North Street, Beijing Economic Technological Investment & Development Area,
Beijing 100076, P.R. China
Phone 86-10-6788-0551 Fax 86-10-6788-2878

YASKAWA ELECTRIC CORPORATION

YASKAWA

Specifications are subject to change without notice
for ongoing product modifications and improvements.

MANUAL NO. SIE-C815-14.18