MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-A

User's Manual

type AJ71C22S1

MITSUBISHI ELECTRIC

REVISIONS

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INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC-A Series of General Purpose Programmable Controllers. Please read this manual carefully so that the equipment is used to its optimum. A copy of this manual should be forwarded to the end user.

CONTENTS

1. INTRODUCTION

This manual describes specifications, handling and programming procedure for AJ71C22S1 multidrop link module.

The AJ71C22S1 is an upgrade of AJ71C22.

Specifications, functions, programming, and external dimensions of the AJ71C22S1 are the same as those of the AJ71C22 with an exception of newly added functions.

The AJ71C22S1 allows communication of up to 512 points of ON/OFF data with the following stations multidropped on the RS-422 interface. The AJ71C22S1 may be used for distances up to 500 m (1640.5 ft) and the following units may be used as slave stations:

A0J2C214 link module (local)

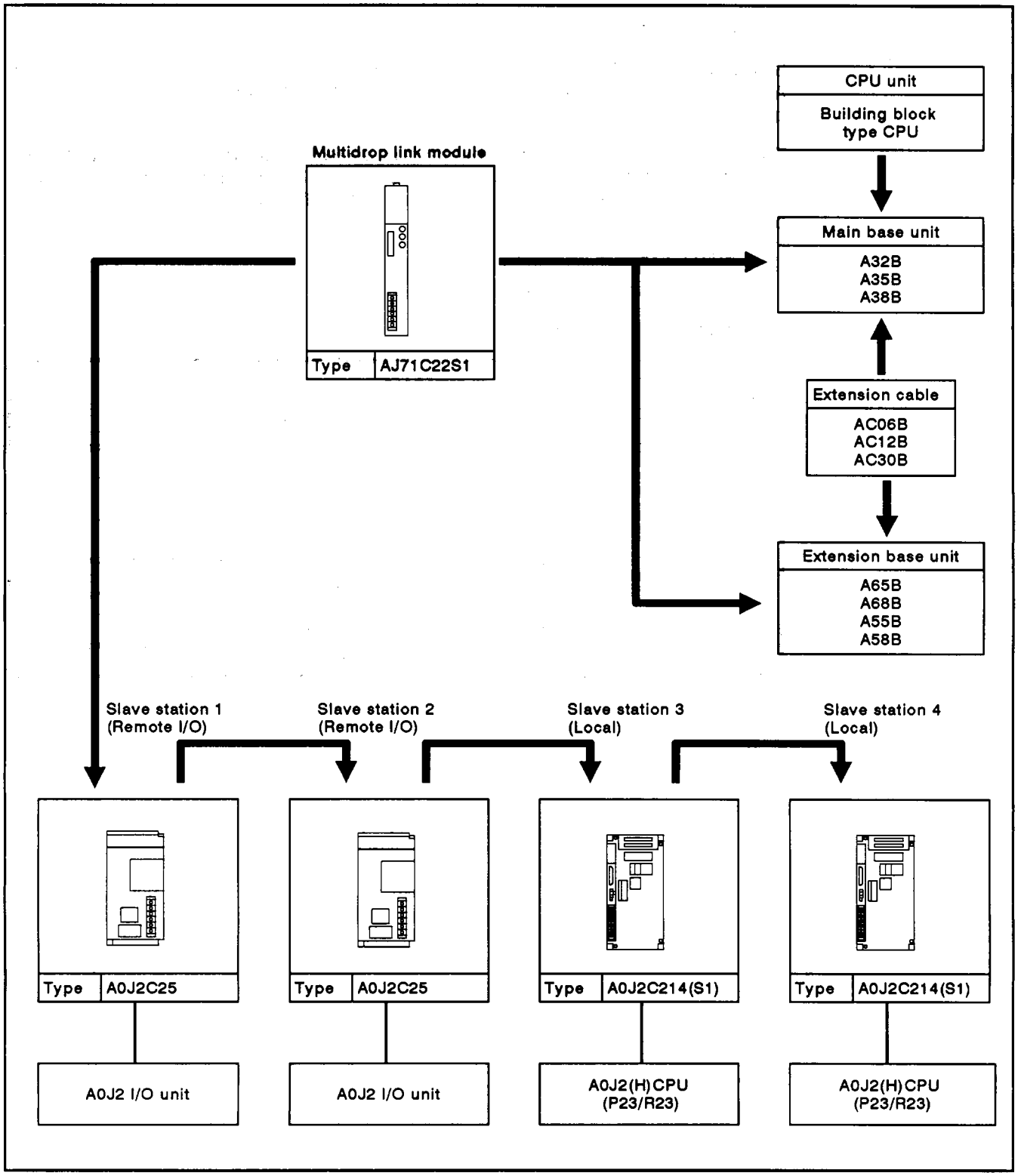
A0J2C25 remote I/O unit (remote I/O)

1.1 Comparison between AJ71C22S1 and AJ71C22

Item \ Module Name	AJ71C22S1	AJ71C22
Applicable CPU module	Same CPU modules (see Section 2.2)	
Modules connectable as a local station	A0J2C214S1 A0J2C214	(usable together with each other)
Modules connectable as a remote station	A0J2C25	
Max. number of send/receive points	512 points (setting possible in 256/512 points) (For a slave station, setting is possible for up to 128 send and 128 receive points.)	256 points (For a slave station, setting is possible for up to 128 send and 128 receive points.)
Setting of off-link station	A designated station can be set in the off-link status (all send and receive data is set off.)	(function not supported)

2. SYSTEM CONFIGURATION

2.1 Overall Configuration



2.2 Applicable A-Series Systems

(1) The AJ71C22S1 can be used with the following CPU units:

Applicable CPU Units		
A0J2HCPU		
A1NCPU(P21/R21)	A1CPU(P21/R21)	A2ACPU(P21/R21)
A2NCPU(P21/R21)	A2CPU(P21/R21)	A2ACPU(P21/R21)-S1
A2NCPU(P21/R21)-S1	A2CPU(P21/R21)-S1	A3ACPU(P21/R21)
A3NCPU(P21/R21)	A3CPU(P21/R21)	
A3HCPU(P21/R21)		
A3MCPU(P21/R21)		
A73CPU(P21/R21)		

POINT

An AJ71C22S1 cannot be used as a remote I/O station.

(2) The AJ71C22S1 can be loaded in any base unit I/O slot with the following exceptions:

(a) Base units without power supplies (i.e. A55B and A58B extension bases). Where this is unavoidable, ensure that the main base unit power supply has sufficient current capacity after taking into account the volt drop over the length of the extension cable. For further details, refer to the relevant CPU User's Manual.

(b) The AJ71C22S1 cannot be loaded in the last slot of the extension 7th stage if an A3CPU(P21/R21) is used.

This restriction may be ignored when an A3NCPU, A3HCPU, or A3MCPU is used.

(c) The maximum number of AJ71C22S1 that can be used for one PC CPU varies depending on the CPU unit:

6 modules for A2ACPU and A3ACPU
2 modules for other CPUs.

If more number of AJ71C22S1 modules are used, an error (SP.UNIT LAY ERROR) occurs.

When the AJ71C22S1 is used in combination with the following modules, the above specified maximum number includes these modules.

1) AJ71C24(S3) computer link module

2) AD51 intelligent communication module

3) AJ71C23 host controller high-speed link module

4) A0J2-C214(S1) link module (only with A0J2HCPU)

5) AJ71C21(S1) terminal interface module (only in BASIC programming mode)

(3) The AJ71C22S1 allows connection of up to eight slave station units specified below:

Connectable slave station units
A0J2C214(S1) (for local station)
A0J2C25 (for remote I/O station)

Note that an A0J2C25 can be used within the first to fourth station.

3. SPECIFICATIONS

3.1 General Specifications

Table 3.1 General Specifications

Item	Specifications				
Operating ambient temperature	0 to 55°C				
Storage ambient temperature	-20 to 75°C				
Operating ambient humidity	10 to 90% RH, no condensation				
Storage ambient humidity	10 to 90% RH, no condensation				
Vibration resistance	Conforms to *JIS C 0911	Frequency	Acceleration	Amplitude	Sweep Count
		10 to 55 Hz	—	0.075 mm (0.003 inch)	10 times * (1 octave/ minute)
		55 to 150 Hz	1g	—	
Shock resistance	Conforms to JIS C0912 (10g x 3 times in 3 directions)				
Noise durability	By noise simulator 1500 Vpp noise voltage, 1 μs noise width and 25 to 60 Hz noise frequency				
Dielectric withstand voltage	1500 VAC for 1 minute across AC external terminals and ground				
Insulation ambience	5 MΩ or larger by 500 VDC insulation resistance tester across batch of AC external terminals and ground				
Operating ambience	To be free from corrosive gases. Dust should be minimal.				
Cooling method	Self-cooling				

REMARK

One octave marked with an asterisk (*) indicates a change from the initial frequency to double or half frequency. For example any of the changes from 10 Hz to 20 Hz, from 20 Hz to 40 Hz, from 40 Hz to 20 Hz, and 20 Hz to 10 Hz are referred to as one octave.

Note: *JIS : Japanese Industrial Standard

3.2 Performance Specifications

3.2.1 Performance specifications

Item		Specifications	
Link points	Total number of link points	512 inputs/outputs (total of 8 stations)	
	Link points per station	Max. 128 inputs and Max. 128 outputs	
Number of stations		Max. 8 slave stations to one AJ71C22S1	
Overall distance		Max. 500 m (1640.5 ft)	
Transmission interface		Conforms to EIA. RS-422.	
Number of interfaces		1	
Slave station	A0J2C214(S1) A0J2C25	Inputs	Max. 128 inputs per station
		Outputs	Max. 128 outputs per station
External connection		Terminal block (M4 x 0.7 (metric thread) screws)	
Recommended cable		See Section 3.2.4	
Number of I/O points occupied		32*	
Current consumption		5 VDC, 1.4 A	
Weight kg (lb)		0.6 (1.32)	
Size mm (inch)		250 (9.84) (H) x 37.5 (1.48) (W) x 120 (4.72) (D)	

*: When I/O allocation of parameters is performed, allocate 32 points to a special function module. (F32 points)

3.2.2 Transmission specifications

Item		Specifications
Synchronization		Asynchronous
Communication		Half duplex
Communication speed (BPS)		38,400
Data format	Start bit	1 bit
	Data length	7 bits
	Parity bit	Even
	Stop bit	1 bit
Transmission code		ASCII
Error detection		Parity check (vertical parity)
		BCC (block check character) check (horizontal parity)
		Overrun error check
		Framing error check
		Time check
		Received data check

3.2.3 RS-422 interface specifications

The RS-422 interface (terminal block) is used for data communication with the slave stations. For wiring, see Section 4.7.

Terminal Block	Signal	Block Diagram	Signal Direction
SDA	Send data (SDA)	(+) 330 (−)	To slave
SDB	Send data (SDB)		
RDA	Receive data (RDA)	(+) 330 (−)	From slave
RDB	Receive data (RDB)		
SG	Signal ground (SG)		
FG	Frame ground (FG)		

3.2.4 RS-422 cable specifications

Any cable conforming to the following specifications can be used for RS-422 connection.

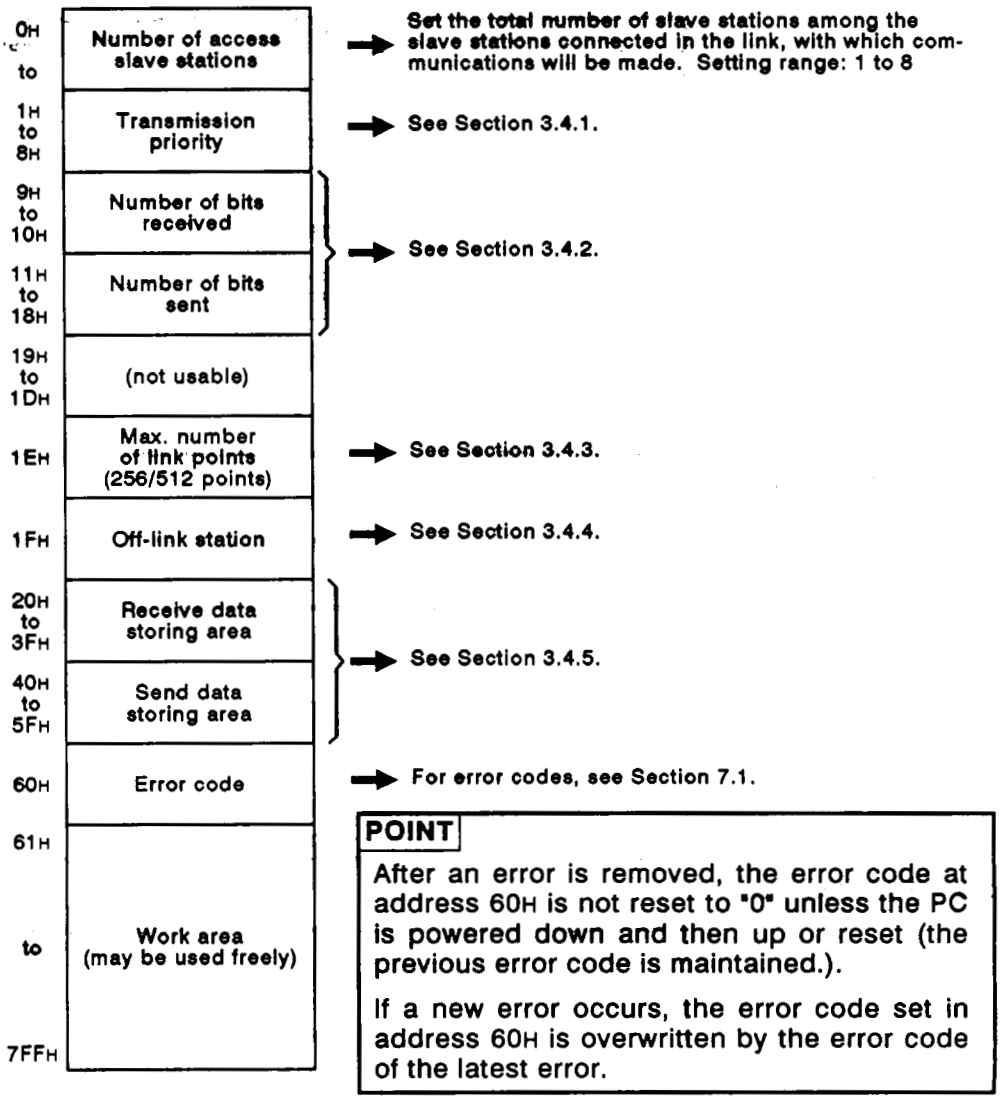
Item	Specifications
Type	Shielded cable
Number of pins	3 pairs
Conductor resistance (20 °C)	88.0 Ω/km max.
Insulation resistance	10,000M Ωkm max.
Dielectric strength	500 VDC, 1 minute
Electrostatic capacity (1KHz)	60nF/km max. on average
Characteristic impedance (100KHz)	110 ± 10 Ω

3.3 Function List

Item	Function
Data communication	(1) Bit data is sent to and received from a maximum of 8 slave stations via the RS-422 interface. (2) Maximum number of bits transferred: Total of 512 inputs/outputs for all slave stations and up to 128 inputs and 128 outputs per station (3) For communication with a slave station, the following may be specified for the network: a) Sequence of communication with slave stations b) Priority order of slave station data c) Number of bits communicated with each slave station (4) A slave station can be set in the off-link status. The data (send/receive data) can be set OFF for the specified slave station.
Communication data monitoring	1 Byte of communication data can be monitored as selected.
Unit loopback test	Self check

3.4 Buffer Memory

The AJ71C22S1 has a buffer memory for communication with the PC CPU.



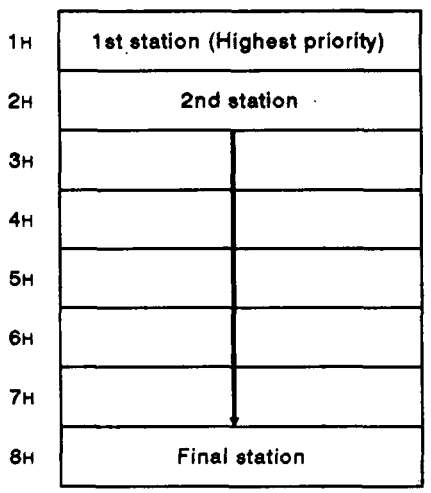
POINT

After an error is removed, the error code at address 60H is not reset to "0" unless the PC is powered down and then up or reset (the previous error code is maintained.).

If a new error occurs, the error code set in address 60H is overwritten by the error code of the latest error.

3.4.1 Number of slave stations and transmission priority definition

Specify the number of slave stations to be accessed and their corresponding communication priority. The number of slave stations is specified at buffer address 0H and the priority order in addresses 1H to 8H.



Use fixed codes shown.

	Fixed Code
Station 1	62H
Station 2	63H
Station 3	64H
Station 4	65H
Station 5	66H
Station 6	67H
Station 7	68H
Station 8	69H

Example:

To specify slave station communication priority as: stations 2, 7, 4, 1, 5

1H	63H
2H	68H
3H	65H
4H	62H
5H	66H
6H	
7H	
8H	

Specify the number of slave stations in buffer memory address 0.

POINT

(1) The "number of accessed slave stations" determines the maximum number of slave stations which may be accessed.

If further stations are specified in the priority list, these are ignored.

(2) Error code "33" is written to address 60H if:

1) The same station number is repeated;

2) The specified number of slave stations is greater than the number set in the priority list (e.g. 5 stations specified at address 0H, but only three stations listed in addresses 1H to 3H).

3) A code other than 62H to 69H is set in the range where the setting for the specified number of slave station is made.

3.4.2 Number of bits received and number of bits sent

Specify the number of bits of data to be received and set. Specify the number of receive bits at addresses 9H to 10H and the number of send bits at addresses 11H to 18H. Note the following restrictions:

(1) The total number of receive plus send bits for all stations must not exceed 512.

(2) The maximum number of bits received at any station must not exceed 128.

(3) The maximum number of bits sent from any station must not exceed 128.

(4) Communication data must be specified in batches of 8 bits.

9H	Station 1 area	Number of bits of receive data
AH	Station 2 area	
BH	Station 3 area	
CH	Station 4 area	
DH	Station 5 area	
EH	Station 6 area	
FH	Station 7 area	
10H	Station 8 area	
11H	Station 1 area	Number of bits of send data
12H	Station 2 area	
13H	Station 3 area	
14H	Station 4 area	
15H	Station 5 area	
16H	Station 6 area	
17H	Station 7 area	
18H	Station 8 area	

POINT

If the Communication data setting is not a multiple of 8, error code "33" is written to buffer address 60H.

Example: To set the following number of bits:

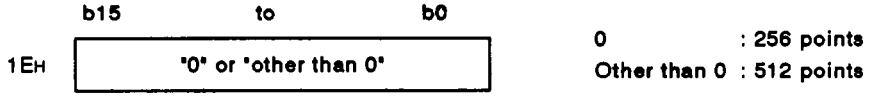
(Station 1, 2 = A0J2C25, station 4 = A0J2C214)

	Station 1	Station 2	Station 4
Receive (bits)	8	24	16
Send (bits)	16	8	16

9H	8	Number of bits of receive data
AH	24	
BH	0	
CH	16	
DH	0	
EH	0	
FH	0	
10H	0	
11H	16	Number of bits of send data
12H	8	
13H	0	
14H	16	
15H	0	
16H	0	
17H	0	
18H	0	

3.4.3 Maximum number of link points

The maximum number of points for data communications with remote or local stations is set (either 256 or 512 points) Setting is made at address 1EH in buffer memory in "0" or "other than 0".



