MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-A

User's Manual

PROFIBUS interface module type AJ71PB96

MITSUBISHI ELECTRIC

REVISIONS

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

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INTRODUCTION

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

CONTENTS

1. GENERAL DESCRIPTION

This manual describes the specifications, handling, programming methods of AJ71PB96 type PROFIBUS interface module (hereinafter abbreviated to AJ71PB96 or I/F module) used to incorporate the A Series programmable controller into the PROFIBUS network.
The AJ71PB96 has the following functions:

(1) Installing the AJ71PB96 on the A Series programmable controller makes it possible to perform PROFIBUS communication.
The AJ71PB96 can act as a server or a client of FMS in the PROFIBUS network. When the AJ71PB96 acts as a server, other client station can read/write the programmable controller variable objects and so on.
When it acts as a client, it can read and write variables of other server devices from the sequence program.

For the FMS service capable of operating as a server and the FMS service capable of operating as a client, refer to Appendix 2, "A List of FMS Services".

(2) When the S/W package SW0IX-PB96PE or SW0IX5-PB96PE for PROFIBUS interface (hereinafter abbreviated to SW0IX-PB96PE and SW0IX5-PB96PE) is used on IBM-PC/AT, it is possible to set the communication parameters of AJ71PB96 (setting of token cyclic time, etc) and perform monitoring of statistical information (number of retries, etc).

POINT

For details of FMS service issued from the client and its response, refer to the "FMS Interface Manual (IB-66459)".

CAUTION

Do not attempt to communicate with an AJ71PB96 using a software package other than those compatible with the AJ71PB96.

In this Users manual, the CPU type is designated as shown below.

Programmable controller CPU	Building block type CPU	A1N, A2N, A2N-S1, A3NCPU(P21/R21) A1, A2, A2-S1, A3CPU(P21/R21) A3HCPU(P21/R21) A3MCPU(P21/R21) A2A, A2A-S1, A3ACPU(P21/R21)
	Small building block type CPU	A1SCPU
	Compact type CPU	A0J2CPU(P23/R23) A0J2HCPU(P21/R21)

POINT

The I/O address for the I/F module in this manual stands for the address when the I/F module is installed at the slot No. 0 of the main base unit using the building block type CPU. If the I/F module is installed at other than the slot No. 0 or used with A1SCPU and compact type CPU, programming should be carried out using the I/O addresses assigned to the I/F module.

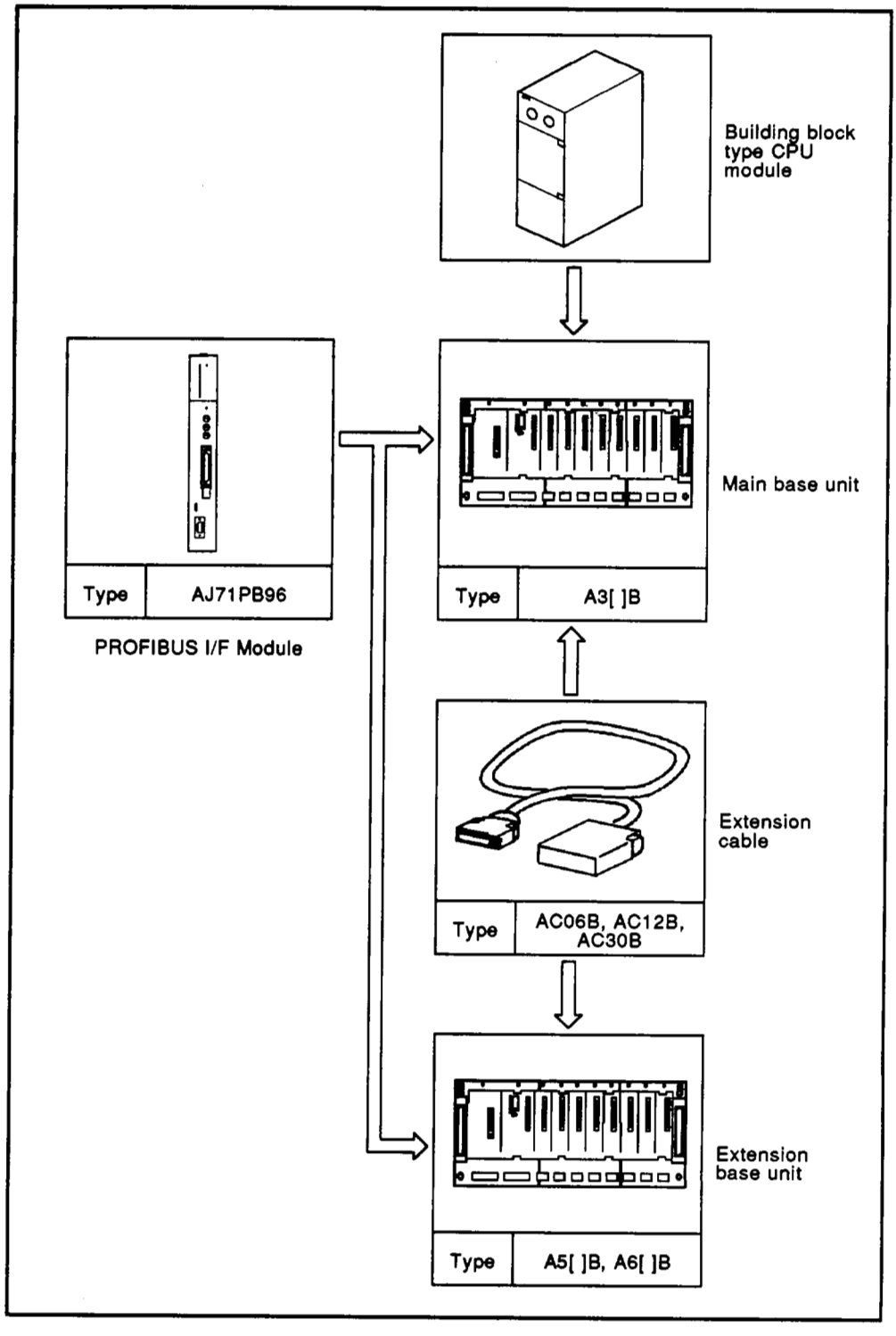
NOTE

Mitsubishi Electric cannot guarantee that the equipment will function correctly if any operation not described in this manual is performed.

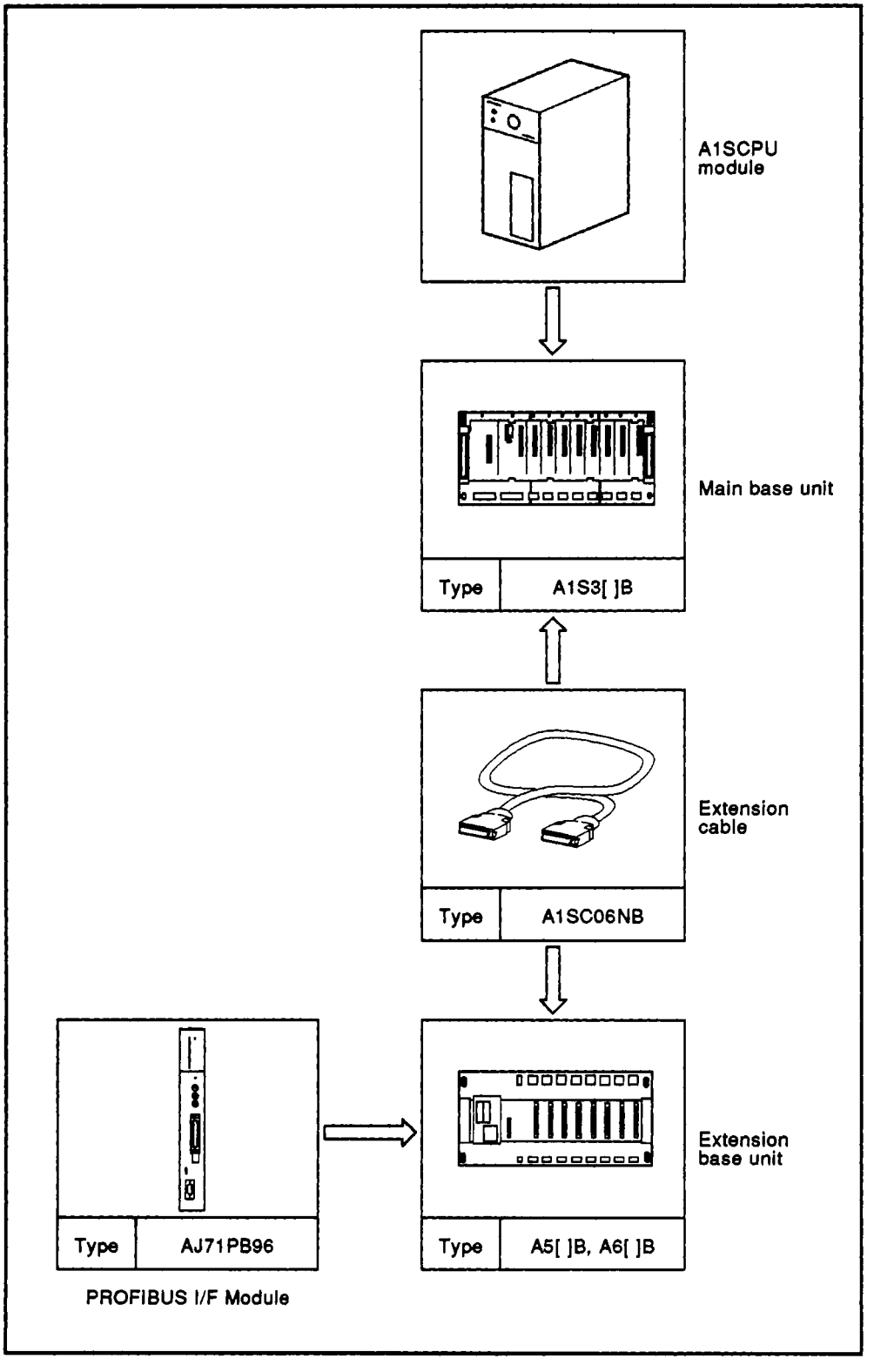
2. SYSTEM CONFIGURATION

2.1 Entire Configuration

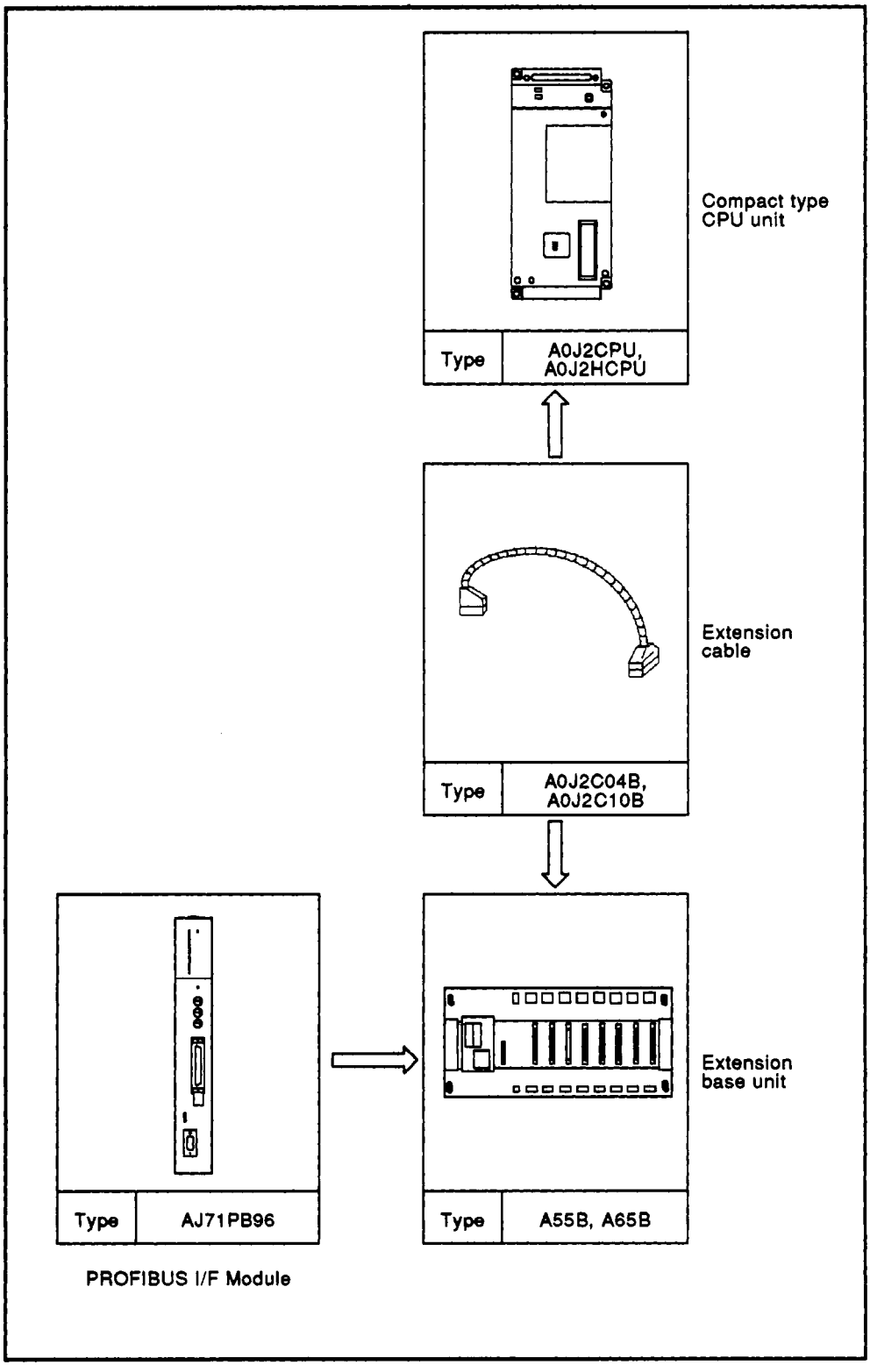
(1) In case of building block type CPU:
Entire configuration of I/F module using the building block type CPU is shown below.



