MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-A

User's Manual

Master
type MELSECNET/MINI

MITSUBISHI ELECTRIC

CONTENTS

1. INTRODUCTION

This manual includes specifications, handling instructions and programming procedures for the AJ71PT32 data link module (referred to as "master module") for use as the master station of a MELSECNET/MINI data link system (referred to as "MINI link"). The AJ71PT32 is a master unit used for both optical and twisted pair data links. The AJ71PT32 and AJ71P32/T32 have the same functions and are compatible with each other.
The I/O specifications of MINI link remote I/O stations are given in the MELSECNET/MINI Remote I/O User's Manual.

The general CPU names used in this manual include the following CPU models:

(1) PC CPU

A1(E), A2(E), A3(E)CPU(P21/R21)
A1N, A2N, A3NCPU(P21/R21)
A3HCPU(P21/R21)
A0J2CPU(P23/R23)

(2) Building block type CPU

A1(E), A2(E), A3(E)CPU(P21/R21)
A1N, A2N, A3NCPU(P21/R21)
A3HCPU(P21/R21)

(3) Compact type CPU

A0J2CPU(P23/R23)

POINT

In this manual, the I/O addresses of the master module assume that the master module is loaded on slot 0 of the main base unit used with the building block type CPU. If the master module is loaded on any other slot or is used with the A0J2CPU, its I/O addresses should be determined in accordance with the CPU module I/O address assignment.

REVISIONS

※The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Dec., 1988	IB (NA) 66164-A	First edition

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.

1.1 MINI Link Features

The MINI link is a remote I/O system which uses the master module on the main or extension base unit.
This system is designed to reduce wiring work costs for I/O devices installed away from the PC CPU.
For example, remote I/O stations installed to a conveyor line, machines and equipment, etc. can be controlled from the master module via optical fiber/twisted pair cables.

(1) Max. 512 link points
One master module allows up to 64 remote I/O stations to be connected and up to 512 inputs/outputs to be controlled.
The number of master modules loaded is not limited.

(2) Fast I/O refresh
The I/O refresh time between the master and remote I/O stations is between 3.2 and 3.9ms for 512 points.

(3) I/O refresh system
A batch or a partial refresh system is available in accordance with the remote I/O unit used.
(a) Batch refresh
Remote I/O station data is transferred by one I/O refresh. 8 input or output points can be controlled by a remote I/O unit which occupies 1 station.
(b) Partial refresh
Remote I/O station data is transferred by several I/O refreshes. This system allows many I/O points to be controlled by a few occupied stations, e.g. 64 input and 64 output points can be controlled by the AJ35PTF-128DT which occupies 4 stations.

(4) Remote I/O unit types
The following remote I/O units and module are available:
(a) Stand-alone remote I/O unit
Has a high-strength, drip-proof casing made of aluminum diecast for installation onto a machine and may be used as a relay box.
Its protective structure conforms to IP54G (JEM1030).
(b) Compact remote I/O unit
Same in style as the A0J2 I/O units. Models available are 32-point dedicated input, 24-point dedicated output, 16-point input/12-point output and 32-point input/24-point output compound units.
(c) Partial refresh type remote I/O unit
Refreshes remote I/O station data in groups of given points. Allows many I/O points to be controlled with a few stations occupied by the master module.
(d) AJ72PT35 link module
Allows the A series building block type I/O modules to be used in the MINI link system.

(5) The MINI link may be used with the MELSECNET system. Any of the tier two master station and the tier three master station and local stations in the MELSECNET may be used as the master station in the MINI link.

(6) Ease of machining optical cable connectors
Optical cable connectors can be machined easily by the user with the tool kit available from Mitsubishi.

(7) Ease of checking luminous energy in optical data link system
In luminous energy check mode of the master module, luminous energy can be checked by connecting the optical power tester to the receive connector of each remote I/O station.

REMARKS

The MINI link does not have a loopback function as it has only one loop of data link cables.

1.2 Function Block Diagram

Fig. 1.2 shows the sequence of remote I/O station data in the MINI link.

(1) I/O refresh is continuously executed between the master module and remote I/O stations at intervals of 3.2 to 3.9ms (512 points).

(2) I/O refresh and master station sequence program are executed asynchronously, with the exception that I/O refresh is stopped while the FROM/TO instruction is executed from the PC CPU to the master module.

(3) Input data from a remote I/O station is read from the master module buffer memory by the FROM instruction.

(4) Output data to a remote I/O station is written to the master module buffer memory by the TO instruction.

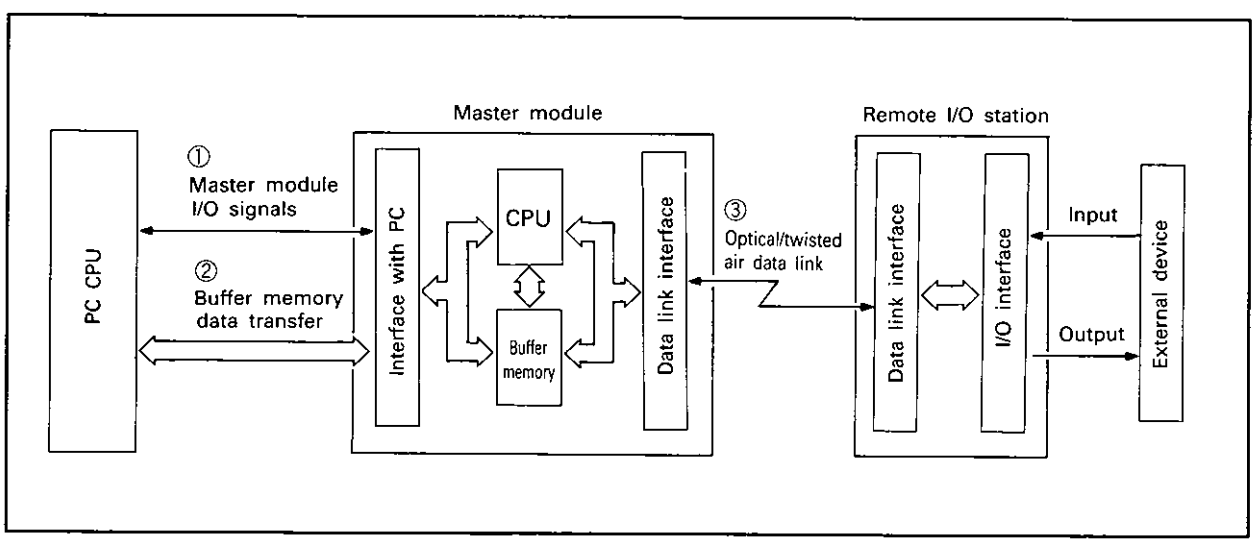


Fig. 1.2 Function Block Diagram

1) I/O signals assigned to the master module. These signals are used for communication between the PC CPU and master module. For more information, see Section 3.3.

2) Allows remote I/O station input data to be read, output data to be written, a faulty station to be read, etc. Buffer memory data transfer is made by the FROM and TO instructions in the sequence program. For full information of the buffer memory, see Section 3.4.

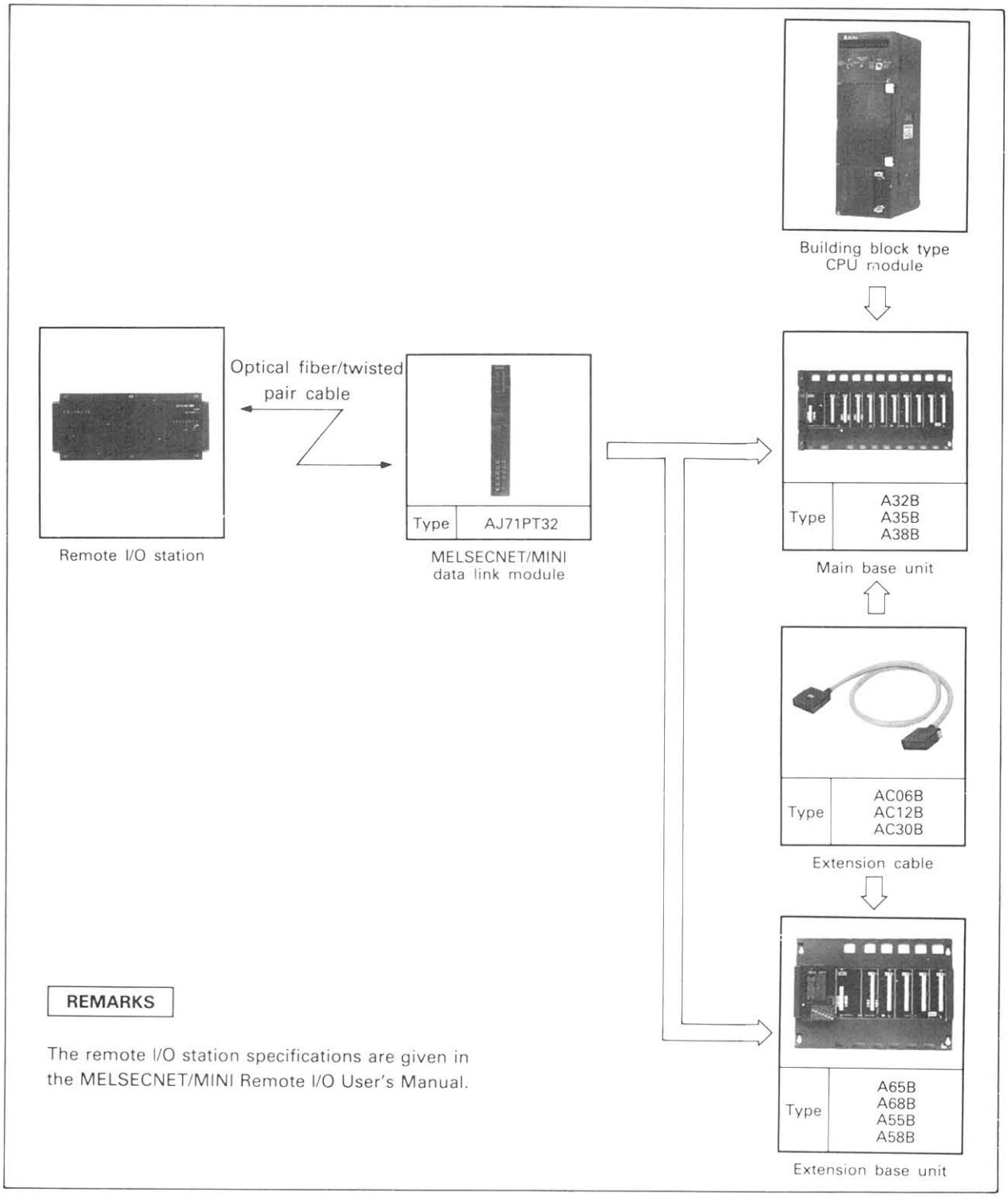
3) Data link start is directed from the sequence program. After data transfer is initiated, I/O refresh is continually executed independently of the sequence program execution.

2. SYSTEM CONFIGURATION

2.1 Overall Configuration

The master module may be used on the A series base unit in either of the building block type CPU (Fig. 2.1) and compact type CPU (Fig. 2.2) systems as shown below:

(1) Building block type CPU system

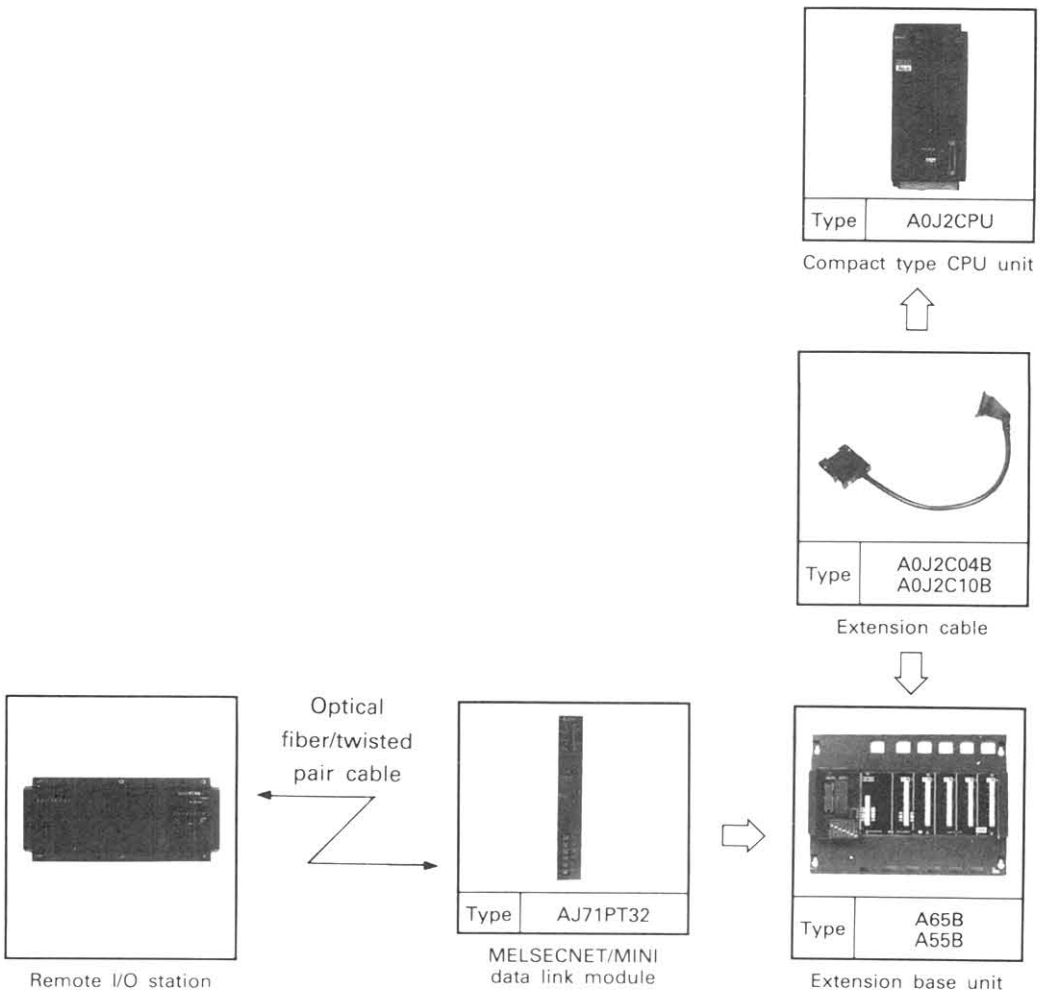


REMARKS

The remote I/O station specifications are given in the MELSECNET/MINI Remote I/O User's Manual.

Fig. 2.1 Building Block Type CPU System Configuration

(2) Compact type CPU system



REMARKS

For remote I/O specifications, see the MELSECNET/MINI Remote I/O User's Manual.

Fig. 2.2 Compact Type CPU System Configuration

2.2 Applicable A-Series System

The master module can be used with the following CPU models:

Applicable model A0J2CPU	A1CPU A2CPU A3CPU A3HCPU	A1ECPU A2ECPU A3ECPU	A1NCPU A2NCPU A3NCPU

There is no limit to the number of master modules loaded. The master module may be loaded on any slot of the base unit with the following precautions:

(1) When using the master module with the A55B or A58B extension bases (i.e. those without power supplies), select the power supply for the main base unit in accordance with the corresponding CPU User's Manual.

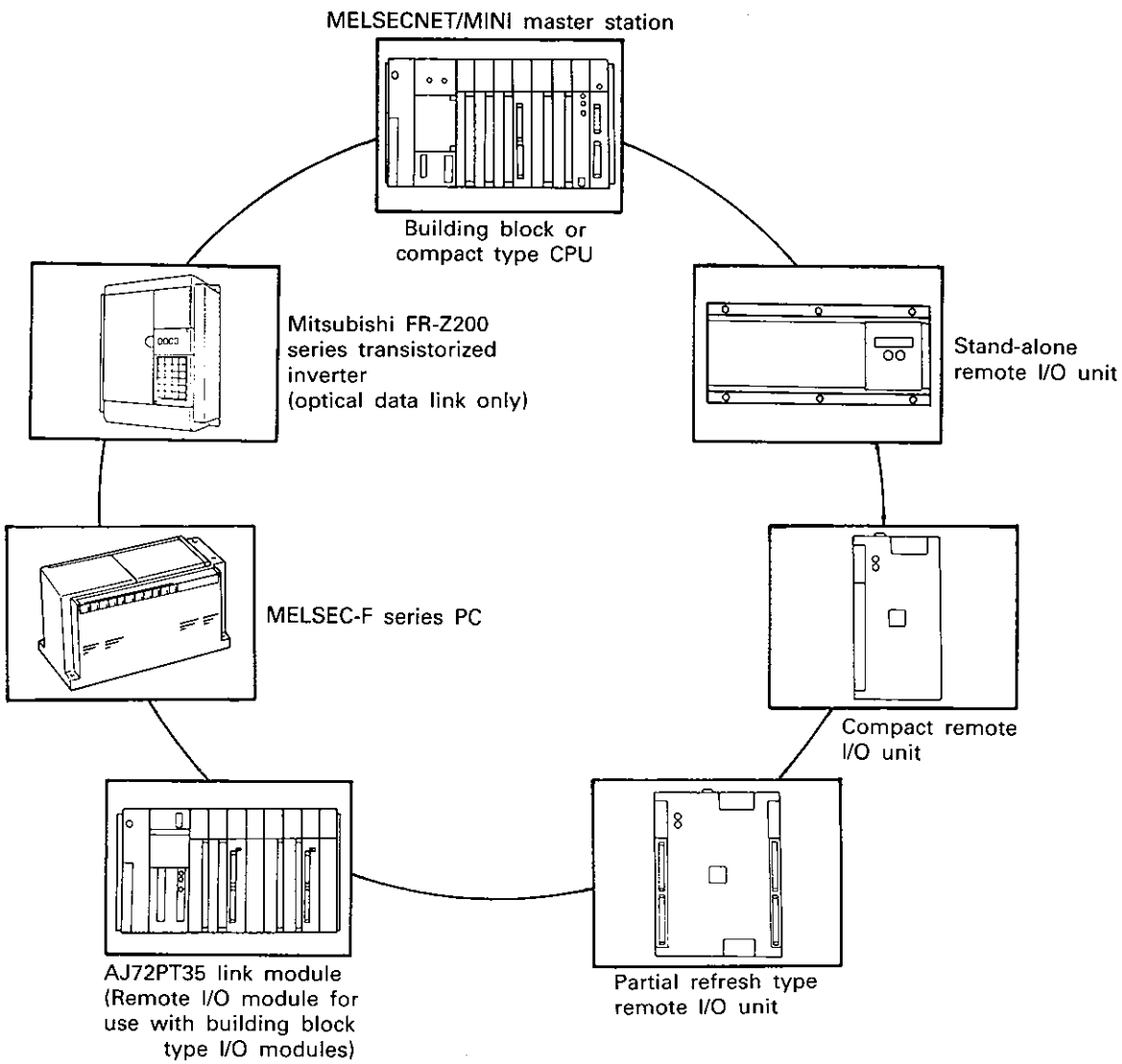
(2) The master module may be loaded to the master station or a local station but not into a remote I/O station in a MELSECNET data link system. The following CPU models are required for the MELSECNET data link system.

Applicable models to master or local stations	A1(E)CPUP21/R21 A2(E)CPUP21/R21 A3(E)CPUP21/R21 A3HCPUP21/R21 A0J2CPUP23/R23	A1NCPUP21/R21 A2NCPUP21/R21 A3NCPUP21/R21 (local only)

(3) The master module cannot be used on the last slot of the seventh extension stage in an A3(E)CPU(P21/R21) system.

2.3 System Configuration Example

The MINI link is configured by loading the master module to the main or extension base unit used with the PC CPU as the master station.
In addition to the A series remote I/O units, the MINI link allows use of the MELSEC-F series PCs, Mitsubishi FR-Z200 series transistorized inverters, etc.
Fig. 2.3 shows an example of a data link system configuration.



REMARKS

(1) Optical fiber and twisted pair cables used depend on the unit connected.

Fig. 2.3 System Configuration Example

2.4 Equipment Used with the MINI Link

Equipment	Type	Description	Number of Points Occupied
CPU module	A0J2CPU(P23/R23)	Program capacity: 7K steps Number of I/O points: 336	—
	A1CPU(P21/R21) A1ECPU(P21/R21) A1NCPU(P21/R21)	Program capacity: 6K steps Number of I/O points: 256	—
	A2CPU(P21/R21) A2ECPU(P21/R21) A2NCPU(P21/R21)	Program capacity: 14K steps Number of I/O points: 512	—
	A3CPU(P21/R21) A3ECPU(P21/R21) A3NCPU(P21/R21)	Program capacity: 30K steps × 2 Number of I/O points: 2048	—
	A3HCPU(P21/R21)	Program capacity: 30K steps × 2 Number of I/O points: 2048	—
Data link module	AJ71PT32	MELSECNET/MINI master unit for optical and twisted pair data links	32 points

<table>
<tr><th>Equipment</th><th>Type</th><th>Description</th><th>Remarks</th></tr>
<tr><td>Optical fiber cable connector</td><td>CA9104AP</td><td>1-core connector for use with the optical fiber cable. Consists of the following:
<table><tr><th>Equipment</th><th>Quantity</th></tr><tr><td>Housing</td><td>1</td></tr><tr><td>Ferrule</td><td>1</td></tr><tr><td>Sleeve</td><td>1</td></tr></table></td><td rowspan="3">The optical fiber cable connector and assembling tool kit are only used with the plastic fiber.</td></tr>
<tr><td>Assembling tool kit</td><td>CT9004P</td><td>For assembling optical fiber cable connectors. Consists of the following:
<table><tr><th>Equipment</th><th>Type</th><th>Quantity</th></tr><tr><td>Fiber stripper</td><td>ST1000</td><td>1</td></tr><tr><td>Fiber cutter</td><td>CV1000</td><td>1</td></tr><tr><td>Fiber clamper</td><td>FC1000</td><td>1</td></tr><tr><td>Replacement blade for cutter</td><td>——</td><td>1</td></tr></table></td></tr>
<tr><td>Optical power tester</td><td>HT-101P</td><td>For measuring the luminous energy of the MINI link.</td></tr>
<tr><td>Optical fiber cable</td><td>——</td><td>Optical fiber cable for MINI link.</td><td>User prepared in accordance with Section 3.2.2.</td></tr>
<tr><td>Twisted pair shield cable</td><td>——</td><td>Twisted pair cable for MINI link.</td><td>User prepared in accordance with Section 3.2.3.</td></tr>
<tr><td>Cable-through fitting</td><td>——</td><td>For sealing cables into a stand-alone remote I/O station.</td><td>User prepared.</td></tr>
</table>

2.5 Notes on Configuring the System

The following must be noted for the MINI link system to protect remote I/O stations from input fault.

(1) For prevention of input fault at power-on and -off

(a) The master station must powered up after or simultaneously with remote I/O stations.
(b) The master station must powered down before or simultaneously with remote I/O stations.

REMARKS

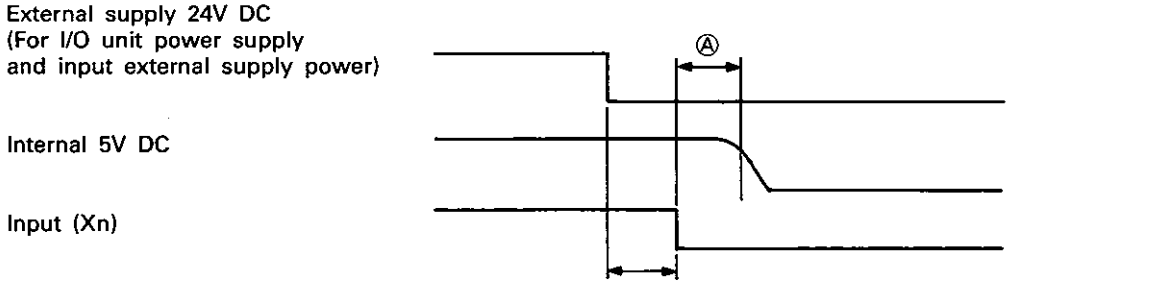
The following power supplies are available for remote I/O stations. For further information, see the MELSECNET/MINI Remote I/O User's Manual.

(a) I/O unit power supply ····· Internally converted to 5V DC and used in the internal circuit of the remote I/O station.
(b) Input external supply power····· Power supply for the input remote I/O unit only.
(c) Output external supply power····· Power supply for the output remote I/O unit only.

(2) For prevention of input fault due to instantaneous power failure of remote I/O station

Input fault may be caused by instantaneous power failure occurring at the remote I/O station power supply.

(a) Input fault caused by instantaneous power failure
The remote I/O hardware uses the I/O unit power supply of 5V DC converted by itself from 24V DC).
If instantaneous power failure occurs at the remote I/O station, the time elapsed until 5V DC in the remote I/O is switched off) becomes greater than the input unit switch-off response time. Hence, input fault occurs if I/O refresh is executed within the period of time indicated by Ⓐ below.



When the input external supply power is switched off, input (Xn) is switched off after the input unit switch-off response time has elapsed.

(b) For prevention of input fault

Cables should be wired so that the same power supply provides power to the power supply module, stabilizing power supply, and input external supply power (AC input only).