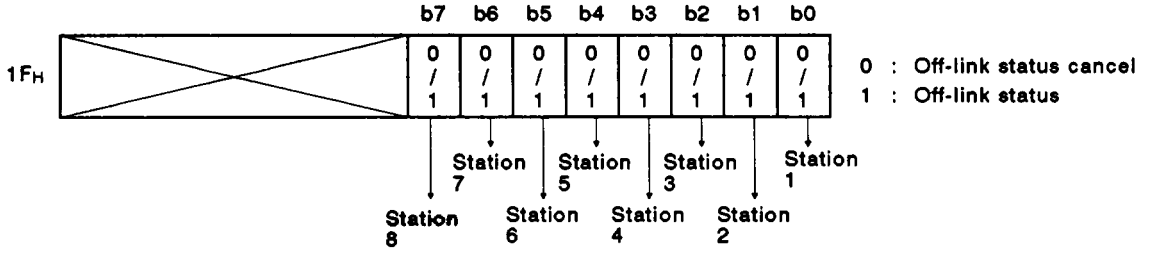
POINT

Communication (send/receive) data is stored in different manner according to the setting for this area.

If the setting is changed, designation of communication program read/write address must also be changed.

3.4.4 Off-link station

The off-link station setting area is used to set the slave stations that are set in the off-link status. The lower 8 bits of buffer memory address 1FH are used for this setting.



3.4.5 Receive data and send data storing areas

Communication data between the master and slave stations is written to the lower 8 bits of buffer memory addresses 20H to 5FH.

Received data is written to addresses 20H to 3FH. Data for send is written to addresses 40H to 5FH using a sequence program and then sent to slave stations automatically.

This data area must be assigned to slave station in order of station numbers (ignoring the transmission priority) in accordance with the number of bits specified for communication, setting at address 20H or 40H.

Assignment for storing the data differs depending on the set maximum number of link points (256 or 512).

(1) 256 point setting

Assignment of communication data storage areas is described below when the maximum number of link points is 256. For this explanation the number of link points are assumed to have been set as shown below for each station.

	Station 1	Station 2	Station 3	Station 4
Receive (bits)	8	24	0	48
Send (bits)	24	16	24	16

	Not used	ON/OFF data: (n+7)th point to "n"th point	
20H		Receive data of station 1 1st to 8th points	Receive data storing area
21H		Receive data of station 2 1st to 8th points	
22H		Receive data of station 2 9th to 16th points	
23H		Receive data of station 2 17th to 24th points	
24H		Receive data of station 4 1st to 8th points	
25H		Receive data of station 4 9th to 16th points	
26H		Receive data of station 4 17th to 24th points	
27H		Receive data of station 4 25th to 32nd points	
28H		Receive data of station 4 33rd to 40th points	
29H		Receive data of station 4 41st to 48th points	
2AH to 3FH			
40H		Send data of station 1 1st to 8th points	Send data storing area
41H		Send data of station 1 9th to 16th points	
42H		Send data of station 1 17th to 24th points	
43H		Send data of station 2 1st to 8th points	
44H		Send data of station 2 9th to 16th points	
45H		Send data of station 3 1st to 8th points	
46H		Send data of station 3 9th to 16th points	
47H		Send data of station 3 17th to 24th points	
48H		Send data of station 4 1st to 8th points	
49H		Send data of station 4 9th to 16th points	
4AH to 5FH			

(2) 512 bit setting

Assignment of communication data storage areas is described below when the maximum number of link points is 512. For this explanation the number of link points are assumed to have been set as shown below for each station.

	Station 1	Station 2	Station 3	Station 4
Receive (bits)	8	24	0	48
Send (bits)	24	16	24	16

ON/OFF data

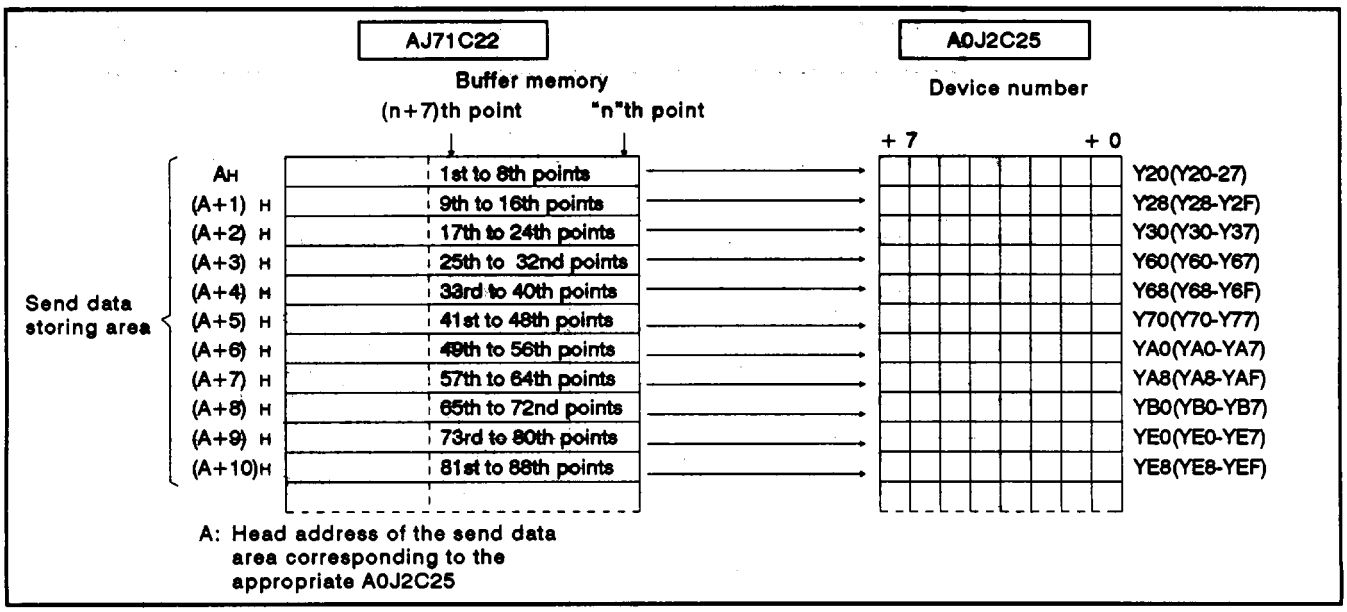
	(n+7)th point Upper 8 bits "n"th point	(n+7)th point Lower 8 bits "n"th point	
20H	Receive data of station 2 1st to 8th points	Receive data of station 1 1st to 8th points	Receive data storing area
21H	Receive data of station 2 17th to 24th points	Receive data of station 2 9th to 16th points	
22H	Receive data of station 4 9th to 16th points	Receive data of station 4 1st to 8th points	
23H	Receive data of station 4 25th to 32nd points	Receive data of station 4 17th to 24th points	
24H	Receive data of station 4 41st to 48th points	Receive data of station 4 33rd to 40th points	
25H to 3FH			
40H	Send data of station 1 9th to 16th points	Send data of station 1 1st to 8th points	Send data storing area
41H	Send data of station 2 1st to 8th points	Send data of station 1 17th to 24th points	
42H	Send data of station 3 1st to 8th points	Send data of station 2 9th to 16th points	
43H	Send data of station 3 17th to 24th points	Send data of station 3 9th to 16th points	
44H	Send data of station 4 9th to 16th points	Send data of station 4 1st to 8th points	
45H to 5FH			

3.5 Data Communication with Slave Stations in 256 Point Setting

3.5.1 Communication with A0J2C25

(1) Sending data from AJ71C22S1 to A0J2C25

When sending data from AJ71C22S1 to A0H2C25, the bits sent from the AJ71C22S1 buffer correspond to A0H2C25 outputs (Y) as indicated below.



Writing ON/OFF data to the bits in the area corresponding to the A0J2C5 within the send data storing area in AJ71C22S1 buffer memory turns on/off the outputs (Y) of the A0J2C25 corresponding to each bit.

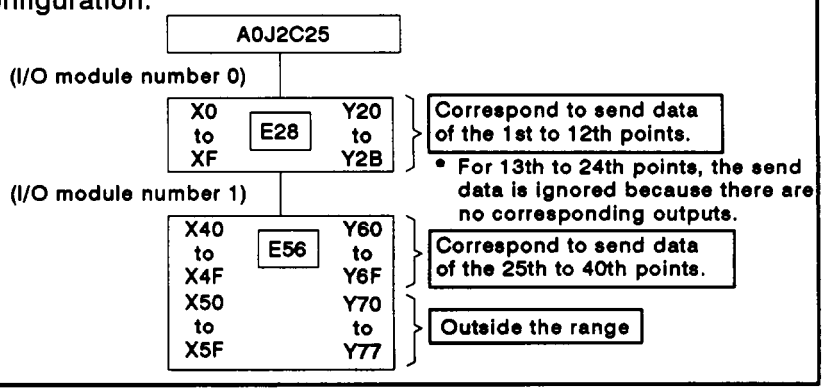
Writing "1" to bit 0 (1st point) of address A_H, for example, turns Y20 of A0J2C5 ON.

POINT

An A0J2C25 handles the number of I/O points at fixed numbers (input: 32 points, output: 24 points) regardless of the number of I/O points of an I/O module (A0J2-E56[ ][ ], E28[ ][ ], E32[ ], E24[ ]) to be connected.

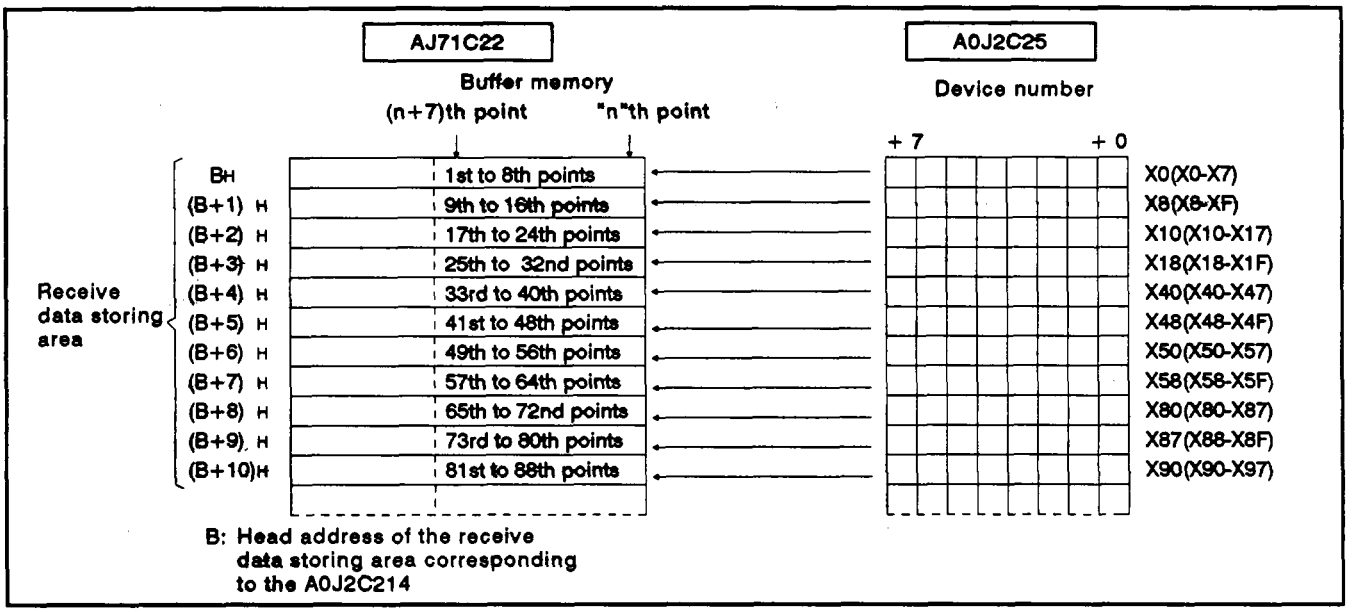
If a 28-point I/O module is connected to the A0J2C25, there are no output destination for the latter 14 points and, therefore, C214 send data is ignored. In the case of a dedicated input module, output destination is not available for 24 output points and, thus, C214 send data is ignored similarly.

Example: When 40 output data points are set with the following system configuration:



(2) Data received from A0J2C25 by AJ71C22S1

When receiving data by AJ71C22S1, the bits in the AJ71C22S1 buffer memory correspond to A0J2C25 inputs (X) as indicated below.



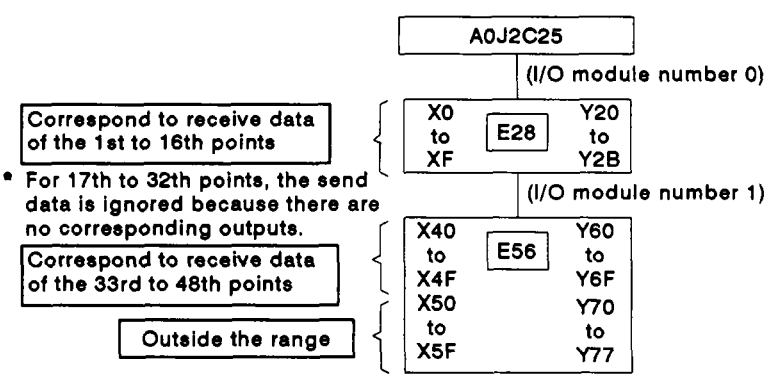
During data receiving, bits in the AJ71C22S1 buffer memory that correspond to the inputs (X) of the A0J2C25 are turned ON(1)/OFF(0) in response to turning ON/OFF of the inputs (X) of the A0J2C25. When X1 of the A0J2C25 is turned ON, for example, the first bit (2nd point) at address BH of the AJ71C22S1 is turned ON automatically.

POINT

An A0J2C25 handles the number of I/O points at fixed numbers (input: 32 points, output: 24 points) regardless of the number of I/O points of an I/O module (A0J2-E56[ ][ ], E28[ ][ ], E32[ ], E24[ ]) to be connected.

If a 28-point I/O module is connected to the A0J2C25, there are no inputs corresponding to the latter 16 input points and, therefore, the data received by the AJ71C22S1 is all set OFF (0). In the case of a dedicated output module, inputs corresponding to the 32 input points are not available and, thus, the data received by the AJ71C22S1 is all set OFF (0).

Example: When 48 input data points are set with the following system configuration:

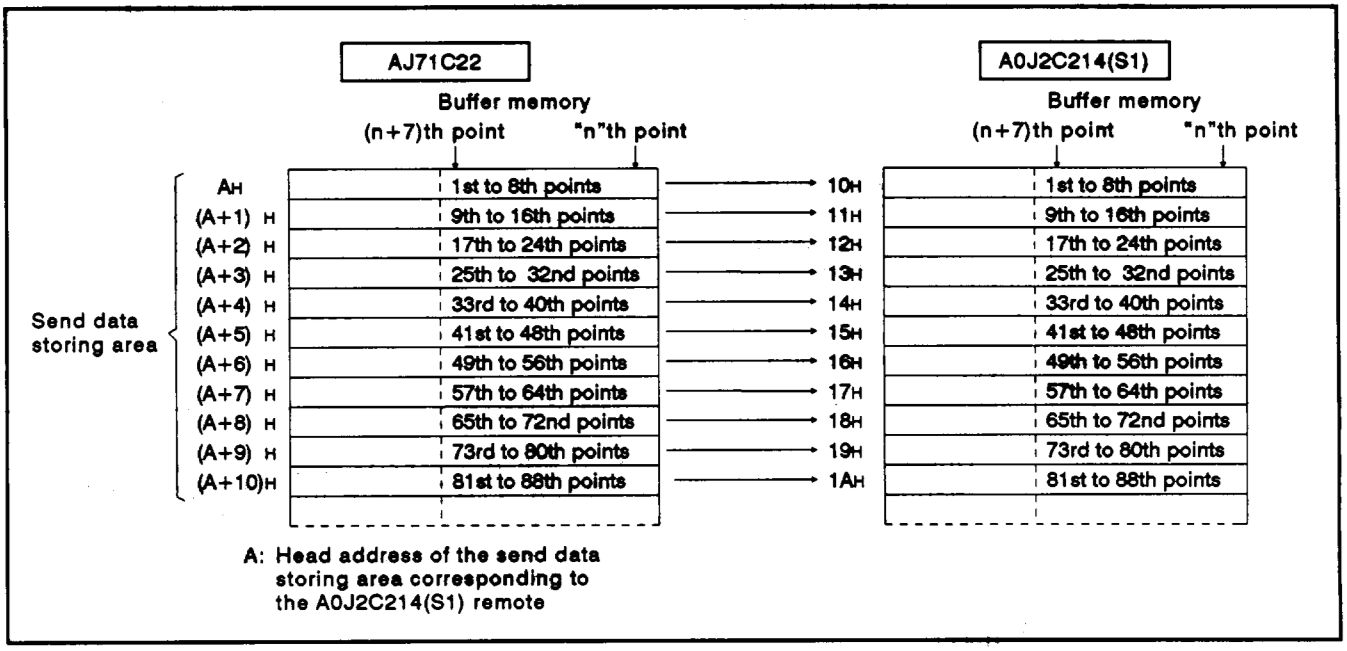


3.5.2 Communication with A0J2C214(S1)

For information on the A0J2C214(S1) buffer memory, see the A0J2C214S1 Multidrop function User's Manual.

(1) Data sent from AJ71C22S1 to A0J2C214(S1)

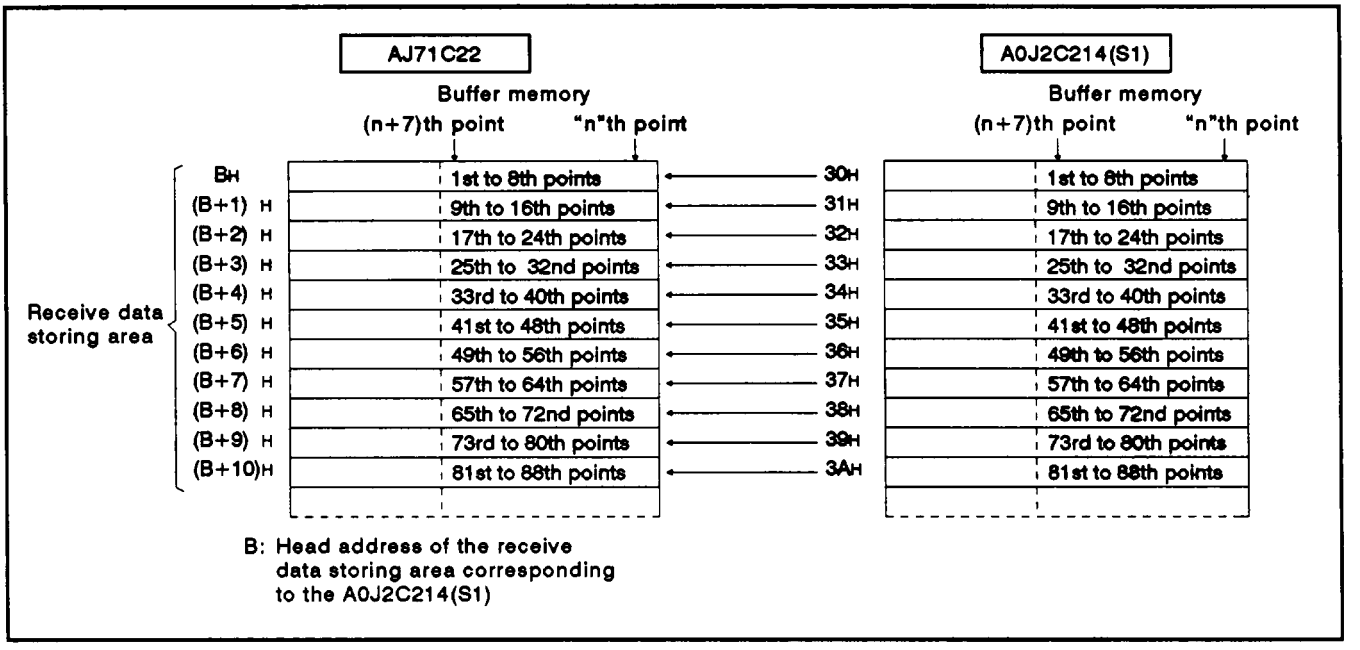
For data transmission from the AJ71C22S1 to the A0J2C214(S1), the AJ71C22S1 buffer memory bits correspond to the A0H2C214(S1) buffer memory bits as shown below.