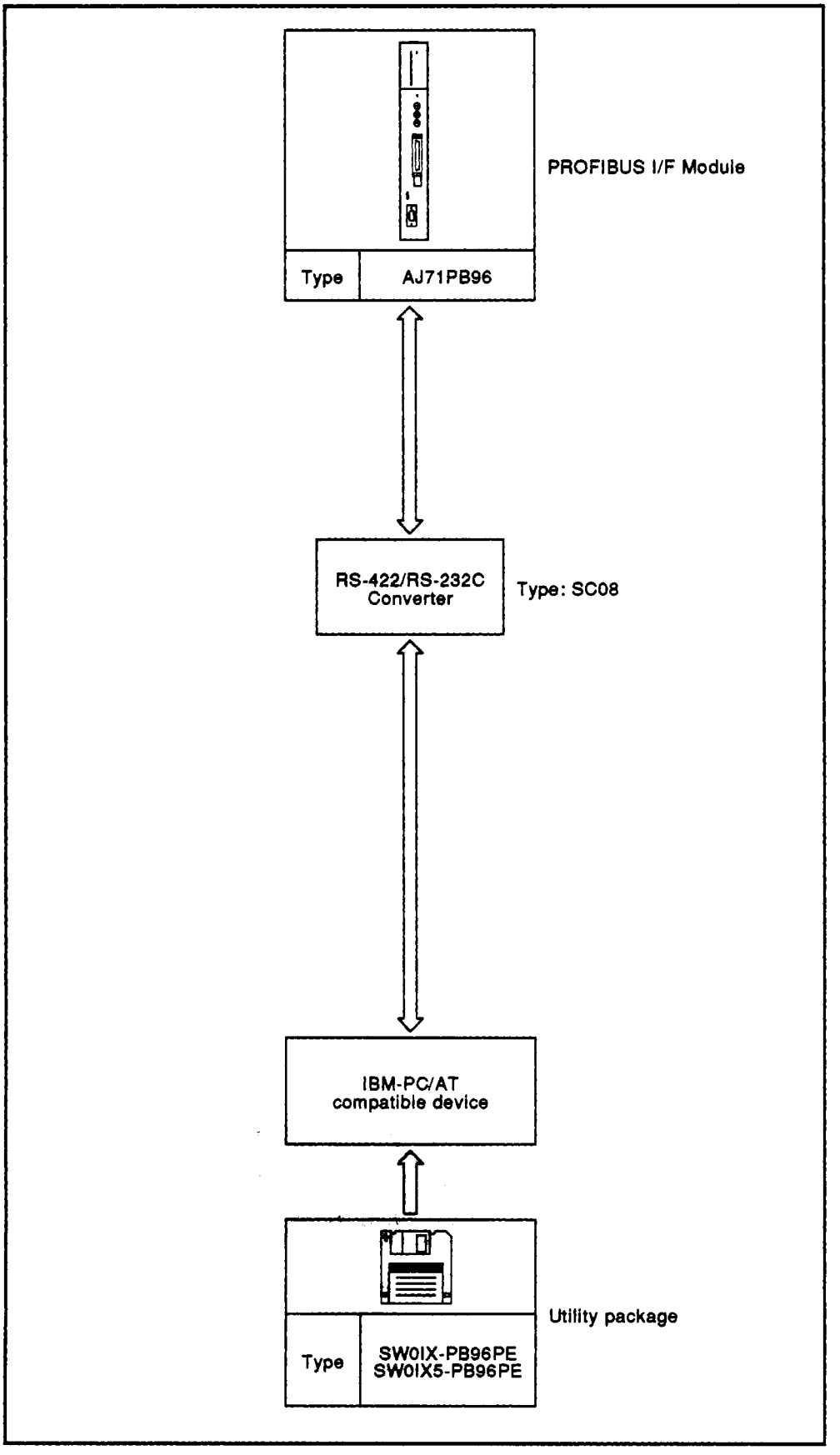
(2) In case of A1SCPU:
Entire configuration of I/F module using the A1SCPU module is shown below.



(3) In case of compact type CPU:
Entire configuration of I/F module using the compact type CPU unit is shown below.



(4) Configuration of peripheral devices



2.2 Applicable Systems

(1) The I/F module can be used with the following CPUs:

Applicable CPUs	A0J2CPU (P23/R23)	A0J2HCPU (P21/R21)
	A1NCPU (P21/R21)	A1CPU (P21/R21)
	A2NCPU (P21/R21)	A2CPU (P21/R21)
	A2NCPU (P21/R21)-S1	A2CPU (P21/R21)-S1
	A3NCPU (P21/R21)	A3CPU (P21/R21)
	A3HCPU (P21/R21)	A3MCPU (P21/R21)
	A2ACPU (P21/R21)	
	A2ACPU (P21/R21)-S1	A3ACPU (P21/R21)
	A1SCPU	

(2) A single I/F module can be installed on each programmable controller CPU.

(a) When the I/F module is used with A0J2CPU (P23/R23), neither AD51 nor A0J2C214 can be used.

(b) When the I/F modules are used with A2ACPU (P21/R21), A2ACPU(P21/R21)-S1, and A3ACPU (P21/R21) in combination with the following units/modules, up to six I/F modules can be used in total.

(c) When the I/F modules are used with applicable CPUs other than the CPUs described in the items (a) and (b) in combination with the following units/modules, up to two I/F modules can be used in total.

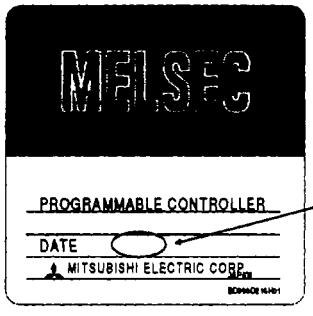
- AJ71C24(S3/S6), AD51(S3), AD51H, AD57G, AJ71C22, AJ71P41, AJ71E71

POINT

Only PC CPU manufactured after March, 1986 can be used with the AJ71PB96.

Applicability can be confirmed by checking the date area of the PC CPU name plate.

The following shows how to check the PC CPU name plate:



PC CPU that can be used with the AJ71PB96

603

This shows it was manufactured in March, 1986.

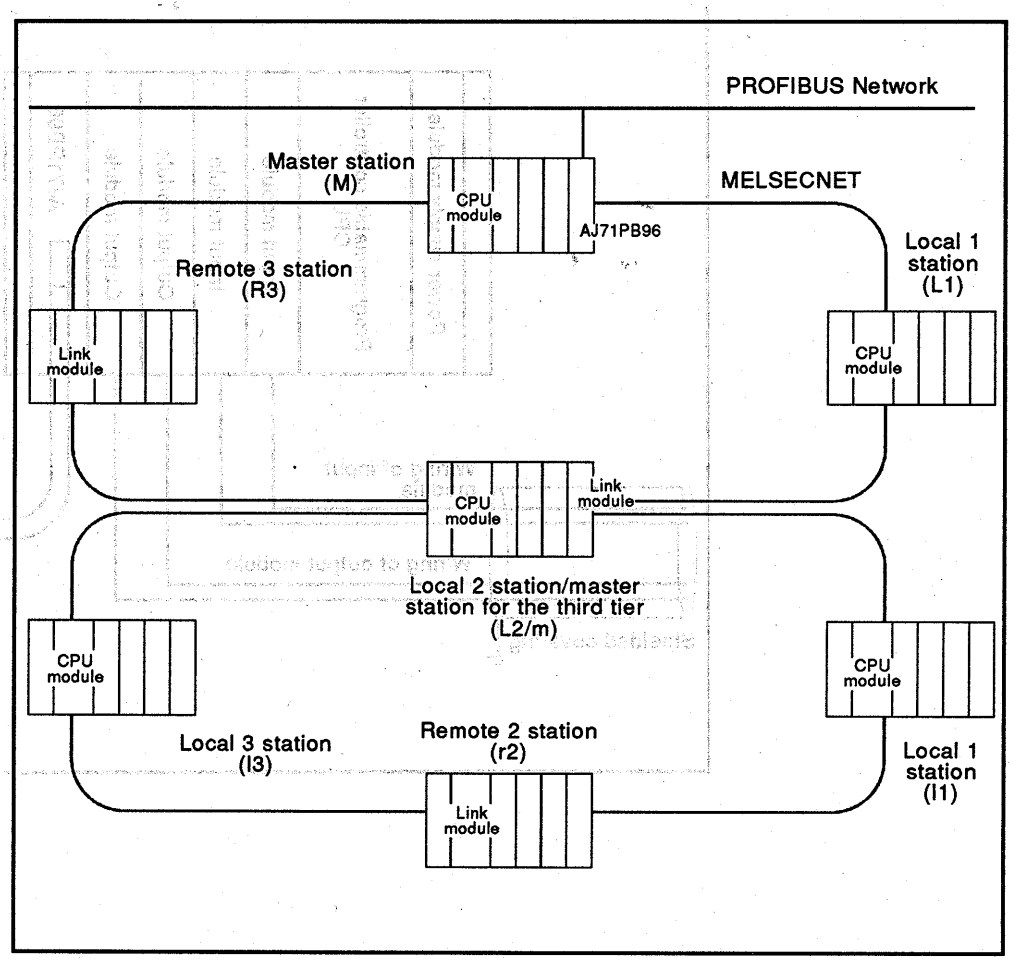
2.3 Precautions Against System Configuration

(1) The I/F module can be installed at any slot of the base unit except for the following cases:

(a) Avoid installing on the extension base units without a power supply module (A5[ ] type extension base units) as much as possible because this may cause running short of capacity of power supply. If the I/F module is to be installed on those units, refer to the Users Manual of the CPU module for selection of power supply module and extension cable.

(b) The I/F module cannot be installed at the extended seventhlast slot of A3CPU.

(2) On the MELSECNET data link system, the I/F module should be installed at the master and local stations. The I/F module cannot be used with the remote I/O station.



The MELSECNET stations in the system above accessible from the PROFIBUS network are as follows:

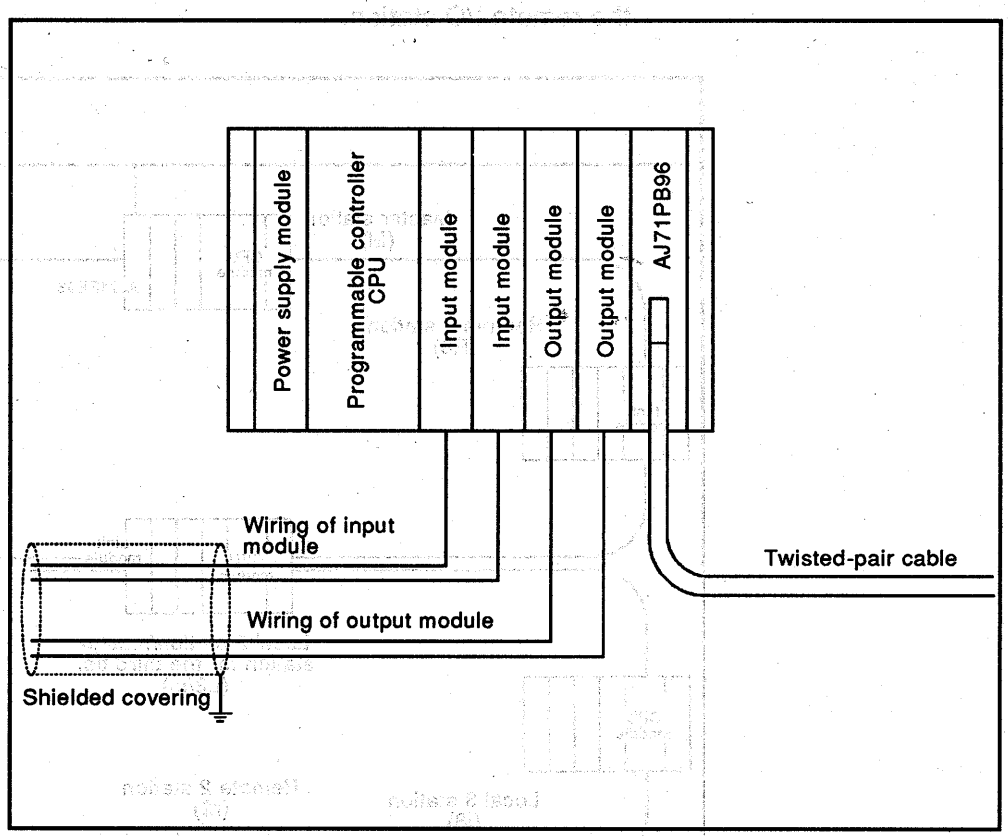
(1) When installed at the master station(M) ---------- >M,L1,L2/m,R3
(2) When installed at the master/local stations(L2/n) -- >L2/m,l1,r2,l3
(3) When installed at the local stations (L1, l1, l3) ---- >Host (self) station only

2.4 Precautions Against Wiring

As one of the requirements to give full play to AJ71PB96's functions and make up the system with high reliability, it is necessary to have an external wiring unsusceptible to an influence of noise. Precautions against external wiring of AJ71PB96 is described below.

(1) Do not route the wire of AJ71PB96 close to or bundle it together with the main circuit and high-tension lines, or the load-carrying lines from other than the programmable controller. Otherwise, the module may be susceptible to an influence of noise and surge induction.

(2) The wires from the input/output modules of the programmable controller should be away from the communication cable of PROFIBUS interface module as far as possible as shown in the figure below.