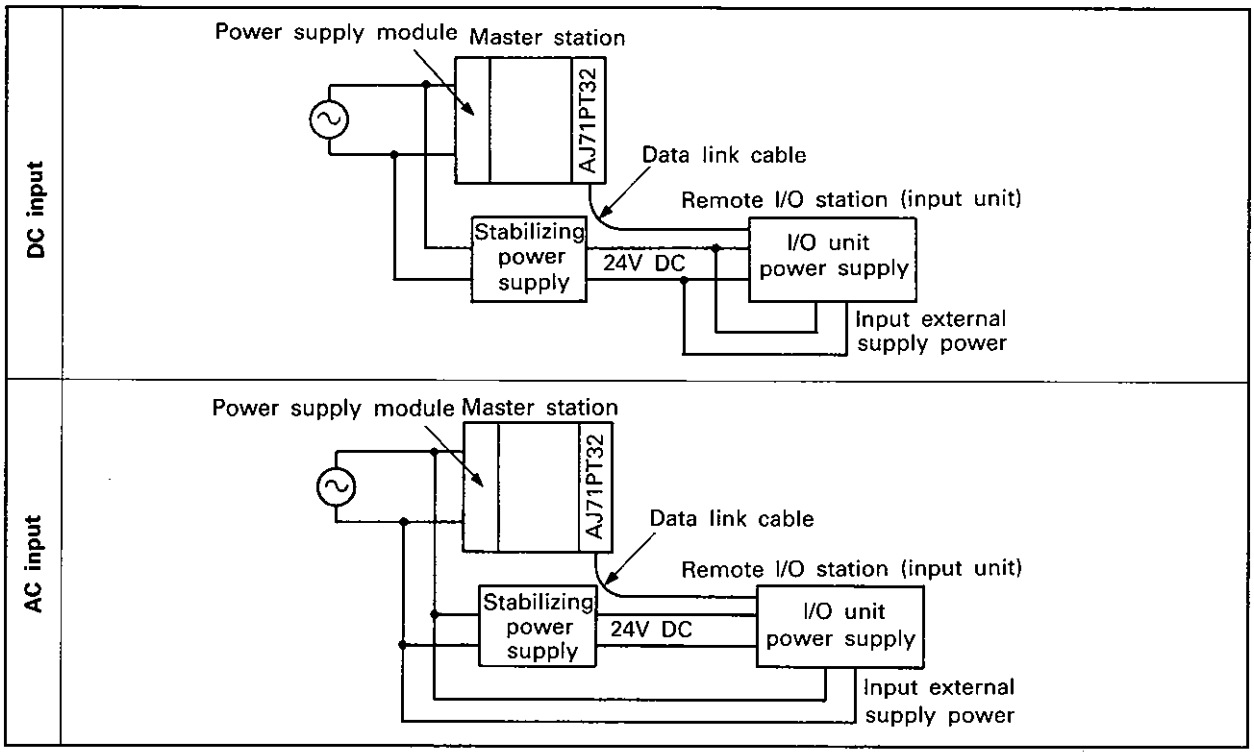
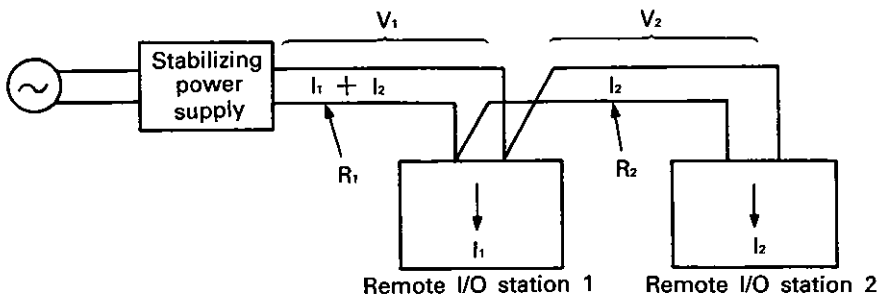


Fig. 2.4 Power Supply Wiring Example

REMARKS

Voltage drop should be taken into consideration when selecting and routing cables for supplying power from one power supply to several remote I/O units.



V_1 : Voltage drop between stabilizing power supply and remote I/O station 1
V_2 : Voltage drop between remote I/O stations 1 and 2
R_1 : Electrical resistance between stabilizing power supply and remote I/O station 1
R_2 : Electrical resistance between remote I/O stations 1 and 2
I_1 : Current consumed by remote I/O station 1
I_2 : Current consumed by remote I/O station 2

(1) Calculating the voltage drop

$$V_1 = R_1 \times (I_1 + I_2)$$
$$V_2 = R_2 \times I_2$$

(2) Calculating the receive terminal voltage of remote I/O station

(Receiving end voltage of remote I/O station 1) = (stabilizing power supply voltage) $- V_1$
(Receiving end voltage of remote I/O station 2) = (stabilizing power supply voltage) $- V_1 - V_2$

The remote I/O station may be connected if its receiving end voltage is equal to or greater than its rated voltage.

3. SPECIFICATIONS

3.1 General Specifications

Table 3.1 shows the common specifications of various units used.

Item	Specifications				
Operating ambient temperature	0 to 55℃				
Storage ambient temperature	−20 to 75℃				
Operating ambient humidity	10 to 90%RH, non-condensing				
Storage ambient humidity	10 to 90%RH, non-condensing				
Vibration resistance	Conforms to *JIS C 0911	**Frequency**	**Acceleration**	**Amplitude**	**Sweep Count**
		10 to 55Hz	——	0.075mm (0.003inch)	10 times
		55 to 150Hz	1g	——	*(1 octave/minute)
Shock resistance	Conforms to *JIS C 0912 (10g × 3 times in 3 directions)				
Noise durability	By noise simulator of 1500Vpp noise voltage, 1μs noise width and 25 to 60Hz noise frequency				
Dielectric withstand voltage	1500V AC for 1 minute across AC external terminals and ground 500V AC for 1 minute across DC external terminals and ground				
Insulation resistance	5MΩ or larger by 500V DC insulation resistance tester across AC external terminals and ground				
Grounding	Class 3 grounding; grounding is not required when it is impossible.				
Operating ambience	Free of corrosive gases. Dust should be minimal.				
Cooling method	Self-cooling				

Table 3.1 General Specifications

REMARKS

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

*JIS: Japanese Industrial Standard

3.2 Performance Specifications

3.2.1 Performance specifications

		AJ71PT32		Remarks
		Optical Data Link	Twisted Pair Data Link	
For one master module	Max. number of link stations	64		No limit to the number of master modules used.
	Input (points)	512		Number of input/output points = 8 per remote I/O station. Total number of input + output points = 512.
	Output (points)	512		
I/O refresh time (ms)		3.2 to 3.9*1		
Communication speed (BPS)		1.5M		
Max. interstation transmission distance (m/ft)		50/164*3	100/328 (50/164)*2	No limit to overall distance.
Number of I/O points occupied		32		Parameter setting of a special function module should be 32 points.
5V DC internal current consumption (A)		0.3		
Weight kg (lb)		0.4 (0.88)		

(1) Max. number of link stations per master module

Indicates that the total number of occupied stations assigned to the remote I/O units is up to 64 stations.
For example, up to 8 compact remote I/O units (AJ35PTF-56DT which occupies 8 stations) can be connected.
For the number of stations occupied by the remote I/O units, see the MELSECNET/MINI Remote I/O User's Manual.

(2) Max. number of link points per master module

Depends on the type of remote I/O unit connected.

Example 1: If 8 compact remote I/O units (AJ35PTF-56DT which occupies 8 stations) are used, 256 input and 192 output points can be controlled.

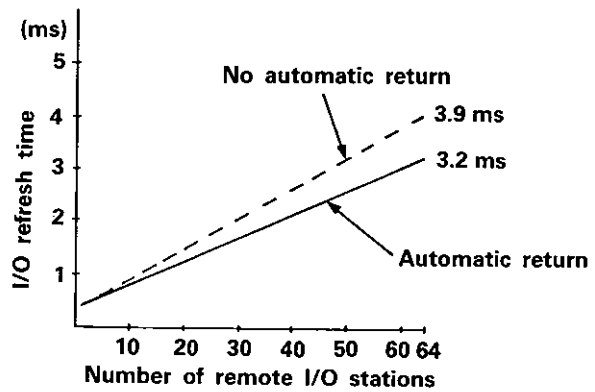
Example 2: If 16 partial refresh type remote I/O units (AJ35PTF-128DT which occupies 4 stations) are used, 1024 input and 1024 output points can be controlled.

REMARKS

Use of the partial refresh type remote I/O unit increases the maximum number of link points per master module but makes the I/O response time longer than the batch refresh type remote I/O unit, e.g. the response time of the AJ35PTF-128DT is 107ms max. for input and 21.5ms for output.

POINT

*1: I/O refresh time depends on the number of remote I/O stations connected, whether automatic return mode has been set or not, and the number of partial refresh type remote I/O units connected.
When partial refresh type remote I/O units are used, (the number of partial refresh type remote I/O units used) × 0.2ms should be added to the I/O refresh time.



*2: The maximum interstation transmission distance depends on the twisted pair cable diameter as follows:

0.2mm²(2.15ft²) to less than 0.5mm²(5.38ft²)·····50m (164ft)
0.5mm²(5.38ft²) or more ····· 100m (328ft)

*3: The interstation transmission distance of the optical fiber cable is between 1(3.28) and 50m(164ft). Normal communication cannot be guaranteed for distances less than 1m.

3

3.2.2 Optical fiber cable specifications

Item	Specifications
Applicable optical cable	Plastic fiber cable
Cable transmission loss	260 dB/km (853 dB/kft)
Minimum optical transmission level	−15 dBm
Maximum optical transmission level	−31 dBm
Optical wave length	660 nm (Visible radiation)
Optical fiber OD	1000 μm
Connector	1-core connector
Minimum allowable bend radius*	25mm(0.98inch) max.*

Table 3.2 Optical Fiber Cable Specifications

*: Applies to the stand-alone remote I/O units which are wired inside the casing.

The following optical fiber cables available from Mitsubishi conform to the specifications in Table 3.2:

Type	Remarks
M-2P-□M-A	PVC coated core cable (standard cable for indoor use, conforming to UL standard)
M-2P-□M-B	Reinforced PVC coated core cable (reinforced cable for indoor use) Cable diameter 5.0mm(0.20inch)
M-2P-□M-C	PE coated core cable (standard cable for indoor use) Cable diameter 2.2mm(0.09inch)

Table 3.3 Optical Fiber Cables

Enter the cable length (m) required in □.

Example: PVC coated core cable of 40m(131ft) length

M-2P-40M-A

3.2.3 Twisted pair cable specifications

Item	Specifications
Cable type	Shield cable
Number of pins	2 or more pins
Conductor resistance (20°C)	88.0Ω/km max.
Insulation resistance	5,000MΩ · km or larger
Dielectric withstand voltage	500V DC, 1 minute
Electrostatic capacity (1kHz)	60nF/km(197nF/kft) max. on average
Characteristic impedance (100kHz)	110 ± 10Ω

Table 3.4 Twisted Pair Cable Specifications

3.3 I/O List for the PC CPU

The master module I/O numbers for the PC CPU are as indicated below.
The following I/O numbers assume that the master module is loaded on slot 0 of the main base unit used with a building block type CPU.

Device No.	Signal	Device No.	Signal
X0	Hardware fault	Y0 to Y17	Reserved
X1	MINI link communicating		
X2	Reserved		
X3		Y18	MINI link communication start
X4		Y19	Reserved
X5	Test mode	Y1A	FROM/TO instruction response designation
X6	MINI link error detection	Y1B	Faulty station data clear designation
X7	MINI link communication error	Y1C	Reserved
X8 to X1F	Reserved	Y1D	Error reset
		Y1E to Y1F	Reserved

Table 3.5 I/O Signal List

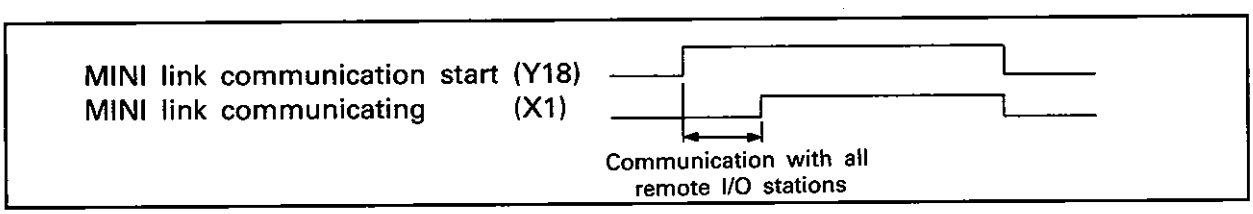
Explanation for the I/O signals

(1) Hardware fault (X0)

(a) On indicates that the master module mode setting switch has been set to any of 6 to 9 or a hardware fault has occurred.
(b) Used as an interlock for the FROM/TO instruction to the master module.

(2) MINI link communicating (X1)

(a) On indicates that the master module has communicated with all remote I/O stations once after Y18 (MINI link communication start) is switched on.
(b) Switched off when Y18 is switched off.
(c) Off indicates that a data communication stop error has occurred.
(d) Used as an interlock for data transfer to and from the master module.



(3) Test mode (X5)

On indicates that the power is switched on with the mode setting switch in any of 3 to 5.

(4) MINI link error detection (X6)·····Communication continued

On indicates that the master station has detected any error in receive data from a remote I/O station.

(a) After X6 is switched on, its state depends on the mode setting (Section 4.3.2) as follows:
- Automatic online return mode
  X6 is switched off after communication is restored.
- No automatic online return mode
  X6 remains on.

(b) The corresponding error code is stored to buffer memory address 108 when X6 is switched on.
The error code is latched. For further details, see Section 3.4.

(5) MINI link communication error (X7)·····Communication stopped

On indicates that the master station is unable to communicate with remote I/O stations.

(a) X7 is switched on when:
- Any remote I/O station power supply is switched off
- Any data link cable is broken
- A communication error has occurred with the mode setting specified for communication stop at the time of online error detection.

(b) The corresponding error code is stored to buffer memory address 107 when X7 is switched on.

(6) MINI link communication start (Y18)

(a) Switch on to start I/O refresh.
(b) X1 is switched on to indicate normal communication with all remote I/O stations.
(c) The FROM area (buffer memory addresses 70 to 192) is cleared when Y18 is switched on.

(7) FROM/TO instruction response designation (Y1A)

Defines priority of access to the master module buffer memory.

(a) Off indicates that the master module processing has priority.
(b) On indicates that the PC CPU's FROM/TO instruction has priority.
(c) The on/off status of Y1A defines the following:

Item \ FROM/TO Instruction Response Designation (Y1A)	OFF	ON
Access to buffer memory	Priority given to master module.	Priority given to PC CPU's FROM/TO instruction.
Receive (input) data read from several stations by one FROM instruction	The receive data refreshed at the same timing can be read.	The receive data refreshed at different timings may be read.
FROM/TO instruction processing time	There is a delay of (0.3ms + 0.2ms × (number of partial refresh stations connected)) max.	No delay.

Table 3.6 FROM/TO Instruction Response Designation

(8) Faulty station data clear designation (Y1B)

Specify whether the receive data from a faulty remote I/O station is cleared or not.
Y1B is independent of the transmission data to a faulty station.

Faulty Station Data Clear Designation (Y1B) / Master Module Buffer Memory	OFF	ON
Transmission data for batch refresh (addresses 10 to 41)	———	———
Receive data for batch refresh (addresses 110 to 141)	Data at occurrence of communication error is retained.	All points are switched off.
Transmission data for partial refresh (addresses 300 to)	———	———
Receive data for partial refresh (addresses 600 to)	Data at occurrence of communication error is retained.	All points are switched off.

Table 3.7 Faulty Station Data Clear Designation

POINT

It is suggested to use no automatic return mode (mode setting switch = 1) when Y1B is on.

(9) Error reset (Y1D)

Used to reset an error when X6 or X7 is switched on.

(a) The error indicated by X6 or X7 can be reset by switching on Y1D when Y18 is off.
(b) Clears the communication error code (buffer memory address 107) and error detection code (address 108).
(c) Switches off the corresponding input device (X6, X7).
(d) ERR. LED reset
Switches off the corresponding error indicator LED (ERR. LOOP LED, ERR. REM LED).

3.4 Buffer Memory

The master module has a buffer memory (not battery backed) for communication of data with the PC CPU.

3.4.1 Buffer memory assignment

Address (Decimal)		Description	Refresh System Availability		
			Batch refresh	Partial refresh	
0	Number of remote I/O stations	Define the remote I/O station range for I/O refresh.	○	○	Can be accessed by the PC CPU.
1	Number of retries	Define the number of retries at occurrence of communication error.	○	○	
		Reserved	—	—	
10 to 41	Transmission data for batch refresh	Stores data output to batch refresh type remote I/O stations.	○	×	
		Reserved	—	—	
70 to 77	Remote I/O station card data	Stores I/O unit types used as remote I/O stations.	○	○	Only read from the PC CPU.
		Reserved	—	—	
90 to 93	Accumulative faulty station detection	Stores faulty station numbers until reset by the sequence program.	○	○	Can be accessed by the PC CPU.
		Reserved	—	—	Only read from the PC CPU.
100 to 103	Faulty station detection	Stores the most recent faulty station numbers.	○	○	
		Reserved	—	—	
107	Communication error code	Stores the reason why X7 (MINI link communication error) has been switched on.	○	○	
108	Error detection code	Latches the ON/OFF state of X6 (MINI link error detection).	○	○	
		Reserved	—	—	
110 to 141	Receive data for batch refresh	Stores the input data to batch refresh type remote I/O stations.	○	×	
		Reserved	—	—	
160	Line error retry counter	Stores the number of retries made when communication cannot be made with all remote I/O stations due to line error.	○	○	
161 to 192	Retry counter	Stores the number of retries made to the faulty station.	○	○	
		Reserved	—	—	
250 to 282	Partial refresh station	Write the partial refresh type remote I/O station numbers and the numbers of digits specified (numbers of partial refresh times).	×	○	Can be accessed by the PC CPU.
		Reserved	—	—	
300 to 555	Transmission data for partial refresh	Stores data output to partial refresh type remote I/O stations.	×	○	
		Reserved	—	—	
598	Accumulative input error detection	Holds the partial refresh input data receive error until reset by the sequence program.	×	○	
599	Input faulty station detection	Stores the partial refresh input data receive error.	×	○	
600 to 855	Receive data for partial refresh	Stores input data to partial refresh type remote I/O stations.	×	○	Only read from the PC CPU.

POINT

(1) The buffer memory is cleared (to 0) and 2 written to address 1 (number of retries) when the PC CPU is powered up or reset.
(2) Any data must not be written to other than addresses 0, 1, 10 to 41, 90 to 93, 250 to 282, 300 to 555, 598 and 599 from the PC CPU.
(3) The reserved areas are used by the master module system.
(4) Data in the read-only areas including the reserved areas can be read from the PC CPU sequentially, e.g. data can be read from the accumulative faulty station detection (addresses 90 to 93) and faulty station detection (addresses 100 to 103) areas by using one FROM instruction.

3.4.2 Buffer memory and data location

(1) Number of remote I/O stations (address 0)

(a) Define the remote I/O station range for I/O refresh.
(b) I/O refresh is performed for up to the remote I/O station specified in address 0.
For example, remote I/O stations 1 to 20 are refreshed when 20 is set to address 0.
(c) Specify the last remote I/O station number connected to the master module.
The value specified should include the number of occupied stations if the last remote I/O station occupies two or more stations, e.g. set 13 to address 0 to allow data link for up to station 10 that occupies 4 stations.
(d) Defaults to 0.
(e) Any value between 1 and 64 may be specified. Any value set outside this range flags an initial data error when Y18 is switched on.
(f) The number of remote I/O stations should be written to address 0 with Y18 off as the value on the leading edge of Y18 is valid.

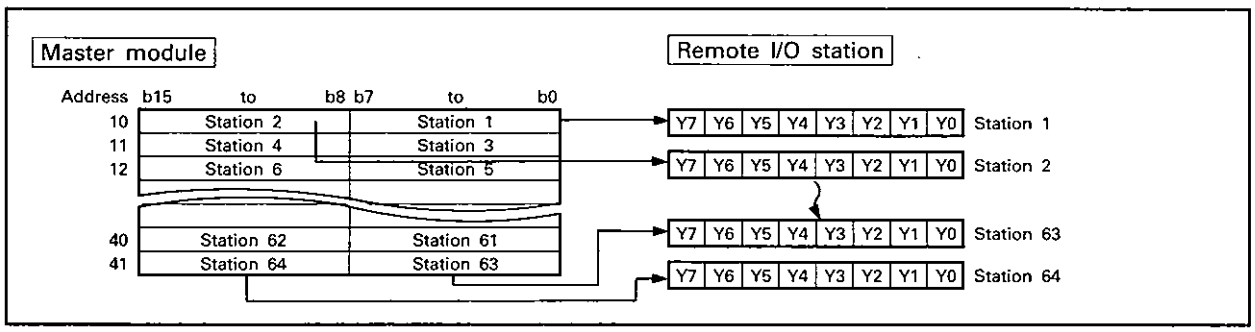
(2) Number of retries (address 1)

(a) Define the number of retries made to the faulty remote I/O station.
(b) Defaults to 2.
(c) Any value between 0 and 32 may be specified.
(d) The number of retries should be written to address 1 when Y18 is off as the value on the leading edge of Y18 is valid.
(e) A communication error occurs if the faulty remote I/O station cannot be restored after retry is made the specified number of times.

(3) Transmission data for batch refresh (addresses 10 to 41)

(a) Output to output remote I/O stations.

(b) Buffer memory assignment is as follows:



(c) Batch refresh transmission data is made up of 8 bits per remote I/O station as shown below.

bn+7	bn+6	bn+5	bn+4	bn+3	bn+2	bn+1	bn+0
Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0

1: ON
0: OFF

*: n depends on the remote I/O station number.
b0 to b7 for odd-numbered stations 1, 3 ····· 63
b8 to b15 for even-numbered stations 2, 4 ····· 64

(4) Remote I/O station card data (addresses 70 to 77)

(a) Stores the card data of the I/O units used as remote I/O stations.

(b) There are three types of card data which are expressed in two bits.

00: Indicates that there is no remote I/O station or the station could not make initial communication.
01: Indicates an input remote I/O station.
10: Indicates an output remote I/O station.

(c) Data is made up as indicated below:

Address	b15 b14	b13 b12	b11 b10	b9 b8	b7 b6	b5 b4	b3 b2	b1 b0
70	Station 8	Station 7	Station 6	Station 5	Station 4	Station 3	Station 2	Station 1
71	Station 16	Station 15	Station 14	Station 13	Station 12	Station 11	Station 10	Station 9
	Station 24	Station 23	Station 22	Station 21	Station 20	Station 19	Station 18	Station 17
76	Station 56	Station 55	Station 54	Station 53				
77	Station 64	Station 63	Station 62	Station 61	Station 60	Station 59	Station 58	Station 57

(d) Remote I/O station card data is processed only once when Y18 is switched on.

(5) Accumulative faulty station detection (addresses 90 to 93)

(a) Sets 1 to the bit corresponding to the faulty remote I/O station.

(b) The corresponding bit is not reset to 0 if the faulty station is restored. Addresses 90 to 93 indicate accumulative faulty stations indicated in the faulty station detection area (addresses 100 to 103).

(c) Reset to 0 when Y18 is switched on.

(d) The data make-up is as indicated below:

Address	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
90	Station 16	Station 15	Station 14	Station 13	Station 12	Station 11	Station 10	Station 9	Station 8	Station 7	Station 6	Station 5	Station 4	Station 3	Station 2	Station 1
91	Station 32	Station 31	Station 30	Station 29	Station 28	Station 27	Station 26	Station 25	Station 24	Station 23	Station 22	Station 21	Station 20	Station 19	Station 18	Station 17
92	Station 48	Station 47	Station 46	Station 45	Station 44	Station 43	Station 42	Station 41	Station 40	Station 39	Station 38	Station 37	Station 36	Station 35	Station 34	Station 33
93	Station 64	Station 63	Station 62	Station 61	Station 60	Station 59	Station 58	Station 57	Station 56	Station 55	Station 54	Station 53	Station 52	Station 51	Station 50	Station 49

1: Error
0: Normal

(6) Faulty station detection (addresses 100 to 103)

(a) Sets 1 to the bit corresponding to the faulty remote I/O station. 1 indicates that normal communication could not be made after retry processing had been performed the specified number of times (address 1).

(b) In automatic return mode, the corresponding bit is reset to 0 when the faulty station is restored.
In no automatic return mode, the corresponding bit remains 1.

(c) Any faulty station is detected when Y18 is on. Data is held when Y18 is off.