Writing ON/OFF data at each bit in the send data storing area of AJ71C22S1 buffer memory corresponding to A0J2C214(S1) turns the bits ON/OFF in the receive data storing area of A0J2C214(S1) buffer memory. Writing "1" to bit 0 (1st point) at address AH, for example, sets "1" at bit 0 (1st point) at address "0" of A0J2C214(S1).

(2) Data received by AJ71C22S1 from A0J2C214(S1)

When receiving data from the A0J2C214(S1), the AJ71C22S1 buffer memory bits correspond to the A0J2C214(S1) buffer memory bits as shown below:



Writing ON/OFF data to send data storing area of A0J2C214(S1) buffer memory turns the bits ON/OFF in the AJ71C22S1 buffer memory corresponding to the A0J2C214(S1) buffer memory bits.

Writing "1" to bit 1 (2nd point) at address 30H of the A0J2C214(S1), for example, sets "1" at bit 1 (2nd point) of AJ71C22S1.

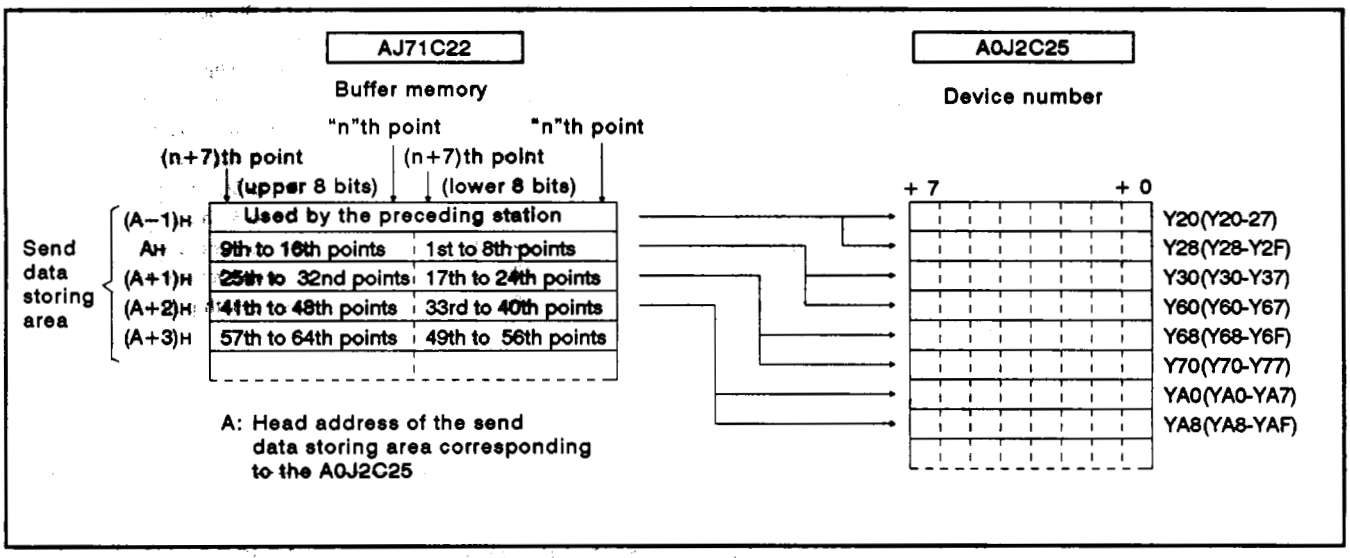
3.6 Data Communication with Slave Stations in 512 Bit Setting

3.6.1 Communication with A0J2C25

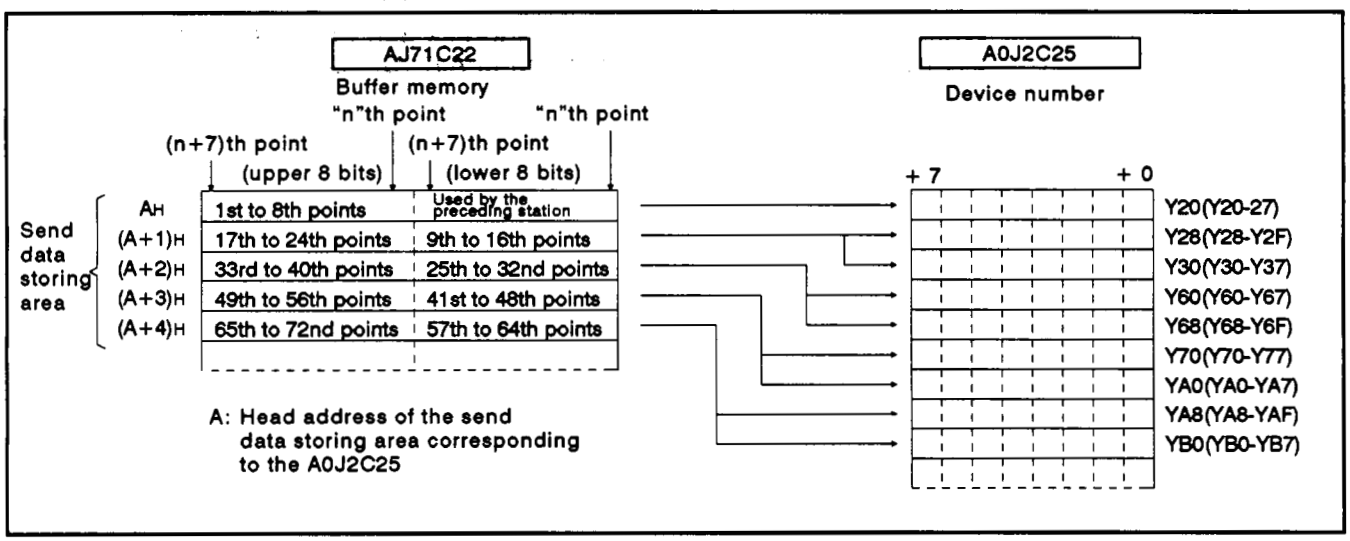
(1) Sending data from AJ71C22S1 to A0J2C25

When sending data from AJ71C22S1 to A0J2C25, the bits sent from the AJ71C22S1 buffer memory correspond to A0J2C25 outputs (Y) as indicated below.

(a) If the preceding station uses up to upper 8 bits



(b) If the preceding station uses only lower 8 bits



(c) In sending the data, writing ON/OFF data to the bits in the area corresponding to the A0J2C25 within the send data storing area in AJ71C22S1 buffer memory turns on/off the outputs (Y) of the A0J2C25 corresponding to each bit.

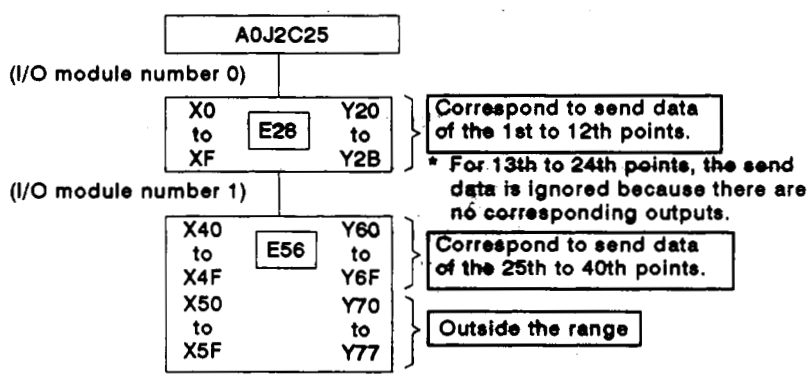
For example, writing "1" to bit 0 of address AH in the case of condition (a) or writing "1" to bit 8 of address AH in the case of condition (b), turns Y20 of A0J2C25 ON.

POINT

An A0J2C25 handles the number of I/O points at fixed numbers (input: 32 points, output: 24 points) regardless of the number of I/O points of an I/O module (A0J2-E56[ ][ ], E28[ ][ ], E32[ ], E24[ ]) to be connected.

If a 28-point I/O module is connected to the A0J2C25, there are no output destination for the latter 14 points and, therefore, AJ71C22S1 send data is ignored. In the case of a dedicated input module, output destination is not available for 24 output points and, thus, AJ71C22S1 send data is ignored in the same way.

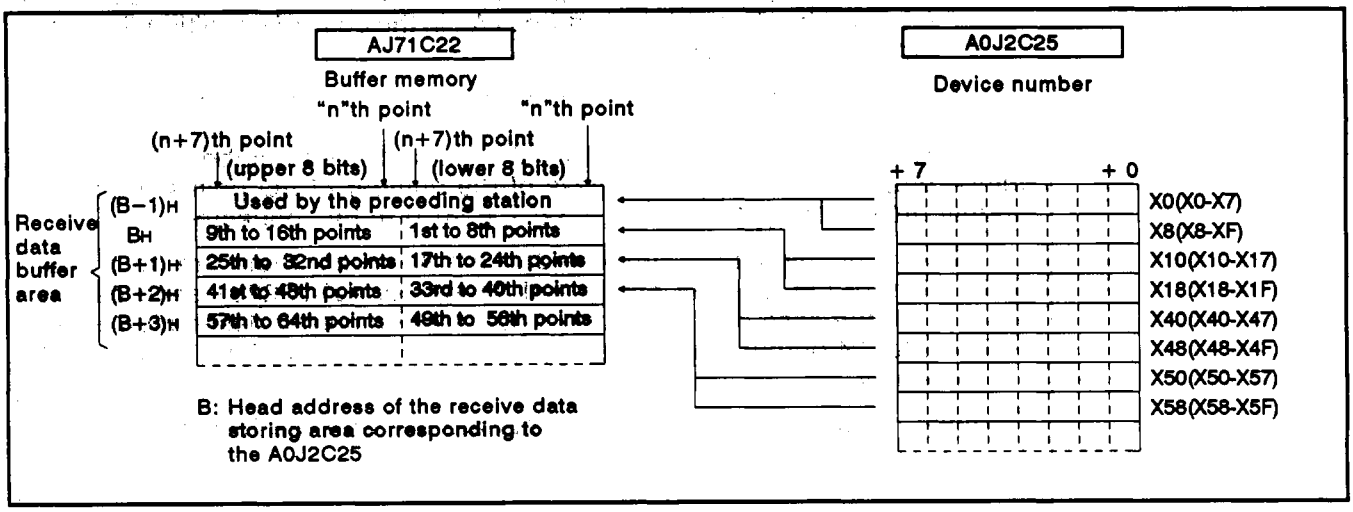
Example: When 40 output data points are set with the following system configuration.



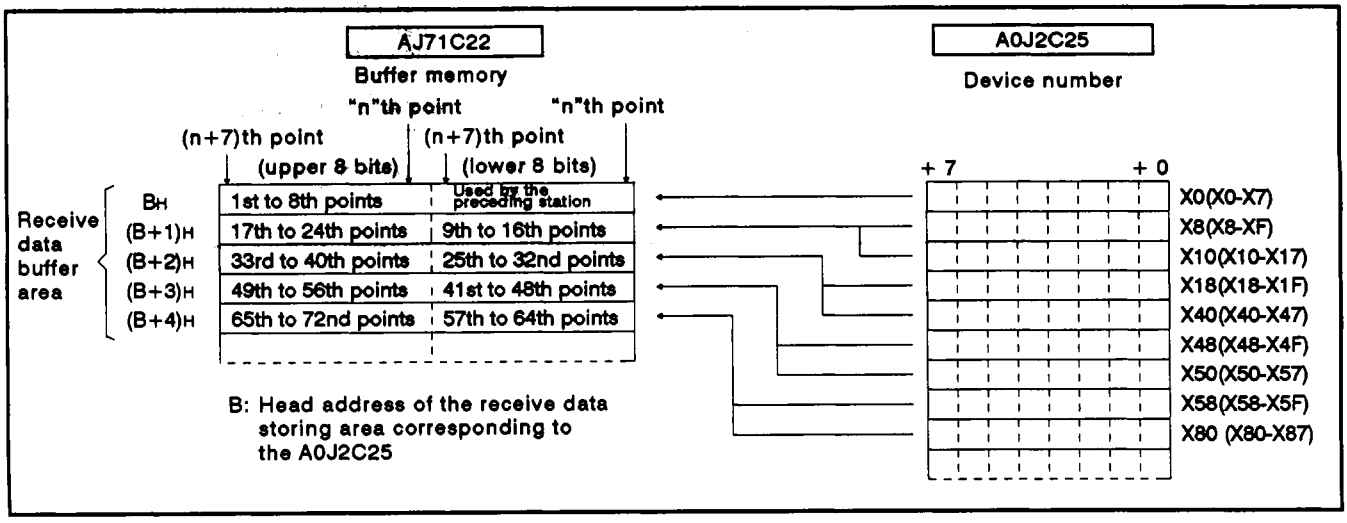
(2) Data received from A0J2C25 by AJ71C22S1

When receiving data by AJ71C22S1, the bits in the AJ71C22 buffer memory correspond to A0J2C25 inputs (X) as indicated below.

(a) When the preceding station uses up to upper 8 bits



(b) When the preceding station uses only lower 8 bits



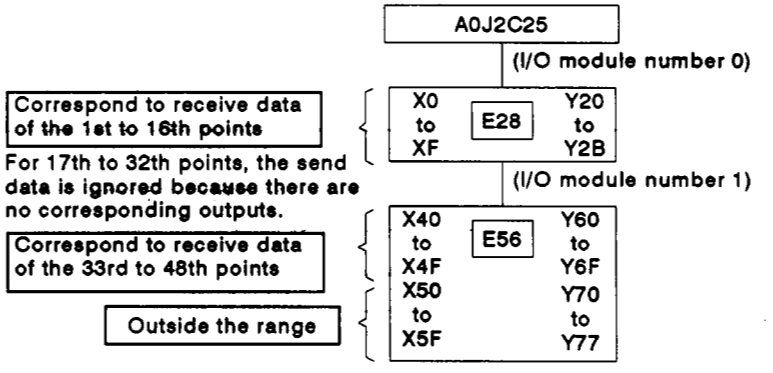
(c) During data receiving, bits in the AJ71C22S1 buffer memory that correspond to the inputs (X) of the A0J2C25 are turned ON(1)/OFF(0) in response to turning ON/OFF of the inputs (X) of the A0J2C25. For example, when X1 of the A0J2C25 is turned ON, bit 1 of address BH of the AJ71C22S1 is automatically turned ON (1) in the case of condition (a), and bit 9 of address BH of the AJ71C22S1 is automatically turned ON (1) in the case of condition (b).

POINT

An A0J2C25 handles the number of I/O points at fixed numbers (input: 32 points, output: 24 points) regardless of the number of I/O points of an I/O module (A0J2-E56[ ][ ], E28[ ][ ], E32[ ], E24[ ]) to be connected.

If a 28-point I/O module is connected to the A0J2C25, there are no inputs corresponding to the latter 16 input points and, therefore, the data received by the AJ71C22S1 is all set OFF (0). In the case of a dedicated output module, inputs corresponding to the 32 input points are not available and, thus, the data received by the AJ71C22S1 is all set OFF (0).

Example: When 48 input data points are set with the following system configuration:

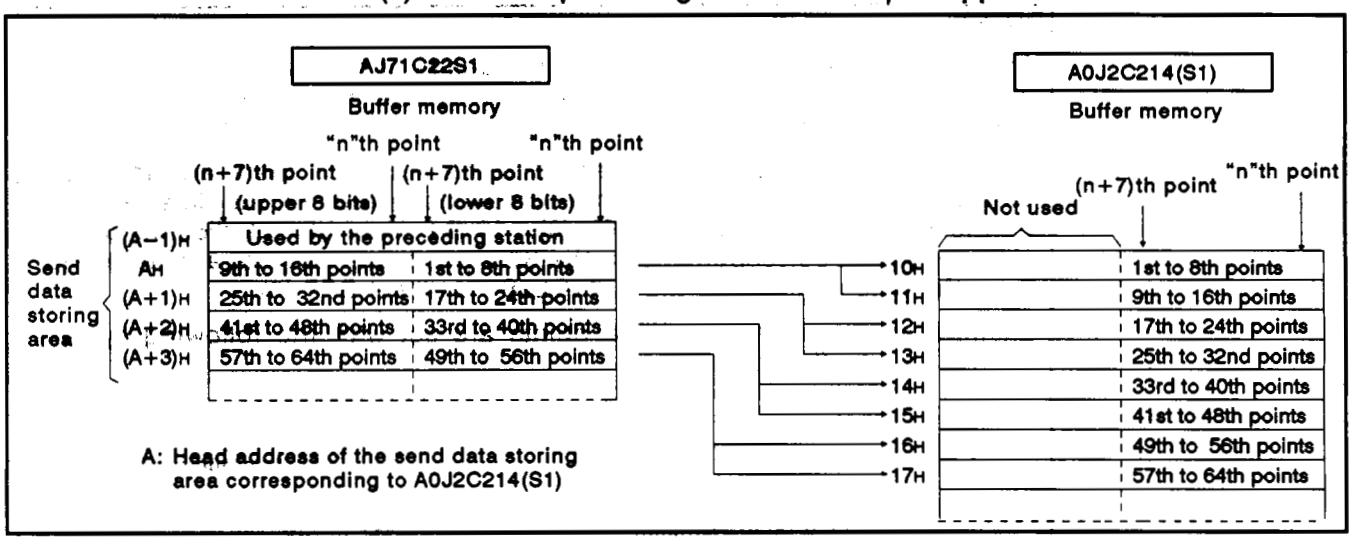


3.6.2 Communication with A0J2C214(S1)

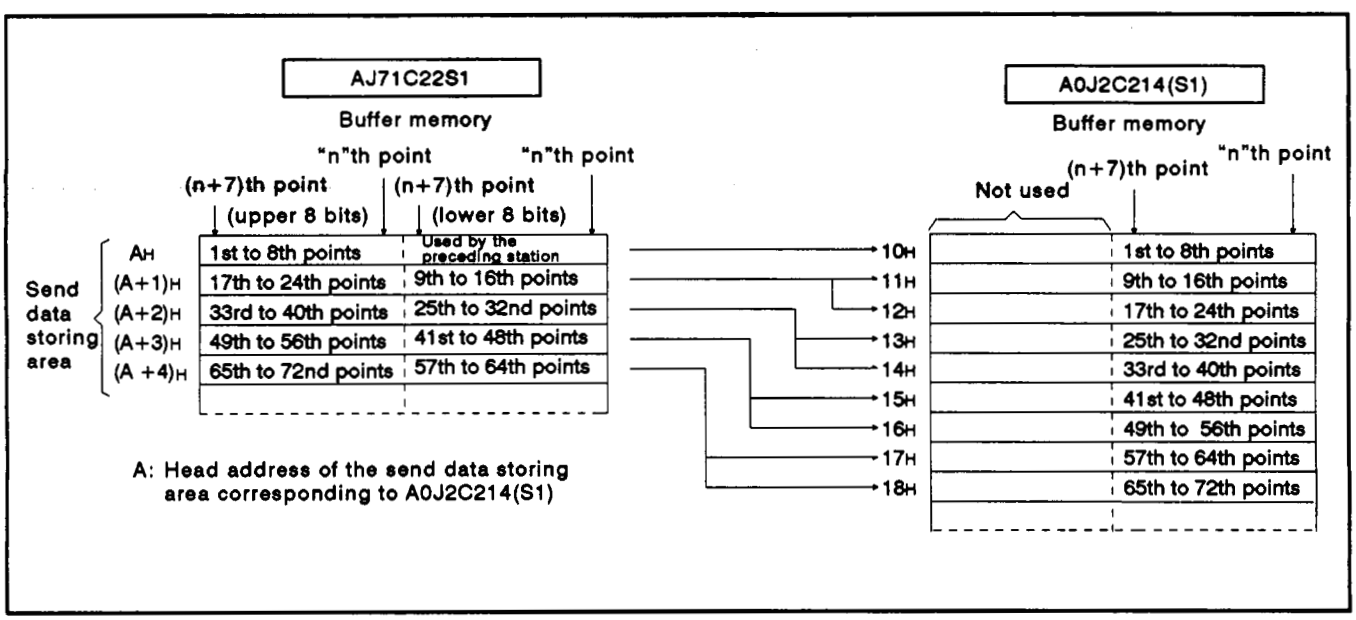
(1) Data sent from AJ71C22S1 to A0J2C214(S1)

For sending data from AJ71C22S1 to A0J2C214(S1), A0J2C214(S1) buffer memory bits correspond to AJ71C22S1 buffer memory bits as shown below.