(3) Grounding

(a) When the PROFIBUS interface module is used, the FG and LG terminals of the power supply module of the programmable controller should basically be grounded.

(b) If communication cannot be performed after grounding because of abnormal voltage applied to the FG terminal, the module may be used without grounding.

3. SPECIFICATIONS

3.1 General Specifications

General specifications of MELSEC-A Series are as shown below.

<table>
<tr><th>Item</th><th colspan="5">Specifications</th></tr>
<tr><td>Operating ambient temperature</td><td colspan="5">0 to 55 °C</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="5">–20 to 75 °C</td></tr>
<tr><td>Operating ambient humidity</td><td colspan="5">10 to 90 % RH, no condensation</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="5">10 to 90 % RH, no condensation</td></tr>
<tr><td rowspan="3">Vibration resistance</td><td rowspan="3">*2Conforms to JIS C 0911.</td><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep count</td></tr>
<tr><td>10 to 55 Hz</td><td>———</td><td>0.075 mm</td><td rowspan="2">10 times *1(1 octave/ 1 min.)</td></tr>
<tr><td>55 to 150 Hz</td><td>9.8 m/s^2</td><td>———</td></tr>
<tr><td>Shock resistance</td><td colspan="5">*2 Conforms to JIS C 0912 (9.8 m/s^2 x 3 times in 3 directions)</td></tr>
<tr><td>Noise resistance</td><td colspan="5">By noise simulator of 1500 V.P.P. noise voltage, 1 μs noise width and 25 to 60 Hz noise frequency.</td></tr>
<tr><td>Dielectric withstand voltage</td><td colspan="5">1500 VAC for 1 minute across batch of AC external terminals and ground</td></tr>
<tr><td>Insulation resistance</td><td colspan="5">5 MΩ or more with 500 VDC insulation resistance tester across batch of AC external terminals and ground</td></tr>
<tr><td>Operating atmosphere</td><td colspan="5">No corrosive gases or dust.</td></tr>
<tr><td>Cooling method</td><td colspan="5">Self-cooling</td></tr>
</table>

REMARKS

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

*2: JIS: Japanese Industrial Standards

3.2 Performance Specifications

List of performance specifications

Performance specifications of I/F module are as listed below.

Item	Specifications	
Transmission speed *1 Maximum transmission distance	Transmission speed	Transmission distance
	9.6 Kbps	1200 m (3936 ft)/1 segment
	19.2 Kbps	
	92.5 Kbps	
	187.5 Kbps	600 m (1968 ft)/1 segment
	500.0 Kbps	200 m (656 ft)/1 segment
Transmitting method	Half-duplex bit serial	
Maximum number of stations connected	32 stations	
Maximum extension distance	* 700 m (2296 ft)	
Encoding method	NRZ	
Synchronizing method	Asynchronous	
Electrical standards and characteristics	Conforms to EIA-RS485.	
Cable	Shielded twisted cable	
Communication protocol	Token passing (between masters) method Polling (between master and slave) method	
Data transfer volume	Maximum 249 bytes / transfer	
Network configuration	Bus type (however, tree type when repeaters are used)	
Maximum transmission distance	4800 m (at transmission speed 92.5 Kbps or less when using three repeaters)	
Number of repeaters / network	Three (maximum)*2	
Number of stations / segment	32 stations (maximum) / segment	
Number of stations / network	127 stations / network (when using 3 repeaters)	
Number of occupying I/O points	32 points	
5 VDC internal current consumption	1.3 A	
Outside dimensions mm(inch)	250 x 37.5 x 120 (9.84 x 1.48 x 4.72)	
Weight kg(lb)	0.5 (1.1)	

*1 Accuracy of transmission speed: within ± 0.3 %

*2 Transmission distance (m(ft)/network) can be extended with the use of repeaters.
Transmission distance (m(ft)/network) = (Number of repeaters + 1) x Transmission distance (m(ft)/network)

3.3 Packaging Specifications

List of packaging specifications

Protocols installed to the I/F module and their conforming standards are as shown below.

<table>
<tr><th>Name of OSI Layer</th><th colspan="2">PROFIBUS Protocol</th><th colspan="2">Conforming Standards</th></tr>
<tr><td>7. Application layer</td><td colspan="2">FMS, LLI,
FMA7</td><td colspan="2">Standards peculiar to PROFIBUS
(DIN19245)</td></tr>
<tr><td>6. Presentation layer</td><td colspan="2">———————</td><td colspan="2">———————</td></tr>
<tr><td>5. Session layer</td><td colspan="2">———————</td><td colspan="2">———————</td></tr>
<tr><td>4. Transport layer</td><td colspan="2">———————</td><td colspan="2">———————</td></tr>
<tr><td>3. Network laye</td><td colspan="2">———————</td><td colspan="2">———————</td></tr>
<tr><td rowspan="2">2. Data link layer</td><td>FDL</td><td rowspan="2">FMA1/2</td><td>Standards peculiar to PROFIBUS (DIN19245)</td><td rowspan="2">Standards peculiar to PROFIBUS (DIN19245)</td></tr>
<tr><td>1. Physical layer</td><td>PHY</td><td>RS485</td></tr>
</table>

NOTE

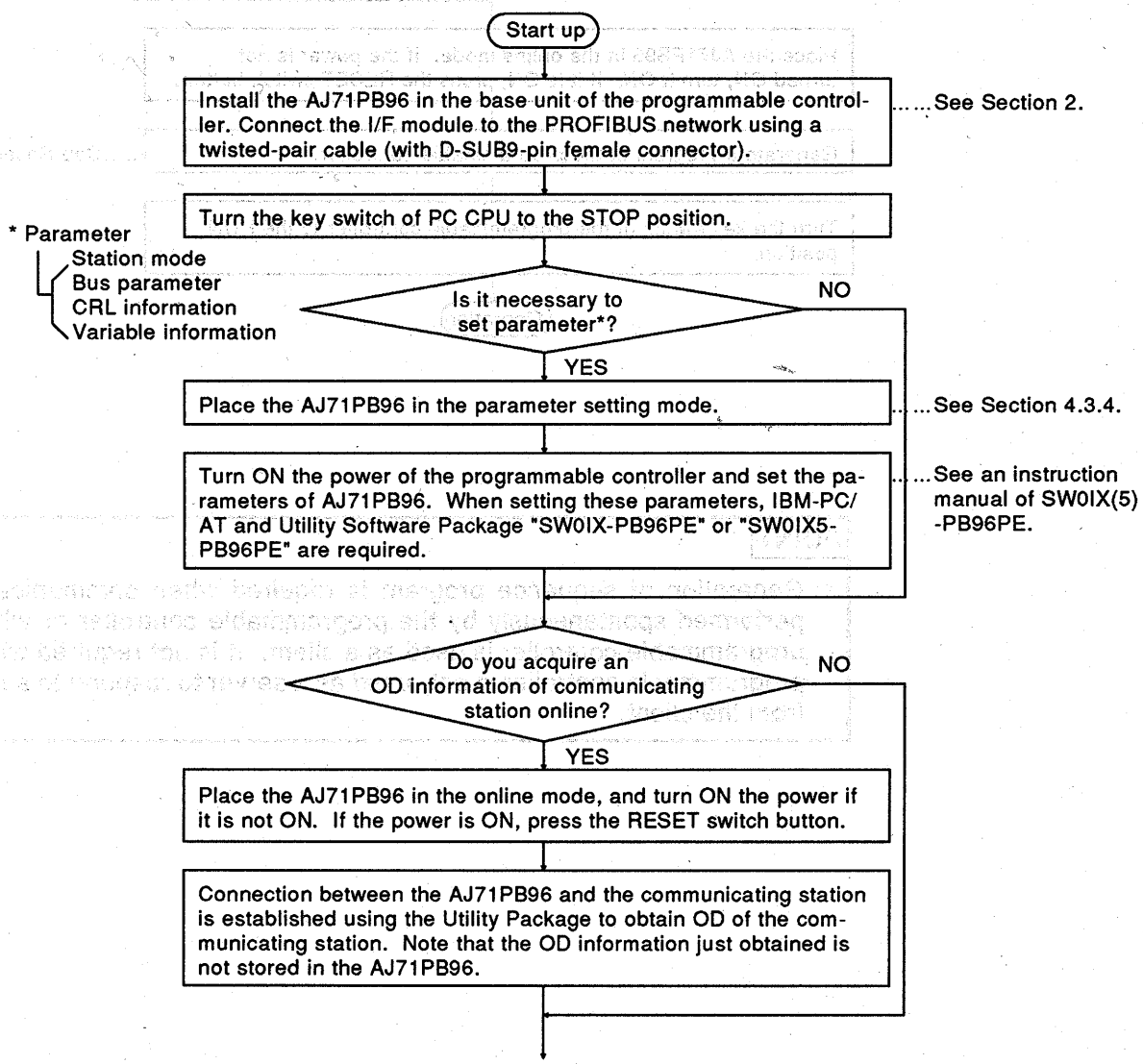
FMA7 service is used for internal control of AJ71PB96.
The FMA7 service cannot be used by a sequence program and a communicating station.

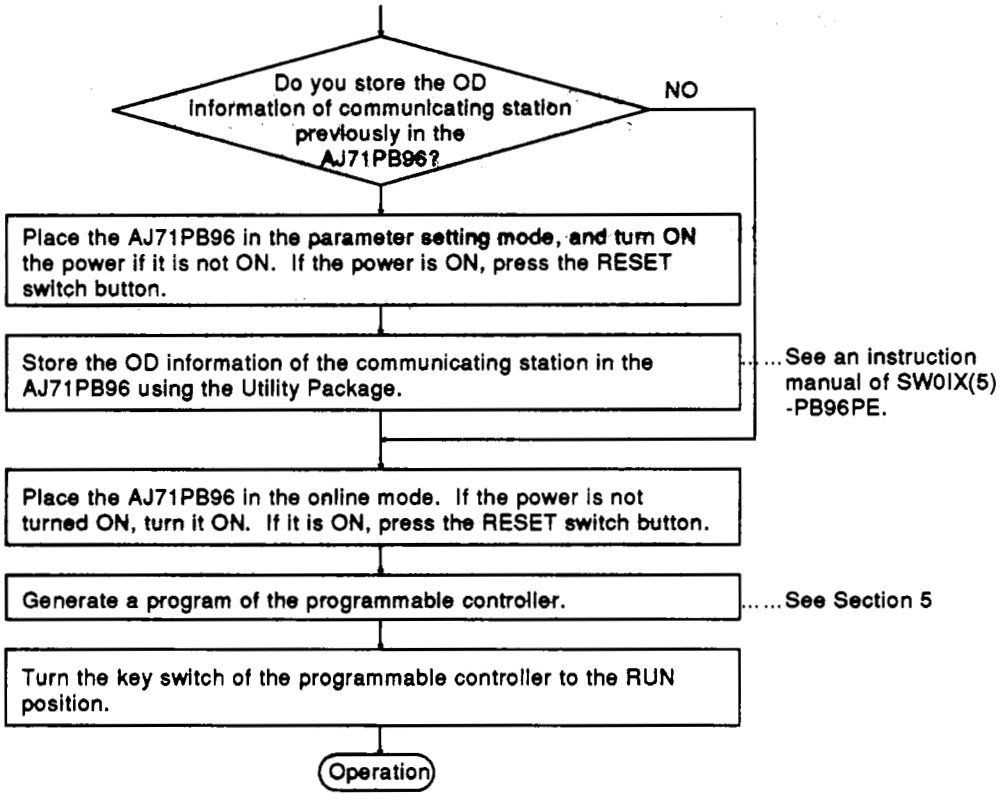
4. PROCEDURE BEFORE OPERATION

Operating procedure prior to the operation of the I/F module, nomenclature of each component of the module, use and setting procedure of rotary switches and DIP switches are described.

4.1 Operating Procedure Before Operation

A procedure when newly connecting a programmable controller to the existing PROFIBUS network is described below.





POINT

*: Generation of sequence program is required when communication is performed spontaneously by the programmable controller or when the programmable controller is used as a client. It is not required when the programmable controller is only used as a server to respond to a request from the client.

4.2 Handling Precautions

Precautions to be observed for proper handling of the I/F module are as described below.

(1) Since a case of the I/F module is made of resin, do not let the module fall or give a strong impact on it.

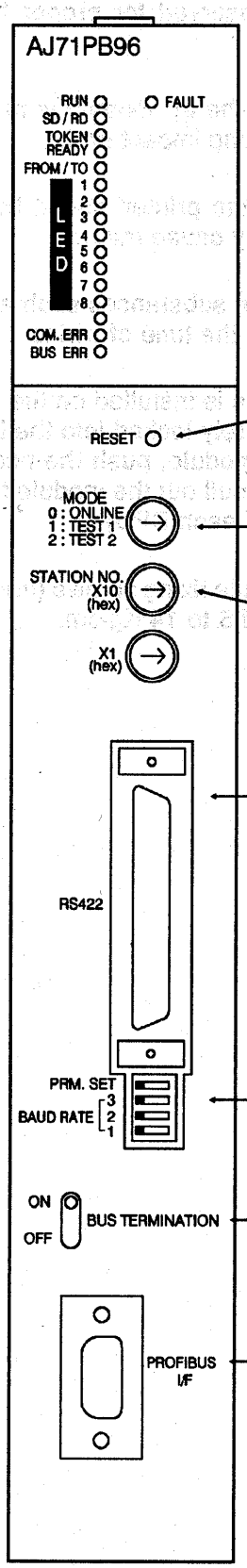
(2) Do not remove the printed circuit board of the module from the case. Otherwise, it may cause failure.

(3) Do not let foreign substances such as wiring scraps intrude into the top of the module at the time of wiring.