(d) Data is made up as indicated below:

Address	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
100	Station 16	Station 15	Station 14	Station 13	Station 12	Station 11	Station 10	Station 9	Station 8	Station 7	Station 6	Station 5	Station 4	Station 3	Station 2	Station 1
101	Station 32	Station 31	Station 30	Station 29	Station 28	Station 27	Station 26	Station 25	Station 24	Station 23	Station 22	Station 21	Station 20	Station 19	Station 18	Station 17
102	Station 48	Station 47	Station 46	Station 45	Station 44	Station 43	Station 42	Station 41	Station 40	Station 39	Station 38	Station 37	Station 36	Station 35	Station 34	Station 33
103	Station 64	Station 63	Station 62	Station 61	Station 60	Station 59	Station 58	Station 57	Station 56	Station 55	Station 54	Station 53	Station 52	Station 51	Station 50	Station 49

1: Error
0: Normal

(7) Communication error code (address 107)

(a) Stores the corresponding error code when X7 is switched on.

(b) Communication error codes are as follows:

Code	Definition	Cause
0	No error	————
1	Initial data error	The number of remote I/O stations or retries is invalid.
2	Line error	A link cable is broken or a remote I/O station power is off.
3	Station fault	Communication has stopped due to a station fault with communication stop mode specified for fault detection.

(c) The communication error code is reset to 0 when Y18 or Y1D is switched on.

(8) Error detection code (address 108)

(a) 1 indicates that X6 has been switched on. 0 indicates normal.

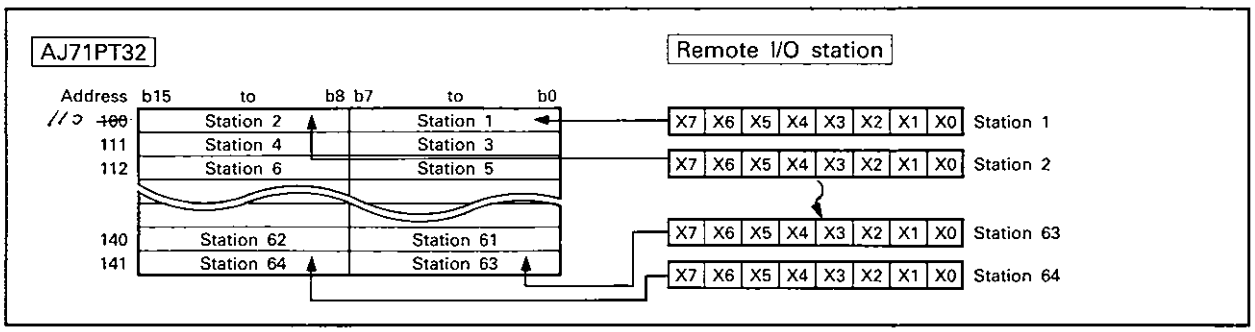
(b) In automatic return mode (mode setting switch = 0), the error detection code remains 1 but X6 is switched off when communication is restored.

(c) Reset to 0 when Y18 or Y1D is switched on.

(9) Receive data for batch refresh (addresses 110 to 141)

(a) Stores ON/OFF data input to the input remote I/O stations.

(b) Buffer memory assignment is as indicated below:



(c) Batch refresh receive data is made up of 8 bits per remote I/O station as shown below:

bn+7	bn+6	bn+5	bn+4	bn+3	bn+2	bn+1	bn+0
X7	X6	X5	X4	X3	X2	X1	X0

1: ON
0: OFF

*: n depends on the remote I/O station number.
b0 to b7 for odd-numbered stations 1, 3 ····· 63
b8 to b15 for even-numbered stations 2, 4 ····· 64

(10) Line error retry counter (address 160)

(a) Stores the number of retry times after a line error has occurred.

(b) Reset to 0 when communication is restored.

(c) Stores the value from address 1 (number of retries) when X7 is switched on.

(11) Retry counter (addresses 161 to 192)

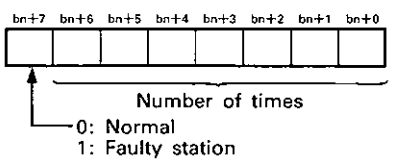
(a) Receives the number of retries made to the faulty remote I/O station.

(b) Reset to 0 when communication is restored.

(c) Buffer memory assignment is as indicated below:

Address	b15 to b8	b7 to b0
161	Station 2	Station 1
162	Station 4	Station 3
163	Station 6	Station 5
191	Station 62	Station 61
192	Station 64	Station 63

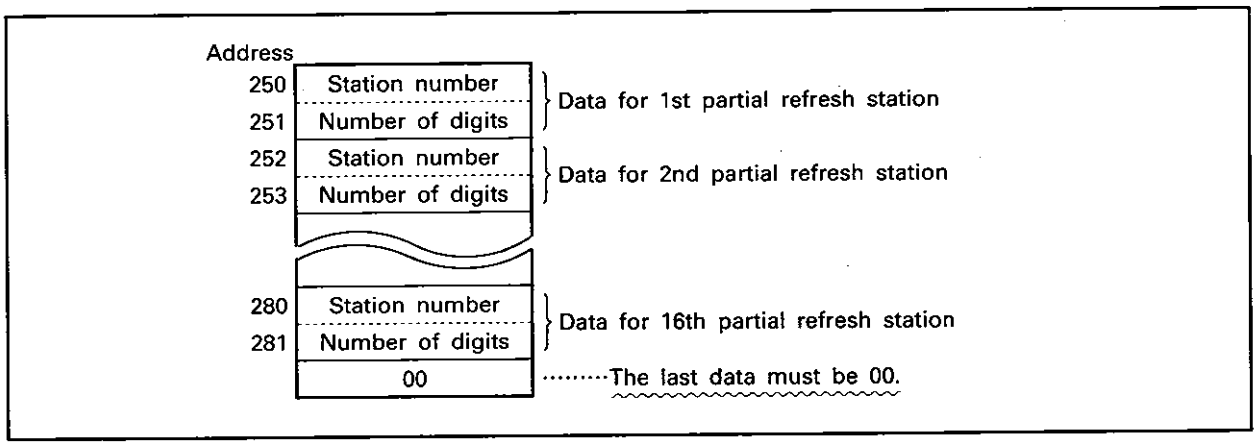
(d) The retry counter has 8 bit locations per remote I/O station as shown below:



*: n depends on the remote I/O station number.
b0 to b7 for odd-numbered stations 1, 3 ····· 63
b8 to b15 for even-numbered stations 2, 4 ····· 64

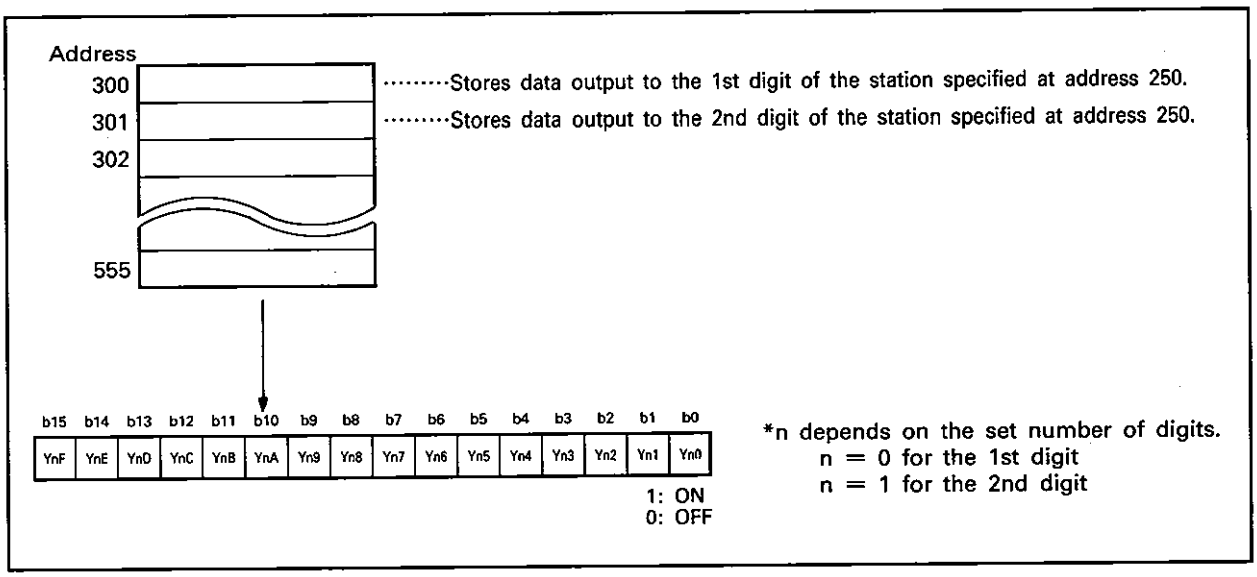
(12) Partial refresh station (addresses 250 to 282)

Specify the station numbers and the numbers of digits (values obtained by dividing the numbers of input and output points by 16) when using the partial refresh type remote I/O units.



(13) Transmission data for partial refresh (addresses 300 to 555)

Stores data output to the partial refresh type remote I/O units. The buffer memory assignment depends on the partial refresh station setting (addresses 250 to 282). For further information, see Section 5.4.



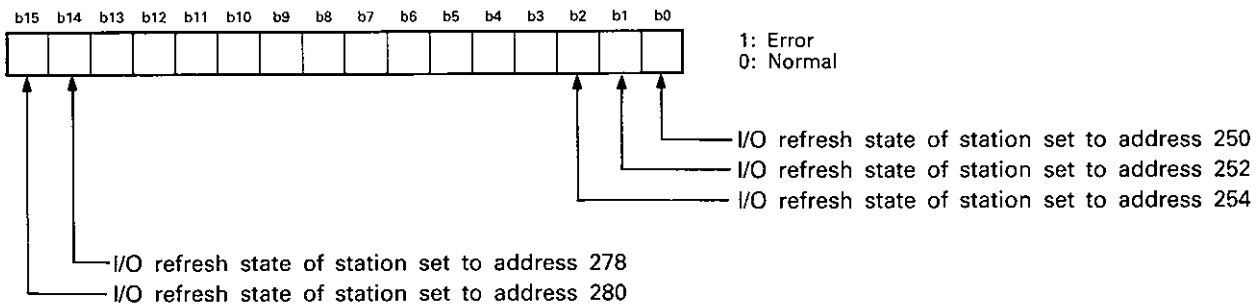
(14) Accumulative input faulty station detection (address 598)

(a) Stores the I/O refresh states of the partial refresh type remote I/O stations. 1 indicates that the input data could not been read within the given period of time.

(b) The corresponding bit is not reset to 0 if the input faulty station is restored to normal, and has the accumulative result of the faulty stations detected by input faulty station detection (address 599).

(c) Reset to 0 when Y18 is switched on.

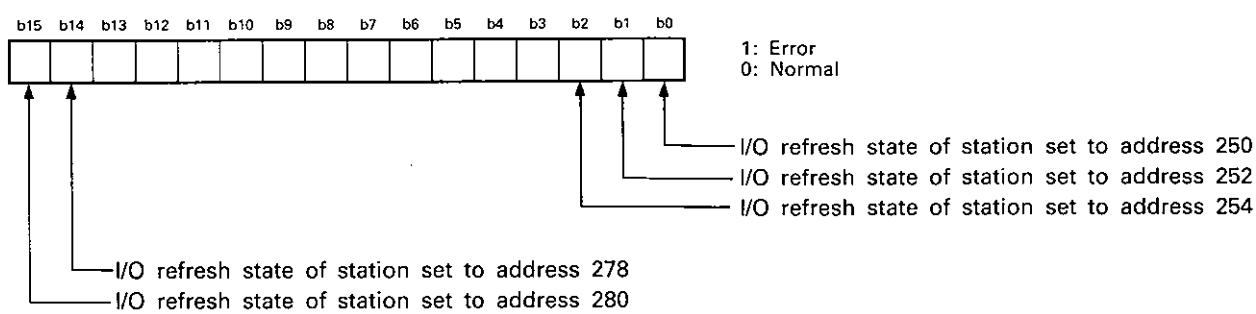
(d) The buffer memory stores the following data. The error data locations for individual stations depend on the partial refresh station setting.



(15) Input faulty station detection (address 599)

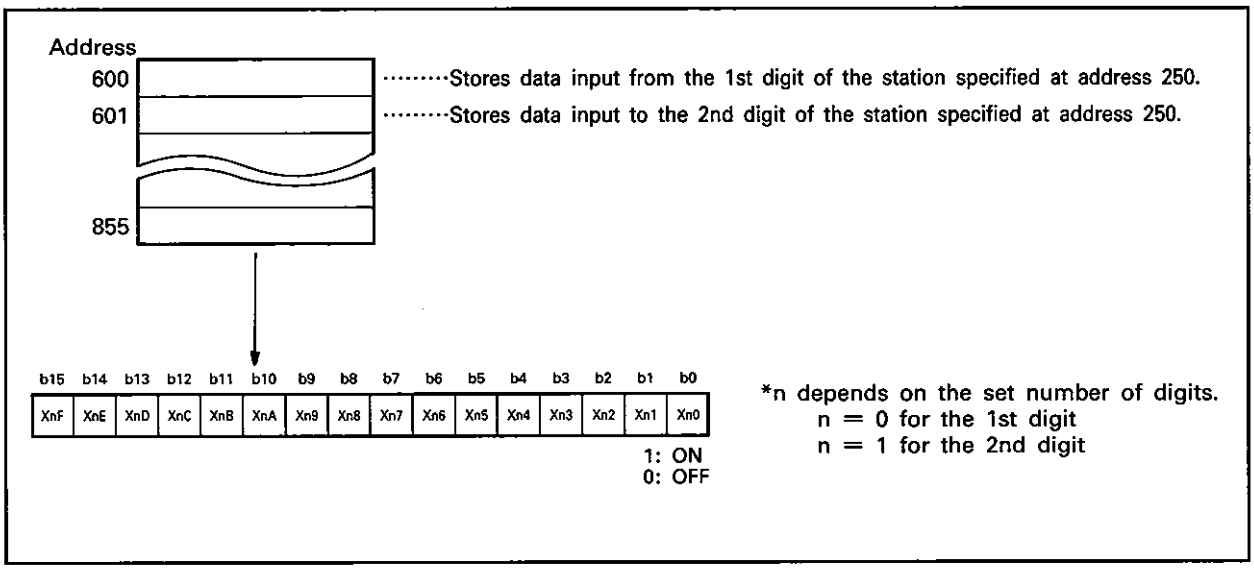
(a) Stores the I/O refresh states of the partial refresh type remote I/O stations. 1 indicates that the input data could not been read within the given period of time.

(b) The buffer memory stores the following data. The error data locations for individual stations depend on the partial refresh station setting.



(16) Receive data for partial refresh (addresses 600 to 855)

Stores data input from the partial refresh type remote I/O units. The buffer memory assignment depends on the partial refresh station setting (addresses 250 to 282). For further information, see Section 5.4.



3.4.3 Buffer memory assignment and the number of stations occupied

The buffer memory addresses for remote I/O station data are determined by the remote I/O station number.
When one remote I/O unit occupies two or more stations, the remote I/O station data is stored as explained below:

(1) Remote I/O data of the occupied stations is stored sequentially to addresses starting at the one corresponding to the specified station number.
For example, if the remote I/O station occupying four stations is set to 1, output data is stored to addresses 10 and 11 and input data to addresses 110 and 111.

(2) Several remote I/O stations are accounted for as one faulty station control unit if a communication error occurs at any of those stations.
For example, if the AJ35PTF-28AS compact remote I/O station (which has 16 input and 12 output points and occupies four stations which are accounted for as one faulty station control unit) is set to station 1, stations 1 to 4 are treated as faulty when the fuse blows.

See the MELSECNET/MINI Remote I/O User's Manual for the number of stations occupied by remote I/O stations and the unit of faulty station control.

3.5 I/O Refresh

I/O refresh indicates I/O data transfer between the master station (master module buffer memory) and remote I/O stations.
Input data is transferred from the remote I/O stations to the buffer memory.
Output data is written from the PC CPU to the buffer memory and output to the remote I/O stations.

I/O refresh processing is performed in accordance with the remote I/O unit type.

(1) Batch refresh type remote I/O unit
Remote I/O station data is transferred by one I/O refresh.
(2) Partial refresh type remote I/O unit
Remote I/O station data is transferred by several I/O refreshes. Specify the number of I/O refresh times (number of digits) in the master module buffer memory by using the sequence program. For full information, see Section 5.4.

I/O refresh execution changes in accordance with the PC CPU operating status and MINI link communication status. See Sections 3.5.1 and 3.5.2.

3.5.1 Relation between PC CPU operating status and I/O refresh

I/O refresh of the MINI link is performed when the master module is in online mode (mode setting switch = 0 to 2 ····· see Section 4.3.2) and Y18 (MINI link communication start) is on.
I/O refresh is stopped by switching off Y18.

(1) Input remote I/O station
(a) During I/O refresh, remote I/O station input data is continually stored to the receive data area (buffer memory addresses 110 to 141, 600 to 855).
(b) When I/O refresh is stopped, the receive data at the time of I/O refresh stop is retained.
(2) Output remote I/O station
(a) During I/O refresh, transmission data (buffer memory addresses 10 to 41, 300 to 555) is output to the output remote I/O stations.
(b) When I/O refresh is stopped, the output unit states depend on their E.C. MODE switch positions.
For full information on the E.C. MODE switch, see the MELSECNET-MINI Remote I/O User's Manual.

I/O Refresh / E.C. MODE Switch	During I/O Refresh (Y18 ON)	I/O Refresh Stop (Y18 OFF)
ON	Output remote I/O units are switched on/off in accordance with the transmission data.	All outputs are switched off.
OFF		Output states at the time of I/O refresh stop is retained.

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3.5.2 I/O refresh at occurrence of communication error

(1) Data communication between the master and remote I/O stations may be continued or stopped in accordance with the error occurring. For further details, see Section 6.1.

(2) Communication error processing depends on Y1B (faulty station data clear designation) on/off state as follows:

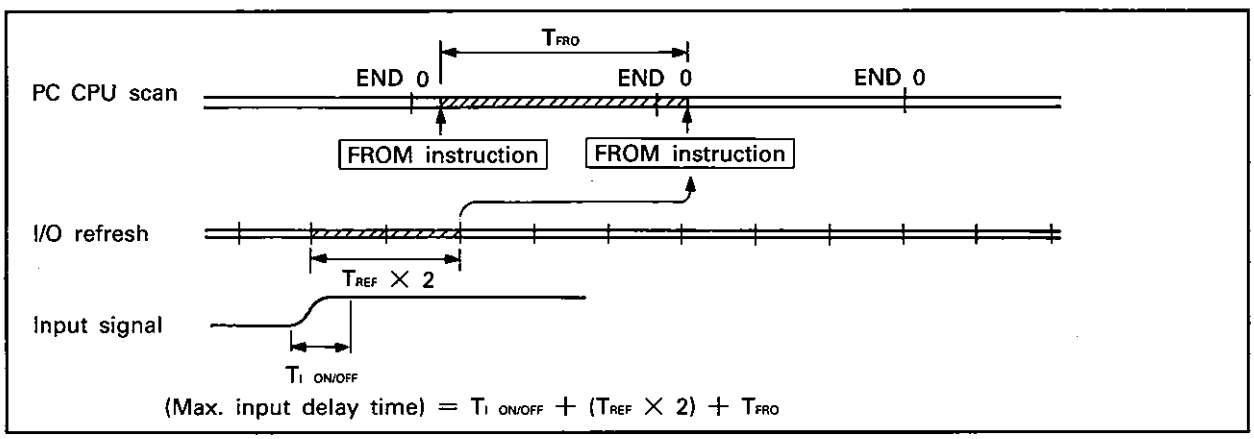
(a) Y1B off
Input data from the faulty remote I/O station is not stored to the buffer memory. The data at error occurrence is retained.
For example, if station 5 becomes faulty in a system of 10 remote I/O stations, the input data of station 5 at error occurrence is retained and the input data of stations 1 to 4 and 6 to 10 is stored to the buffer memory.

(b) Y1B on
All input data from the faulty remote I/O station is cleared.

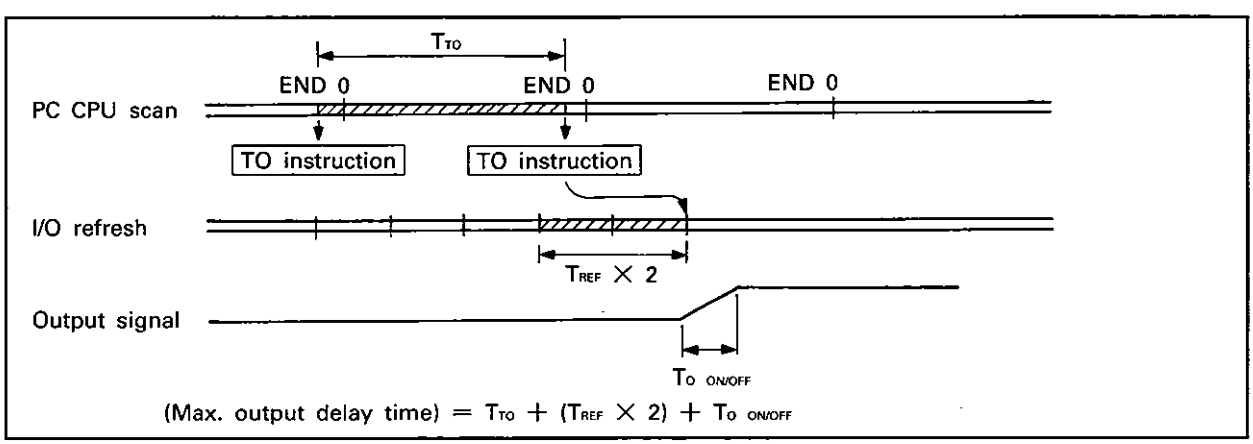
3.5.3 I/O delay time in remote I/O stations

The following I/O signal delays may occur in the MINI link.

(1) The following delays may occur until the PC CPU reads an input signal from a remote I/O station.
  (a) Input remote I/O station response time ($T_{I\ ON/OFF}$)
  Indicates the period of time required for the input unit to be switched from on to off or from off to on. For further details, see the MELSECNET/MINI Remote I/O User's Manual.
  (b) MINI link I/O refresh time (T_{REF})
  See Section 3.2.1.
  (c) FROM instruction processing time (T_{FRO})
  There is a maximum of 1 scan delay if the FROM instruction is executed once during a scan of the sequence program.



(2) The following delays may occur until the PC CPU provides an output signal from an output remote I/O station.
  (a) TO instruction processing time (T_{TO})
  There is a maximum of 1 scan delay if the TO instruction is executed once during a scan of the sequence program.
  (b) MINI link I/O refresh time (T_{REF})
  (c) Output remote I/O station response time ($T_{O\ ON/OFF}$)
  Indicates the period of time required for the output unit to be switched from on to off or from off to on. For further information, see the MELSECNET/MINI Remote I/O User's Manual.



Exercise:

Suppose that the FROM and TO instructions are executed during one sequence program scan under the following conditions:

PC CPU scan time (T_{FRO}, T_{TO}) = 50 ms
I/O refresh time (T_{REF}) = 3.9 ms
Remote I/O unit input response time ($T_{I\ ON/OFF}$) = 25 ms
Remote I/O unit output response time ($T_{O\ ON/OFF}$) = 12 ms

(Max. input delay time) $= T_{I\ ON/OFF} + (T_{REF} \times 2) + T_{FRO}$
$= 25 + (3.9 \times 2) + 50$
$= \underline{82.8\ (ms)}$

(Max. output delay time) $= T_{TO} + (T_{REF} \times 2) + T_{O\ ON/OFF}$
$= 50 + (3.9 \times 2) + 12$
$= \underline{69.8\ (ms)}$

4. PRE-OPERATION SETTING AND PROCEDURE

4.1 Master Module Handling Instructions

(1) Do not subject to the master module to impact or shock.