(a) When the preceding station uses up to upper 8 bits



(b) When the preceding station uses only lower 8 bits

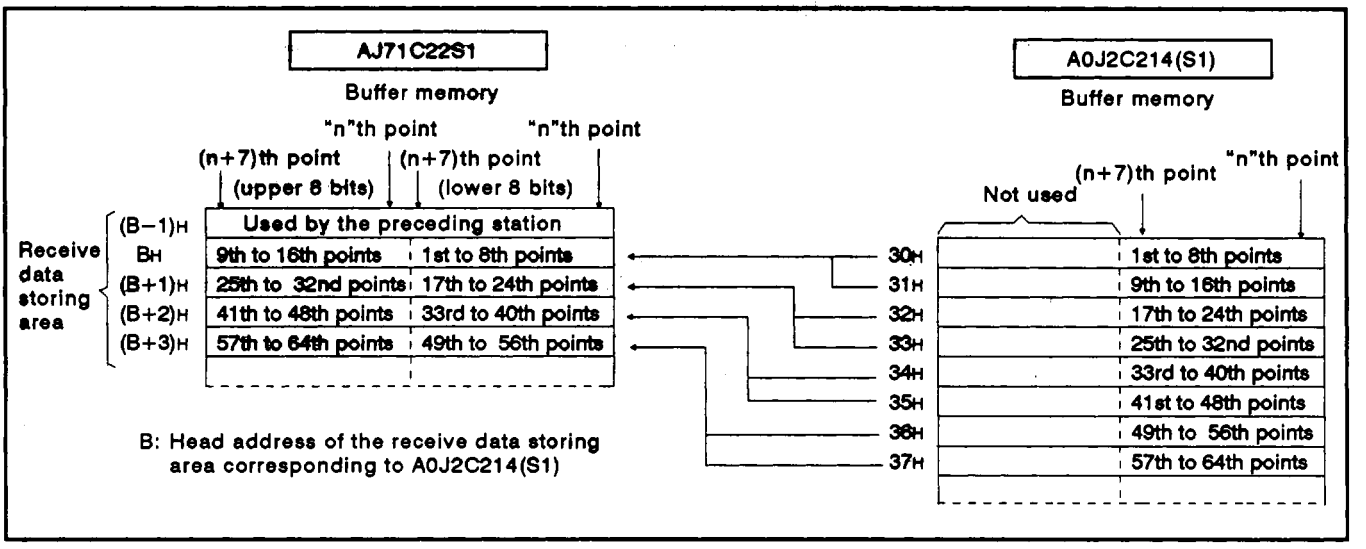


(c) During sending the data, writing ON/OFF data to AJ71C22S1buffer memory bits switches the corresponding A0J2C214(S1) buffer memory bits on/off. Writing "1" to bit 0 of address AH in the case of condition (a) and to bit 8 of address AH in the case of condition (b) sets "1" at bit 0 (first point) of address 10H of A0J2C214(S1).

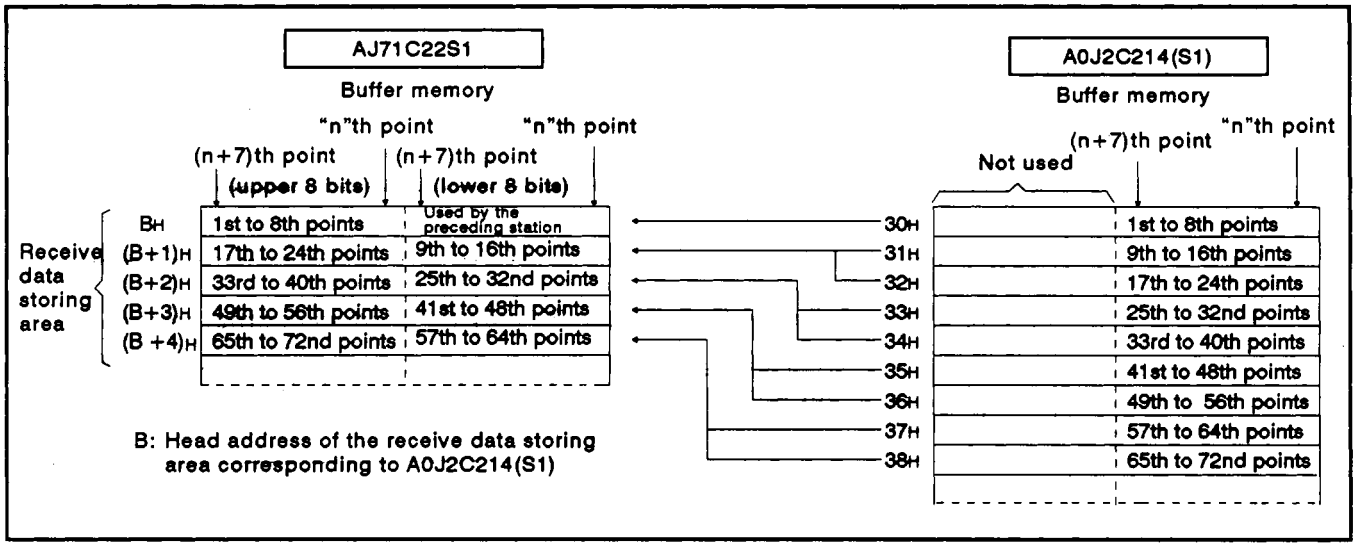
(2) Data received by AJ71C22S1 from A0J2C214(S1)

When receiving data from A0J2C214(S1), AJ71C22S1 buffer memory bits correspond to A0J2C214(S1) buffer memory bits as shown below:

(a) When the preceding station uses up to upper 8 bits



(b) When the preceding station uses only lower 8 bits



(c) In receiving the data by AJ71C22S1, writing ON/OFF data to the send data storing area in A0J2C214(S1) buffer memory switches the corresponding AJ71C22S1memory bits on/off.

For example, writing "1" at bit 1 (2nd point) of address 30H of A0J2C214(S1) sets "1" to bit 1 (2nd point) of address BH of AJ71C22S1, in the case of condition (a), and to bit 9 of address of AJ71C22S1, in the case of condition (b).

3.7 I/O Signals between PC CPU and AJ71C22S1

The AJ71C22S1 PC CPU I/O numbers are listed below. The actual device number will depend on the I/O unit position.

The device numbers indicated assume that the AJ71C22S1 has been loaded in slot 0 of the main base unit.

Signal Direction: AJ71C22S1 to PC CPU		Signal Direction: PC CPU to AJ71C22S1	
Device Number	Description	Device Number	Description
X0	During data transmission sequence (1) On during normal data transmission sequence. (2) Off indicates pre-transmission sequence or an error. (See Section 5.2.2.)	Y10	AJ71C22S1 start signal (1) Switched on to start up the AJ71C22S1 and kept on during operation. (2) Switched off to stop transmission. (See Section 5.2.)
X1	Pre-transmission sequence error (1) On indicates an error during pre-transmission sequence. (2) Switched off when Y11 is turned on. (See Second 5.2.1.)	Y11	Error reset signal Used to switch off X1 or X2. (See Section 5.2.1 and 5.2.2)
X2	Data transmission sequence error (1) On indicates an error during data transmission sequence. (2) Switched off when Y11 is turned on. (See Section 5.2.2.)	Y12	
X3 XC	Reserved		Reserved
XD	WDT (watch dog timer) error Switched on when the AJ71C22S1 WDT times out.	Y1F	
XE XF	Reserved		

POINT

(1) Y0 to YF corresponding to X0 to XF may be used as internal relays.

(2) Y12 to Y1F are used by the OS and, therefore, a sequence program cannot use these outputs. If they are used by the sequence program, the AJ71C22S1 functions cannot be guaranteed.

4. HANDLING

4.1 Handling Instructions

(1) Protect the AJ71C22S1 from impact.

(2) Do not touch the printed circuit board.

(3) Do not allow conductive debris to enter the unit.

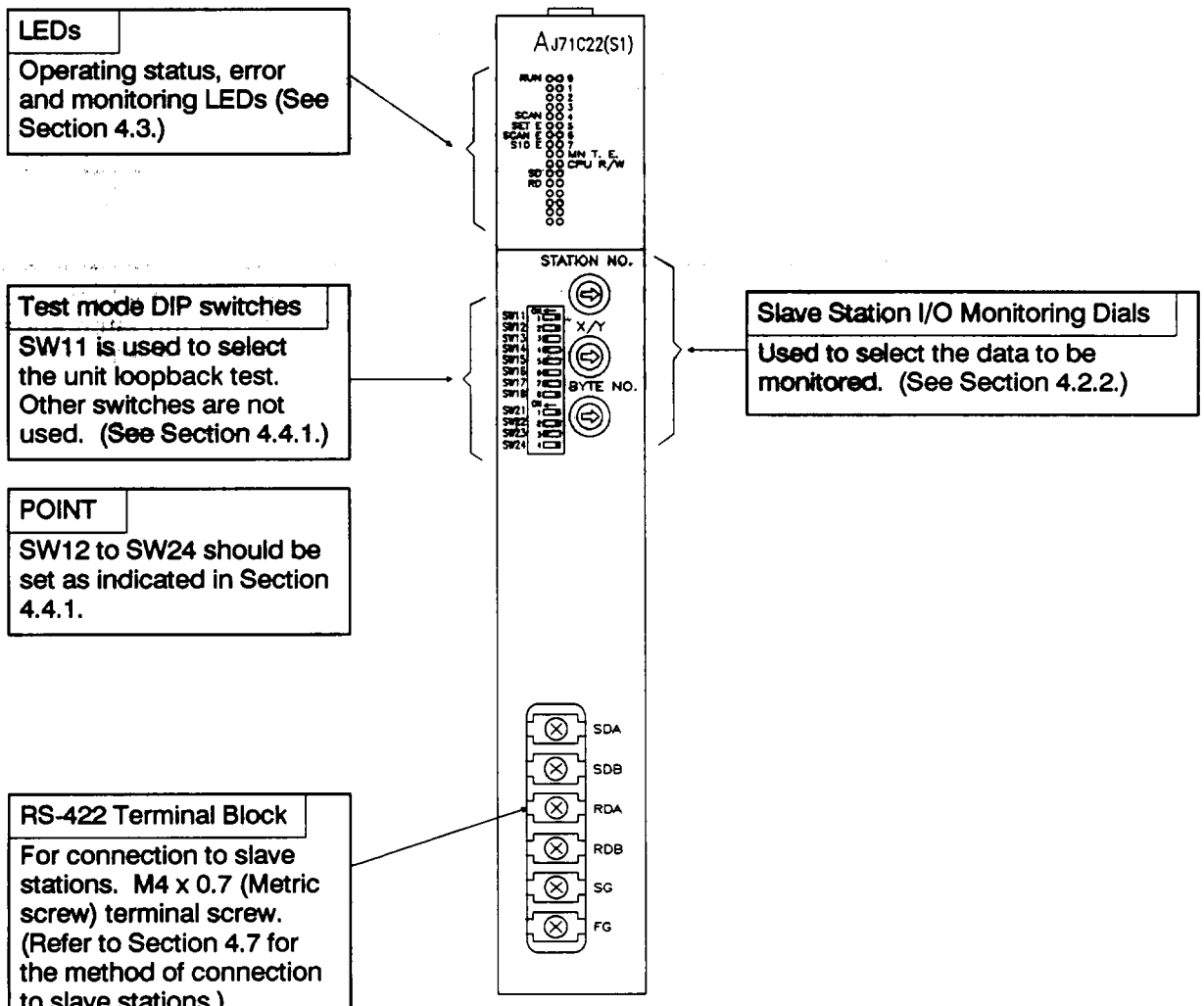
(4) Tighten terminal screws as indicated below:

Screw	Tightening Torque kg·cm (lb· in)
RS-422 terminal screw	8 (6.93) to 14 (12.13)
Unit mounting screw (usually not required)	8 (6.93) to 12 (10.39)

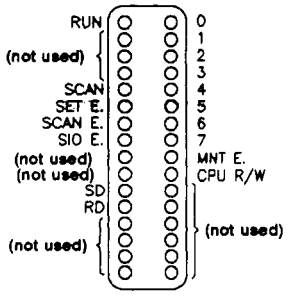
(5) To load the unit onto the base, hook the two lower hooks into the cut out and gently swing the unit into place. Ensure that the top latch engages. To remove the unit, press the top latch and swing the unit out before removing from the base unit.

For details, refer to the User's Manual of the CPU to be used.

4.2 Nomenclature



4.3 LEDs

LED Area	LED	Meaning of LED	LED ON	LED OFF	Initial State of LED
	RUN	Normal run	Normal	WDT error	ON
	SCAN	Data transmission sequence	Data being transmitted	Stand by	OFF
	SET E.	Pre-transmission sequence error	Error	Normal	OFF
	SCAN E.	Data transmission sequence error	Error	Normal	OFF
	SIO E.	RS-422 communication error by loopback selfcheck	Error	Normal	OFF
	SD	RS-422 data communication	Sending	Stand by or error	OFF
	RD		Receiving	Stand by or error	OFF
	0	Slave I/O monitoring (See Section 4.4.2.)	On indicates that the corresponding bit is 1 and off indicates the bit is 0.		OFF
	1				
	2				
	3				
	4				
	5				
	6				
	7				OFF
	MINT E.	Slave I/O monitoring error	Error	Normal	OFF
	CPU R/W	Communication status with CPU	Flickers during communication (Off during communication with CPU)		ON

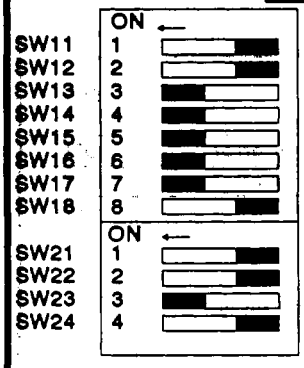
REMARK

For further information on the error indicator LEDs, see Section 7.2. These LEDs are switched off by the error reset signal (Y11).

4.4 Settings

4.4.1 DIP switches

DIP Switch Area	Switch Number	Switch	Switch Position		Remarks
			ON	OFF	
(Factory setting)	SW11	Loopback selfcheck	Testing	Normal transmission	SW11 should be set to OFF during normal operation. See Section 4.5.
	SW12				
	SW13				
	SW14				
	SW15				
	SW16				
	SW17				
	SW18				
	SW21				
	SW22				
	SW23				
	SW24				



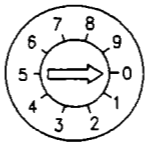
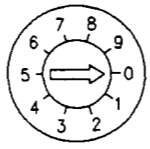
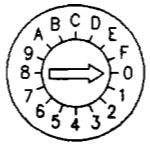
These switches should be set as shown on the left to ensure normal transmission.)

POINT

The PC CPU should be reset after changing the DIP switch setting.

4.4.2 Dial settings

(1) Settings

<table>
<tr><th>Switch</th><th>Description</th><th>Remarks</th></tr>
<tr><td>STATION No.
  </td><td>Set the slave station to be monitored.
<table><tr><th>Setting</th><th>Application</th></tr><tr><td>0</td><td>Not used</td></tr><tr><td>1</td><td>Station 1</td></tr><tr><td>2</td><td>Station 2</td></tr><tr><td>3</td><td>Station 3</td></tr><tr><td>4</td><td>Station 4</td></tr><tr><td>5</td><td>Station 5</td></tr><tr><td>6</td><td>Station 6</td></tr><tr><td>7</td><td>Station 7</td></tr><tr><td>8</td><td>Station 8</td></tr><tr><td>9</td><td>Not used</td></tr></table></td><td>In "Not used" mode or when transmission priority has not been set to the select station, the MNT.E LED is lit and LEDs 0 to 7 go off.</td></tr>
<tr><td>X/Y
  </td><td>Select data to be monitored.
<table><tr><th>Setting</th><th>Application</th></tr><tr><td>0</td><td>Not used</td></tr><tr><td>1</td><td>Data received from the slave</td></tr><tr><td>2</td><td>Data sent to the slave</td></tr><tr><td>3 to 9</td><td>Not used</td></tr></table></td><td>In "Not used" mode, the MNT.E LED is lit and LEDs 0 to 7 go off.</td></tr>
<tr><td>BYTE No.
  </td><td>Set the byte (8 points) of the relevant slave station communication data to be monitored.
<table><tr><th>Setting</th><th>Application</th></tr><tr><td>1</td><td>1st byte (1st to 8th points)</td></tr><tr><td>2</td><td>2nd byte (9th to 16th points)</td></tr><tr><td>3</td><td>3rd byte (17th to 24th points)</td></tr><tr><td>4</td><td>4th byte (25th to 32nd points)</td></tr><tr><td>5</td><td>5th byte (33rd to 40th points)</td></tr><tr><td>6</td><td>6th byte (41st to 48th points)</td></tr><tr><td>7</td><td>7th byte (49th to 56th points)</td></tr><tr><td>8</td><td>8th byte (57th to 64th points)</td></tr><tr><td>9</td><td>9th byte (65th to 72nd points)</td></tr><tr><td>A</td><td>10th byte (73rd to 80th points)</td></tr><tr><td>B</td><td>11th byte (81st to 88th points)</td></tr><tr><td>C</td><td>12th byte (89th to 96th points)</td></tr><tr><td>D</td><td>13th byte (97th to 104th points)</td></tr><tr><td>E</td><td>14th byte (105th to 112th points)</td></tr><tr><td>F</td><td>15th byte (113th to 120th points)</td></tr><tr><td>0</td><td>16th byte (121st to 128th points)</td></tr></table></td><td>If the set value exceeds the communication data point setting, the MNT.E.LED is lit and LEDs 0 to 7 go off.</td></tr>
</table>

Example:

Receive and send data areas are assigned in the buffer memory as shown.

	Station 1	Station 3	Staion 7	Monitor Setting
Send	24 points	8 points	16 points	STATION No. ..... Sets Station 3. X/Y ..... Sets send data.
Receive	8 points	24 points	16 points	BYTE No. ..... Sets the 3rd byte.