(4) When the module is installed on the base, push it onto the base so that the hook is securely locked into the base.
To remove the module, push the hook to completely disengage it from the base before pull out the module toward you (For details, refer to the Users Manual of each CPU).

(5) Tighten the module fixing screws (unnecessary during normal operation) within a range of 8 to 14 Kg·cm.

4.3 Nomenclature of Each Component



(1) Status indication LED
For details, refer to Section 4.3.1.

(2) RESET switch
For details, refer to Section 4.3.2.

(3) MODE setting switch
For details, refer to Section 4.3.3.

(4) STATION ADDRESS setting switches
For details, refer to Section 4.3.4.

(5) RS422 connector
Connection port with peripheral device

(6) DIP switches
For details, refer to Section 4.3.5.

(7) BUS TERMINATION RESISTANCE selector switch
For details, refer to Section 4.3.6.

(8) Connector for connection of twisted-pair cable
For connection to PROFIBUS network through the twisted-pair cable

4.3.1 Status indication LED

The LEDs at the upper on the front panel of the AJ71PB96 are described.

LED Name	Description
RUN	Lights up when the I/F module is normally operating. Goes out due to hardware abnormality.
SD/RD	Lights up when data is sending and/or receiving on the PROFIBUS network.
TOKEN	Lights up when TOKEN is retained (goes out when TOKEN is released). *1
READY	Lights up when preparation for entry into the PROFIBUS network is completed and at the time of entrance.
FROM/TO	Lights up when FROM/TO instructions from the PC CPU are executing.
LED1 to LED8	Indicates a state of initialization during ONLINE operation*2, or a state of self-test (See Appendix 1).
COM.ERR	Lights up when there are any abnormalities at the communication hardware of the PROFIBUS.
BUS ERR.	Lights up when those other than memory area are accessed (hardware error).
FAULT	Lights up when there occur any errors.

*1 The more the number of nodes that enter for the Token Ring is, the longer the TOKEN LED goes out.

*2 Indication of state of initialization during ONLINE operation is as follows:

LED1	ON	:	Indicates that the ACPU communication is being initialized.
LED1	Blinking	:	Indicates that the module has any hardware abnormalities.
LED2	ON	:	Indicates that bus parameter, OD, and CRL are being initialized.
LED2	Blinking	:	Indicates that it is necessary to check the bus parameter, OD, and CRL for setting.
LED3	ON	:	Indicates that the communication hardware is being initialized.
LED3	Blinking	:	Indicates that there occur any communication hardware abnormalities.
LED4	ON	:	Indicates that the OD is being loaded onto the communication hardware.
LED4	Blinking	:	Indicates that it is necessary to check the OD for setting.
LED5	ON	:	Indicates that the bus parameter is being initialized and loaded into the communication hardware.
LED5	Blinking	:	Indicates that it is necessary to check the bus parameter for setting.
LED6	ON	:	Indicates that the CRL is being loaded into the communication hardware.
LED6	Blinking	:	Indicates that it is necessary to check the CRL for setting.
LED7	ON	:	Indicates that the communication hardware is being started.
LED7	Blinking	:	Indicates that there occur any communication hardware abnormalities.

4.3.2 RESET switch

The RESET switch of the AJ71PB96 is described.

When this switch is pressed, all operations within the PROFIBUS interface such as communication processing are interrupted and initialization is carried out. The RESET switch is used when initialization is required to start up the network. The switch has such a structure as difficult to be pressed erroneously during communication. The RESET switch is operated by pressing with the end of a small screwdriver.

NOTE

The RESET switch on the PC CPU cannot be used to initialize the PROFIBUS interface.

4.3.3 MODE setting switch

This switch is used to set normal operating mode (ONLINE) and self-diagnostic mode (TEST1, TEST2).

Setting	Description	
0	ONLINE	Setting position for normal operation.
1	TEST1	Setting position for self-diagnostic mode. An MPU of the I/F module and a local memory are tested repeatedly and continuously.
2	TEST2	Setting position for self-diagnostic mode. The MPU of the I/F module and the communication hardware are tested repeatedly and continuously.
3 to F	Do not set anything to these positions.	

For procedure of self-diagnosis, refer to Appendix 1.

4.3.4 STATION ADDRESS setting switches

These switches are used to set the addresses of the PROFIBUS network.

The addresses should be set in a range of 00h to 7Eh.

If other values than those described above are set, the LEDs 1 to 4 are all lit up when the power is turned ON, indicating a state of error.

4.3.5 DIP switches

These switches are used to set the parameters, and effective only when the MODE setting is "0 (zero)" (ONLINE).

(1) PRM. SET: Used to change operation.
Either parameter setting mode or communication mode is to be selected.
This DIP switch is turned to ON when setting the parameters, and normally to OFF.

(2) BAUD RATE: Used to select a baud rate.

Transmission Speed		3	2	1	Remarks
0	9.6 Kbps	OFF	OFF	OFF	Default value
1	19.2 Kbps	OFF	OFF	ON	
2	93.75 Kbps	OFF	ON	OFF	
3	187.5 Kbps	OFF	ON	ON	
4	500.0 Kbps	ON	OFF	OFF	
5	————	ON	OFF	ON	When these DIP switches are set, the LEDs 5 to 8 are lit up, indicating error state.
6	————	ON	ON	OFF	
7	————	ON	ON	ON	

NOTE

Set these switches before turning ON the power.
Even if the setting of these switches is changed during operation, the mode is not changed. Either turn OFF the power once and then restart the module, or press the RESET switch.

4.3.6 BUS TERMINATION RESISTANCE selector switch

Change over depending on where AJ71PB96 is installed in the PROFIBUS network.

When AJ71PB96 is installed to either of both end of PROFIBUS network, turn this switch to "ON" to enable the termination resistance.
Otherwise, turn the switch to "OFF" to disable the termination resistance.

5. PROGRAMMING

This section describes the programming for communication between the AJ71PB96 and the PC CPU. For details of FMS service and its response, refer to the "FMS Interface Manual" separately available.

5.1 Communicating Configuration of AJ71PB96

(1) Master/slave station
The AJ71PB96 can use the software package SW0IX-PB96PE or SW0IX5-PB96PE (optional) for IBM-PC/AT to set the parameters, allowing it to select its operation functioning either as a master station or as a slave station. This has been set to master station at the factory.

(2) Client and server functions
Whether the AJ71PB96 serves as a client or a server is determined as follows:

- In case of communication between master and slave, since a connection establishment cannot be requested from the slave station, the I/F module cannot be a client when it is operating as a slave station.
- In case of communication between master and master, since both stations have a right to become a client, the station that issues a service request becomes a client.

(3) Communication type
The AJ71PB96 can use the software package SW0IX-PB96PE or SW0IX5-PB96PE (optional) for IBM-PC/AT to set the parameters, allowing it to use all types of communication prescribed by the PROFIBUS. Master-master acyclic open connection as responder (MMAC/0) has been set at the factory.

(4) Maximum number of communications
An AJ71PB96 can handle up to 32 communications simultaneously. However, this assumes that all PDU sizes for all CRLs are set to values no greater than 200 using SW0IX-PB96PE or SW0IX5-PB96PE (available separately). If even one PDU size is set to a value greater than 200, the maximum number of communications will be reduced to 16.

REMARK

- For services capable of using in each mode, refer to Appendix 2.

5.2 Input/Output for PC CPU

With the use of general-purpose inputs and outputs that the I/F module has, ON/OFF signals can be sent and/or received between the PC CPU. Available general-purpose I/O number and its description are described. The I/O number denotes those ones when the I/F module is installed at the slot No.0 on the main base unit.

5.2.1 List of I/O signals

Direction of Signals: From the AJ71PB96 to the PC CPU		Direction of Signals: From the PC CPU to the AJ71PB96	
Device No.	**Description**	**Device No.**	**Description**
X00	Request processing complete signal (Area No.1)	Y00	Request demand signal (Area No.1)
X01	Request processing complete signal (Area No.2)	Y01	Request demand signal (Area No.2)
X02	Request processing complete signal (Area No.3)	Y02	Request demand signal (Area No.3)
X03	UCS receive signal (receive-only area)	Y03	UCS read complete signal (receive-only area)
X04 to X0C	Unusable.	Y04	Not used
		Y05 to Y06	These devices are used by the system, so prohibited from being used.
		Y07 to Y0F	Not used
X0D	PROFIBS I/F WDT error signal		
X0E, X0F	Unusable.		
X10		Y10	
X11 to X1A	Unusable.	Y11 to Y19	Not used
		Y1A to Y1F	These devices are used by the system, so prohibited from being used.
X1B	PROFIBUS I/F communication READY signal		
X1C	PROFIBUS I/F error signal		
X1D	PROFIBUS I/F module READY signal		
X1E, X1F	Unusable.		

REMARKS

- WDT: Watch dog timer
- The area of Y not used can be used in place of internal relay M.
- For a relation between the I/O number and the slot, refer to the PC CPU manual.
- UCS: Unconfirmed Service

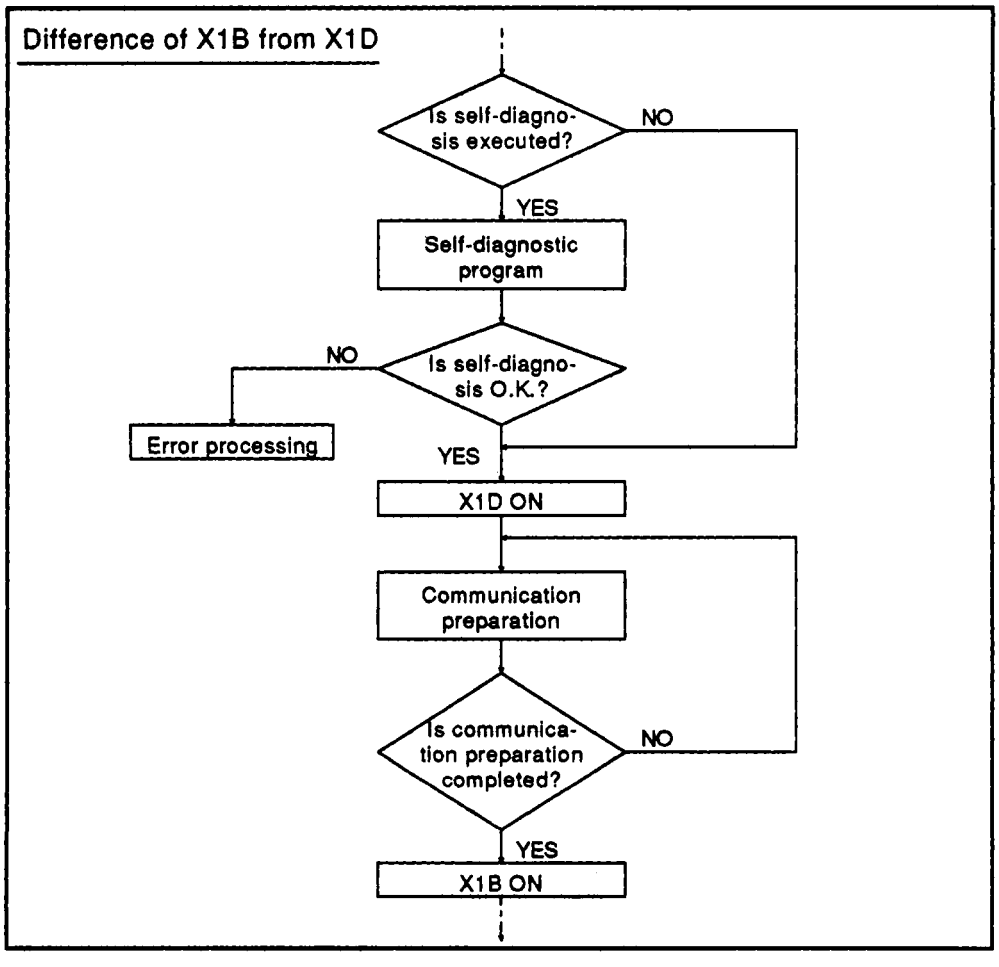
5.2.2 Explanation of input/output signals

(1) Request processing complete signal (X00 to X02) and request demand signal (Y00 to Y02) are used as a handshake signal when the PC CPU performs spontaneous PROFIBUS communication. For the method of using it, refer to the appropriate section. The signals X03 and Y03 are used for unconfirmed service receive-only.

(2) PROFIBUS I/F communication READY signal (X1B)
This signal is ON when the AJ71PB96 is ready for communication. The PC CPU should be programmed so that it starts PROFIBUS communication after this signal is ON.

(3) PROFIBUS I/F error signal (X1C)
This signal becomes ON when the AJ71PB96 detects any errors.

(4) PROFIBUS I/F module READY signal (X1D)
This signal is ON when the AJ71PB96 module is ready for operation. With the self-diagnosis being set, this signal is ON when the self-diagnosis is finished normally. For the difference from the communication READY signal (X1B), refer to the flow chart below.



(5) PROFIBUS I/F watch dog timer error signal (X0D)
This signal becomes ON when the AJ71PB96 detects a watch dog timer error.

5.3 Buffer Memory

A buffer memory in the AJ71PB96 for sending data to and receiving data from the PC CPU is described. This area is accessed by the FROM/TO instruction of the sequence program. The buffer memory in the AJ71PB96 consists of three request areas, three request answer areas, an information area, a receive area, three read/write areas, and a receive data area.