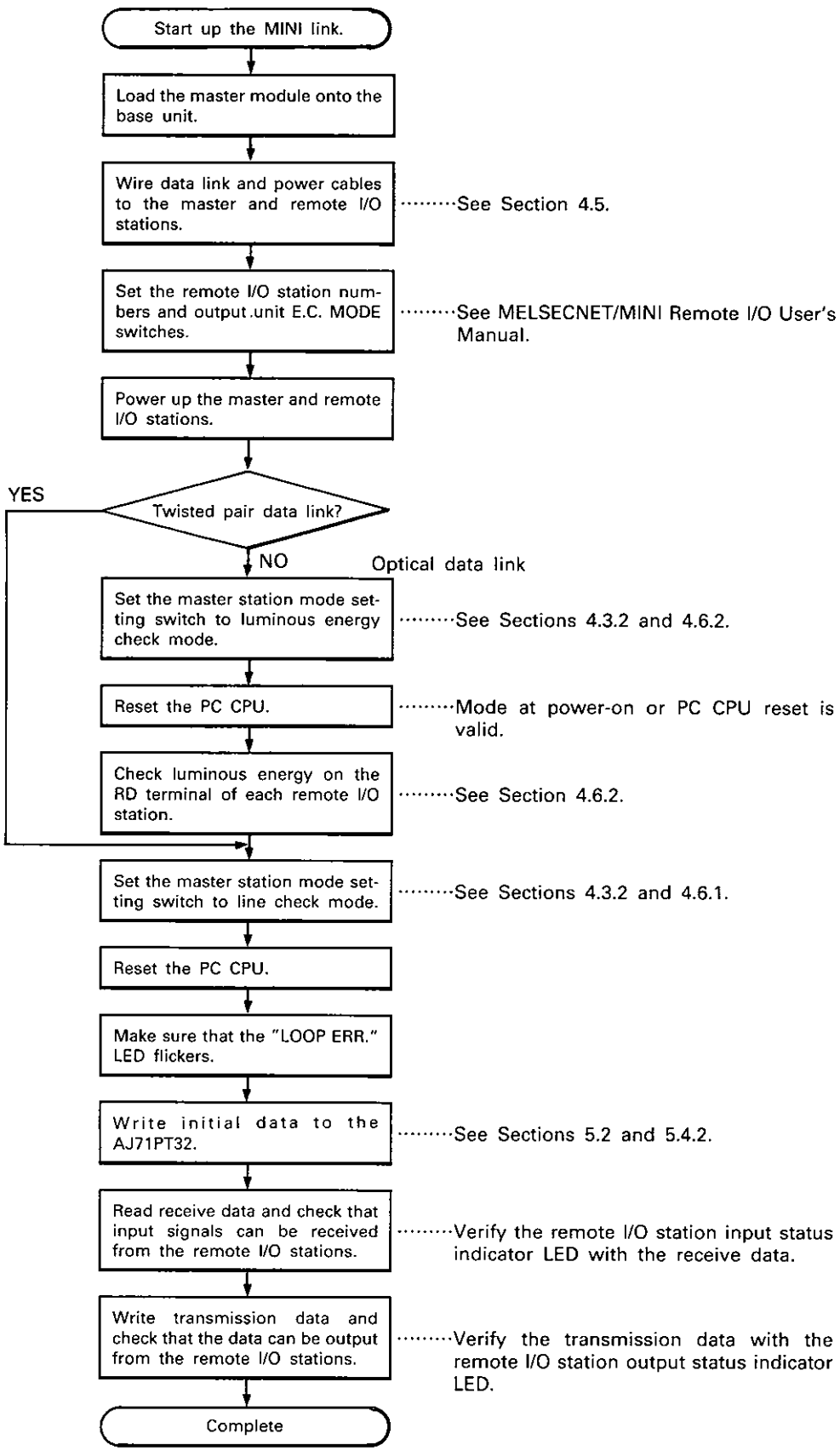
(2) Do not remove printed circuit boards from the housing. There are no user-serviceable parts on the boards.

(3) Ensure that no conductive debris can enter the module. If it does, make sure that it is removed. Guard particularly against wire offcuts.

(4) Tighten module mounting screws (optional) to 8(6.93)-14kg·cm(12.1lb·inch) torque.

(5) To load the module onto the base, hook the two lower lugs into the cut out and gently swing the module into place. Ensure that the top catch engages. To remove the module, press the top catch and swing the module out before unhooking the lower lugs. (For further details, see the corresponding CPU User's Manual.)

4.2 Pre-Operation Setting and Procedure



4.3 Master Station Nomenclature and Settings

4.3.1 Master module nomenclature

For settings, see Sections 4.3.2 and 4.3.3.

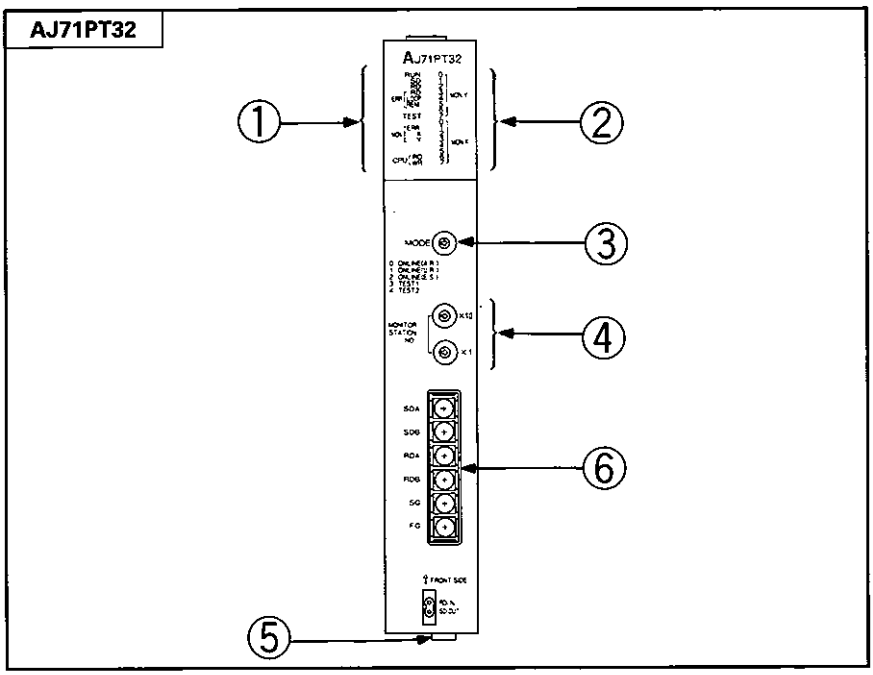


Fig. 4.1 Master Module External Views

No.	Description	Explanation
①	Operating status indicator LEDs	Indicate operating status, error definitions, etc.

LED		Definition
RUN		On indicates that the master module is normal. Off indicates a hardware fault.
SD		Flicker indicates that data is being transmitted.
RD		Flicker indicates that data is being received.
ERR.	RD	On indicates that a receive data error has occurred.
	LOOP	On indicates that a line error has occurred.
	REM	On indicates that a station is faulty.
TEST		On indicates test mode.
MON.	ERR.	On indicates that the remote I/O station selected by the monitor station number setting switch is faulty.
	X	On indicates that the remote I/O station selected by the monitor station number setting switch is an input unit.
	Y	On indicates that the remote I/O station selected by the monitor station number setting switch is an output unit.
CPU	RD	On indicates that the FROM instruction has been executed from the PC CPU.
	WR	On indicates that the TO instruction has been executed from the PC CPU.

<table>
<tr><th>No.</th><th>Description</th><th>Explanation</th></tr>
<tr><td>②</td><td>Remote I/O station monitoring LEDs</td><td>Indicates the I/O status of the corresponding remote I/O station selected by the monitor station number setting switch.
<table>
<tr><th colspan="2">LED</th><th>Definition</th></tr>
<tr><td rowspan="8">MON.</td><td>Y0</td><td rowspan="8">Indicates the transmission data of the remote I/O station selected by the monitor station number setting switch.</td></tr>
<tr><td>Y1</td></tr>
<tr><td>Y2</td></tr>
<tr><td>Y3</td></tr>
<tr><td>Y4</td></tr>
<tr><td>Y5</td></tr>
<tr><td>Y6</td></tr>
<tr><td>Y7</td></tr>
<tr><td rowspan="8">MON.</td><td>X0</td><td rowspan="8">Indicates the receive data of the remote station selected by the monitor station number setting switch.</td></tr>
<tr><td>X1</td></tr>
<tr><td>X2</td></tr>
<tr><td>X3</td></tr>
<tr><td>X4</td></tr>
<tr><td>X5</td></tr>
<tr><td>X6</td></tr>
<tr><td>X7</td></tr>
</table></td></tr>
<tr><td>③</td><td>Mode setting switch</td><td>Used to switch the link module mode.</td></tr>
<tr><td>④</td><td>Monitor station number setting switch</td><td>Sets the remote I/O station number to be monitored on the corresponding remote I/O station monitoring LED.</td></tr>
<tr><td>⑤</td><td>Optical link data transfer connector</td><td>For optical fiber cables.</td></tr>
<tr><td>⑥</td><td>Twisted pair link data transfer terminal block</td><td>Used to connect twisted pair cables. Terminal screws are M4.</td></tr>
</table>

4.3.2 Mode setting switch

Any of the following MINI link operation modes is selected by the mode setting switch.
For further details of test modes, see Section 4.6.

Switch Position	Mode	Description	Remarks
0	ONLINE (A.R.)	Online automatic return Disconnects a faulty remote I/O station from the system and continues I/O refresh with the other stations if a communication error occurs and automatically returns the faulty station to the system when the fault is removed.	Online mode
1	ONLINE (U.R.)	Online no-automatic return Disconnects a faulty remote I/O station from the system and continues I/O refresh with the other stations if a communication error occurs. The system should be restarted up to return the faulty station to the system.	Online mode In online no-automatic return mode, all outputs of the faulty remote I/O station are switched off independently of its E.C. MODE switch setting (ON/OFF).
2	ONLINE (E.S.)	Communication stop at online error detection Disconnects all remote I/O stations (stops I/O refresh) from the system if a communication error occurs at any remote I/O station. The system should be restarted up to return all stations to the system.	Online mode
3	TEST 1	Line check mode Checks for MINI link hardware fault and cable breakage.	Test mode
4	TEST 2	Luminous energy check mode Measures luminous energy at the receive terminal of each remote I/O station in an optical data link system.	Test mode
5 to 9	——	Not used	The TEST LED is lit when 5 is selected. The RUN and TEST LEDs are switched off when any of 6 to 9 is selected.

Table 4.1 Mode Setting Switch Positions and Functions

4.3.3 Monitor station number setting switch

By setting this switch as required, the I/O status of the corresponding batch refresh type remote I/O station can be monitored by the LED on the master module front panel.
The I/O status of any partial refresh type remote I/O station cannot be monitored.

(1) Set the required remote I/O station number.

(2) The following states can be monitored:

(a) Corresponding remote I/O station communication status ("MON. ERR" LED)
- On indicates that a communication error has been detected. Off indicates a normal communication status.

(b) Corresponding remote I/O station unit status ("MON. X, Y" LEDs)
- The "MON. X" LED is lit to indicate that the remote I/O station is an input unit.
- The "MON. Y" LED is lit to indicate that the remote I/O station is an output unit.
- All "MON. X, Y" LEDs are switched off when the PC CPU is powered up or reset.

(c) Corresponding remote I/O station I/O status ("MON. Y0 to Y7, MON. X0 to X7" LEDs)
- The "MON. Y0 to Y7" LEDs indicate the contents of the transmission data area (buffer memory addresses 10 to 41).
- The "MON. X0 to X7" LEDs indicate the contents of the receive data area (buffer memory addresses 110 to 141).

(3) The remote I/O station status can only be monitored when the mode setting switch is set to 0, 1 or 2. (online mode).

POINT

Remote I/O station I/O status monitoring allows the batch refresh transmission and receive data in the buffer memory to be displayed.
When Y18 (MINI link communication start) is off, I/O refresh remains stopped and remote I/O station I/O status monitoring displays the status at the time of Y18 switch-off.

4.4. Setting the Remote I/O Station Numbers

Specify the remote I/O station numbers to determine the buffer memory addresses for remote I/O station data, noting the following:

(1) Any station number must not be changed during I/O refresh to prevent input or output fault.

(2) Station numbers may be set between 1 and 64.

(3) The I/O refresh range depends on the number of remote I/O stations (buffer memory address 0). For example, if 10 exists at address 0, I/O refresh is performed with remote I/O stations 1 to 10. For further information, see Section 5.2.

(4) Station numbers do not have to be sequential, e.g. as shown in Fig. 4.2.

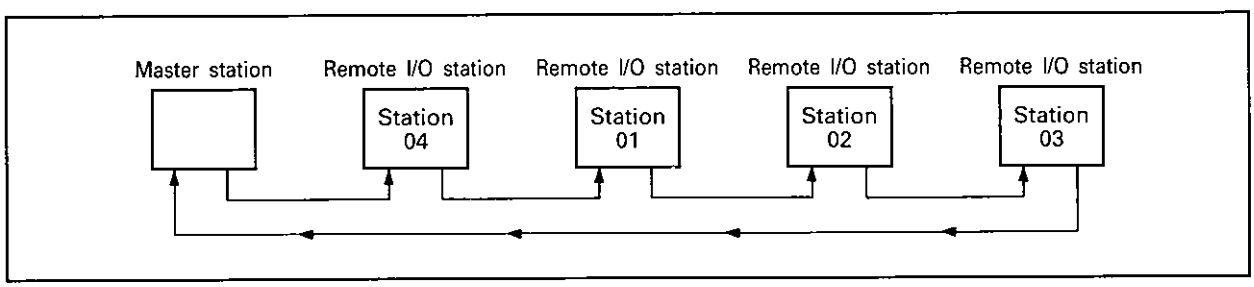


Fig. 4.2 Remote I/O Station Number Setting

REMARKS

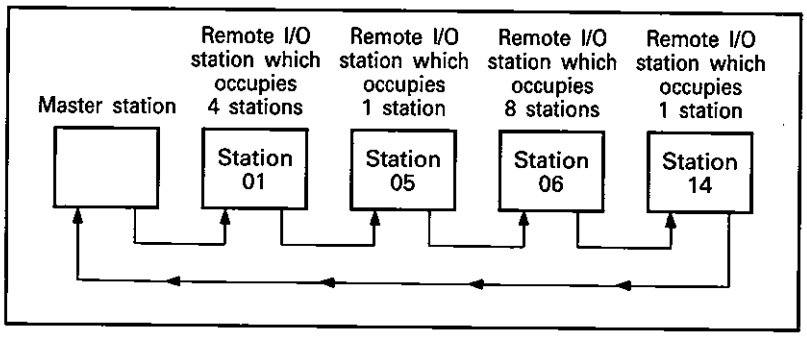
It is suggested to set sequential numbers to the input and output remote I/O stations individually so that the transmission and receive data is transferred sequentially.
For instance, if there are 10 input and 10 output remote I/O stations, set 1-10 to the input remote I/O stations and 11-20 to the output stations. This defines the receive data addresses as 110-114 and the transmission data addresses as 15-19 to allow sequential data transfer.

(5) Remote I/O station numbers must not be skipped. Any station with a number specified but without a remote I/O unit connected is regarded as faulty.

POINT

(1) A remote I/O station number must not be repeated in the same loop. After setting, check that the same number has not been used more than once.

(2) Station numbers must be specified in accordance with the number of stations occupied by the remote I/O station, e.g. the remote I/O station that occupies four stations (station 01 in the following example) must be accounted for as stations 1 to 4:



4.5 Wiring

4.5.1 Handling instructions for optical fiber and twisted pair cables

Handle cables with special care.

(1) Do not bend the cable to less than specified minimum bending radius.
(2) Do not crush the cable.
(3) Do not twist the cable.
(4) Do not pull the cable by the connector.
(5) Do not tension the cable.

4.5.2 Connection of optical fiber cables

(1) Connect the optical fiber cables as shown in Fig. 4.3.

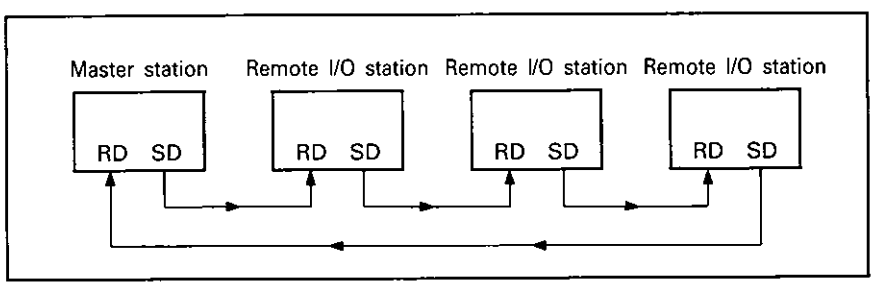


Fig. 4.3 Connection of Optical Fiber Cables

POINT

Station numbers may be set independently of the data link cable connection sequence. For full information, see Section 4.4.

(2) Optical fiber cable engagement

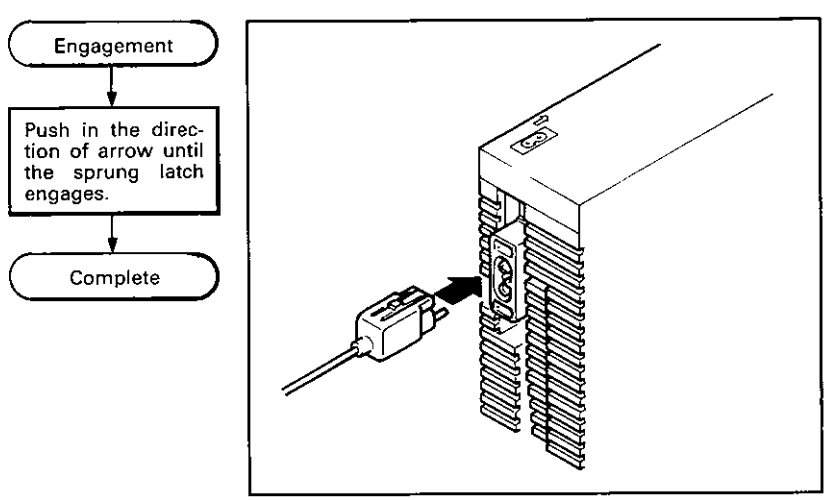


Fig. 4.4 Optical Fiber Cable Engagement

(3) Optical fiber cable disengagement

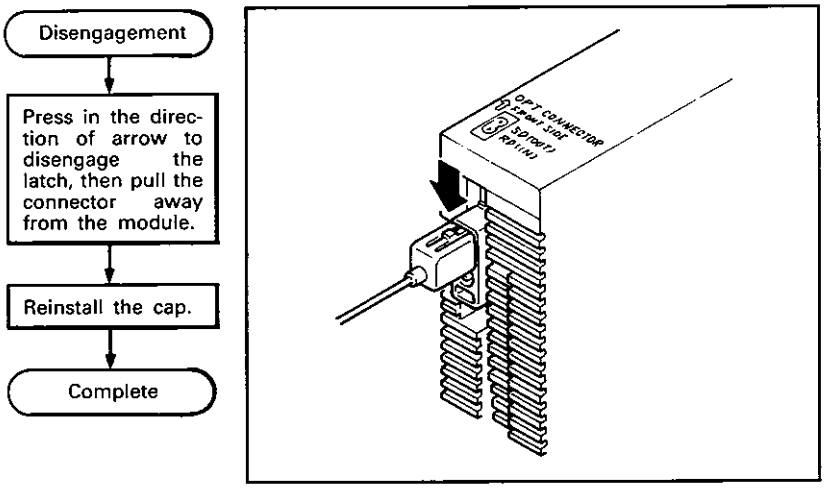
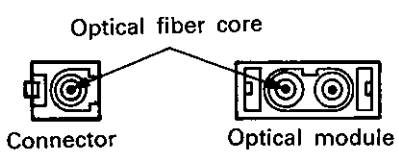


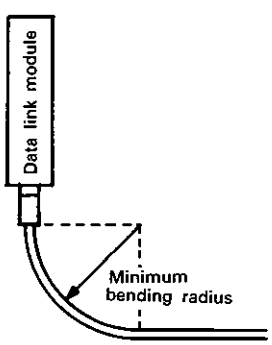
Fig. 4.5 Optical Fiber Cable Disengagement

POINT

(1) Do not touch the optical fiber cores in the connector or the optical module and keep them clean. Always fit the protective cap to the connector and optical module when not in use.

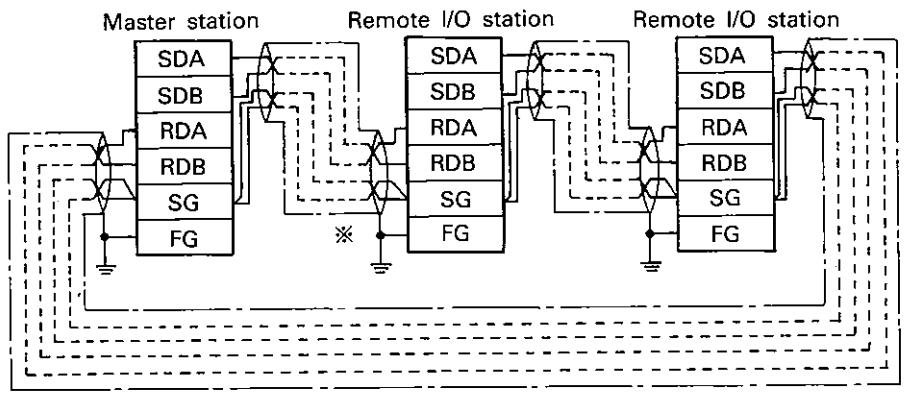


(2) Any optical fiber cable must be bent within its minimum bending radius to protect the optical fiber core.



4.5.3 Connection of twisted pair cables

Connect the twisted pair shield cables as shown in Fig. 4.6. The terminal arrangement of the remote I/O station is given in the MELSECNET/MINI Remote I/O User's Manual.



*Ground the shields of the receive or transmission terminals at one point.

Fig. 4.6 Connection of Twisted Pair Cables

REMARKS

(1) The twisted pair shield cable terminal block uses M4(0.16) screws. Use appropriate solderless terminals.
(2) Tightening torque is 8(6.93) to 14kg·cm(12.1lb·inch).

4.5.4 Connection of units for both optical and twisted pair data links

Both the optical fiber and twisted pair cables may be used in the same loop to connect any link unit for use as an optical/twisted pair data link model as shown in Fig. 4.7.

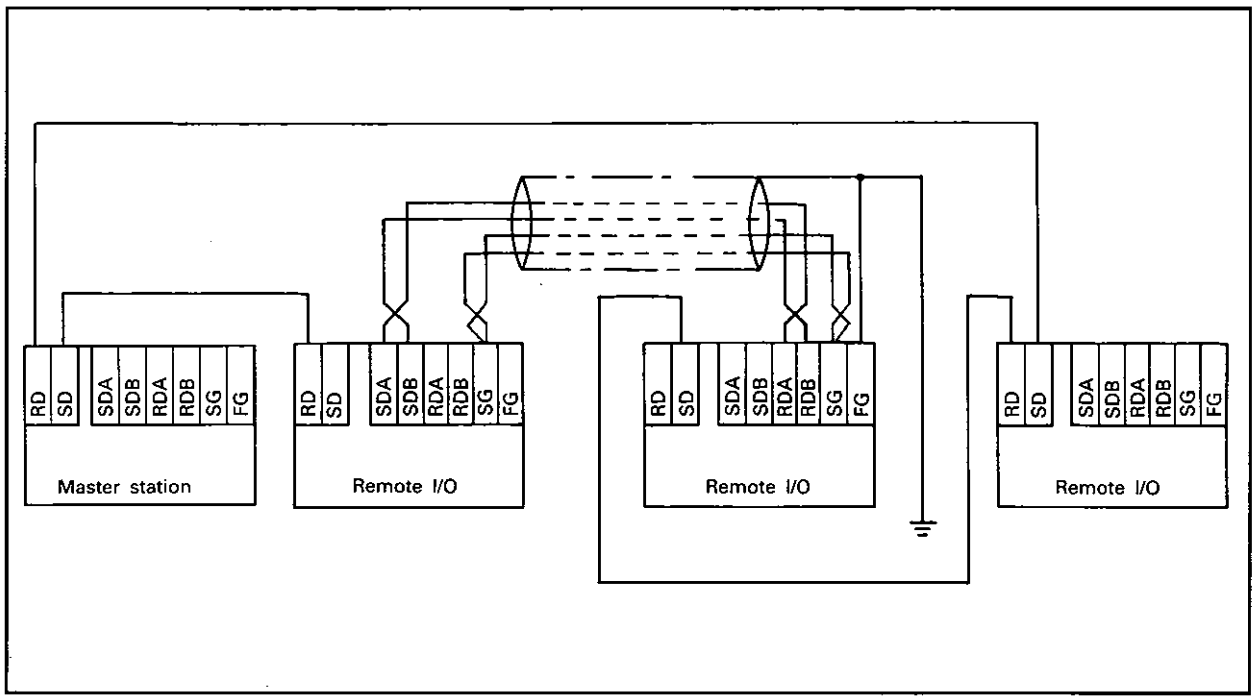


Fig. 4.7 Connection of Cables for Optical/Twisted Pair Data Link Model

POINT

(1) Ground the shields of the receive or transmission terminals at one point.
(2) Fit the supplied protective caps to optical connectors not in use.

4.6 Test Mode

4.6.1 Line check mode

Used to check for link unit hardware fault and optical fiber/twisted pair cable breakage.
In the optical data link system, line check must be performed after measuring luminous energy.