(a) When the maximum number of link points is 512:

When the maximum number of link points is 256:
(Buffer memory)

20H	1st byte - Station 1	*1
21H	2nd byte - Station 1	
22H	3rd byte - Station 3	
23H	1st byte - Station 3	
24H	1st byte - Station 7	
25H	2nd byte - Station 7	
26H to 3FH		
40H	1st byte - Station 1	*2
41H	1st byte - Station 3	
42H	2nd byte - Station 3	
43H	3rd byte - Station 3	
44H	1st byte - Station 7	
45H	2nd byte - Station 7	
46H to 5FH		

The above setting designates address 43H in the buffer memory.

When the maximum number of link points is 512:
(Buffer memory)

20H	2nd byte - Station 1	1st byte - Station 1
21H	1st byte - Station 3	3rd byte - Station 1
22H	1st byte - Station 7	1st byte - Station 7
23H to 3FH		*1
40H	1st byte - Station 3	1st byte - Station 1
41H	3rd byte - Station 3	2nd byte - Station 3
42H	2nd byte - Station 7	1st byte - Station 7
43H to 5FH		*2

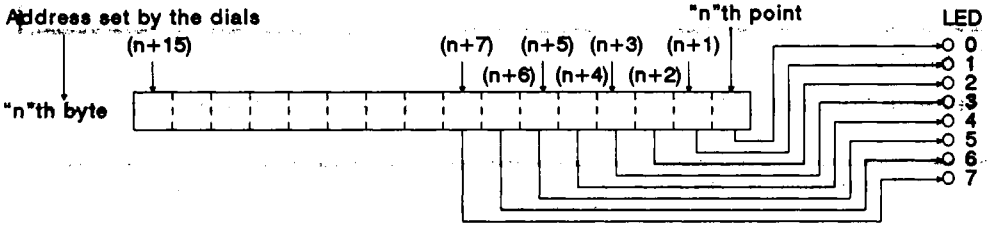
The above setting designates upper 8 bits at address 41H in the buffer memory.

*1: Received data storing area
*2: Send data stroing area

(2) Monitoring status

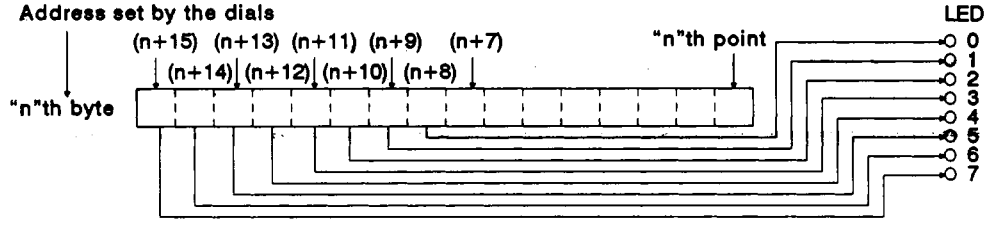
LEDs 0 to 7 at the front panel of the AJ71C22S1 indicate the ON/OFF status of each bit in the specified 8 points.

(a) When the lower byte is specified:



The LEDs corresponding to bits containing 1 are switched on.

(b) When the upper byte is specified:



The LEDs corresponding to bits containing 1 are switched on.

POINT

(1) The I/O data to be monitored changes as the dial is moved. There is no need to reset the CPU when the specified byte is changed.

(2) The MNT.E LED indicates that any dial has been set to an invalid position.

4.5 Unit Loopback Test

Checks the communication status of the AJ71C22S1 RS-422 interface.

(1) Pre-test procedure

(a) Set SW11 to ON.

(b) Wire the RS-422 interface as shown below.

RS-422 Signal	Cabling
SDA	
SDB	
RDA	
RDB	
SG	
FG	

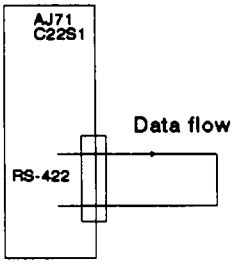
(c) Reset the PC CPU

(d) Setting for the number of slave stations, the transmission order, and the I/O data points, etc. is not necessary.

(e) The PC CPU operating status may be either RUN or STOP.

(2) Test

Data sent from terminals SDA and SDB is received by RDA and RDB, and the received data is checked against the sent data.



(3) Result

If communication is normal, the SIO E.LED remains off and the SD and RD LEDs flicker.

If communication is faulty, the SIO E.LED is lit to indicate that a) the cabling is not as specified above or any cable is broken or b) the AJ71C22S1 hardware is faulty.

4.6 Wiring Instructions

For reliable operation, protect all wiring against noise.

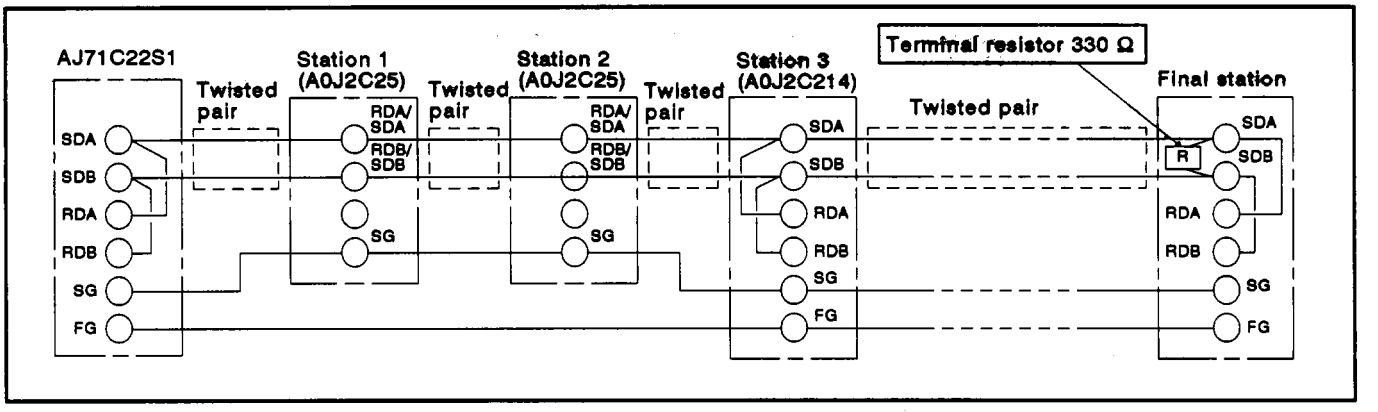
(1) Keep cables carrying data at least 100mm (3.94 inch) away from main circuit wiring, high voltage cables and normal PC input and output wiring.

(2) Ground shield wires of cable shields at one point only.

(3) Use M4 solderless terminals for connection to the RS-422 terminal block (Terminal screw diameter = 4mm (0.16 inch)).

4.7 RS-422 Wiring and Terminal Resistor Connection

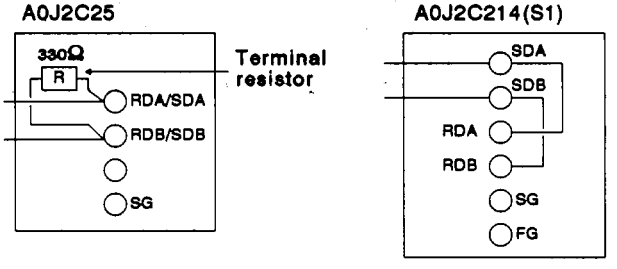
Connect the AJ71C22S1 and slave stations as shown below.



(1) The AJ71C22S1 should be located at the end of the system as shown above.

(2) The following terminals must be connected between stations:

* SDA (or RDA) and SDA (or RDA)
* SDB (or RDB) and SDB (or RDB)
* SG and SG
* FG and FG (not provided on the A0J2C25. The shield must be grounded at one point.)



Set either of SW22 or SW23 to ON (external connection of resistor not required).

(3) The terminal resistor must be set in the final station as follow:

The terminal resistor is used to prevent data communication errors.

REMARK

The terminal resistor is used at the setting and/or receiving port of end stations to protect transmission signals. In the AJ71C22S1 system, this terminal is required at one port only because the same cable is used for data transmission and receiving.

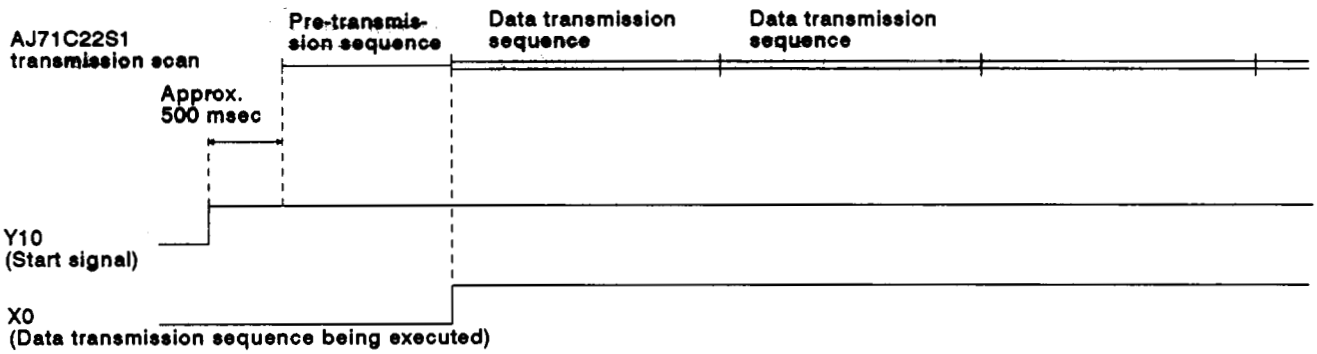
POINT

(1) The AJ71C22S1 has a built-in terminal resistor.

(2) Refer to appropriate manuals for the A0J2C25 and A0J2C214(S1) station number switch settings, etc..

5. CONTROL

5.1 Control Procedure



(1) Approximately 500 msec after Y10 is switched on, the pre-transmission sequence checks the link status and I/O points.

(2) The pre-transmission sequence refers to the processing in which the connection with a slave station, number of I/O points, etc. are checked.

(3) When the pre-transmission checks are complete, the data transmission sequence is started automatically and X0 is switched on.

For writing data to and reading from the AJ71C22S1 with the PC CPU, write a sequence program so that read/write is executed only after the execution of the pre-transmission sequence has been executed.

(4) The data transmission sequence refers to the processing in which the I/O data is sent to and received from a slave station. Data communication is executed in the order of the station numbers set by the transmission priority order setting. After the communication with all the set slave stations has been completed, communication is executed with the first slave station again, thus communication is executed cyclically.

5.2 Error Control

5.2.1 Pre-transmission sequence error control

(1) If an error occurs during the pre-transmission sequence, communication with all slave stations is stopped and:

(a) X1 in the AJ71C22S1 switches on;

(b) The SET E.LED is lit;

(c) The error code is written to buffer address 60H.

(For error codes, see Section 7.1)

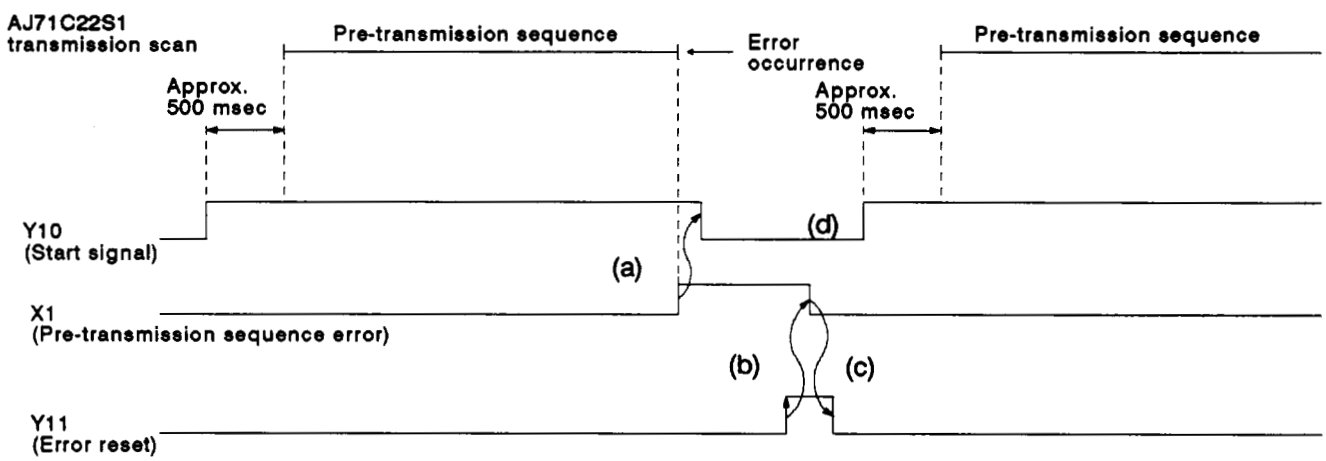
(2) To resume the pre-transmission sequence:

(a) Switch on Y11 in the sequence program to reset the error.

(X1 turns off automatically.)

(b) Switch on Y10 in the sequence program.

(3) Error and restart control timing chart



(a) Arrange for the error detection signal (X1) to switch on Y10 in the sequence program.

(b) Switching Y11 on automatically switches X1 off.

(c) X1 switching off causes Y11 to switch off. (part of the sequence program)

(d) Switch on Y10 in the sequence program, to restart the pre-transmission sequence.

5.2.2 Data transmission sequence error control

(1) If an error occurs during the data transmission sequence, communication with all slave station is stopped and:

(a) X2 in the AJ71C22S1 switches on and X0 off.

(b) The SCAN LED turns off and the SCAN E.LED is lit.

(c) The error code is written to buffer address 60H.

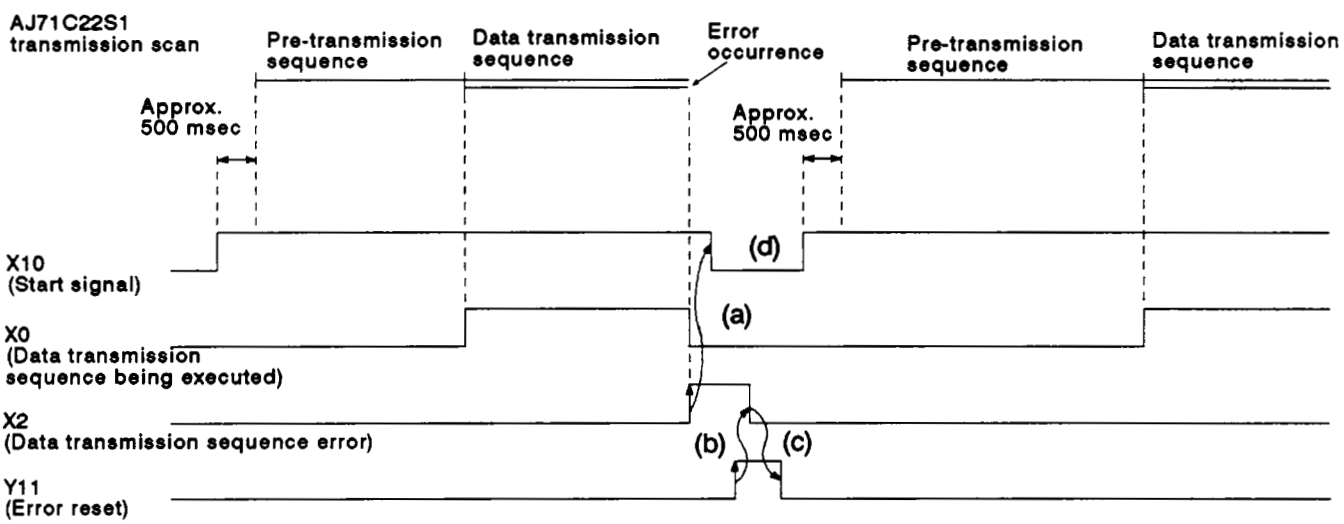
(For error codes, see Section 7.1.)

(2) To restart the data transmission sequence:

(a) Turn on Y11 in the sequence program to reset the error. (X2 turns off automatically.)

(b) Turn on Y10 in the sequence program to execute the pre-transmission sequence.

(3) Error and restart control timing chart (For error codes, see Section 7.1.)



(a) Arrange for the error detection signal X2 to switch off Y10 in the sequence program.

(b) Switching Y11 on automatically switches X2 off.

(c) X2 switching off causes Y11 to switch off (part of the sequence program).

(d) Switch on Y10 in the sequence program, to restart the pre-transmission sequence.

(4) When a data transmission sequence error occurs;

(a) The AJ71C22S1 (master) buffer data remains unchanged.

(b) The A0J2C214 (slave) buffer data remains unchanged.

(c) The A0J2C25 (slave) outputs (Y) are all switched off.

5.3 Control Mode when Link-off Station is Set

(1) Control mode in link-off status

(a) Setting and cancellation of link-off station

To set or cancel the link-off status of a specific station, write "1" (link-off set) or "0" (link-off canceled) to the bit corresponding to that station in address 1FH in the buffer memory.

For details of buffer memory, refer to Section 3.4.

(b) Send/receive data in link-off status

1) Send data

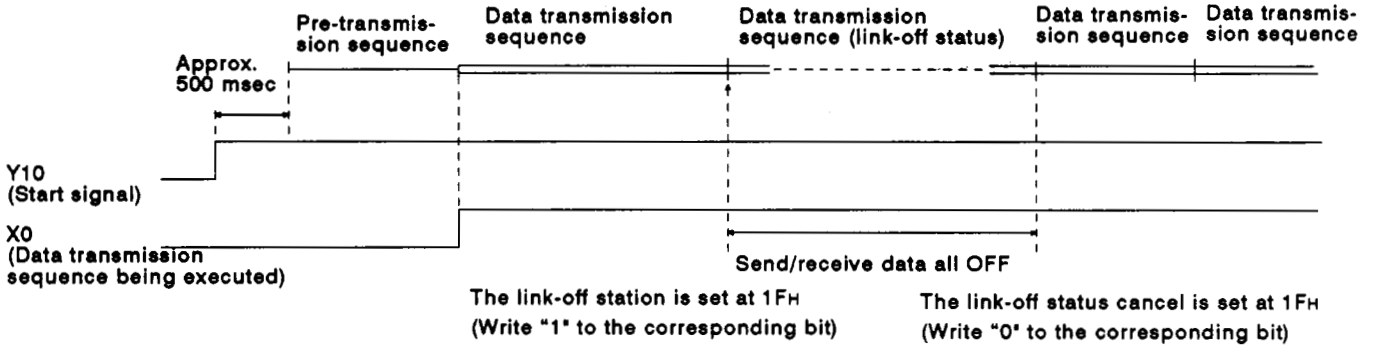
All OFF data is sent to the link-off station regardless of the data written to the send data storing area for the station for which the link-off is set.

2) Receive data

OFF data (0) is set to all bits in the receive data storing area corresponding to the station for which the link-off is set regardless of the data received from the slave station.

(c) Timing chart

The timing chart of the control procedure when the link-off station is set is shown below.