Address (decimal/hexadecimal)		In the unit of word (16-bit)
0/	0	Request area No.1 Description: This is an area in which the PC CPU sets the request data. For its use, refer to Sections 5.3.2 and 5.3.3.
63/	3F	
64/	40	Request answer area No.1 Description: This is an area in which the PC CPU gives an answer in response to a request of request area No.1. For its use, refer to Sections 5.3.2 and 5.3.3.
127/	7F	
128/	80	Request area No.2 Description: This is the same as described for the request area No.1.
191/	BF	
192/	C0	Request answer area No.2 Description: This is the same as described for the request answer area No.1.
255/	FF	
256/	100	Request area No.3 Description: This is the same as described for the request area No.1.
319/	13F	
320/	140	Request answer area No.3 Description: This is the same as described for the request answer area No.1.
383/	17F	
384/	180	Not used (reserved)
447/	1BF	
448/	1C0	Receive area Description: Receive control information of unconfirmed service is set in this area. Data just received is set in the receive-only data area.
511/	1FF	
512/	200	Information area Description: This is an area in which the communication information is displayed. For details, refer to Section 5.3.4.
1152/	480	
1376/	560	Network failure information area Description: This is an area in which media level failure information is displayed. For details, refer to Section 5.3.5.
1407/	57F	
1536/	600	Data area No.1 Description: This is an area in which data is set in order to read and/or write from/to communication station using the request area No.1.
2047/	7FF	
2048/	800	Data area No.2 Description: This is the same as described for data area No.1.
2559/	9FF	
2560/	A00	Data area No.3 Description: This is the same as described for data area No.1.
3071/	BFF	
3072/	C00	Receive data area Description: Data received by the unconfirmed service is set in this area.
3583/	DFF	

5.3.1 FMS service and command number

When services are executed using the request area and the unconfirmed services are received in the receive area, the following command number is used to identify the service.

Service Name	Command	Description
Initiate	0010h	Used to establish a connection.
Abort	0020h	Used to release a connection.
Status	0040h	Used to obtain status information of communicating station.
UnsolicitedStatus	0050h	Used to send PC CPU status.
Identify	0060h	Used to obtain identification information.
Read	01a0, 01a1h	Used to read data.
Write	01c0, 01c1h	Used to write data.
InformationReport	01e0, 01e1h	Used to send arbitrary data.

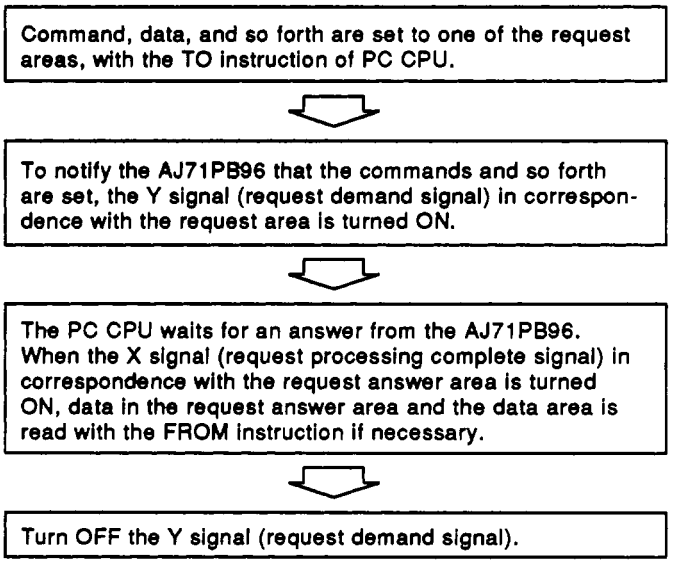
REMARK

- For services used in each mode, refer to Appendix 2.

5.3.2 Timing chart and example of program

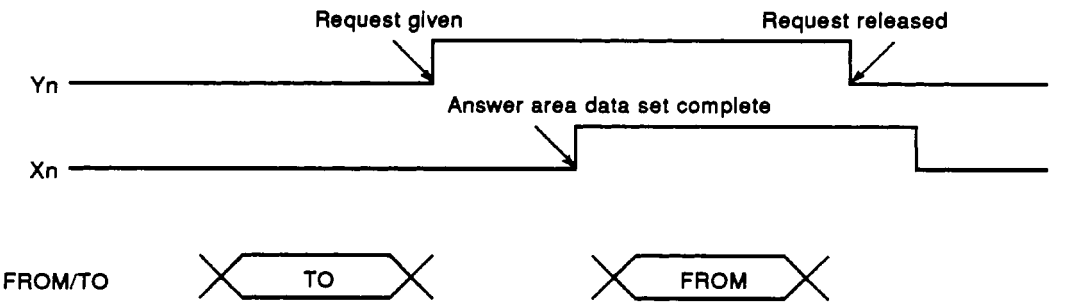
(1) When a request is given from the AJ71PB96:

Services are performed according to the following procedure.



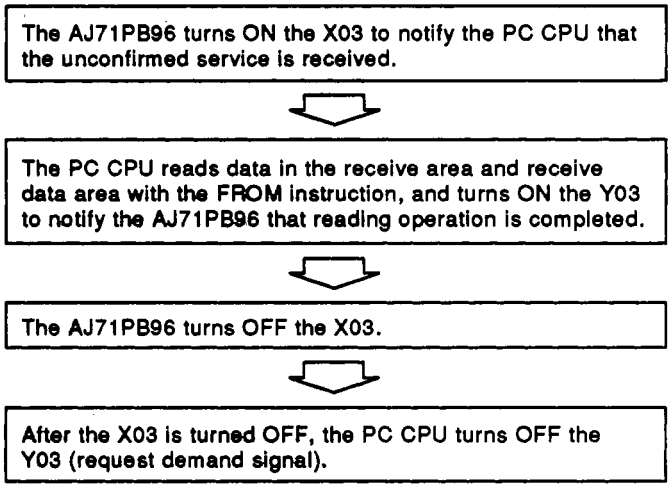
Timing chart

The procedure described above is shown in the timing chart as follows:



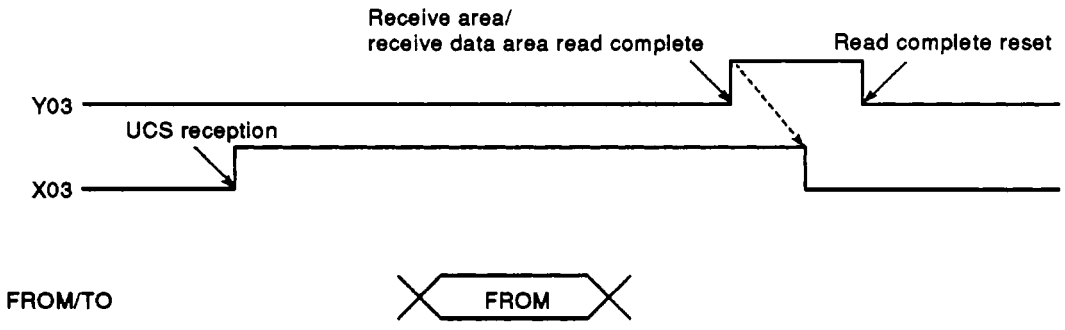
(2) When the unconfirmed service is received:

Services are performed according to the following procedure.



Timing chart

The procedure described above is shown in the timing chart as follows:



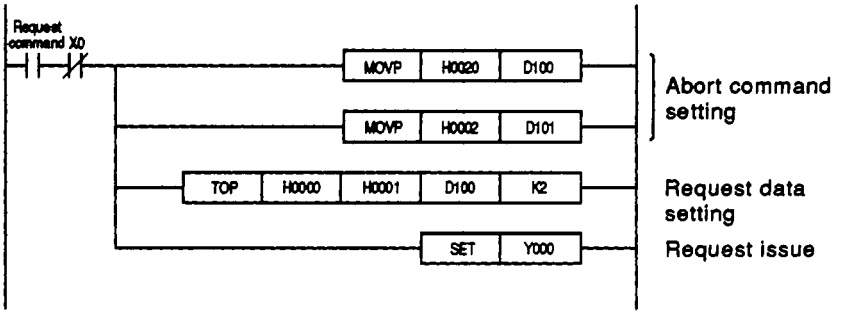
Example of sequence program

An example of sequence program that performs the Abort and Write services using the request area No.1 is shown below. The AJ71PB96 is assumed to be installed at the slot No.0 on the main base unit. For the meanings of each data, refer to Section 5.3.3, "Details of each command".

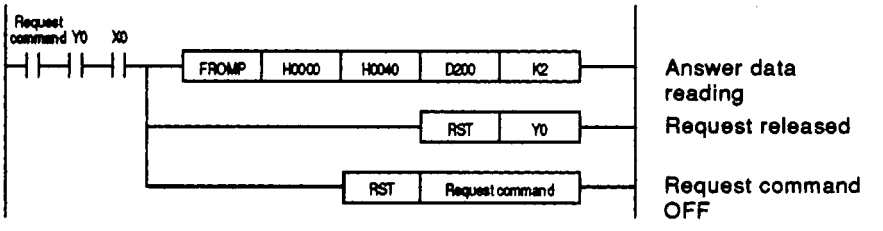
(a) Abort

An example of PC CPU, that sets the Abort command from the PC CPU data register D100 and stores its answer in the D200, is shown below.

Request data setting (TO instruction)



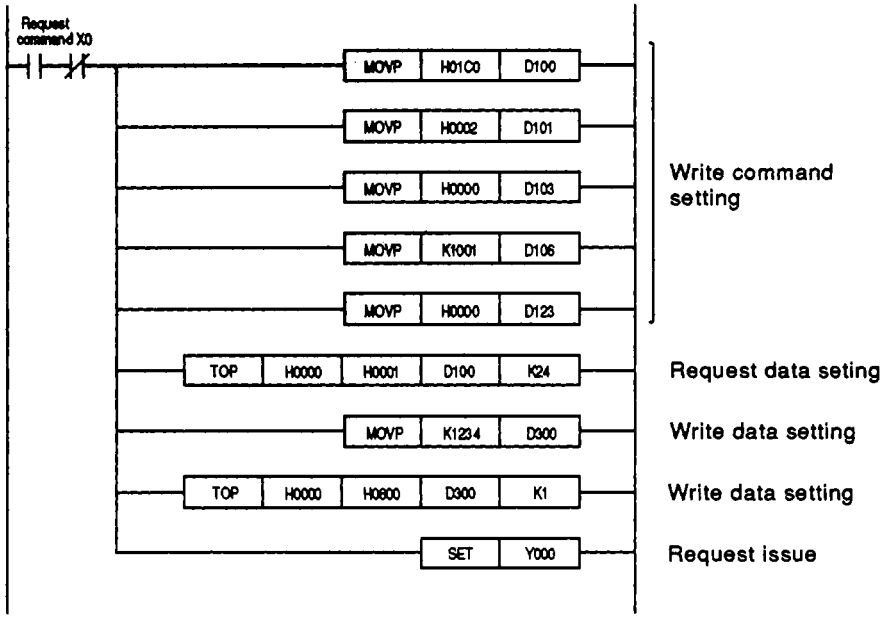
Answer data storing (FROM instruction)



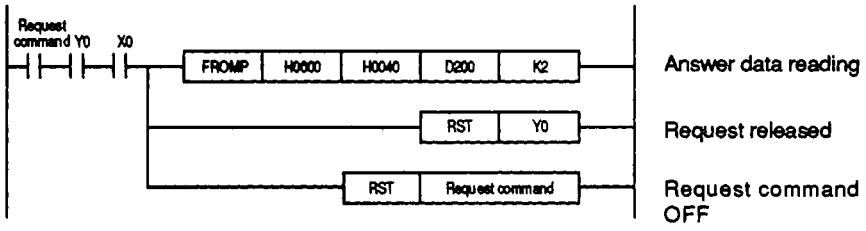
(b) Write

An example of sequence program, that sets the Write command from the D100 of the PC CPU data register and the write data from the D300, and stores its answer in the D200, is shown below.

Request data set (TO instruction)



Answer data storing (FROM instruction)



REMARK

For details of FROM/TO instructions, refer to the programming manual of PC CPU.

5.3.3 Details of each command

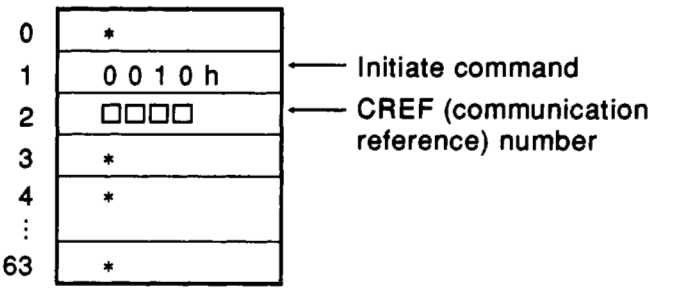
This section describes definitely how to set data in the buffer memory in the AJ71PB96. The request area No.1 is used to explain each command. If the request area No.2 to 3 are used, those addresses should be replaced with appropriate one.

(1) Client function

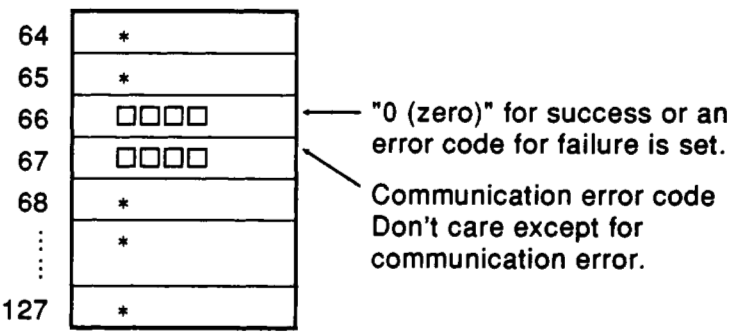
(a) Initiate

This command is used to set the prescribed communication conditions and establish a connection to the communicating station.
To establish a connection, it is necessary to set the CRL parameter by the SW0IX-PB96PE (or SW0IX5-PB96PE).