(1) Checking procedure

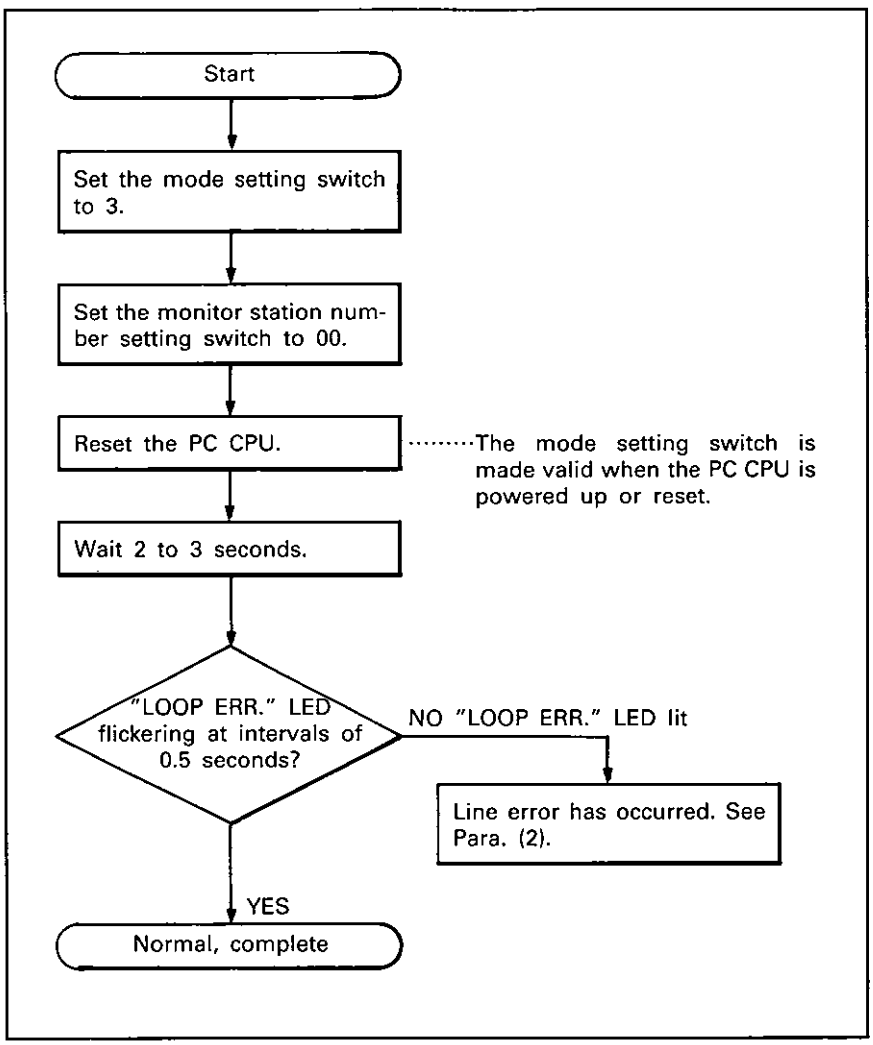


Fig. 4.8 Line Check Procedure

(2) Corrective action
Check the RD and SD LEDs of all stations in data link cable connection order, beginning with the master station transmission (SD) LED. Check the link unit hardware and data link cables as explained below:

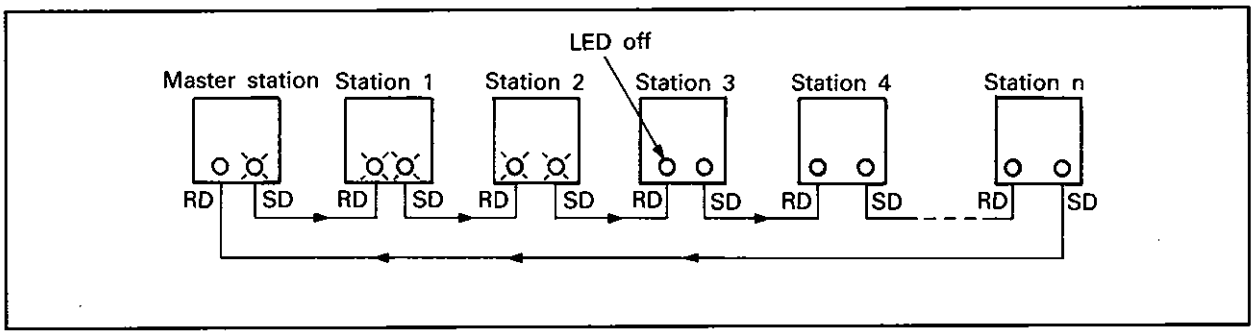


Fig. 4.9 RD/SD LED States at Line Error Occurrence

In Fig. 4.9, the RD and SD LEDs on station 3 are off possibly because:

(a) The data link cable between station 2 SD and station 3 RD is not connected, is broken or its length is greater than the maximum interstation transmission distance.
- Check connection of the data link cable.
- Change the data link cable.
- Check the cable connection distance.

(b) Data link unit hardware of station 2 is faulty.
- Connect the cable between station 1 SD and station 3 RD.

(c) Data link unit hardware of station 3 is faulty.
- Connect the cable between station 2 SD and station 4 RD.

4.6.2 Luminous energy check mode

Used to measure luminous energy at the receive (RD) terminals of all stations in an optical data link system.
This check determines whether the optical fiber cable connectors have been processed appropriately.

REMARKS

This check is made by using the optical power tester available from Mitsubishi.

Luminous energy check procedure is as follows:

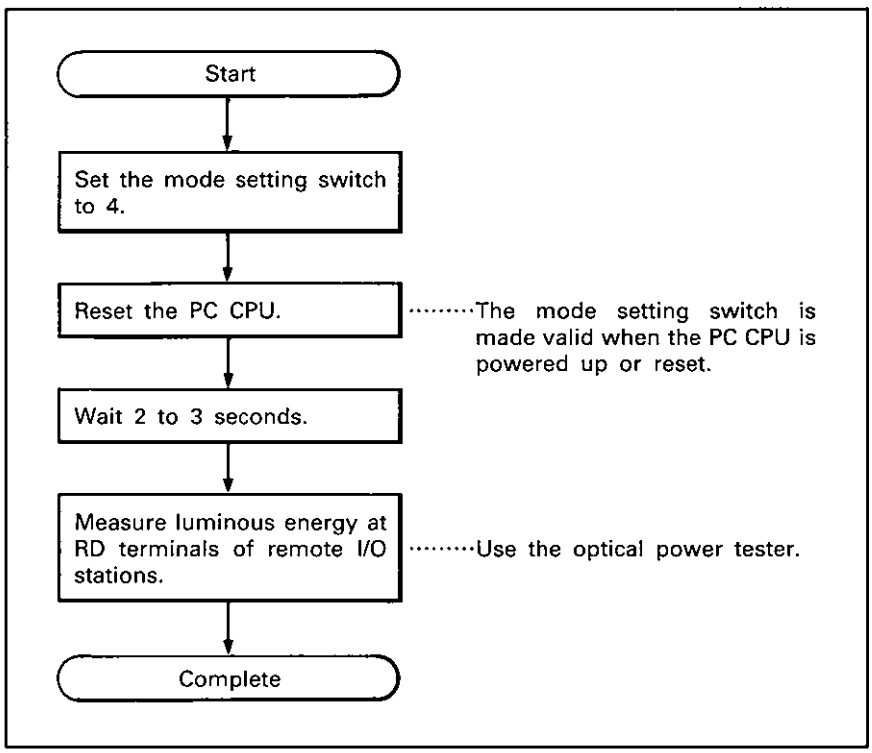


Fig. 4.10 Luminous Energy Check Procedure

5. PROGRAMMING

The program for the MINI link depends on the type of I/O refresh performed as explained below.

5.1 Programming Procedure

In a MINI link system, write initial data to the master module buffer memory to perform I/O refresh.
The initial data must be written before Y18 is switched on.

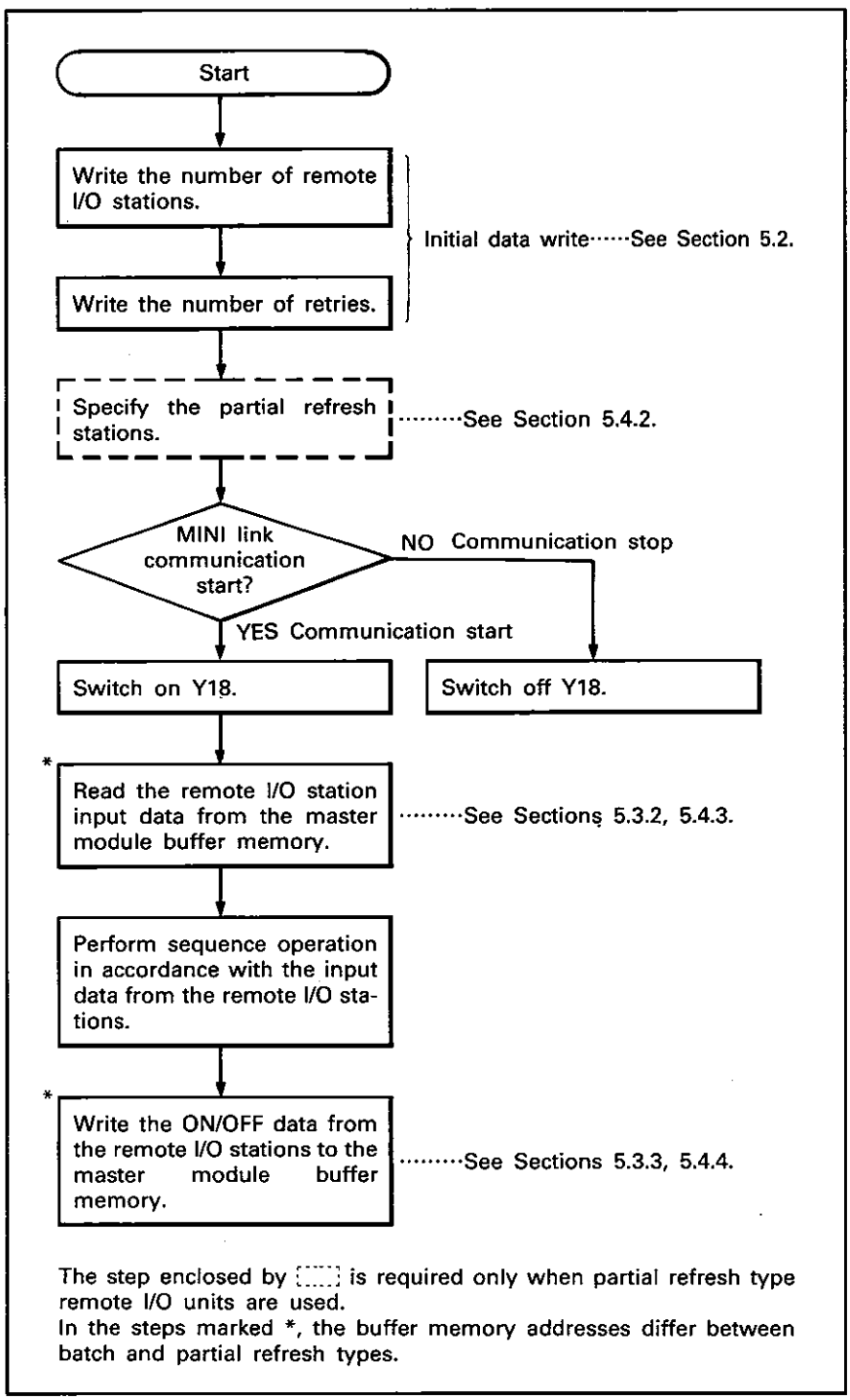


Fig. 5.1 Programming Procedure

5.2 Writing the Initial Data

Note the following when writing the initial data to the master module buffer memory.
The initial data includes the number of remote I/O stations (address 0), number of retries (address 1), and partial refresh station (addresses 250 to 282).
The partial refresh stations must be defined only when partial refresh type remote I/O stations are used. For information on setting, see Section 5.4.2.

(1) Buffer memory assignment related to initial data

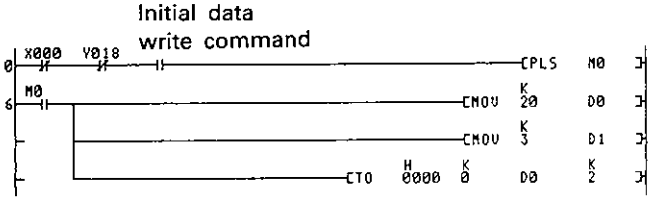
Address (Decimal)	
0	Number of remote I/O stations
1	Number of retries

(2) Number of remote I/O stations (address 0)
  (a) Define the remote I/O station range for I/O refresh.
  (b) I/O refresh is performed for up to the remote I/O station specified in address 0.
  For example, remote I/O stations 1 to 20 are refreshed when 20 is set to address 0.
  (c) Specify the last remote I/O station number connected to the master module.
  The value specified should include the number of occupied stations if the last remote I/O station occupies two or more stations, e.g. set 13 to address 0 to allow data link for up to station 10 that occupies 4 stations.
  (d) Defaults to 0.
  (e) Any value between 1 and 64 may be specified. Any value set outside this range flags an initial data error when Y18 is switched on.

(3) Number of retries (address 1)
  (a) Define the number of retries made to the faulty remote I/O station.
  (b) Defaults to 2.
  (c) Any value between 0 and 32 may be specified.
  (d) A communication error occurs if the faulty remote I/O station cannot be restored after retry is made the specified number of times.

(4) Initial data write timing
  The initial data should be written when Y18 is off because the values on the leading edge of Y18 are valid.

(5) Program example
  The following program sets the number of remote I/O stations to 20 and the number of retries to 3.



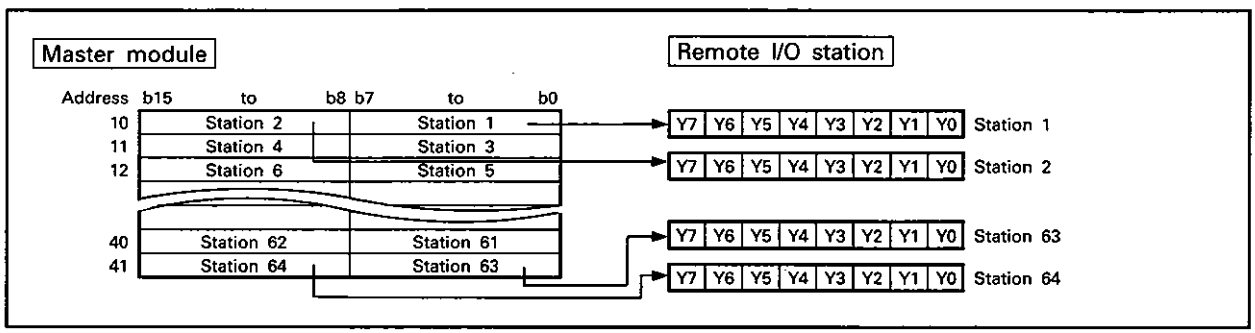
Pulses the initial data write command.
Sets 20 (number of remote I/O stations area) to D0.
Sets 3 (number of retries) to D1.
Writes the initial data to master module buffer memory.

5.3 Programming for Batch Refresh Type Remote I/O Units

Write programs as explained below to transfer I/O data of batch refresh type remote I/O units.
See Section 5.5 for a fail-safe circuit activated at occurrence of a communication error.

5.3.1 Buffer memory for batch refresh

(1) Transmission data for batch refresh (addresses 10 to 41)
(a) Output to output remote I/O stations.
(b) Buffer memory assignment is as follows:



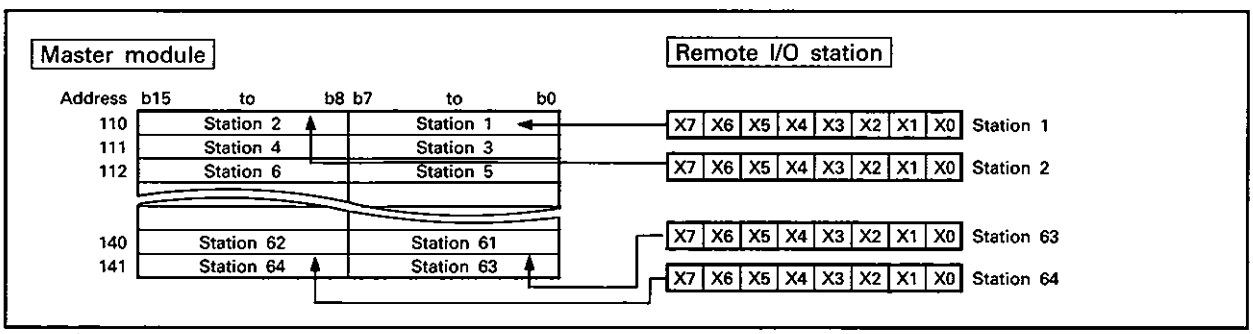
(c) The transmission data has 8 bit locations per remote I/O station as shown below.

bn+7	bn+6	bn+5	bn+4	bn+3	bn+2	bn+1	bn+0
Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0

1: ON
0: OFF

*: n depends on the remote I/O station number.
b0 to b7 for odd-numbered stations 1, 3 ····· 63
b8 to b15 for even-numbered stations 2, 4 ····· 64

(2) Receive data for batch refresh (addresses 110 to 141)
(a) Stores ON/OFF data input to the input remote I/O stations.
(b) Buffer memory assignment is as indicated below:



(c) Batch refresh receive data is made up of 8 bits per remote I/O station as shown below:

bn+7	bn+6	bn+5	bn+4	bn+3	bn+2	bn+1	bn+0
X7	X6	X5	X4	X3	X2	X1	X0

1: ON
0: OFF

*: n depends on the remote I/O station number.
b0 to b7 for odd-numbered stations 1, 3 ····· 63
b8 to b15 for even-numbered stations 2, 4 ····· 64

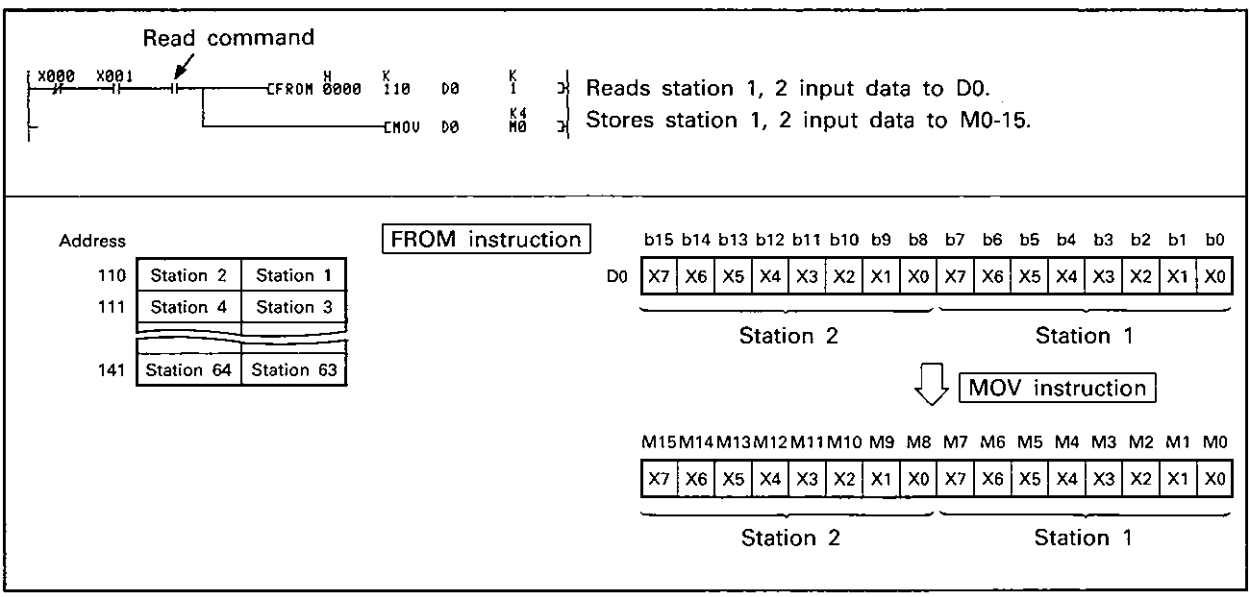
5.3.2 Reading the input data

Write a program as explained below to read the input data of batch refresh type remote I/O stations from the master station buffer memory.

(1) The input data of batch refresh type remote I/O stations exists in the batch refresh receive data area (addresses 110 to 141).

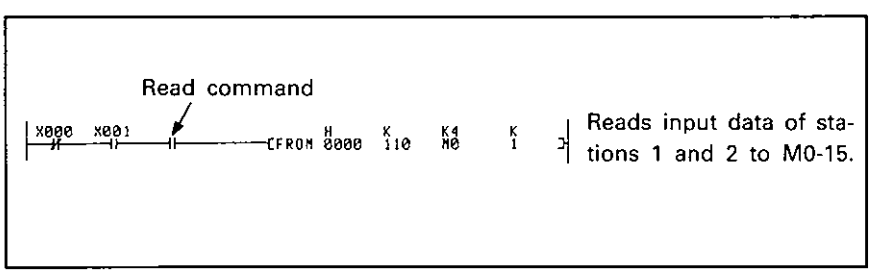
(2) Program example 1

The following program continually reads input data of stations 1 and 2 to M0-15.



REMARKS

The A1N, A2N, and A3NCPU allow bit devices (X, Y, M, L, S, B, F) to be used to store the data read by the FROM instruction.
To use bit devices, program example 1 may be modified as shown below:



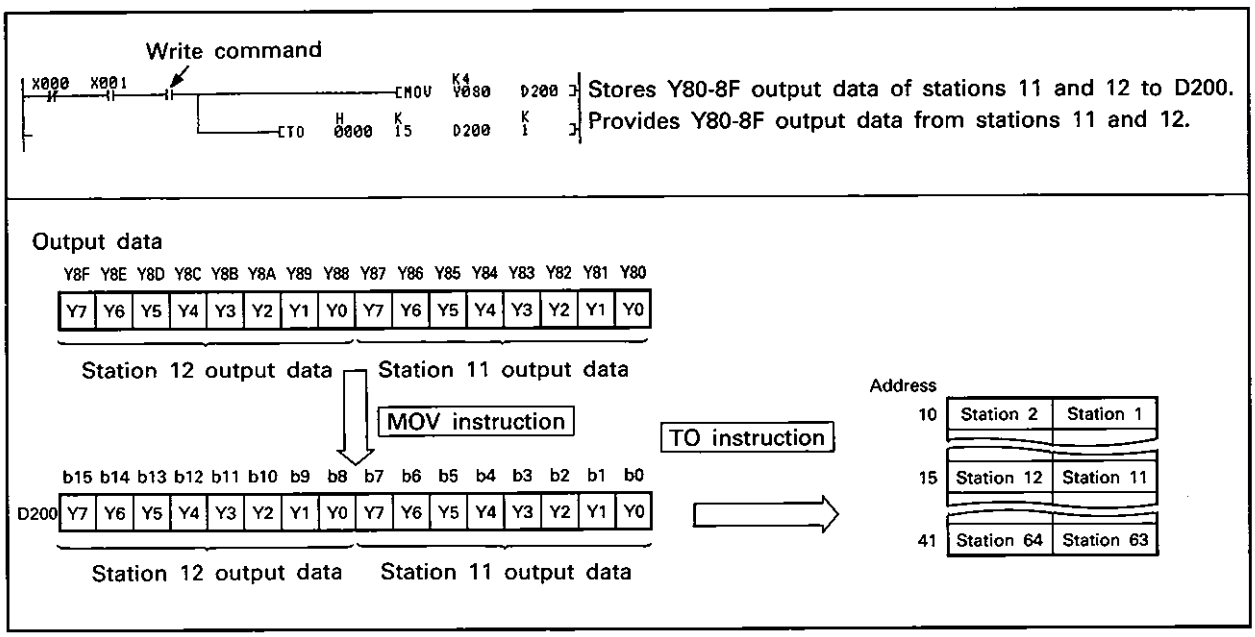
5.3.3 Writing the output data

Write a program as explained below to write the output data of batch refresh type remote I/O stations to the master station buffer memory.

(1) The output data of batch refresh type remote I/O stations is written to the batch refresh transmission data area (addresses 10 to 41).

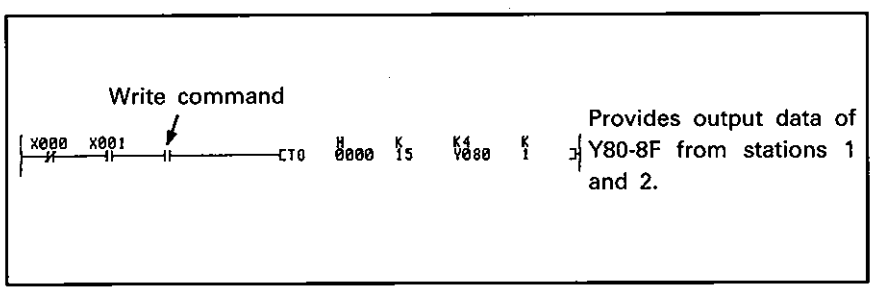
(2) Program example 1

The following program provides output data Y80-8F from stations 11 and 12.