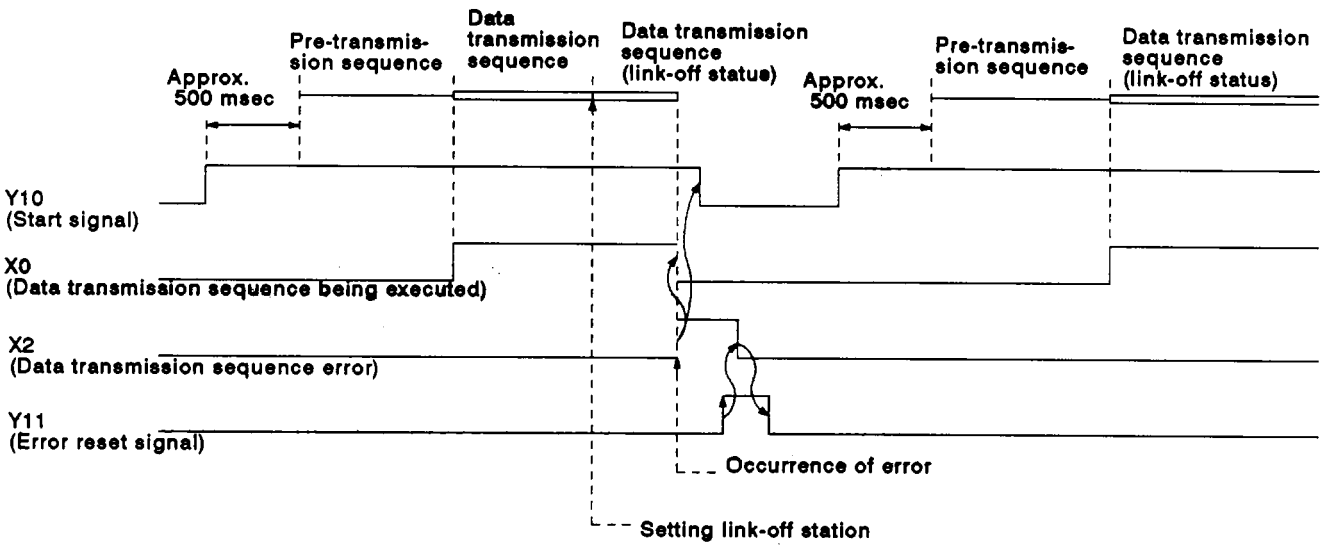


(2) Control mode if an error occurs during link-off status

If an error occurs with the link-off station or other slave station, the master station stops the data transmission sequence.

After resetting the error, turn the start signal ON, and the pre-transmission sequence is executed approximately 500 msec after the turning ON of the signal. The station is again placed in the link-off status when the data transmission sequence starts.

The timing chart of this processing is shown below.



REMARK

The setting for the link-off station is not cleared when an error occurs (X2 ON) or when the error is reset (Y11 ON).

5.4 Transmission Delay Time

During transmission between the AJ71C22S1 and any slave station, there is a delay until one receives data from the other. The delay time per station can be calculated by the following expression. When there are more than on slave station, the delay times of all stations must be added.

$$\text{Delay time} = \left(\frac{X}{8}\right) \times 0.74 + \left(\frac{Y}{8}\right) \times 0.86 + 6.1 \text{ msec}$$

where X= number of data bits received from the corresponding station
Y= number of data bits sent to the corresponding station

5.5 Transmission Break Detection Time

(1) Slave stations detect that the AJ71C22S1 has stopped transmission in the order set in the transmission priority, starting at the slave station next to the last station to communicate with the AJ71C22S1.

Example:

When the AJ71C22S1 stops transmission during communication with station 3 with the transmission precedence set in station order 5, 2, 3, 1 and 7, the transmission break is detected in the following order: station 1, 7, 5, 2, 3.

(2) Times required to detect the transmission break:

(a) The first station detects the break a maximum of 500 msec after the AJ71C22S1 stops transmission.

(b) Time for detection between slave stations

$$\frac{10}{38.4} \times \left(6 + \frac{X + Y}{4}\right) + 2 \text{ msec}$$

where X= number of data points received at the preceding station
Y= number of data points sent at the preceding station

POINT

(1) The A0J2C25 switches all outputs off after detecting a break in transmission.

(2) The A0J2C214(S1) buffer data is retained after transmission is stopped.

(3) The PC CPU can detect a break in AJ71C22S1 transmission from the ON/OFF status of X0, X1 and X2.

6. PROGRAMMING

6.1 Notes on Programming

(1) The AJ71C22S1 buffer memory data is initialized by:

(a) Resetting the PC CPU

(b) Switching the PC power off

(2) The initial data in the buffer memory is written to the AJ71C22S1 operating system (OS) after Y10 switches on. Hence data at buffer addresses 0H to 18H cannot be rewritten during the pre-transmission of data transmission sequence.

(3) For transmission delays between the PC CPU and slave stations, see Section 5.4.

(4) For information on the FROM and TO instructions used for data communication with the PC CPU, see the ACPU programming Manual.

6.2 Initial Data Write Program

See Section 3.4 for buffer memory addresses.

PROGRAM CONDITIONS

(1) AJ71C22S1 I/O assignment.....XC0 to XDF, YC0 to YDF

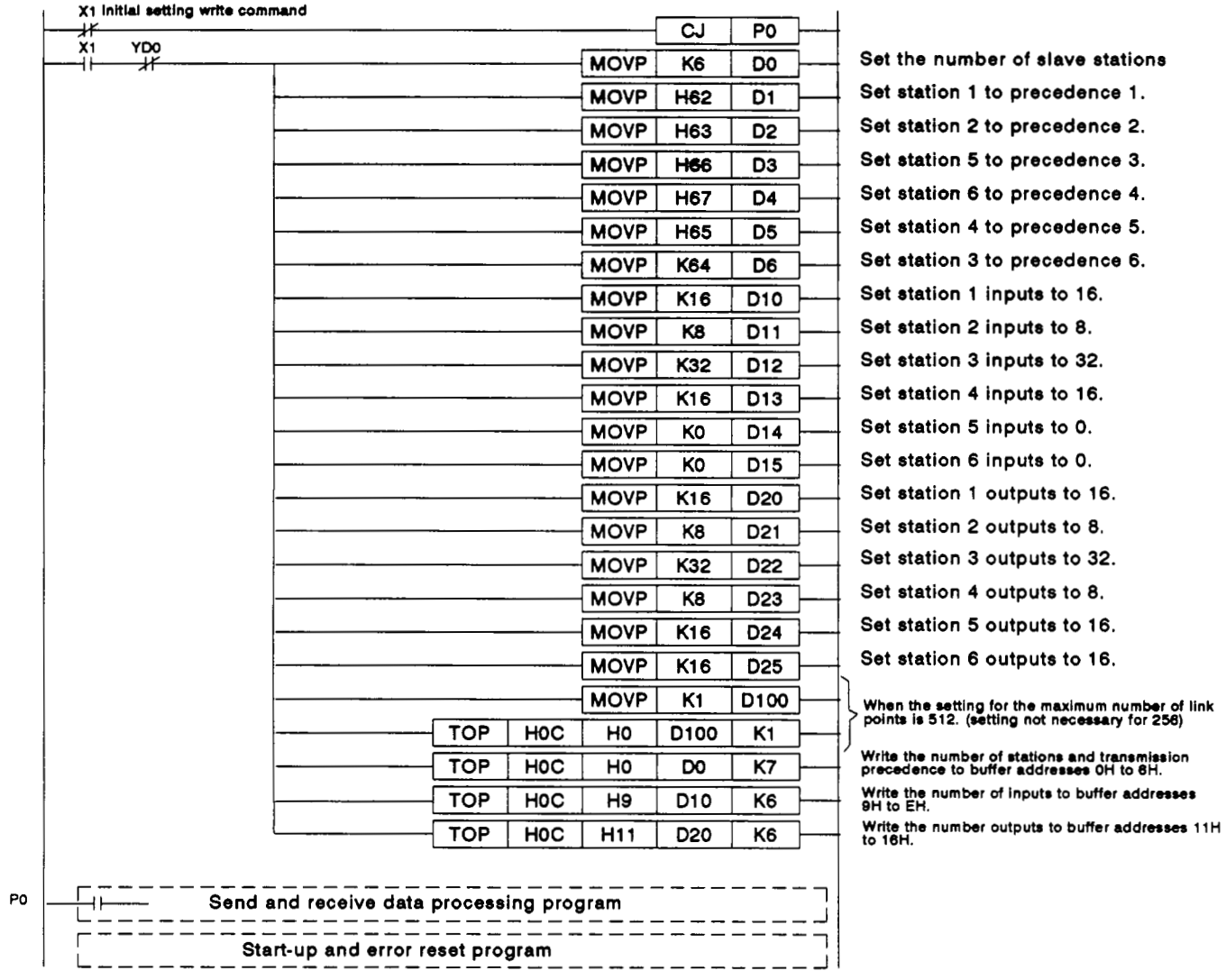
(2) Number of slave stations.....6

(3) Transmission precedence.....Station 1, 2, 5, 6, 4, 3

(4) Number of bits communicated.....

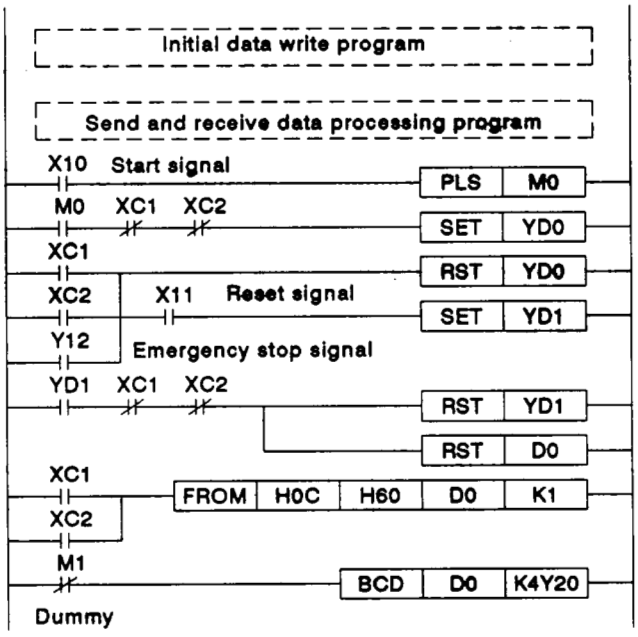
	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6
Received	16	8	32	16	0	0
Sent	16	8	32	8	16	16

PROGRAM EXAMPLE



6.3 Start-up and Error Reset Program

Assume the AJ71C22S1 I/O assignment to be XC0 to XDF, YC0 to YDF.



Convert start-up signal into pulse.

Switch YD0 on to start-up providing error flags XC1 and XC2 are off.

Switch YD0 off to stop start-up if an error has occurred or emergency

Switch R on after error removal to turn X11 on and reset the error.

Check that XC1 or XC2 has switched off and turn off YD1.

Read the error code to buffer address 60H at error occurrence.

Indicate the error code.

6.4 Communication Programs

6.4.1 The program to write send data

This program writes data from the PC CPU to the AJ71C22S1 send buffer memory area.

PROGRAM CONDITIONS

(1) AJ71C22S1 I/O assignment.....XC0 to XDF, YC0 to YDF

(2) Number of slave stations.....3

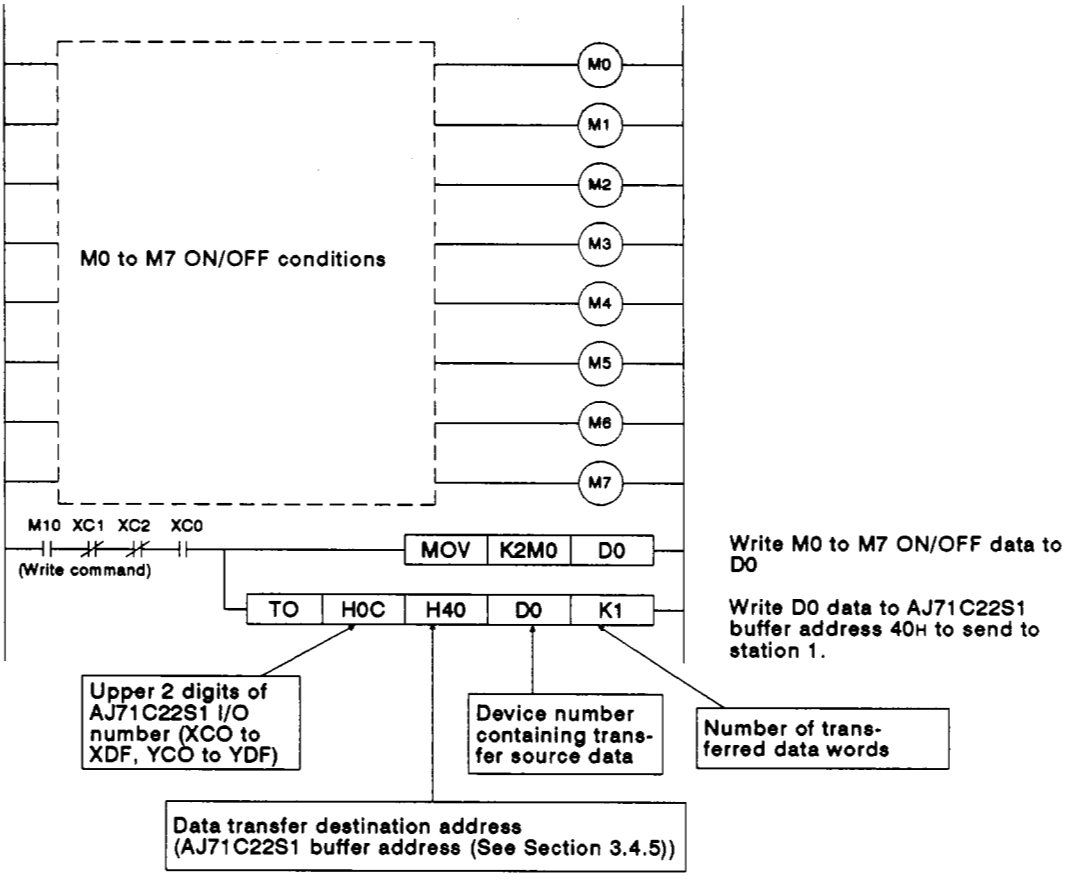
(3) Number of bits per station .....

	Section 1	Section 2	Section 3
Outputs	8	16	8

(4) M0 to M7 ON/OFF data is echoed at the 1st to 6th output devices at station 1.

PROGRAM EXAMPLE

To control the ON/OFF statuses of outputs at station 1



EXPLANATION

(1) Data is written to the specified addresses (output data area) in the AJ71C22S1 buffer memory by the TO instruction and is then automatically sent from the AJ71C22S1 to slave stations.

(2) Data sent to stations 1 to 3 is written to the following AJ71C22S1 buffer addresses:

	Maximum Number of Link Points: 256	Maximum Number of Link Points: 512
Send data at 1st to 8th points in station 1	Lower 8 bits at address 40H	Lower 8 bits at address 40H
Send data at 1st to 8th points in station 2	Lower 8 bits at address 41H	Upper 8 bits at address 40H
Send data at 9th to 16th points in station 2	Lower 8 bits at address 42H	Lower 8 bits at address 41H
Send data at 1st to 8th points in station 3	Lower 8 bits at address 43H	Upper 8 bits at address 41H

IMPORTANT

Data storing method in the send data storing area differs depending on the set maximum number of link points (256 and 512). When the setting is "256", data is stored in units of 8 bits as M0 to M7 in the example program. Upon execution of the TO instruction, "0" (OFF) is written to all upper 8 bits.

When the setting is "512", data transmission should be executed in units of 16 bits (1 word).

6.4.2 The program to read receive data

PROGRAM CONDITIONS

(1) AJ71C22S1 I/O assignment.....XC0 to XDF, YC0 to YDF

(2) Number of slave stations.....3

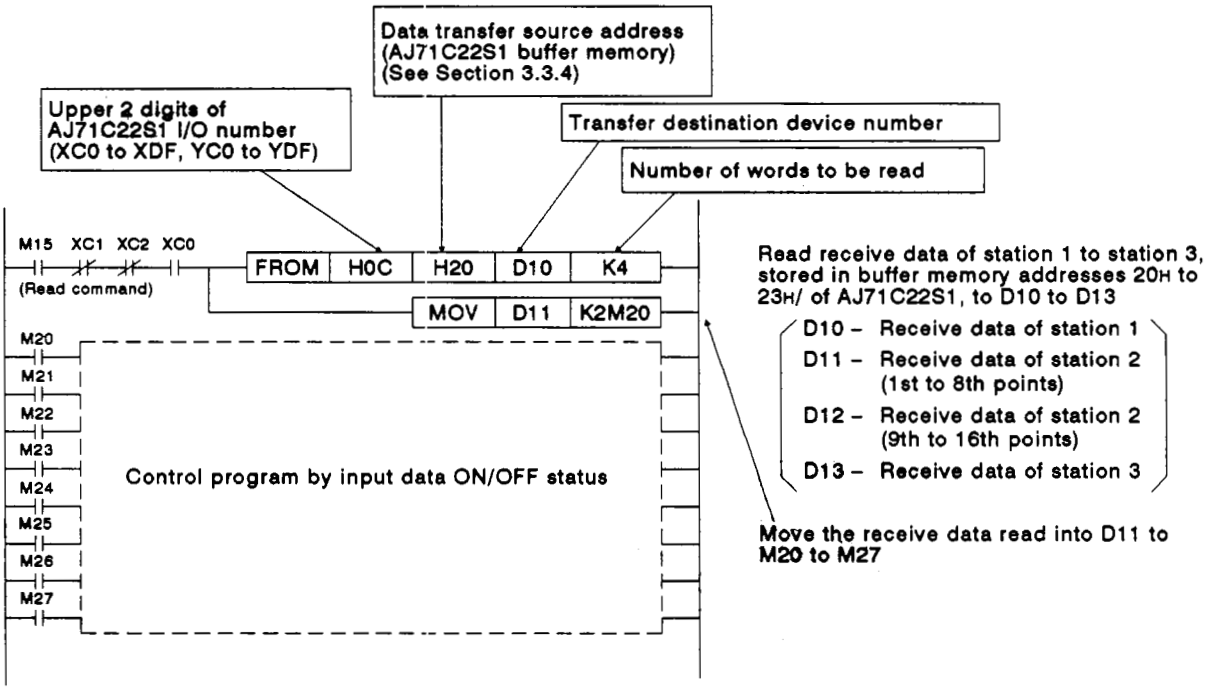
(3) Number of bits per station .....