• Request area



• Request answer area



DESCRIPTION

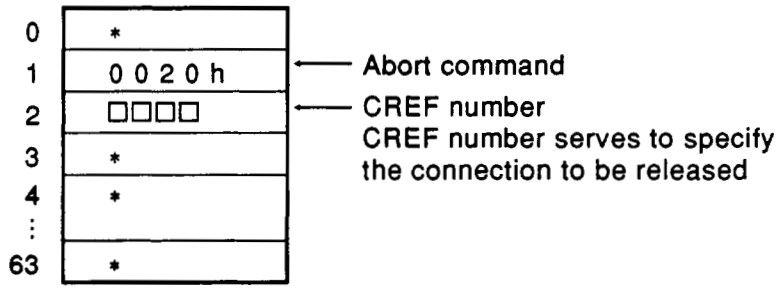
For details of error codes, refer to Appendix 4.

• Don't care for the items marked by an asterisk (*). The values set in the request area are neglected. The values set in the request answer ares are arbitrary.

(b) Abort (association-oriented)

This command is used to release a connection.

• Request area



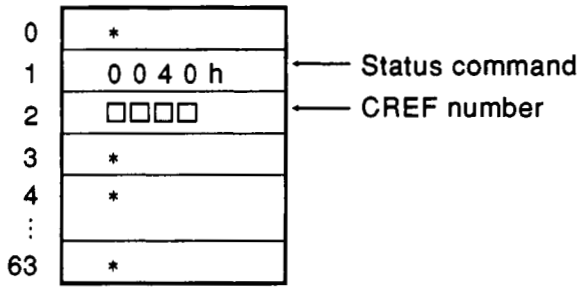
• Request answer area

Same as described for the Initiate command.

(c) Status

This command is used to obtain the status of a communicating station.

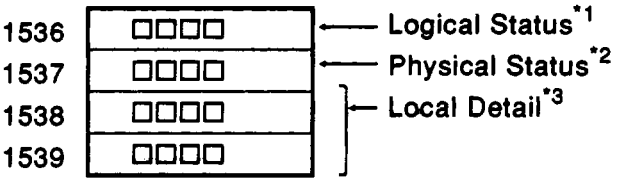
• Request area



• Request answer area

Same as described for the Initiate command.

• Data area



DESCRIPTION

*1 The following values are set:
Communication enabled status
(ALL SERVICES ARE AVAILABLE) - - - - - - - - - - - > 0
Communication enabled status
(LIMITED SERVICES ARE AVAILABLE) - - - - - - - - > 2
OD loading (OD LOADING NON INTERACTING) - - - - - - - - - - > 4
OD loading (OD LOADING INTERACTING) - - - - - - - - - - - - - > 5

*2 The following values are set:
OPERATIONAL - > 0
PARTIALLY OPERATIONAL - > 1
NOT OPERATIONAL - > 2
NEEDS COMMISSIONING - > 3

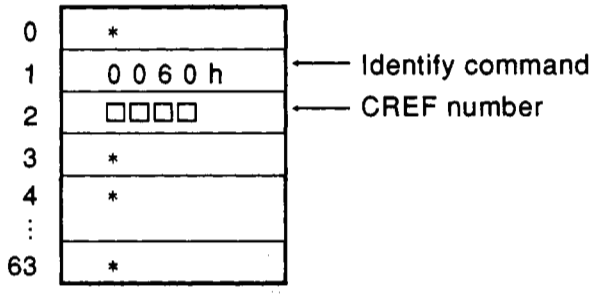
*3 The following values are set:

Address	High order	Low order
1538	econd octet	First octet
1539	00	Third octet

(d) Identify

This command is used to obtain identification information of the server station.

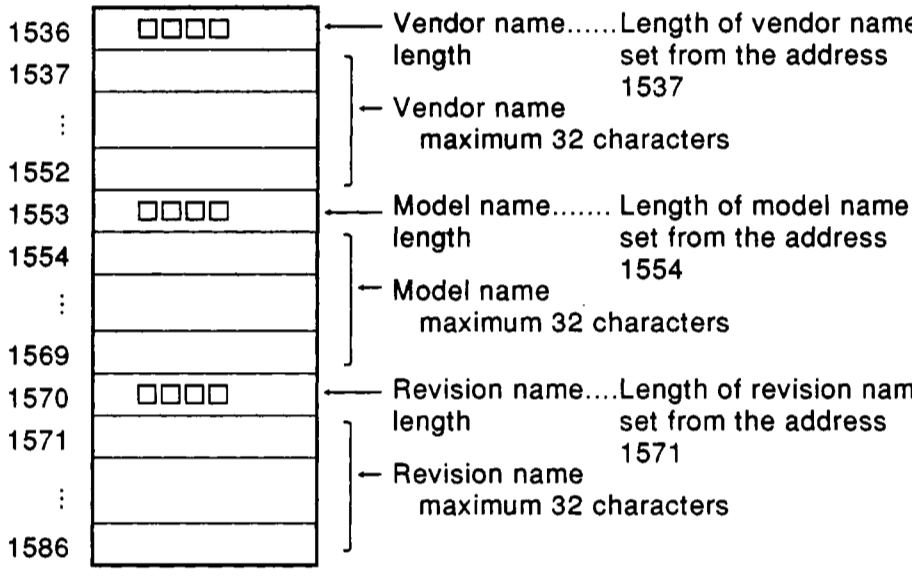
• Request area



• Request answer area

Same as described for the Initiate command.

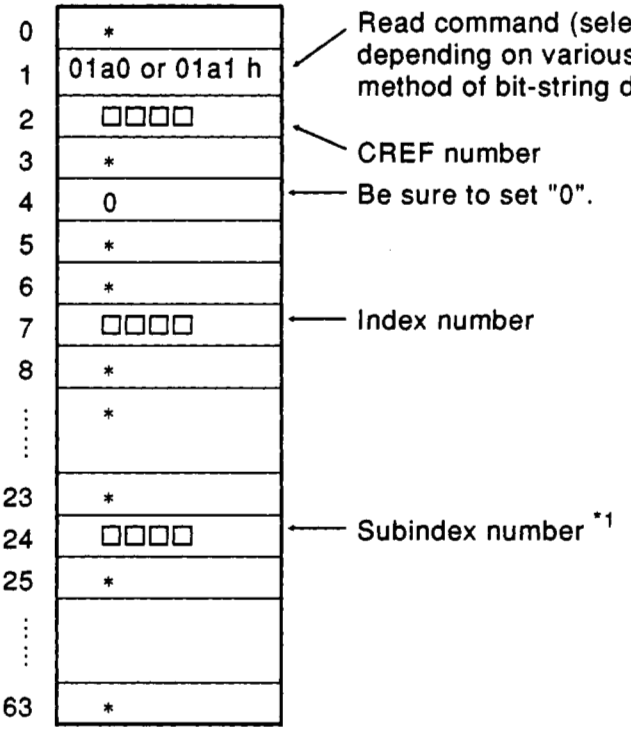
• Data area



(e) Read

This command is used for the PC CPU to read data (variable) of the server.

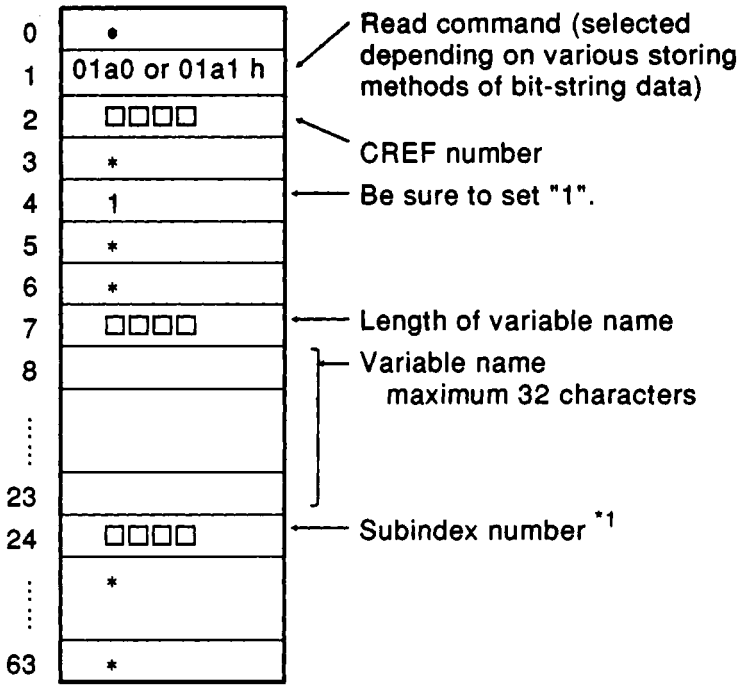
1) Request area (when accessing by index)



DESCRIPTION

*1 The subindex number is used to specify the element in an array to be accessed when array variable is accessed.
If all elements of an array are accessed, specify "0".
If one element of an array is accessed, specify the element number (first element is "1").

2) Request area (when accessing by name)



DESCRIPTION

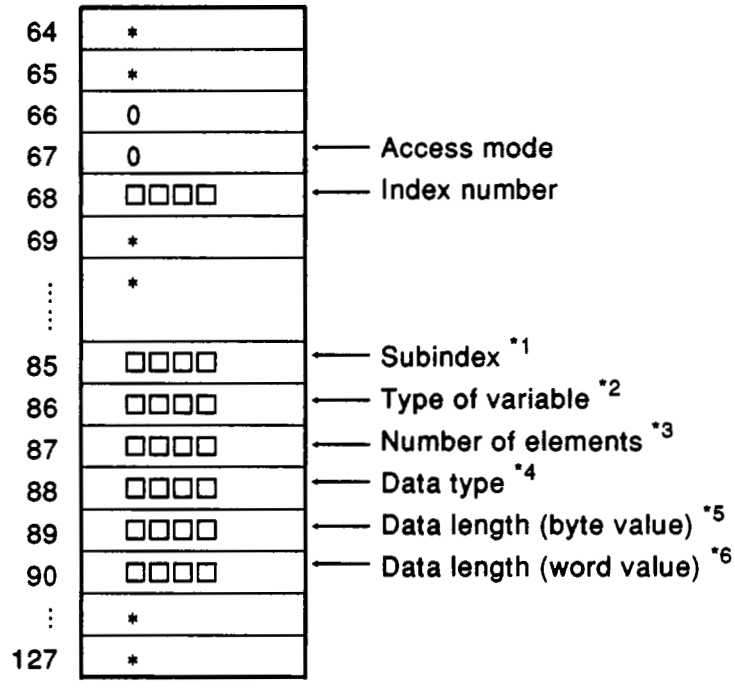
*1 Set the subindex number in the same way as 1).

NOTE

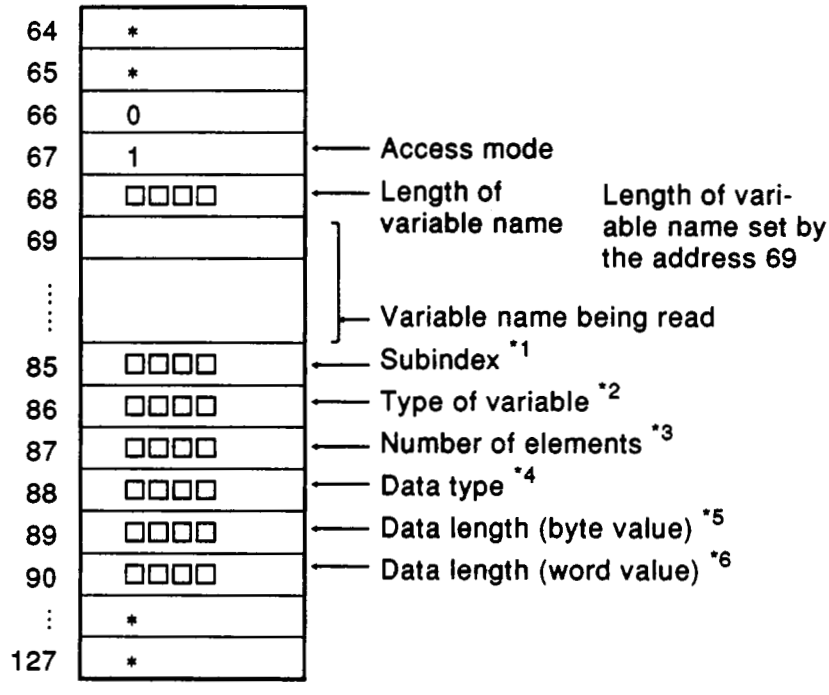
The accessing by name cannot be specified, when the long form of client Get OD is not supported on the specified connection.

• Request answer area

i) When finished normally (when accessing by index)



ii) When finished normally (when accessing by name)



DESCRIPTION

*1 Subindex
The same values as set in the request area are set.

*2 Type of variable (The following values are set):
Array ----------> 0008h
Simple Variable ----------> 0007h

*3 Number of elements (The following values are set):
Array ----------> Number of elements
SimpleVariable ----------> 0001h

*4 Data type (The following values are set):
Boolean ----------> 0001h
Integer8 ----------> 0002h
Integer16 ----------> 0003h
Integer32 ----------> 0004h
Unsigned8 ----------> 0005h
Unsigned16 ----------> 0006h
Unsigned32 ----------> 0007h
OctetString ----------> 000Ah
BitString ----------> 000Eh

*5 Data length (byte) (The following values are set):
Array ----------> Length of data in one element is represented in bytes.
Simple Variable ----> Length of data is represented in bytes.

*6 Data length (word) (The following values are set):
Array ----------> Length of data in one element is represented in words.
Simple Variable ----> Length of data is represented in words.