REMARKS

The A1N, A2N and A3NCPU allow bit devices (X, Y, M, L, S, B, F) to be used to store the data written by the TO instruction.
Program example 1 may be modified as shown below to use bit devices:



5.4 Programming for Partial Refresh Type I/O Units

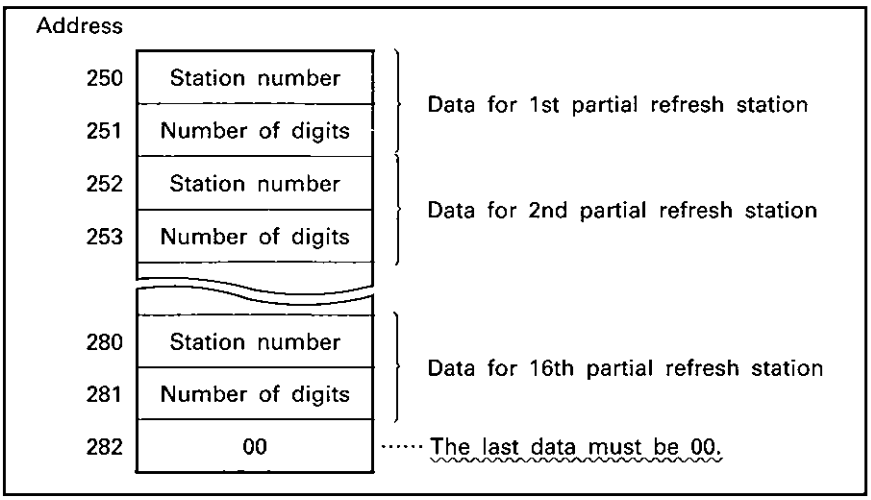
Write programs as explained below to transfer I/O data of partial refresh type remote I/O units.
See Section 5.5 for a fail-safe circuit activated at occurrence of a communication error.

5.4.1 Buffer memory for partial refresh station

(1) Partial refresh station (addresses 250 to 282)

(a) Initial data for use of partial refresh type remote I/O units. Specify the station numbers and the numbers of digits (values obtained by dividing the numbers of input and output points by 16).
Determine the number of digits in accordance with the remote I/O unit manual.

(b) Buffer memory allocation is as indicated below:



(c) Partial refresh station data is made up of two words per remote I/O unit.

Station number·····May be specified between 1 and 64.
Number of digits·····Specify the number of partial refreshes performed for input and output data in decimal.

K [ ][ ][ ]
- [ ][ ]: Specify the number of partial refreshes for input data in the range 0 to 16.
- [ ][ ]: Specify the number of partial refreshes for output data in the range 0 to 16.

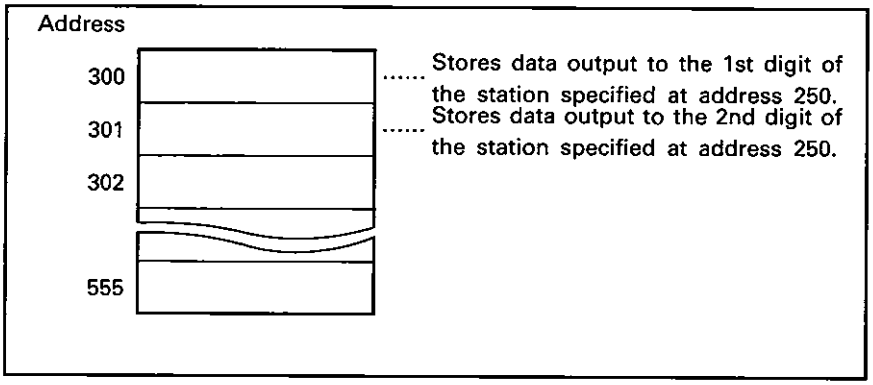
The following example sets station number to 5 and the number of partial refreshes to 4 for input data and 4 for output data.

5 (Station number)
404 (Number of digits)

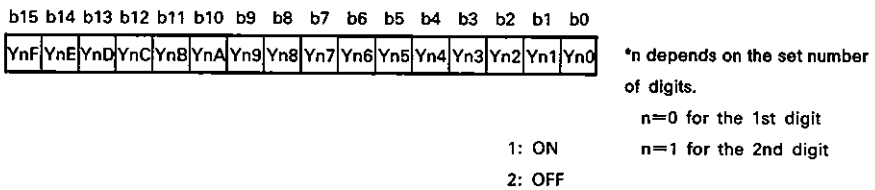
(2) Transmission data for partial refresh (addresses 300 to 555)

(a) Data output to remote I/O stations.

(b) The buffer memory assignment depends on the partial refresh station number and the number of digits specified. For further information, see Section 5.4.2.



(c) Partial refresh transmission data has 16 bit locations per digit as shown below:



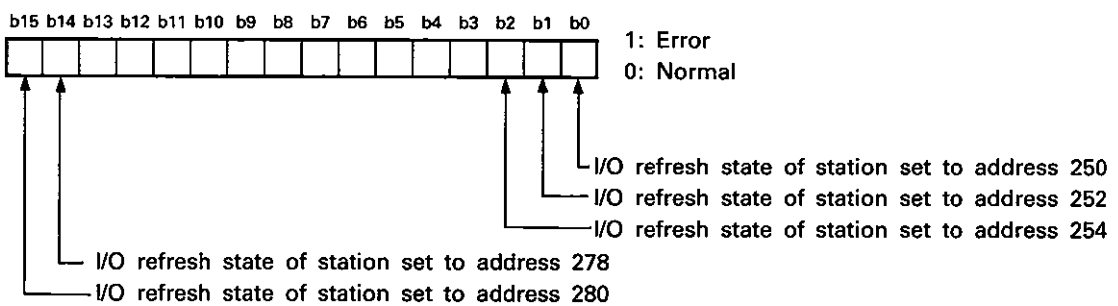
(3) Accumulative input faulty station detection (address 598)

(a) Stores the I/O refresh states of the partial refresh type remote I/O stations. 1 indicates that the input data could not been read within the given period of time.

(b) The corresponding bit is not reset to 0 if the input faulty station is restored to normal, and has the accumulative result of the faulty stations detected by input faulty station detection (address 599).

(c) Reset to 0 when Y18 is switched on.

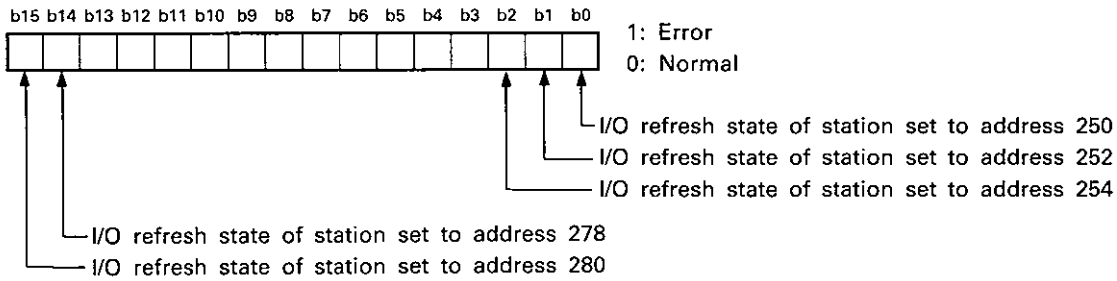
(d) The buffer memory stores the following data. The error data locations for individual stations depend on the partial refresh station setting.



(4) Input faulty station detection (address 599)

(a) Stores the I/O refresh states of the partial refresh type remote I/O stations. 1 indicates that the input data could not been read within the given period of time.

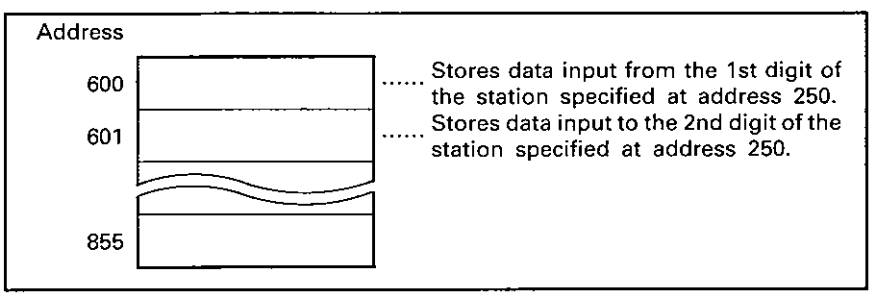
(b) The buffer memory stores the following data. The error data locations for individual stations depend on the partial refresh station setting.



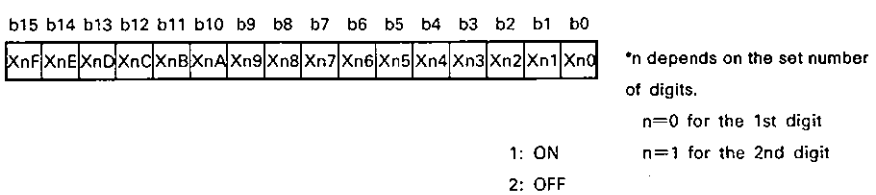
(5) Receive data for partial refresh (addresses 600 to 855)

(a) ON/OFF data input from the partial refresh type remote I/O units.

(b) The buffer memory assignment depends on the partial refresh station number and the number of digits specified. For further information, see Section 5.4.2.



(c) Partial refresh receive data has 16 bit locations per digit as shown below:

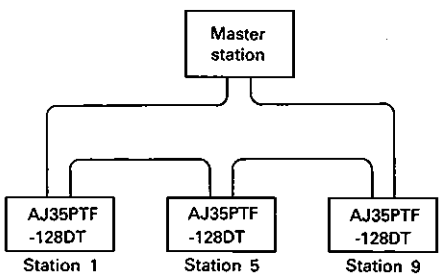


5.4.2 Setting the partial refresh stations

Set station numbers and numbers of digits to buffer memory addresses 250-282 to use partial refresh type remote I/O units. Setting the partial refresh stations determines the partial refresh transmission data, accumulative input error detection, input error detection, and partial refresh receive data locations.

The following system example is used to explain a partial refresh station setting program. Allocate the partial refresh stations using the data sheet in Appendix 2.

System Configuration



REMARKS

The AJ35PTF-128DTs are used under the following conditions:
Number of stations occupied=4
Number of partial refreshes
Input data=4
Output data=4

(1) Entering the partial refresh station setting sheet

Indicates that station 1 is used under the conditions of 4 partial refreshes for input and output data respectively.

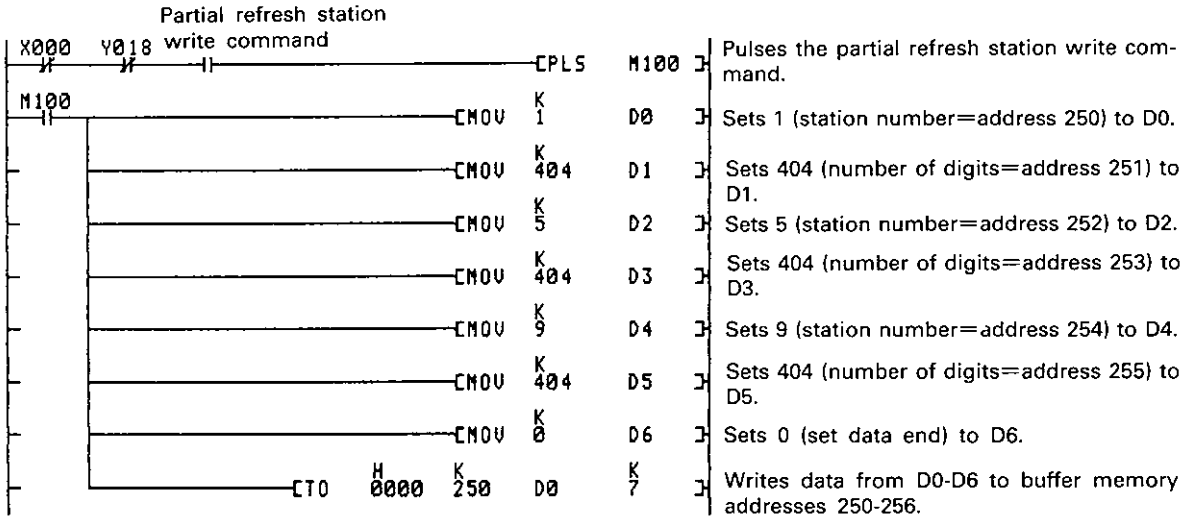
Indicates that the input data of station 1 is stored to buffer memory addresses 600-603.

Indicates that the output data of station 1 is stored to buffer memory addresses 300-303.

Buffer Memory Address	Set Data (Upper: Station number / Lower: Number of digits)	Addresses of I/O Data Location		Remarks
		Input data	Output data	
250	1	600 to 603	300 to 303	AJ35PTF-128DT
1	404			
2	5	604 to 607	304 to 307	AJ35PTF-128DT
3	404			
4	9	608 to 611	308 to 311	AJ35PTF-128DT
5	404			
6	00	to	to	
7				

Indicates the end of partial refresh station set data.

(2) Program example



5.4.3 Reading the input data

Write a program as explained below to read the input data of partial refresh type remote I/O units from the buffer memory of the master module.
For partial refresh receive data assignment, see Section 5.4.2.

(1) Entering the partial refresh station receive data sheet

Indicates that the 1st digit (X0 to F) input data of station 1 is stored to buffer memory address 600.

Indicates that sequence operation is performed for the 1st digit (X0 to F) input data of station 1 after it is transferred to M0-15.

Buffer Memory Address	Remote I/O Station (Station number) – (number of digits)	I/O address	Devices for Storing Receive Data	Remarks
600	1–1	X 0 to F	M0 to 15	
1	–2	10 to 1F	M16 to 31	AJ35PTF-128DT
2	–3	20 to 2F	M32 to 47	of station 1
3	–4	30 to 3F	M48 to 63	
4	5–1	0 to F	M64 to 79	
5	–2	10 to 1F	M80 to 95	AJ35PTF-128DT
6	–3	20 to 2F	M96 to 111	of station 5
7	–4	30 to 3F	M112 to 127	
8	9–1	0 to F	M128 to 143	
9	–2	10 to 1F	M144 to 159	AJ35PTF-128DT
610	–3	20 to 2F	M160 to 175	of station 9
1	–4	30 to 3F	M176 to 191	
2	–	0 to F	to	
3	–	0 to F	to	

(2) Program example

```
X000  X001  Read command
 |     |     |
 |     |     |--[CFROM H0000 K600 D100 K12]   Reads input data from buffer memory addresses 600-611 to D100-111.
 |     |     |
 |     |     |--[CMOV D100 K4M0]    Transfers the 1st digit input data of station 1 to M0-15.
 |     |     |--[CMOV D101 K4M16]   Transfers the 2nd digit input data of station 1 to M16-31.
 |     |     |--[CMOV D102 K4M32]   Transfers the 3rd digit input data of station 1 to M32-47.
 |     |     |--[CMOV D103 K4M48]   Transfers the 4th digit input data of station 1 to M48-63.
 |     |     |--[CMOV D104 K4M64]   Transfers the 1st digit input data of station 5 to M64-79.
 |     |     |--[CMOV D105 K4M80]   Transfers the 2nd digit input data of station 5 to M80-95.
 |     |     |--[CMOV D106 K4M96]   Transfers the 3rd digit input data of station 5 to M96-111.
 |     |     |--[CMOV D107 K4M112]  Transfers the 4th digit input data of station 5 to M112-127.
 |     |     |--[CMOV D108 K4M128]  Transfers the 1st digit input data of station 9 to M128-143.
 |     |     |--[CMOV D109 K4M144]  Transfers the 2nd digit input data of station 9 to M144-159.
 |     |     |--[CMOV D110 K4M160]  Transfers the 3rd digit input data of station 9 to M160-175.
 |     |     |--[CMOV D111 K4M176]  Transfers the 4th digit input data of station 9 to M176-191.
```

5.4.4 Writing the output data

Write a program as explained below to write the output data of partial refresh type remote I/O units to the buffer memory of the master module.
See Section 5.4.2 for partial refresh receive data assignment.

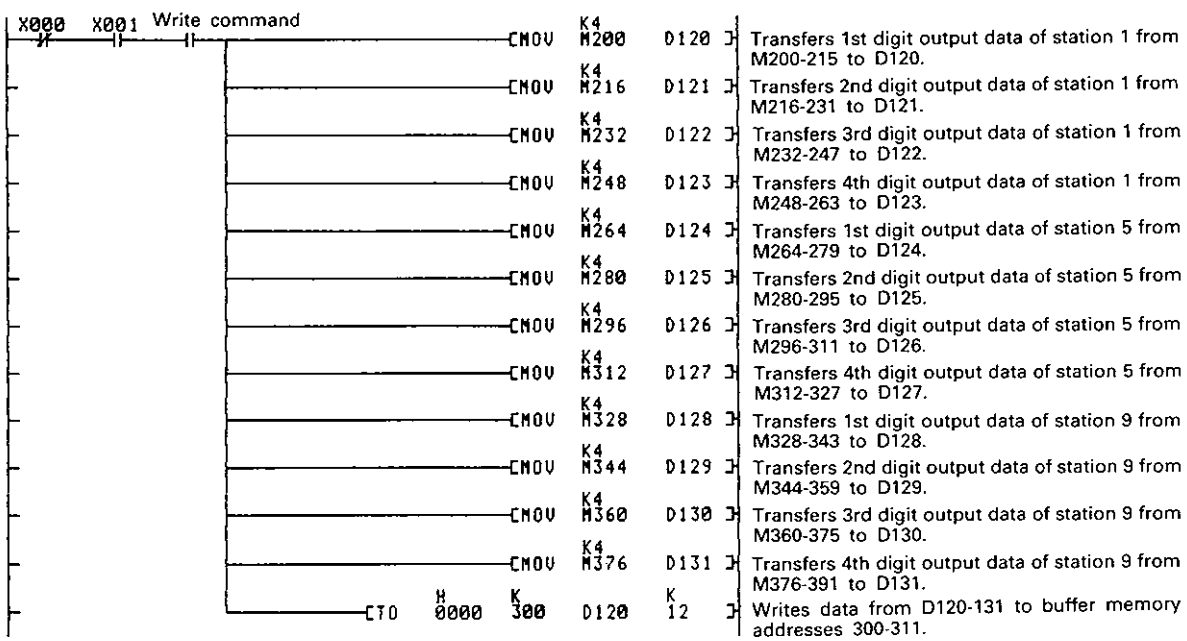
(1) Entering the partial refresh station transmission data sheet

Indicates that sequence operation is performed for the 1st digit (Y0 to F) output data of station 1 using M200-215.

Indicates that the 1st digit (Y0 to F) output data of station 1 is stored to buffer memory address 300.

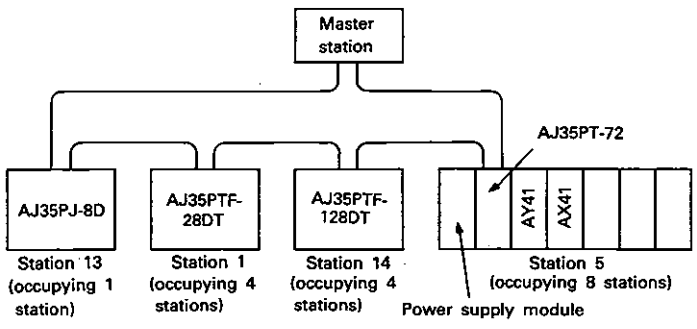
Buffer Memory Address	Remote I/O Station		Devices for Storing Transmission Data	Remarks
	(Station number) – (number of digits)	I/O address		
300	1–1	Y 0 to F	M200 to 215	
1	–2	10 to 1F	M216 to 231	AJ35PTF-128DT
2	–3	20 to 2F	M232 to 247	of station 1
3	–4	30 to 3F	M248 to 263	
4	5–1	0 to F	M264 to 279	
5	–2	10 to 1F	M280 to 295	AJ35PTF-128DT
6	–3	20 to 2F	M296 to 311	of station 5
7	–4	30 to 3F	M312 to 327	
8	9–1	0 to F	M328 to 343	
9	–2	10 to 1F	M344 to 359	AJ35PTF-128DT
310	–3	20 to 2F	M360 to 375	of station 9
1	–4	30 to 3F	M376 to 391	
2	–	0 to F	to	

(2) Program example



5.5 Program Example

The program on the following pages is written for the system shown below which uses both the batch and partial refresh type remote I/O units.



REMARKS

Note on setting the station numbers:

The number of FROM and TO instructions used to transfer data of all remote I/O stations can be reduced by setting the remote I/O station numbers. The above system example indicates the station number setting which allows the batch refresh receive data to be read by one FROM instruction.

(1) Entering the batch refresh communication data sheet

[Batch refresh transmission data assignment]

Buffer Memory Address	Remote I/O Station (Upper: b0 to 7 / Lower: b8 to 15) Station number	I/O address	Device	Remarks	Buffer Memo Addr
10	1	to	to	Empty (Receive station for AJ35PTF-28DT)	
	2	to	to		
1	3	Y10 to 17	Y90 to 97	AJ35PTF-28DT	
	4	Y18 to 1B	Y98 to 9B		
2	5	Y0 to 7	YA0 to A7	AY41 of AJ72PT35	
	6	Y8 to F	YA8 to AF		
3	7	Y10 to 17	YB0 to B7		
	8	Y18 to 1F	YB8 to BF		
4	9	to	to	Empty (Receive station for AX41 of AJ72PT35)	3
	10	to	to		
5	11	to	to		
	12	to	to		
6	13	to	to	Empty (Receive station for AJ35PJ-8D)	
	14	to	to	Reserved for system (as AJ35PTF-128DT is a partial refresh type remote I/O unit)	
7	15	to	to		
	16	to	to		
8	17	to	to		
	18	to	to		

[Batch refresh receive data assignment]

Buffer Memory Address	Remote I/O Station (Upper: b0 to 7 / Lower: b8 to 15) Station number	I/O address	Device	Remarks	Buf Me Ad
110	1	X0 to 7	M200 to 207	AJ35PTF-28DT	
	2	X8 to F	M208 to 215		
1	3	to	to	Empty (Transmission station for AJ35PTF-28DT)	
	4	to	to		
2	5	to	to	Empty (Transmission station for AX41 of AJ72PT35)	
	6	to	to		
3	7	to	to		
	8	to	to		
4	9	X0 to 7	M216 to 223	AX41 of AJ72PT35	
	10	X8 to F	M224 to 231		
5	11	X10 to 17	M232 to 239		
	12	X18 to 1F	M240 to 247		
6	13	X0 to 7	M248 to 255	AJ35PJ-8D	
	14	to	to	Reserved for system (as AJ35PTF-128DT is a partial refresh type remote I/O unit)	
7	15	to	to		
	16	to	to		
8	17	to	to		
	18	to	to		

(2) Entering the partial refresh communication data sheet

[Partial refresh station setting data]

Buffer Memory Address	Set Data (Upper: Station number / Lower: Number of digits)	Addresses of I/O Data Location		Remarks
		Input data	Output data	
250	14	600 to 603	300 to 303	AJ35PTF-128DT
1	404			
2	00	to	to	
3				

[Partial refresh transmission data assignment]

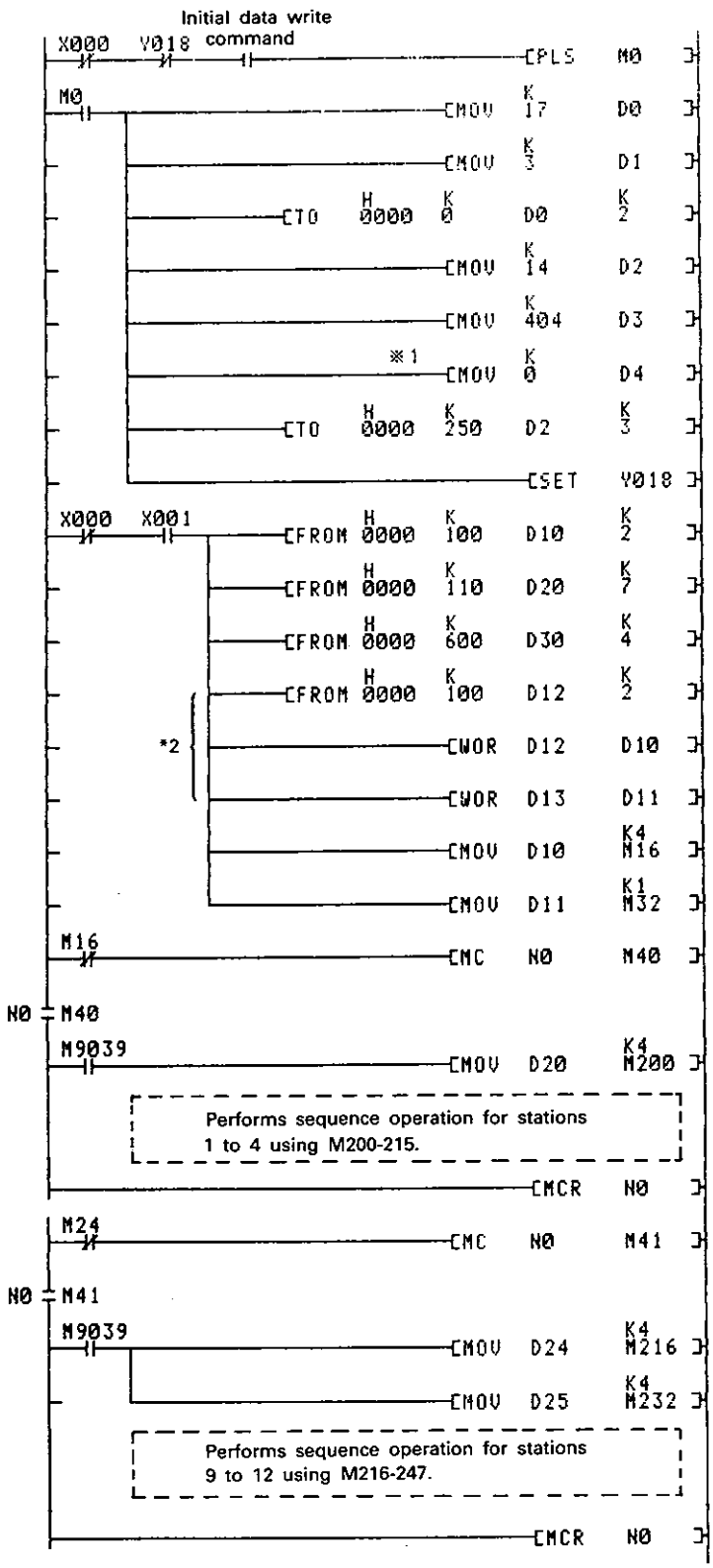
Buffer Memory Address	Remote I/O Station		Devices for Storing Transmission Data	Remarks
	(Station number) – (number of digits)	I/O address		
300	14–1	Y 0 to F	Y C0 to CF	AJ35PTF-128DT of station 14
1	–2	10 to 1F	Y D0 to DF	
2	–3	20 to 2F	Y E0 to EF	
3	–4	30 to 3F	Y F0 to FF	
4	–	0 to F		

[Partial refresh receive data assignment]

Buffer Memory Address	Remote I/O Station		Devices for Storing Receive Data	Remarks
	(Station number) – (number of digits)	I/O address		
600	14–1	X 0 to F	M256 to 271	AJ35PTF-128DT of station 14
1	–2	10 to 1F	M272 to 287	
2	–3	20 to 2F	M288 to 303	
3	–4	30 to 3F	M304 to 319	
4	–	0 to F		

(3) Program

The basic program for writing initial data, reading receive data and writing transmission data is shown on the following pages.
Interlocks appropriate for the system should be provided when writing user programs.