	Section 1	Section 2	Section 3
Outputs	8	16	8

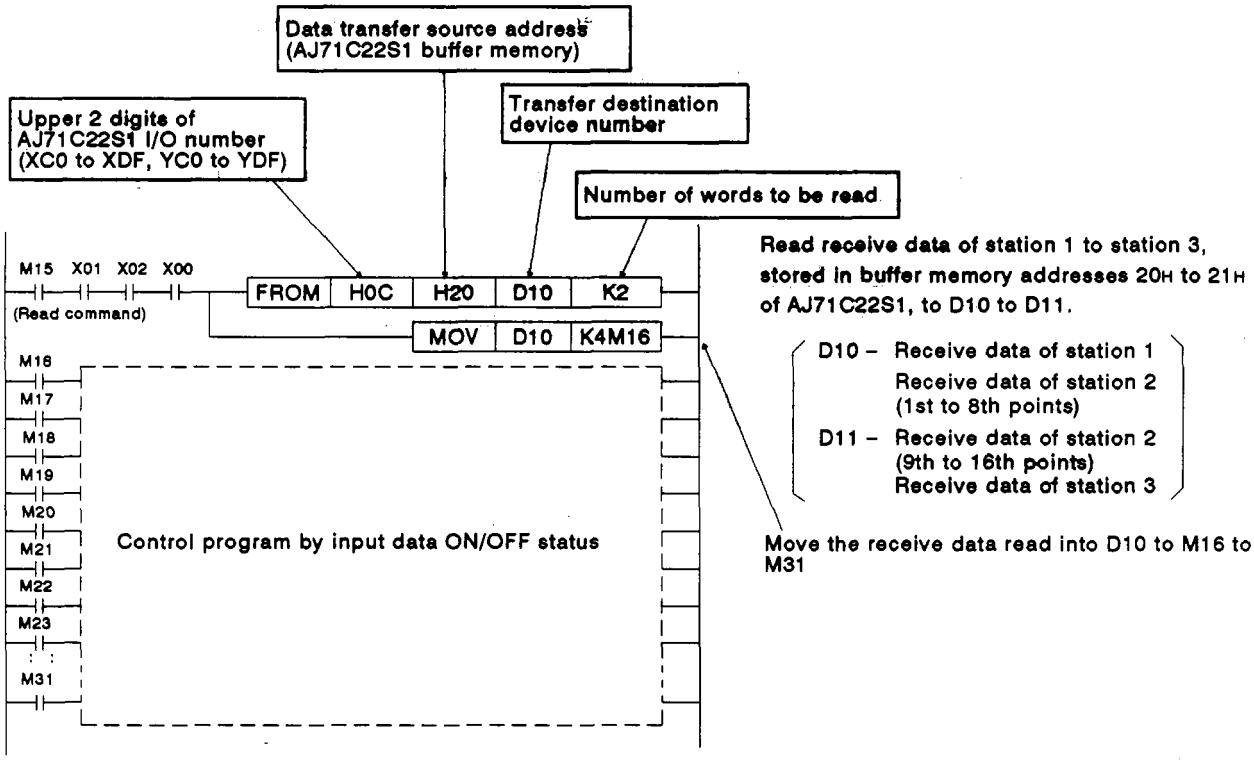
(4) The ON/OFF statuses of 8 bits are read from station 1 to M20 to M27 in the PC CPU.

PROGRAM EXAMPLE 1: 256 link points

To detect and control each point of received ON/OFF data



PROGRAM EXAMPLE 2: 512 link points



EXPLANATION

(1) Data is automatically written from slave stations to the specified addresses (input data area) in the AJ71C22S1 buffer memory.
Therefore, the ON/OFF status of the data sent from a local station can be known by reading the receive data in the AJ71C22S1 buffer memory using the FROM instruction.

(2) Data received from stations 1 to 3 is written to the following AJ71C22S1 buffer addresses:

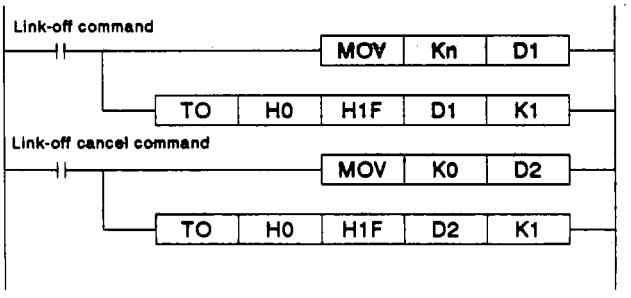
	Maximum Number of Link Points: 256	Maximum Number of Link Points: 512
Receive data at 1st to 8th points in station 1	Lower 8 bits at address 20H	Lower 8 bits at address 20H
Receive data at 1st to 8th points in station 2	Lower 8 bits at address 21H	Upper 8 bits at address 20H
Receive data at 9th to 16th points in station 2	Lower 8 bits at address 22H	Lower 8 bits at address 21H
Receive data at 1st to 8th points in station 3	Lower 8 bits at address 23H	Upper 8 bits at address 21H

IMPORTANT

Data storing method in the receive data storing area differs depending on the set maximum number of send/receive points (256 and 512). When the setting is "512", since it is not possible to read only the upper 8 bits at each address, it is necessary to write a program to execute the processing for only the upper 8 bits after executing the FROM instruction in units of words.

6.5 Program to Set/Cancel Off-link Station

The example program to set/cancel the off-link station is shown below assuming that the AJ71C22S1 is loaded in X00 to X1F and Y00 to Y1F.



7. TROUBLESHOOTING

7.1 Error Code List

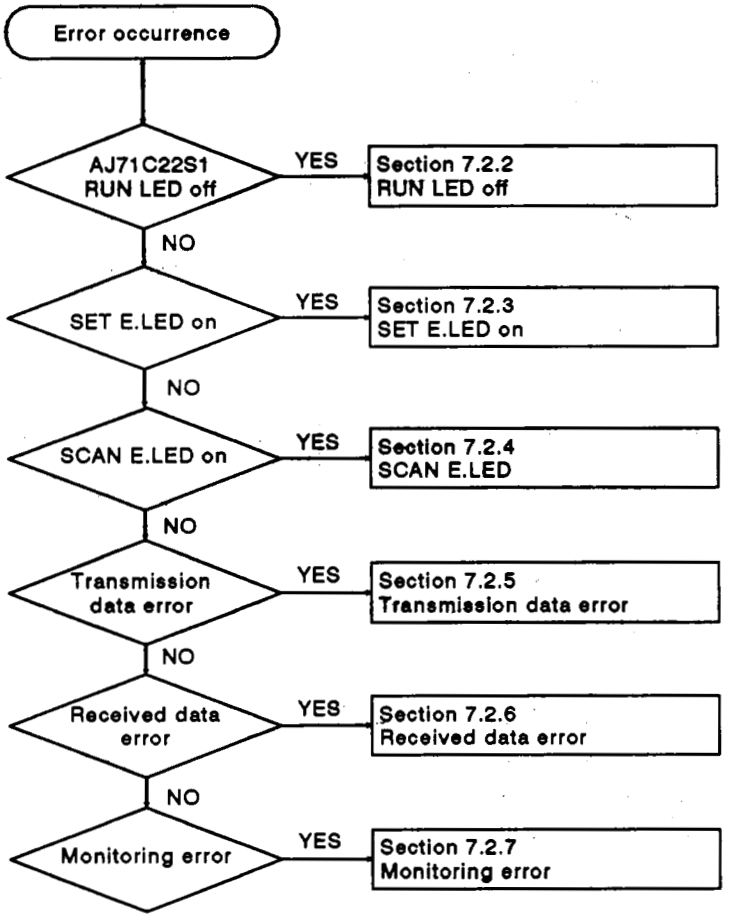
During data transmission between the AJ71C22S1 and slave stations any of the following error codes are written to buffer address 60H in BIN to define the error.

Error Code (Decimal)	Description			LED	Remedy
1	Pre-transmission sequence	Indicates that any of the following errors has occurred during pre-transmission sequence: • Initial data setting error • DIP switch setting error (See Section 4.4.1) • Cable connection error • Data communication error	During communication with station 1	SET E. LED lit	(1) Check initial data. (2) Check DIP switch. (3) Check slave station power. (4) Check cable. (5) Check terminal resistor.
2			During communication with station 2		
3			During communication with station 3		
4			During communication with station 4		
5			During communication with station 5		
6			During communication with station 6		
7			During communication with station 7		
8			During communication with station 8		
9		Initial data has not been transferred from the buffer memory to the RS422 interface transmission buffer.			(1) Check the number of FROM/TO instructions. (2) Hardware fault
17	Data transmission sequence	Indicates that any of the following errors has occurred during data transmission sequence: • Cable error • Data communication error	During communication with station 1	SCAN E. LED lit	(1) Check slave station power. (2) Check cable.
18			During communication with station 2		
19			During communication with station 3		
20			During communication with station 4		
21			During communication with station 5		
22			During communication with station 6		
23			During communication with station 7		
24			During communication with station 8		
25		Data cannot be transferred between the buffer memory and the RS422 interface communication buffer.			(1) Check the number of FROM/TO instructions. (2) Hardware fault
33	Pre-transmission sequence	Initial data is wrong.		SET E. LED lit	Check initial data. (See Section 3.4.)

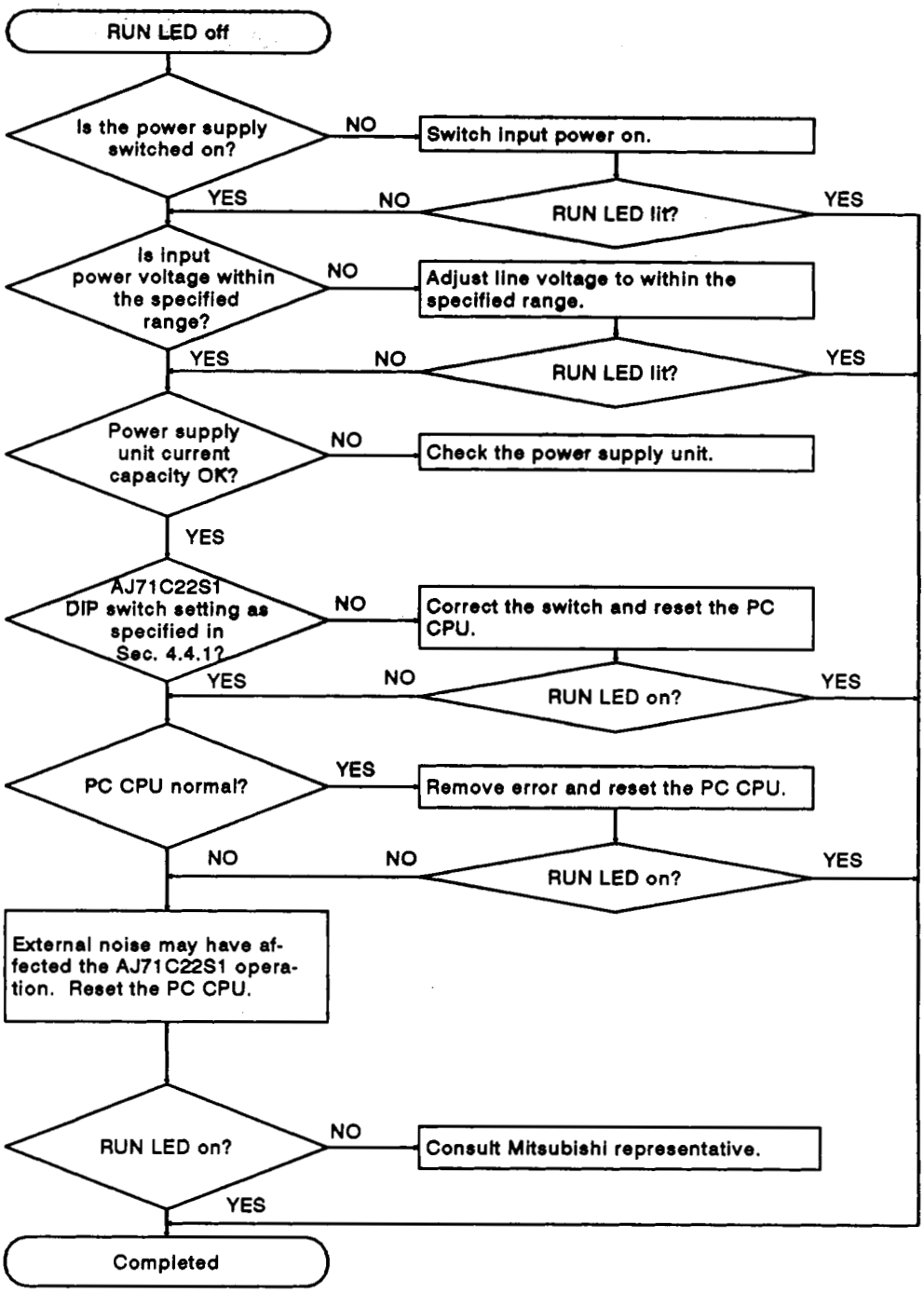
7.2 Troubleshooting

This section gives basic fault finding procedures for the AJ71C22S1. For information on CPU unit troubleshooting, refer to the relevant CPU Unit User's Manual.

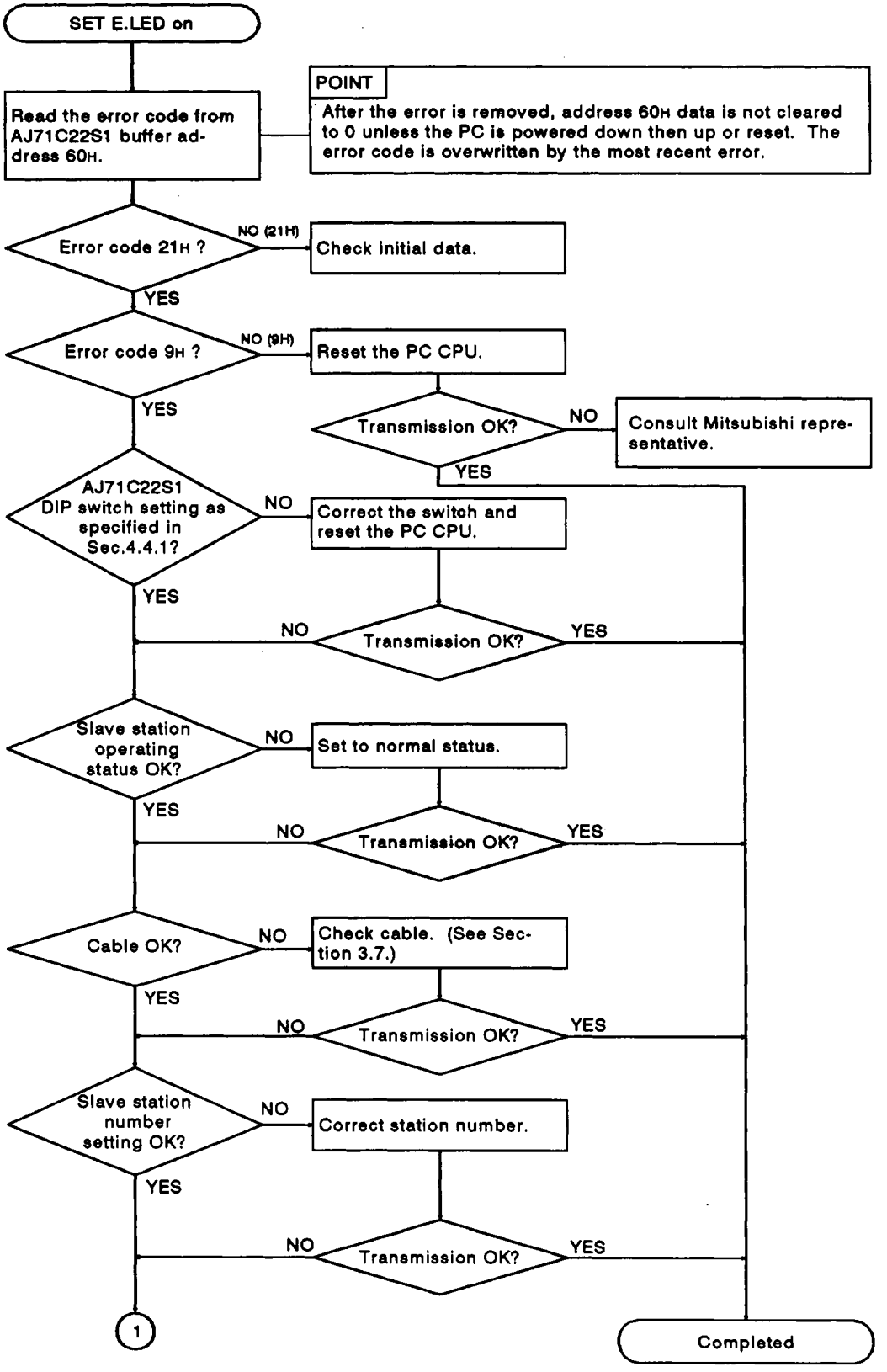
7.2.1 General troubleshooting flow chart