NOTE

- Since the bit string is read in the unit of 8 bits in PROFIBUS communication, length of data just read is represented in bytes.
- Data length (word) is used for a ladder program to read data from the buffer memory. Data length (byte) value is used to judge the high order bytes of final word data to be valid or invalid.
  - When the data length (byte) is an even number, the high order bytes of final word data are valid.
  - When the data length (byte) is an odd number, the high order bytes of final word data are invalid.

iii) When being failed

Same as described for Initiate.

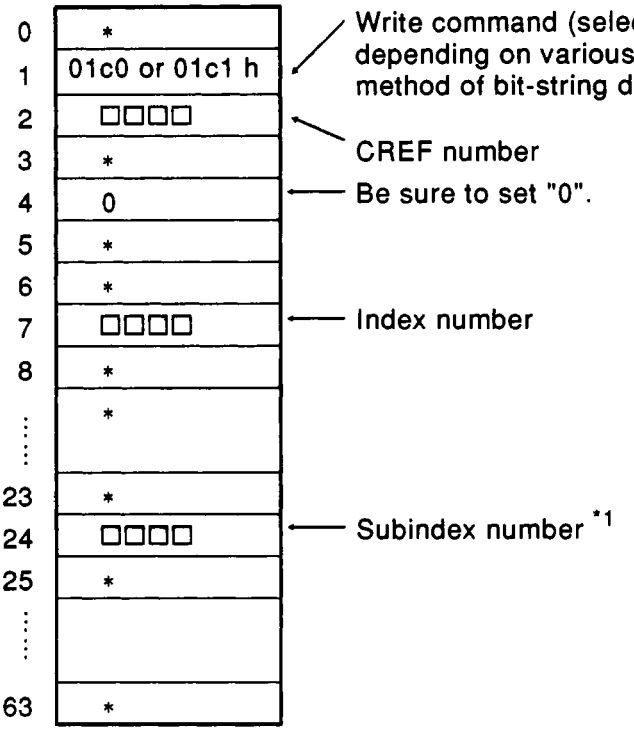
- Data area

When finished normally, data just read is set according to the data type.
Set data format is same as described for write.

(f) Write

This command is used for the PC CPU to write data (variable) to the server.

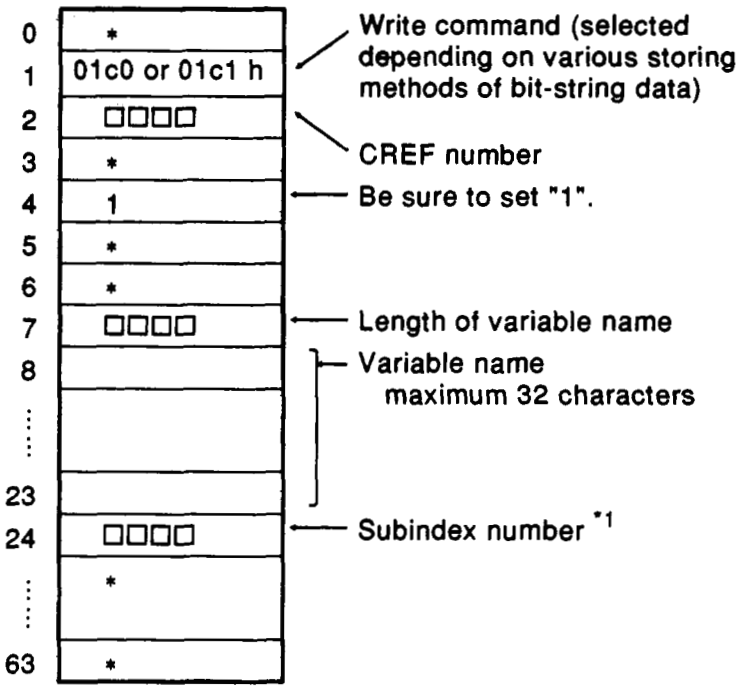
1) Request area (when accessing by index)



DESCRIPITON

*1 The subindex number is used to specify the element in an array to be accessed when array variable is accessed.
If all elements of an array are accessed, specify "0".
If one element of an array is accessed, specify the element number (first element is "1").

2) Request area (when accessing by name)



DESCRIPTION

*1 Set the subindex number in the same way as 1).

NOTE

The accessing by name cannot be specified, when the long form of client Get OD is not supported on the specified connection.

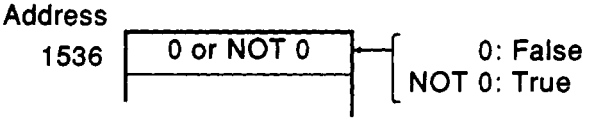
- Request answer area

  Same as described for Initiate command.

• Data area

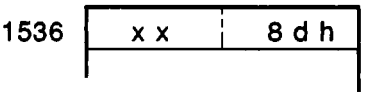
Data to be written should be set as shown below according to the data type.

i) Boolean

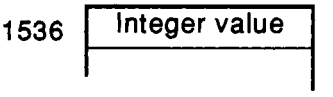


ii) Integer, Unsigned

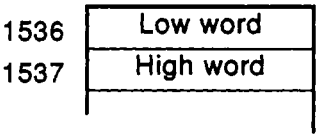
• 8 bits Example: If the value is "8dh"



• 16 bits

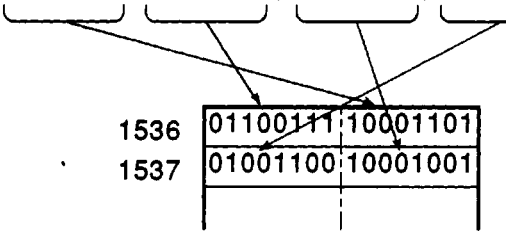


• 32 bits

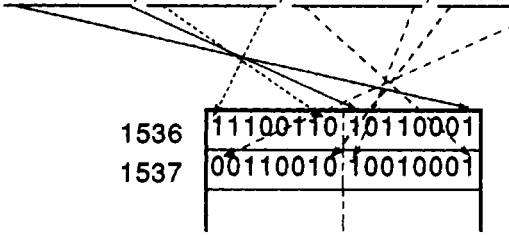


iii) BitString

As to the commands of 01a0h, 01c0h, 01e0h, the data to be transmitted are 10001101, 01100111, 10001001, 01001100:



As to the commands of 01a1h, 01c1h, 01e1h, the data to be transmitted are 10001101, 01100111, 10001001, 01001100:

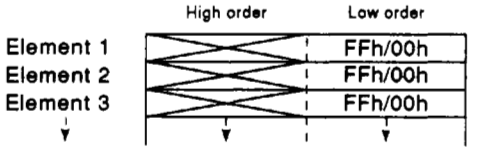
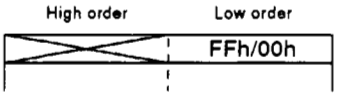
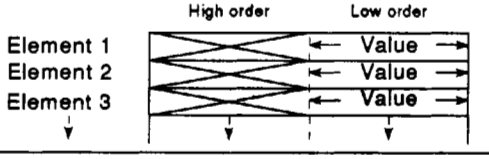
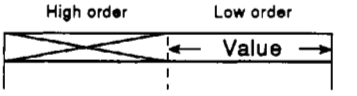
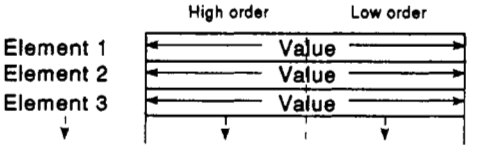
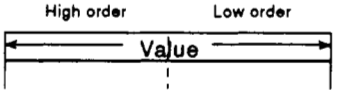
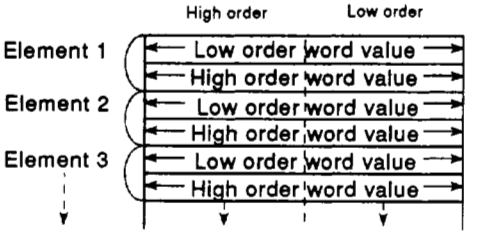
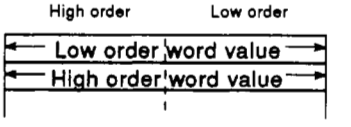
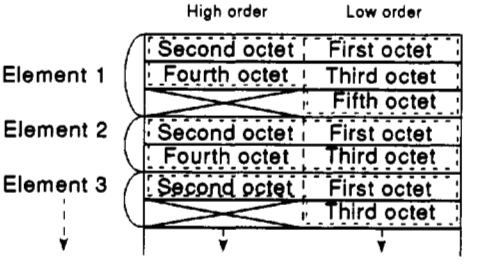
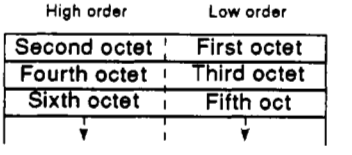
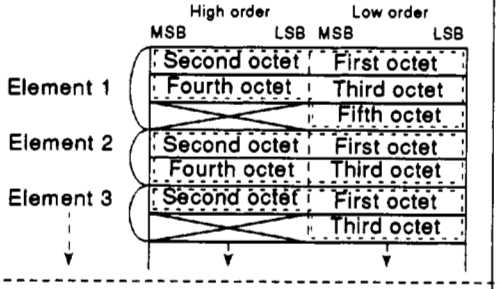
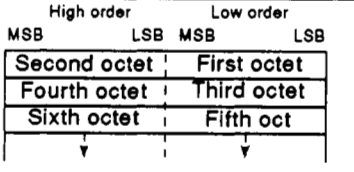
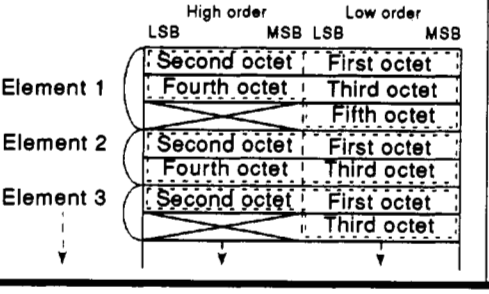
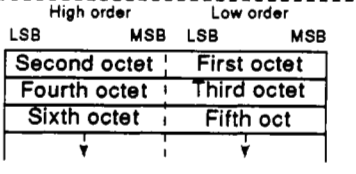


iv) OctetString

The data to be transmitted are 01h, 02h, 03h, 04h, 05h, 06h, the octed strings data should be set as follows:

1536	02h	01h
1537	04h	03h
1539	06h	05h

[Data area structure by data type]

Object Type \ Data Type		Array	Simple Variable
Boolean			
Integer8 / Unsigned8			
Integer16 / Unsigned16			
Integer32 / Unsingned32			
Octet-string			
Bit-string	Without swap		
	With swap		

(2) Unconfirmed service

Unconfirmed service uses different buffer memory area between sending and receiving operations. During sending operation, normal request/answer area is used. During receiving operation, receive area exclusive to unconfirmed service is used.

POINT

It is possible to perform sending/receiving operation of unconfirmed service in the following cases. Note that the unconfirmed service cannot be used in the other cases.

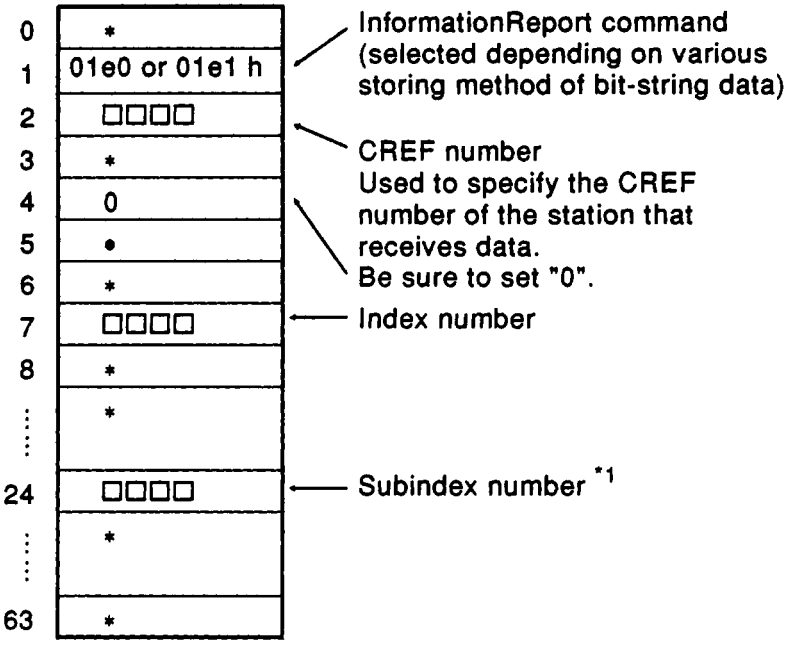
- Cases capable of sending the unconfirmed service:
  1) Master–Master connection
  2) Master of Master–slave connection
  3) Master and slave of master–slave connection with slave initiative
  4) Requester of broadcast/multicast communication
- Cases capable of receiving the unconfirmed service:
  1) Master–Master connection
  2) Slave of Master–slave connection
  3) Master and slave of master–slave connection with slave initiative
  4) Receiver of broadcast/multicast communication

(a) InformationReport

• Sending case

This command is used to send arbitrary data of such as data register.