Pulses the initial data write command.

Sets the number of remote I/O stations = 17 to D0.

Sets the number of retries = 3 to D1.

Writes the numbers of remote I/O stations and retries to the buffer memory.

Sets the set data of partial refresh station 14 to D2 and D3.

Sets 0 (indicating end of set data) to D4.

Writes the partial refresh station set data to the buffer memory.

Switches on MINI link communication start (Y18).

Reads faulty station detection data (stations 1 to 17) to D10 and D11.

Reads batch refresh receive data (stations 1 to 13) to D20-D26.

Reads partial refresh receive data (station 14) to D30-D33.

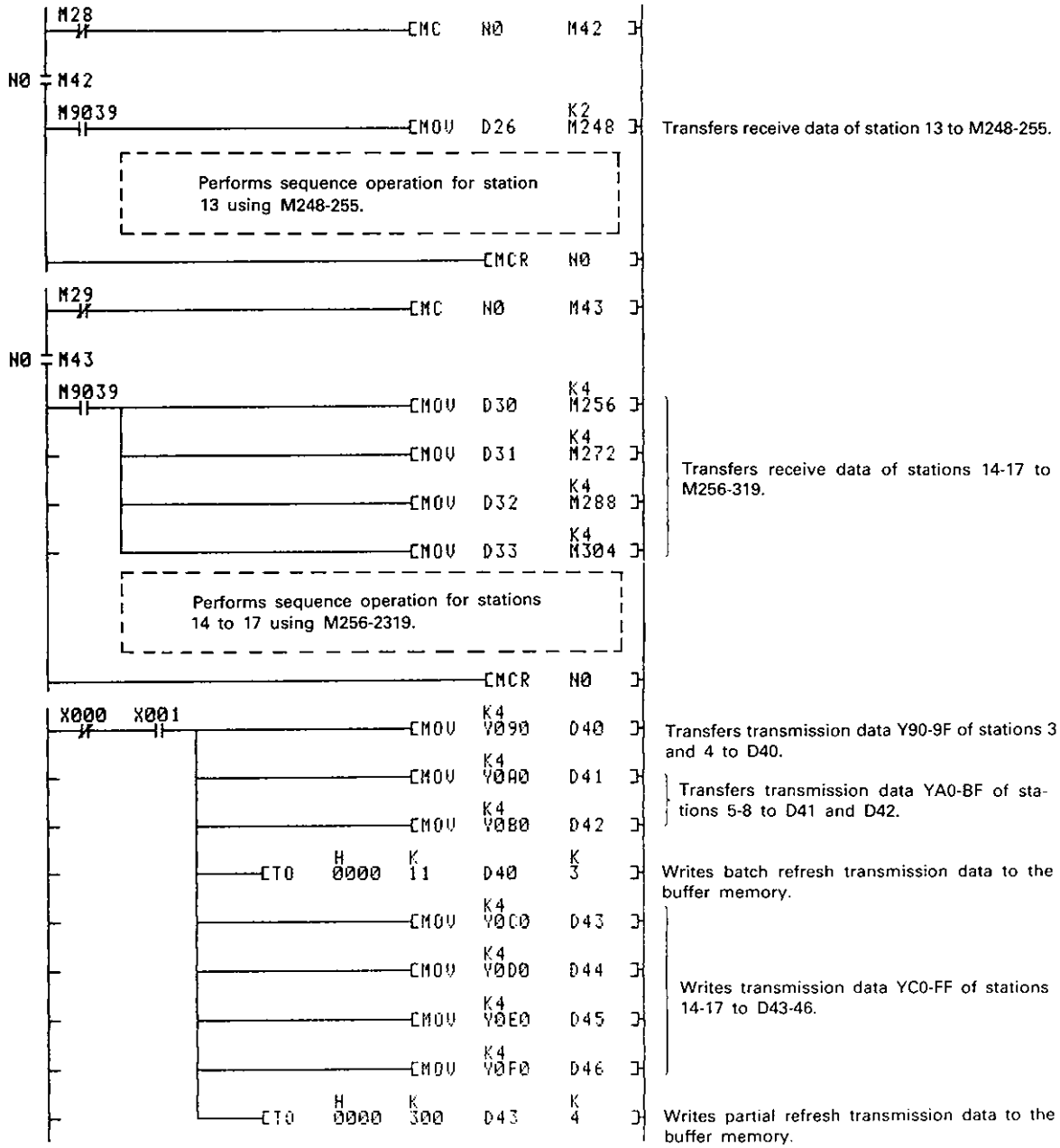
Reads error detection data station numbers (1 to 17) to D12 and D13.

ORs faulty station detection data before and after reading receive data to detect communication error that have occurred during receive data read.

Transfers faulty station detection data (stations 1 to 17) to M16-32 which are used as interlocks for communication error.

Transfers receive data of stations 1 and 2 to M200-215.

Transfers receive data of stations 9-12 to M216-247.



REMARKS

*1: 0 must be written at the end of the partial refresh station set data.

*2: Ladder for detecting a communication error which has occurred between faulty station detection data read and receive data read.
When Y1B (faulty station data clear designation) is off, data at error occurrence is retained if a communication error occurs. The program areamarked *2 is not required for a system which may continue operation with the set receive data.

6. TROUBLESHOOTING

6.1 Data Communication Errors

There are two types of errors which may occur during data communication between the master module and remote I/O stations.

(1) Error which only stops data communication with the faulty remote I/O station.

(2) Error which stops data communication with all remote I/O stations.

REMARKS

A communication error indicates that normal communication could not be made after retries had been made the number of retries set to buffer memory address 1.

6.1.1 Data communication continue error

The following operations are performed when the error occurring only stops communication with the faulty station and continues communication with the other stations:

(1) Switches on X6 (MINI link error detection).
X6 is switched off when communication is restored. For further details, see Section 3.3.

(2) Stores the faulty station number to buffer memory addresses 100-103.

(a) Sets 1 to the corresponding bit.

(b) In automatic return mode, the corresponding bit is reset to 0 when the faulty station is restored.

(c) In no automatic return mode, the corresponding bit remains 1.

(3) Stores the accumulative faulty station numbers to buffer memory addresses 90-93. This area stores the accumulative result of faulty stations explained in Para. (2).

(4) Stores the error detection code in buffer memory address 108. 1 is written to this address when any station causes a communication error. 1 remains if communication is restored.

(5) Clears the faulty station, accumulative faulty station and error detection code when Y18 is switched on.

(6) Switches on the "ERR. REM" LED of the master module.

(7) Switches off all outputs of the faulty station in no automatic return mode.

POINT

The data communication continue error may occur when:

(1) The remote I/O stations connected do not coincide with the number of remote I/O stations (address 0) specified.
For example, an error occurs at station 3 when the number of stations set is 5 and there are stations 1, 2, 4 and 5 connected.

(2) The fuse in an output remote I/O station has blown.

(3) A communication data error has occurred due to noise. In this case examine the data link cable wiring and ground methods.

6.1.2 Data communication stop error

The following operations are performed when the error occurring has stopped data communication with all remote I/O stations.

(1) Switches X1 off and X7 on.

(2) Stores the corresponding error code to buffer memory address 107.

Error Code	Definition	Cause
0	No error	———
1	Initial data error	I/O refresh has been initiated after setting the number of remote I/O stations to other than 1-64, the number of retries to other than 1-32, and the partial refresh station to other than 250-282.
2	Line error	Any data link cable has been broken or remote I/O station power switched off.
3	Station fault	Data communication has been stopped due to station fault with the mode setting switch set to 2 (communication stop specified at online error detection).

Table 6.1 Communication Error Code List

(3) When code 3 is stored to address 107, 1 is set to the corresponding bit of the faulty station area (addresses 90 to 93) and accumulative faulty station area (addresses 100 to 103).

(4) The communication error code can be cleared by:

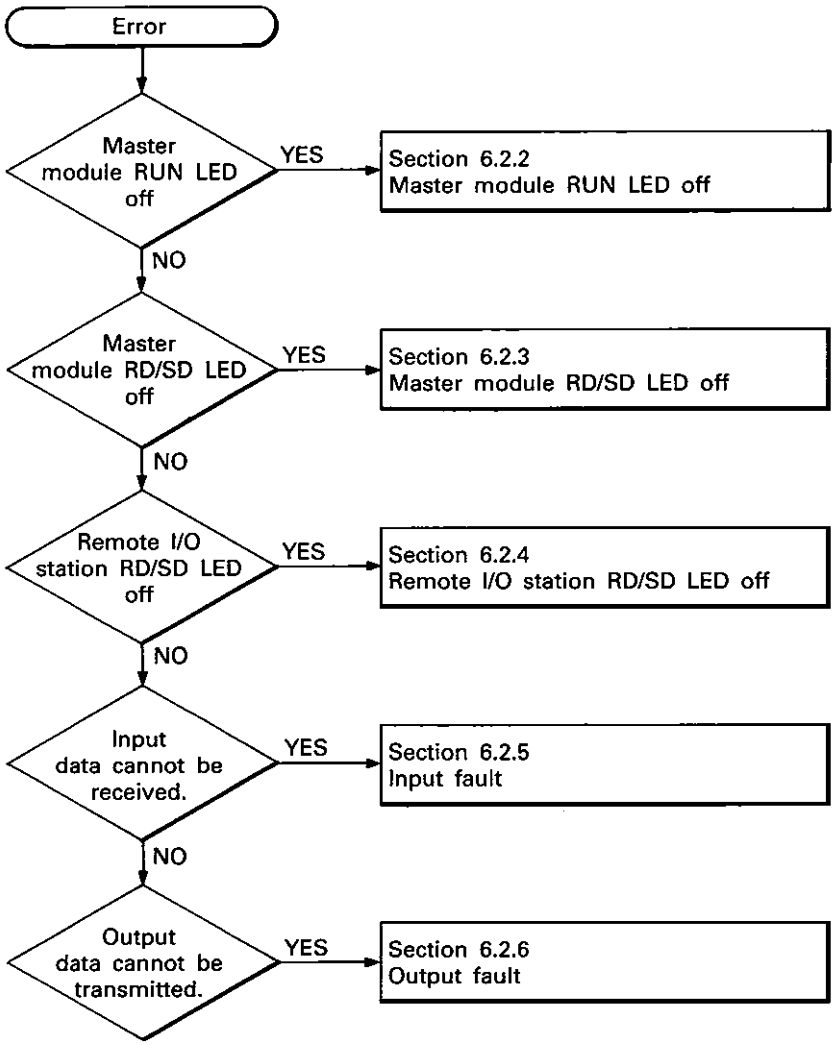
(a) Switching on Y18.
(b) Switching on Y1D with Y18 off.

(5) The faulty station and accumulative faulty station bits are reset to 0 when Y18 is switched on.

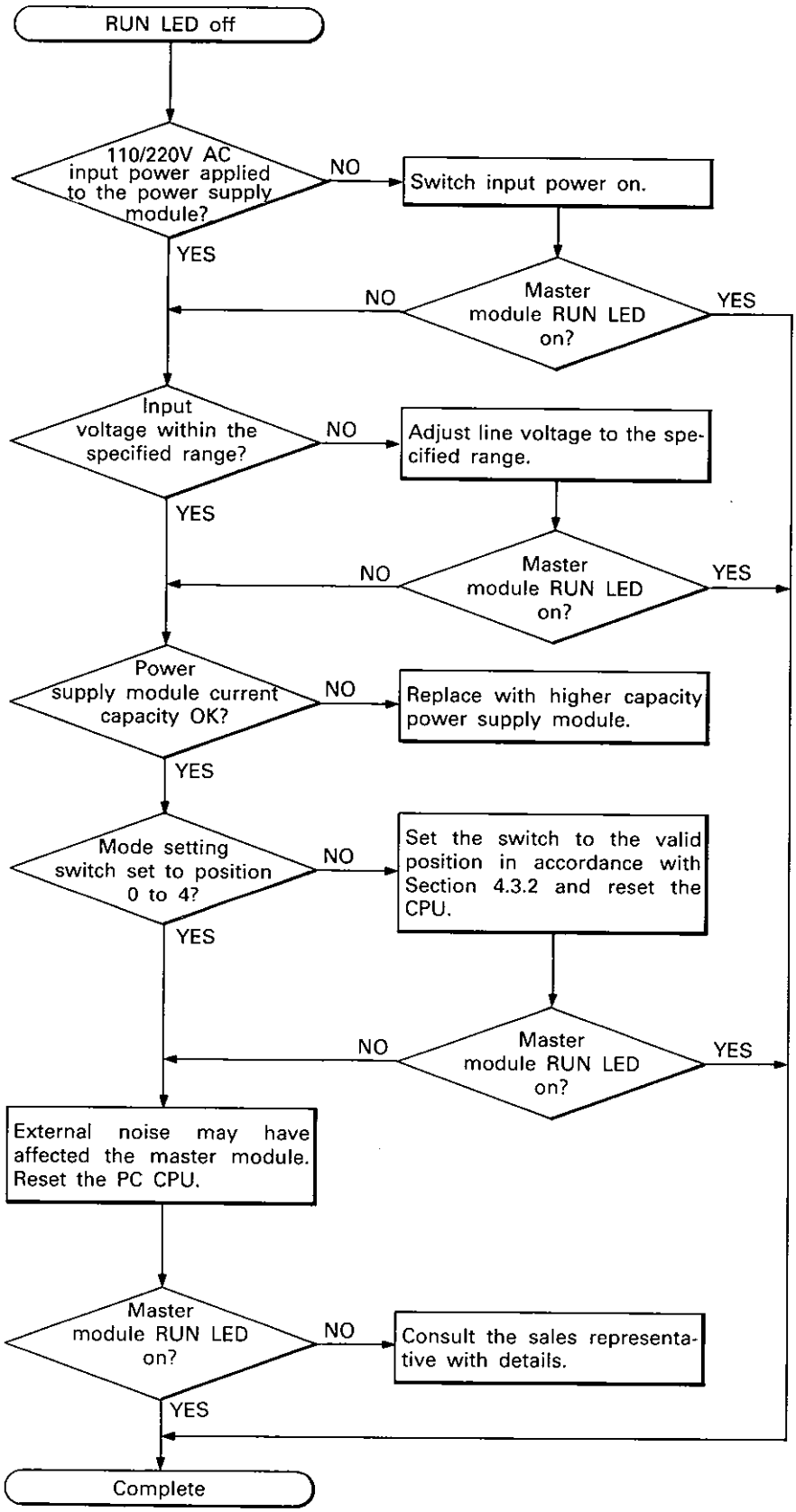
6.2 Troubleshooting

Basic troubleshooting procedures are given below. For information on PC CPU module troubleshooting, see the corresponding CPU Module User's Manual.

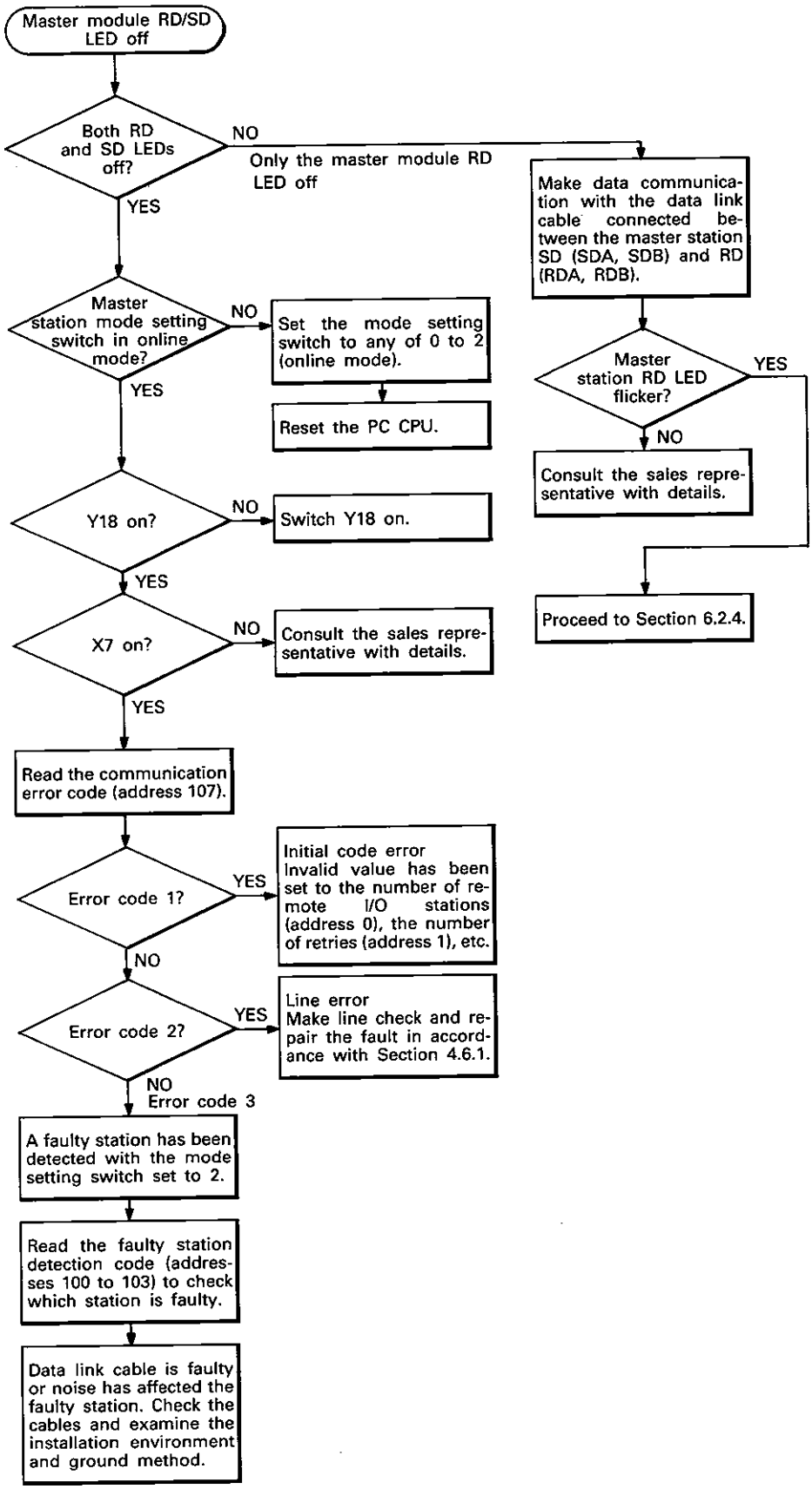
6.2.1 General troubleshooting flowchart



6.2.2 Master module RUN LED off



6.2.3 Master module RD/SD LED off



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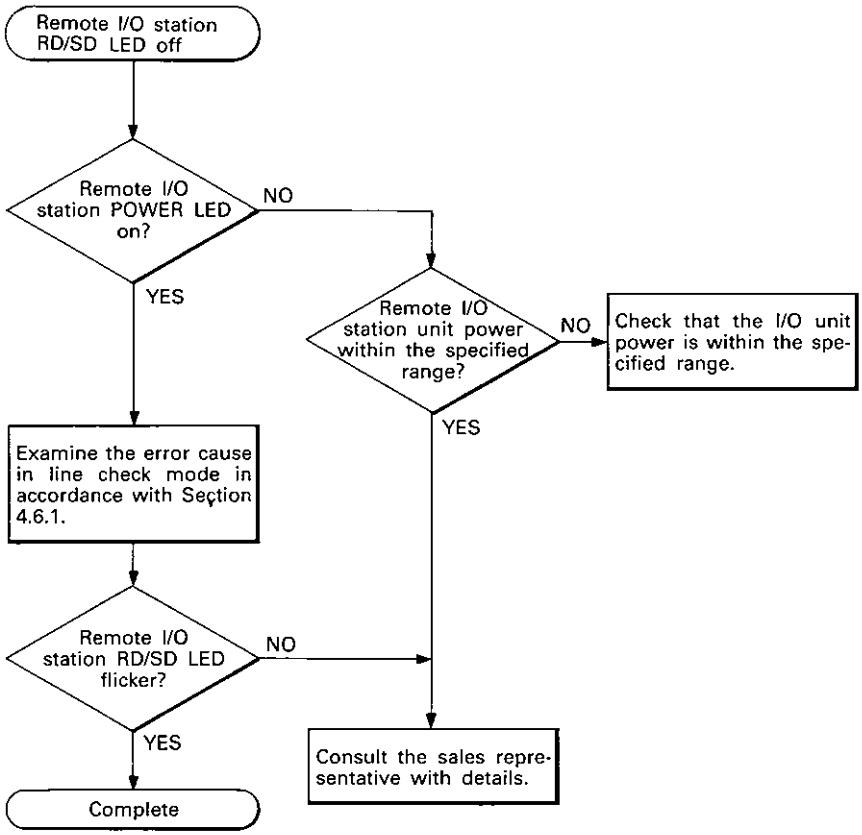
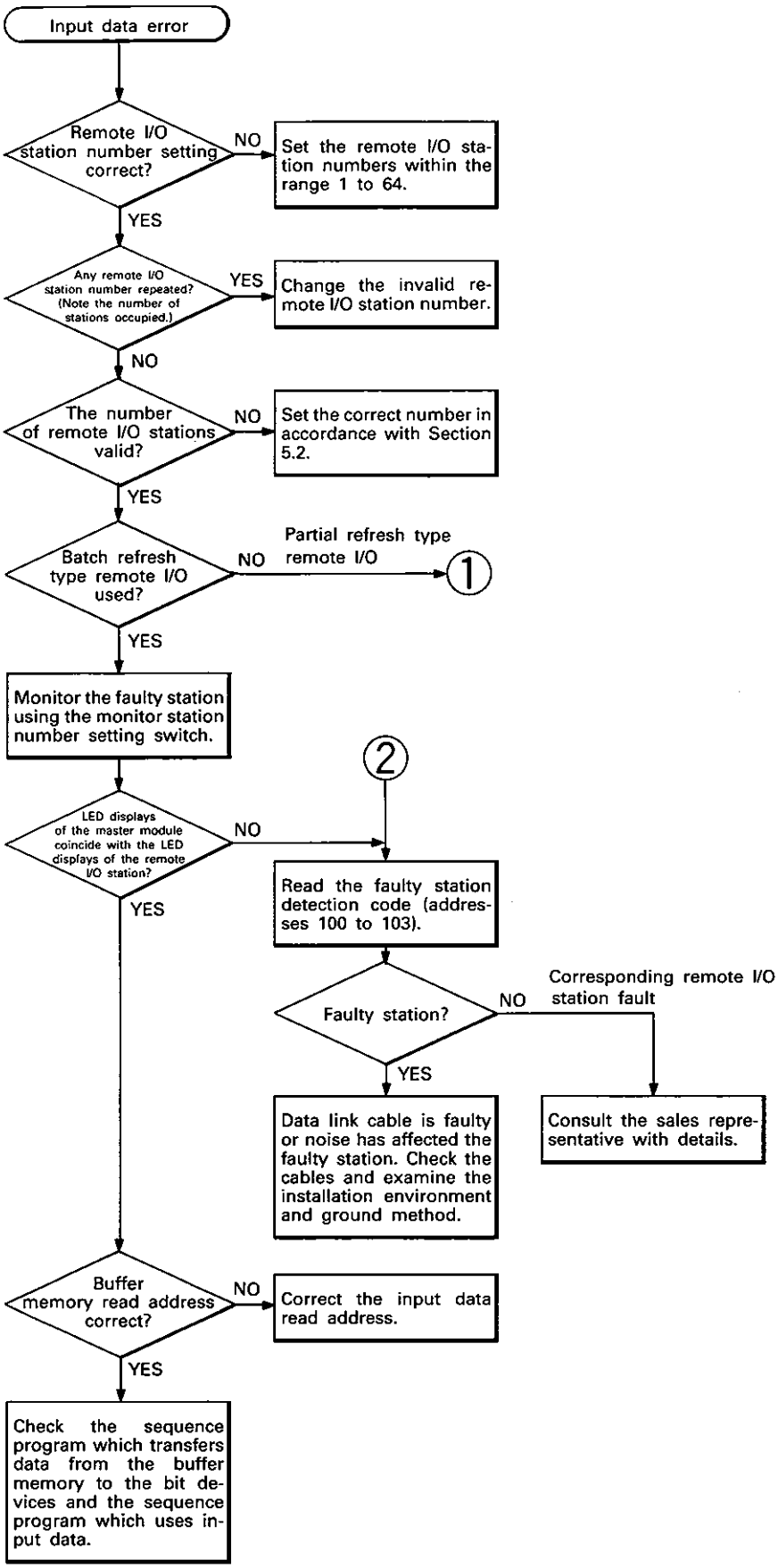
6.2.4 Remote I/O station RD/SD LED off