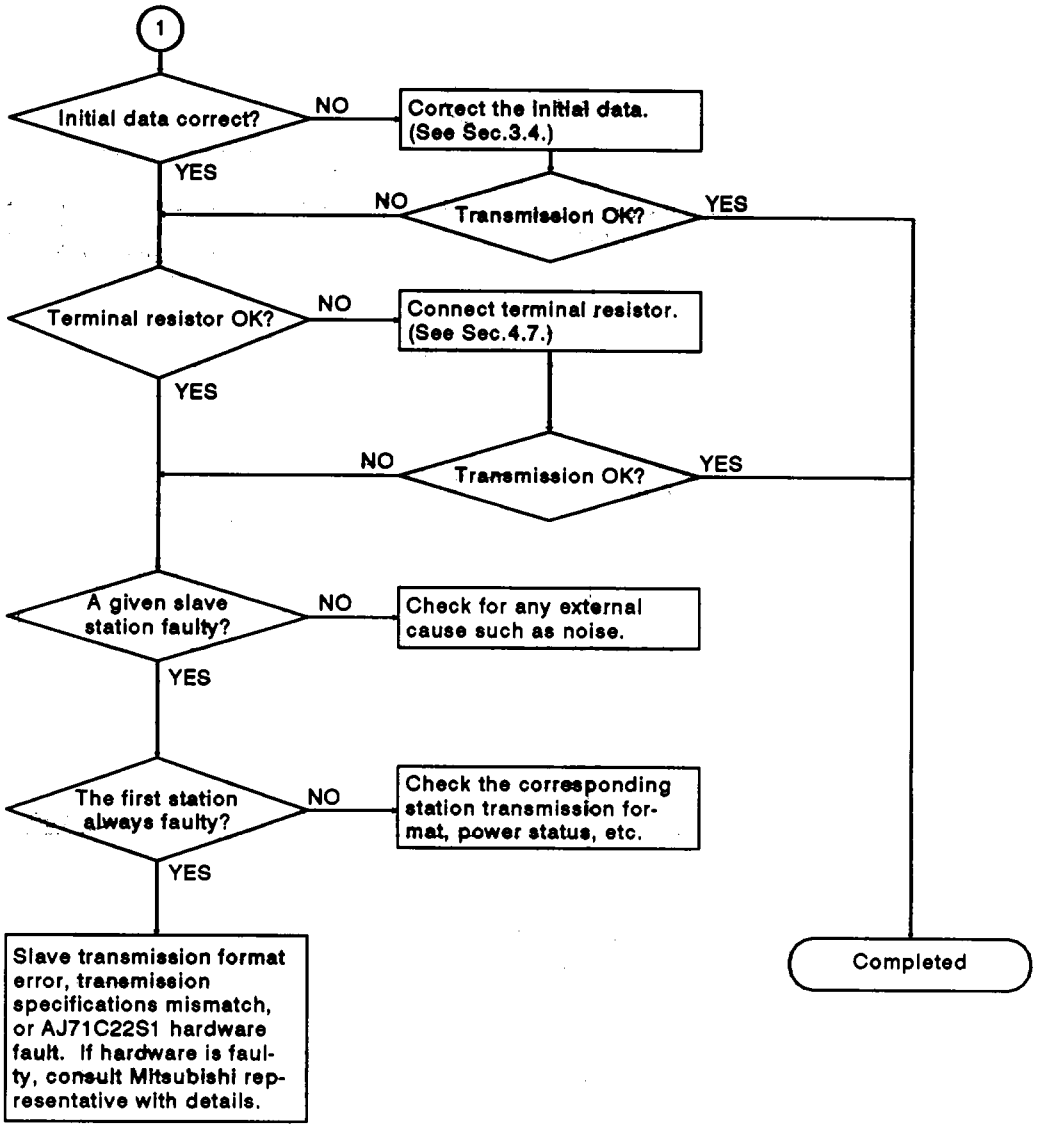


7.2.2 RUN LED off

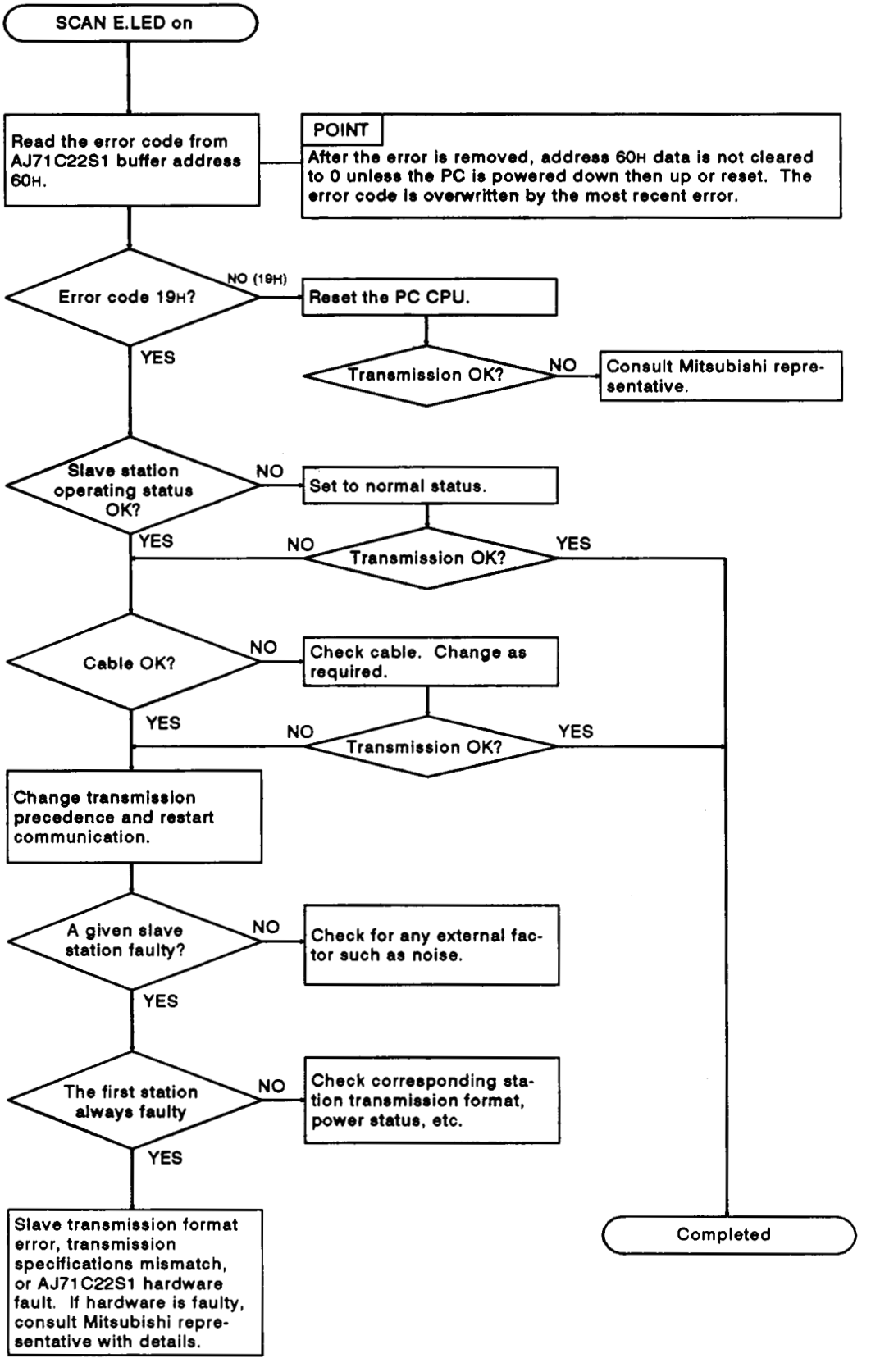


7.2.3 SET E. LED lit

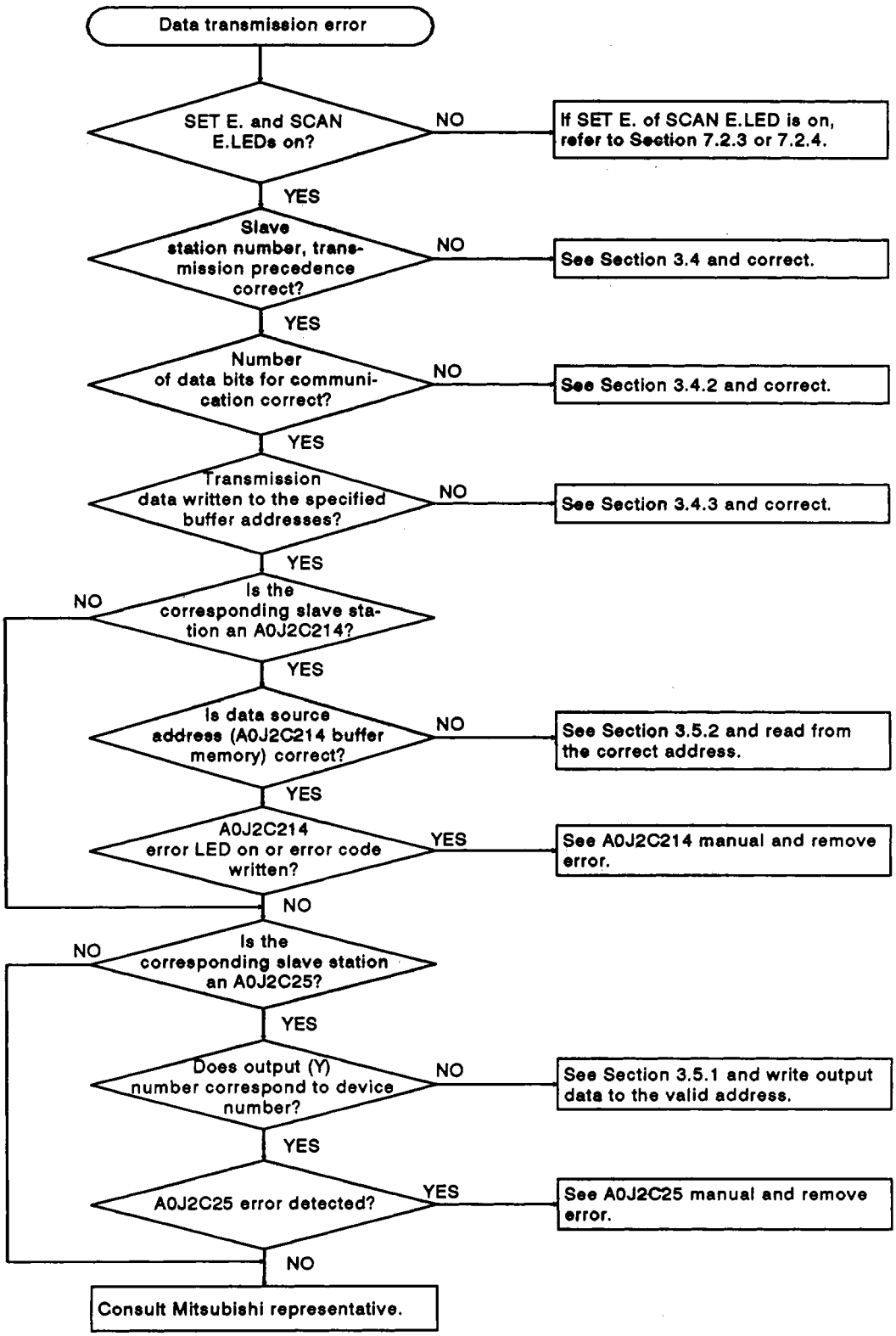



1
Initial data correct?
NO
Correct the initial data. (See Sec.3.4.)
YES
NO
Transmission OK?
YES
Terminal resistor OK?
NO
Connect terminal resistor. (See Sec.4.7.)
YES
NO
Transmission OK?
YES
A given slave station faulty?
NO
Check for any external cause such as noise.
YES
The first station always faulty?
NO
Check the corresponding station transmission format, power status, etc.
YES
Slave transmission format error, transmission specifications mismatch, or AJ71C22S1 hardware fault. If hardware is faulty, consult Mitsubishi representative with details.
Completed

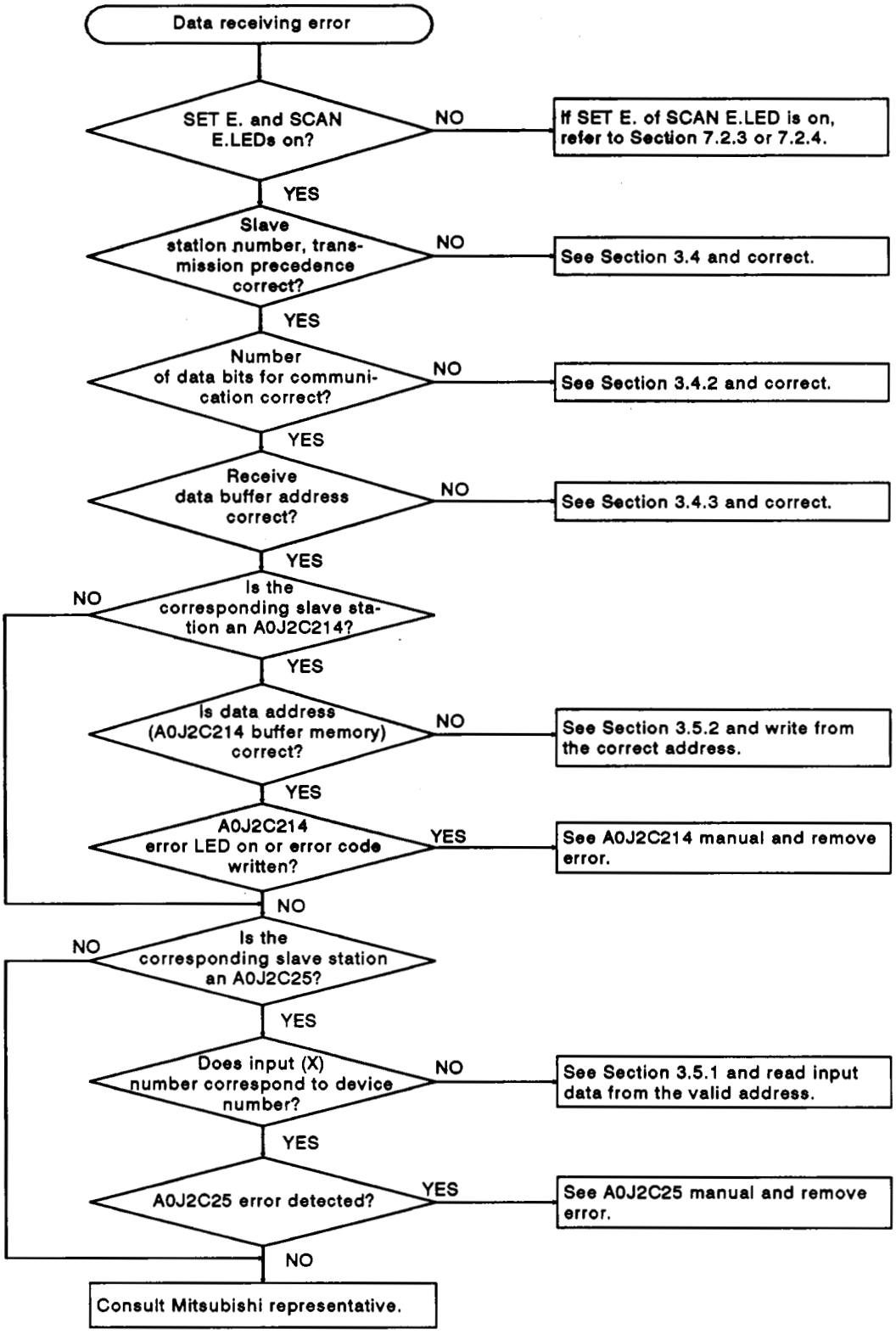
7.2.4 SCAN E. LED lit



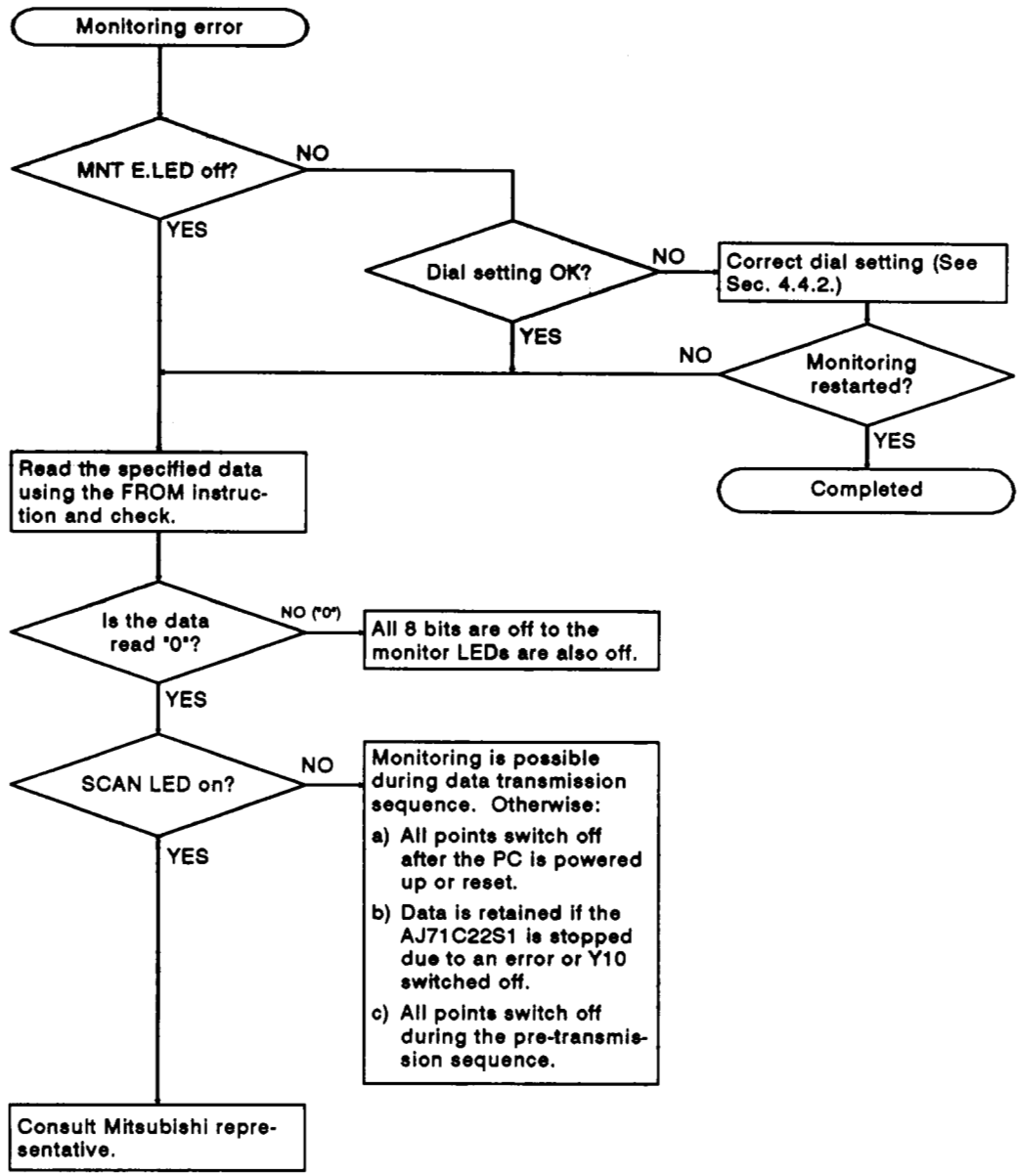
7.2.5 Failure of data transmission to slave station



7.2.6 Failure to receive data from slave station

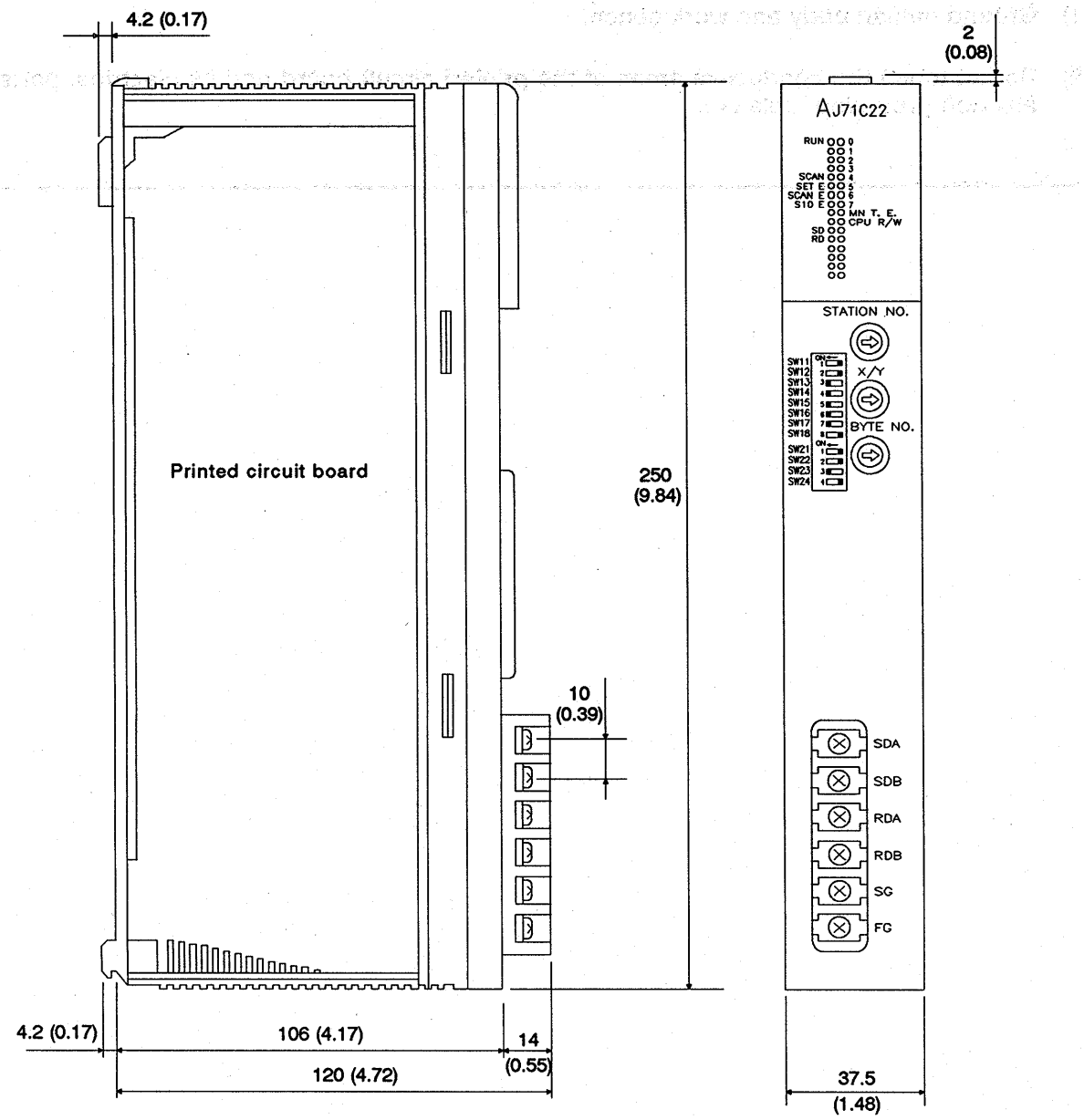


7.2.7 Monitoring error



APPENDIX

APPENDIX 1 External View



IMPORTANT

The components on the printed circuit boards will be damaged by static electricity, so avoid handling them directly. If it is necessary to handle them take the following precautions.

(1) Ground human body and work bench.

(2) Do not touch the conductive areas of the printed circuit board and its electrical parts with any non-grounded tools etc.

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