6.2.5 Input fault



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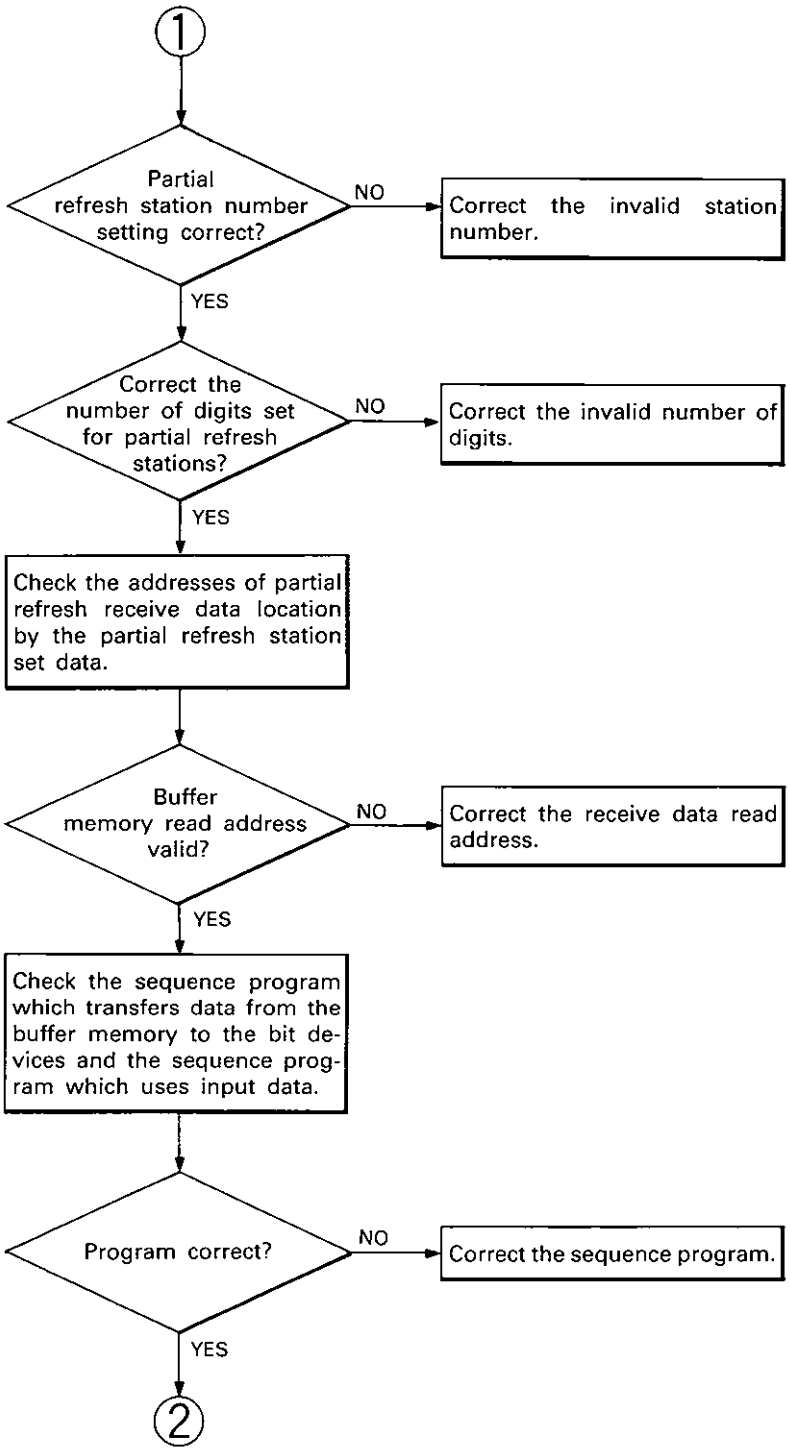
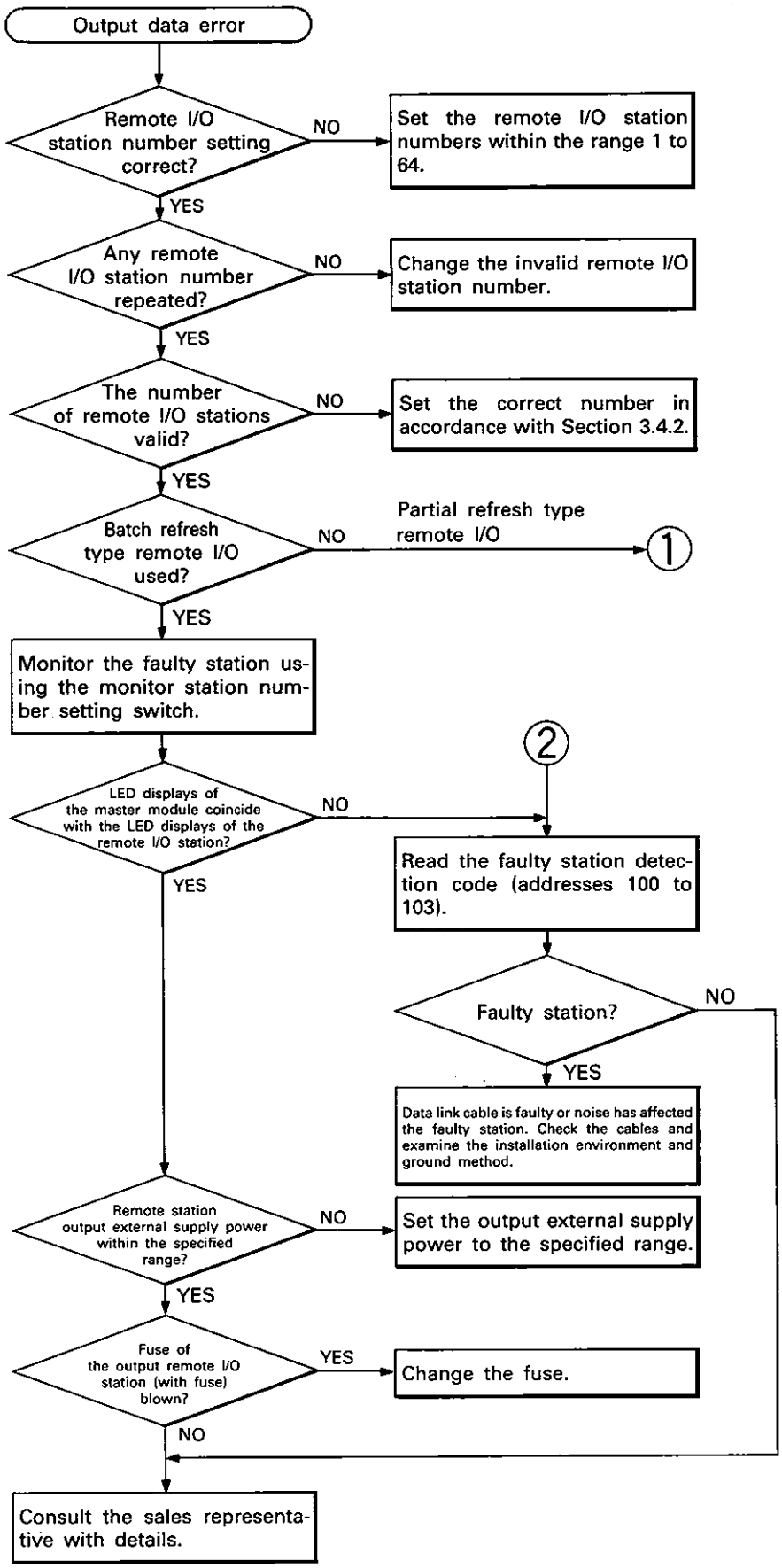
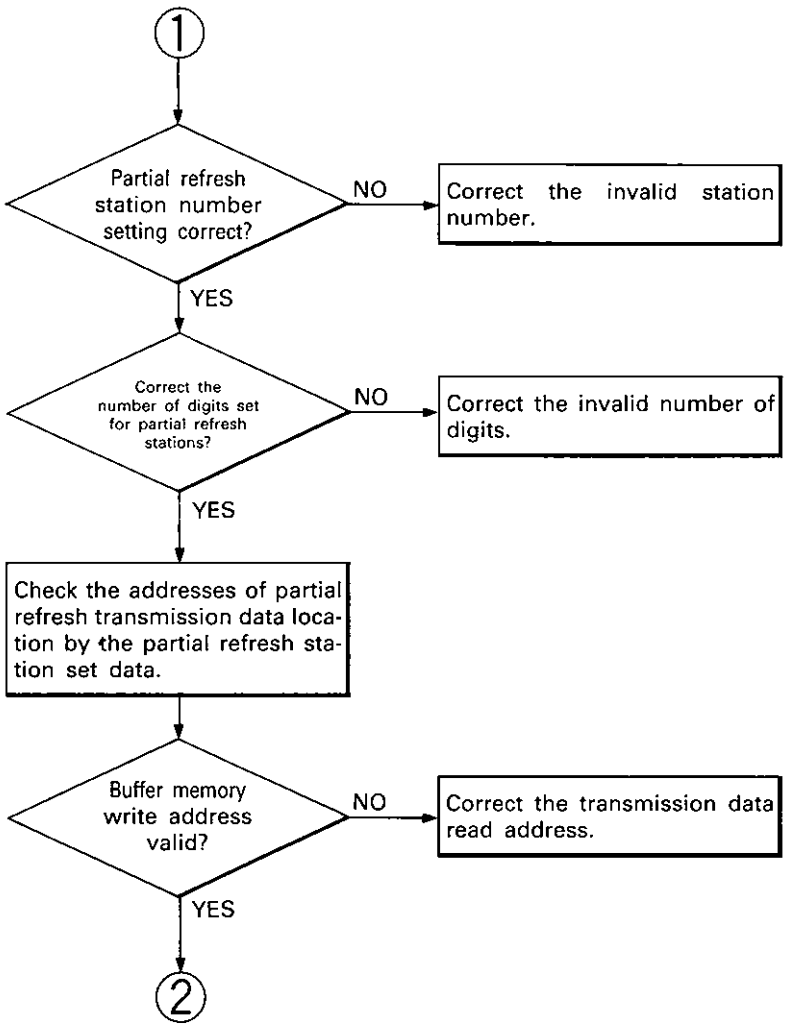

1
Partial refresh station number setting correct?
NO
Correct the invalid station number.
YES
Correct the number of digits set for partial refresh stations?
NO
Correct the invalid number of digits.
YES
Check the addresses of partial refresh receive data location by the partial refresh station set data.
Buffer memory read address valid?
NO
Correct the receive data read address.
YES
Check the sequence program which transfers data from the buffer memory to the bit devices and the sequence program which uses input data.
Program correct?
NO
Correct the sequence program.
YES
2

6.2.6 Output fault




1
Partial refresh station number setting correct?
NO
Correct the invalid station number.
YES
Correct the number of digits set for partial refresh stations?
NO
Correct the invalid number of digits.
YES
Check the addresses of partial refresh transmission data location by the partial refresh station set data.
Buffer memory write address valid?
NO
Correct the transmission data read address.
YES
2

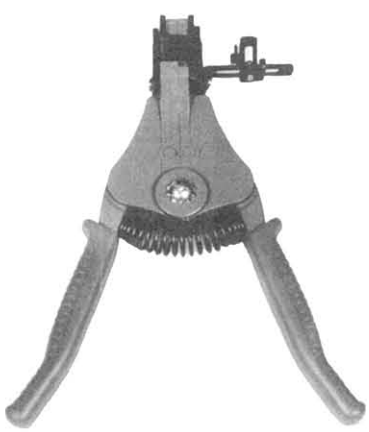
APPENDICES

Appendix 1. Optical Connector Manufacturing Method

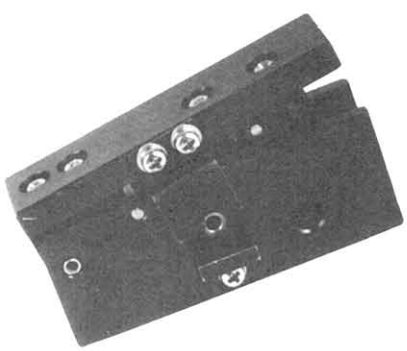
(1) Assembling tools

Description	Type	Quantity
Fiber stripper	ST 1000	1
Fiber cutter	CV 1000	1
Fiber clamper	FC 1000	1
Optical power tester	HT 101P	1
Cutter replacement blade	———	1

Fiber stripper



Fiber cutter



Fiber clamper

Optical power tester

APP

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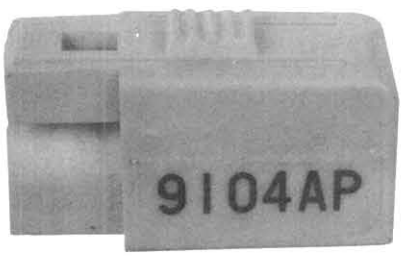
(2) Connector parts

Description	Quantity
Housing	1
Ferrule	1
Sleeve	1

Housing



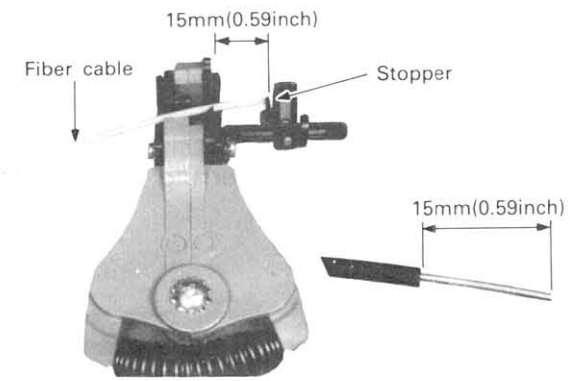
Ferrule

Sleeve

(3) Assembling procedure

1. Stripping the outer sheath

Set the end face of the optical fiber cable to the stripper stopper and strip the outer sheath approx. 15mm(0.59inch).



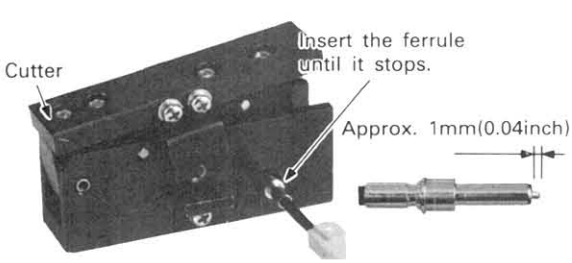
2. Inserting the sleeve

3. Inserting the housing

4. Inserting the ferrule

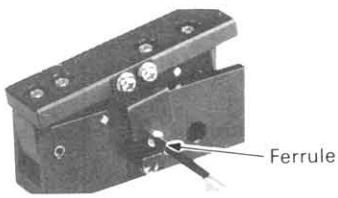
Insert the ferrule until the fiber comes out of the ferrule end and stops.

5. Cutting the fiber



The fiber is cut off approx. 1mm(0.4inch) from the ferrule end.

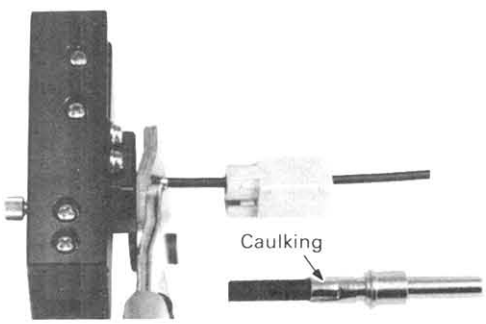
6. Positioning the fiber end face



Push the ferrule until the fiber end is aligned with the ferrule end.

7. Caulking the fiber

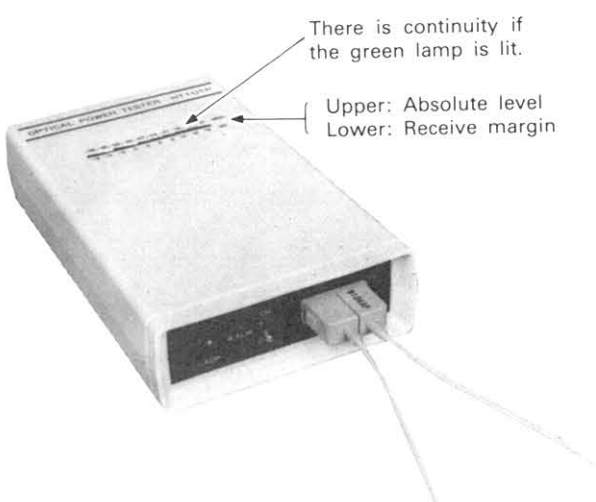
With the fiber in the state of Step 6, caulk the fiber outer sheath. (Check that the fiber is not in the outside of the ferrule end.)



8. Reassembling

Return the housing and sleeve to the ferrule area.

9. Making optical continuity check



APP

Appendix 2. Communication Data Assignment Sheets

(1) Batch refresh communication data sheet

Buffer Memory Address	Remote I/O Station (Upper: b0 to 7 / Lower: b8 to 15)			Remarks	Buffer Memory Address	Remote I/O Station (Upper: b0 to 7 / Lower: b8 to 15)			Remarks
	Station number	I/O address	Device			Station number	I/O address	Device	
10	1	to	to		26	33	to	to	
	2	to	to			34	to	to	
1	3	to	to		7	35	to	to	
	4	to	to			36	to	to	
2	5	to	to		8	37	to	to	
	6	to	to			38	to	to	
3	7	to	to		9	39	to	to	
	8	to	to			40	to	to	
4	9	to	to		30	41	to	to	
	10	to	to			42	to	to	
5	11	to	to		1	43	to	to	
	12	to	to			44	to	to	
6	13	to	to		2	45	to	to	
	14	to	to			46	to	to	
7	15	to	to		3	47	to	to	
	16	to	to			48	to	to	
8	17	to	to		4	49	to	to	
	18	to	to			50	to	to	
9	19	to	to		5	51	to	to	
	20	to	to			52	to	to	
20	21	to	to		6	53	to	to	
	22	to	to			54	to	to	
1	23	to	to		7	55	to	to	
	24	to	to			56	to	to	
2	25	to	to		8	57	to	to	
	26	to	to			58	to	to	
3	27	to	to		9	59	to	to	
	28	to	to			60	to	to	
4	29	to	to		40	61	to	to	
	30	to	to			62	to	to	
5	31	to	to		1	63	to	to	
	32	to	to			64	to	to	

APP

(2) Partial refresh station set data sheet

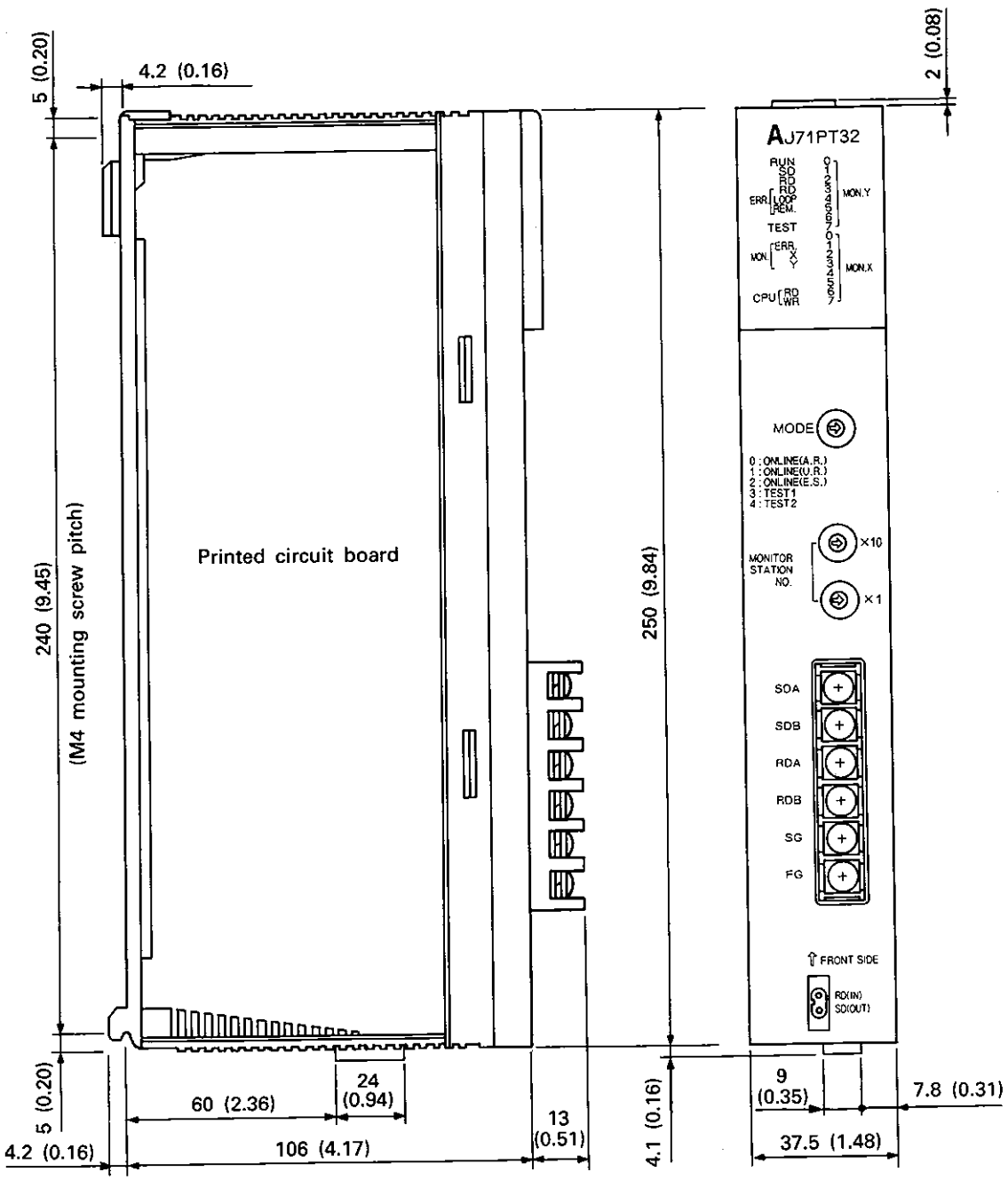
Buffer Memory Address	Set Data (Upper: Station number / Lower: Number of digits)	Addresses of I/O Data Location		Remarks
		Input data	Output data	
250		to	to	
1				
2		to	to	
3				
4		to	to	
5				
6		to	to	
7				
8		to	to	
9				
260		to	to	
1				
2		to	to	
3				
4		to	to	
5				
6		to	to	
7				
8		to	to	
9				
270		to	to	
1				
2		to	to	
3				
4		to	to	
5				
6		to	to	
7				
8		to	to	
9				
280		to	to	
1				

(3) Partial refresh communication data sheet

Buffer Memory Address	Remote I/O Station		Devices for Storing Receive Data	Remarks
	(Station number) – (number of digits)	I/O address		
0	–	0 to F	to	
1	–	0 to F	to	
2	–	0 to F	to	
3	–	0 to F	to	
4	–	0 to F	to	
5	–	0 to F	to	
6	–	0 to F	to	
7	–	0 to F	to	
8	–	0 to F	to	
9	–	0 to F	to	
0	–	0 to F	to	
1	–	0 to F	to	
2	–	0 to F	to	
3	–	0 to F	to	
4	–	0 to F	to	
5	–	0 to F	to	
6	–	0 to F	to	
7	–	0 to F	to	
8	–	0 to F	to	
9	–	0 to F	to	
0	–	0 to F	to	
1	–	0 to F	to	
2	–	0 to F	to	
3	–	0 to F	to	
4	–	0 to F	to	
5	–	0 to F	to	
6	–	0 to F	to	
7	–	0 to F	to	
8	–	0 to F	to	
9	–	0 to F	to	

Appendix 3. Dimensions

(1) AJ71PT32



Unit: mm (inch)

APP

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.

Under no circumstances will Mitsubishi Electric be liable or responsible for any consequential damage that may arise as a result of the installation or use of this equipment.

All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.

Owing to the very great variety in possible applications of this equipment, you must satisfy yourself as to its suitability for your specific application.

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