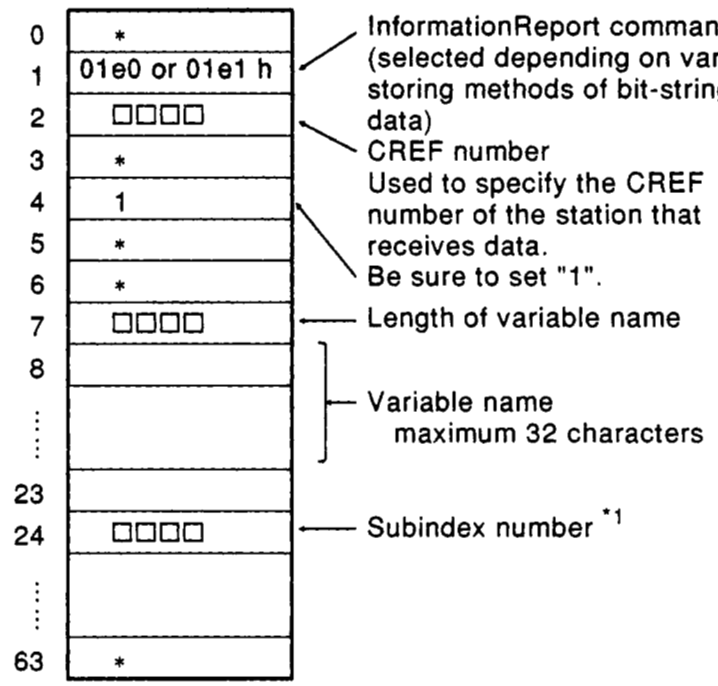
i) Request area (when accessing by index)



DESCRIPTION

*1 The subindex number is used to specify the element in an array to be accessed when array variable is accessed.
If all elements of an array are accessed, specify "0".
If one element of an array is accessed, specify the element number (first element is "1").

ii) Request area (when accessing by name)



DESCRIPTION

*1 The subindex number is used to specify the element in an array to be accessed when array variable is accessed.
If all elements of an array are accessed, specify "0".
If one element of an array is accessed, specify the element number (first element is "1").

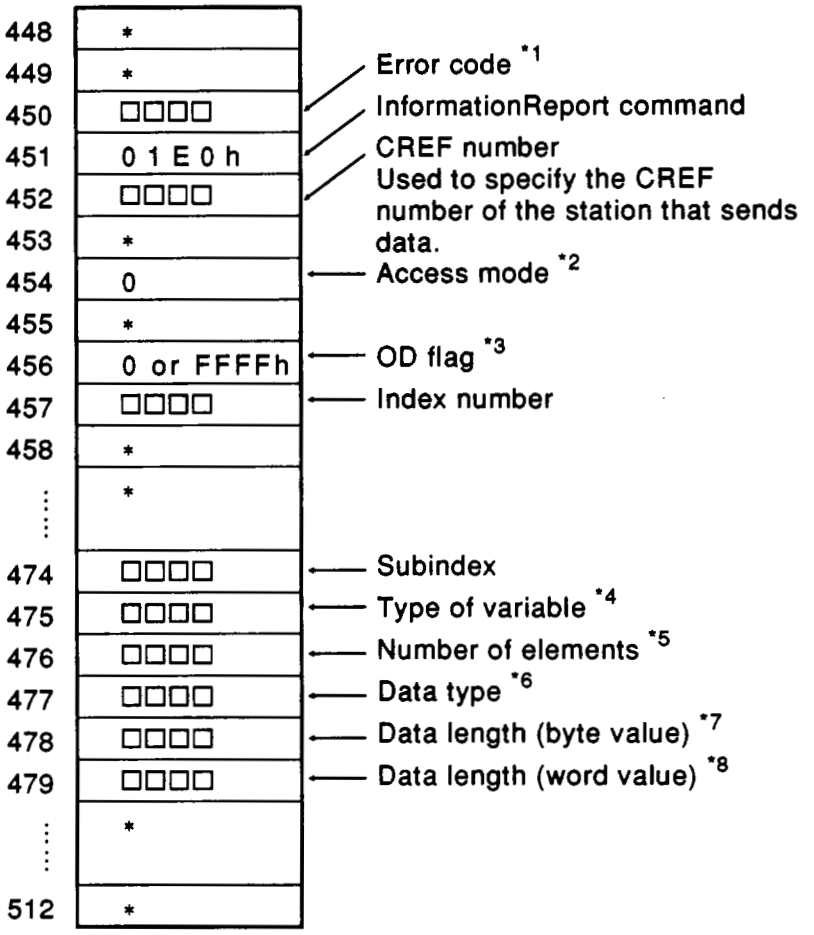
- Request answer area

Same as described in Section 5.3.3, (a) Initiate command.

- Receiving case

Data just received and variable information are set in the buffer memory.

i) Receive area (when an index is employed for access mode)



DESCRIPTION

*1 For details of error codes, refer to Appendix.

*2 If an index is employed for access mode, "0" is set without fail.

*3 Indicates whether or not reference was made to the OD when receive data was set in the receive data area.
Reference made ----------> 0000h
Reference not made ----------> FFFFh
Reference is not made to the OD in the case of a responder open connection (/0), or in broadcast and multicast connections.

*4 Type of variable (The following values are set):
Array ----------> 0008h
Simple Variable ----------> 0007h
When OD flag = FFFFh ----------> FFFFh

DESCRIPTION

*5 Number of elements (The following values are set):
Array ----------> Number of elements
Simple Variable ----------> 0001h
When OD flag = FFFFh ----------> 0001h

*6 Data type (The following values are set):
Boolean ----------> 0001h
Integer8 ----------> 0002h
Integer16 ----------> 0003h
Integer32 ----------> 0004h
Unsigned8 ----------> 0005h
Unsigned16 ----------> 0006h
Unsigned32 ----------> 0007h
OctetString ----------> 000Ah
BitString ----------> 000Eh
When OD flag = FFFFh ----------> FFFFh

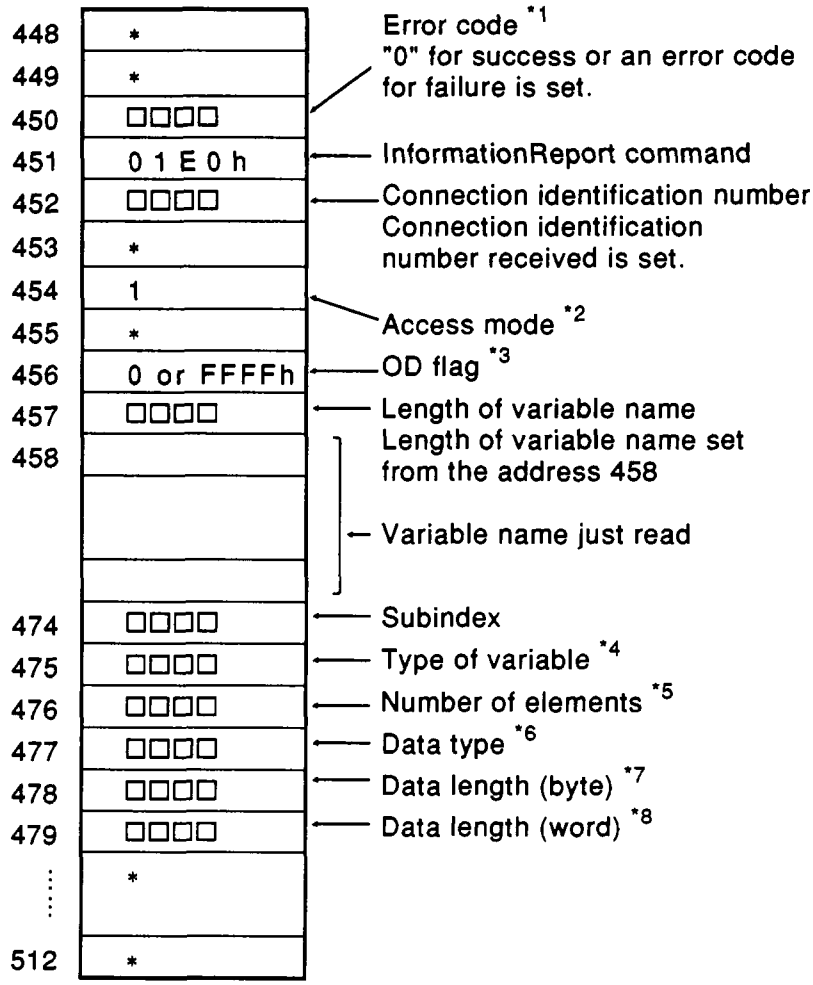
*7 Data length (byte) (The following values are set):
Array ----------> Length of data in one element is represented in bytes.
Simple Variable ----------> Length of data is represented in bytes.
When OD flag = FFFFh ---> Data length of the data indicated in bytes.

*8 Data length (word) (The following values are set):
Array ----------> Length of data in one element is represented in words.
Simple Variable ----------> Length of data is represented in words.
When OD flag = FFFFh ---> Data length of the data indicated in words.

NOTE

- Since the bit string is read in the unit of 8 bits in PROFIBUS communication, length of data just read is represented in bytes.
- Data length (word) is used for a ladder program to read data from the buffer memory. Data length (byte) value is used to judge the high order bytes of final word data to be valid or invalid.
  - When the data length (byte) is an even number, the high order bytes of final word data are valid.
  - When the data length (byte) is an odd number, the high order bytes of final word data are invalid.

ii) Receive area (when name is employed for access mode)



DESCRIPTION

*1 For details of error codes, refer to Appendix.

*2 When name is employed for access mode, "1" is set without fail.

*3 OD flag
*4 Type of variable
*5 Number of elements
*6 Data type
*7 Data length (byte)
*8 Data length (word)

i) Refer to pages 5-26 and 27 for receive area (when an index is employed for access mode).

• Receive data area

i) When the OD flag of the receive area is FFFFh
Receive data is set in the receive area without making reference to the OD.
The data is set in the manner shown below (same as Octet String).

Assuming that the values are: 01h, 02h, 03h, 04h, 05h, 06h they will be set as follows:

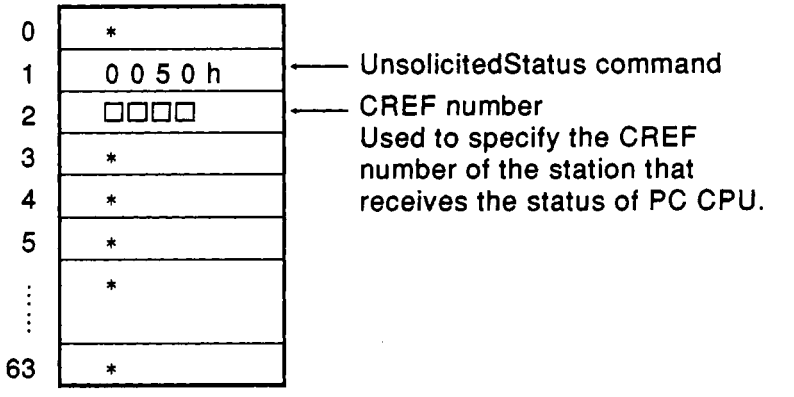
1536	02h	01h
1537	04h	03h
1538	06h	05h

ii) When the OD flag of the receive area is not FFFFh
Same as for the write data area.

(b) UnsolicitedStatus

Sending case
This command is used to notify the communicating station the status of PC CPU (special relay).

• Request area



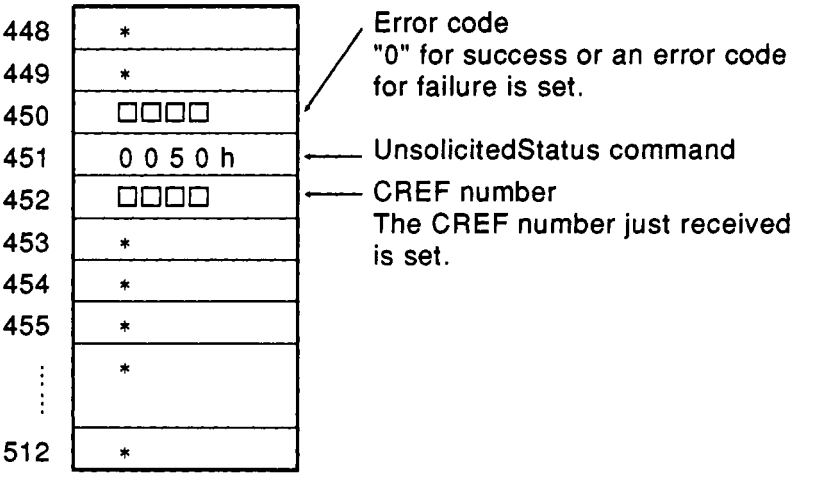
DESCRIPTION
*1 Set in the same way as InformationReport.

• Request answer area

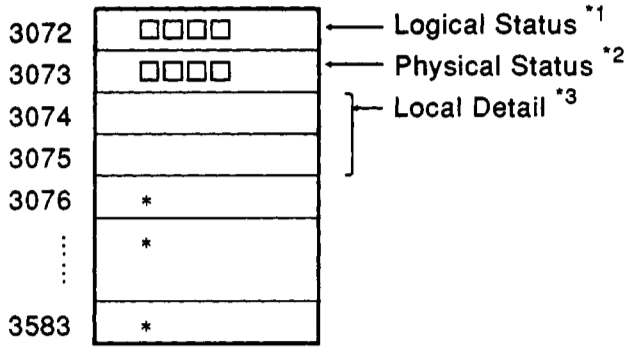
Same as described in Section 5.3.3, (a) Initiate command.

Receiving case
Arbitrary status information just received is written.

• Receive area



• Receive data area



DESCRIPTION

*1 The following values are set:
Communication enabled status
(ALL SERVICES ARE AVAILABLE) - - - - - - - - - - - - - > 0
Communication enabled status
(LIMITED SERVICES ARE AVAILABLE) - - - - - - - - - - > 2
OD loading (OD LOADING NON INTERACTING) - - - - - - - - - > 4
OD loading (OD LOADING INTERACTING) - - - - - - - - - - - - > 5

*2 The following values are set:
OPERATIONAL - > 0
PARTIALLY OPERATIONAL - > 1
NOT OPERATIONAL - > 2
NEEDS COMMISSIONING - > 3

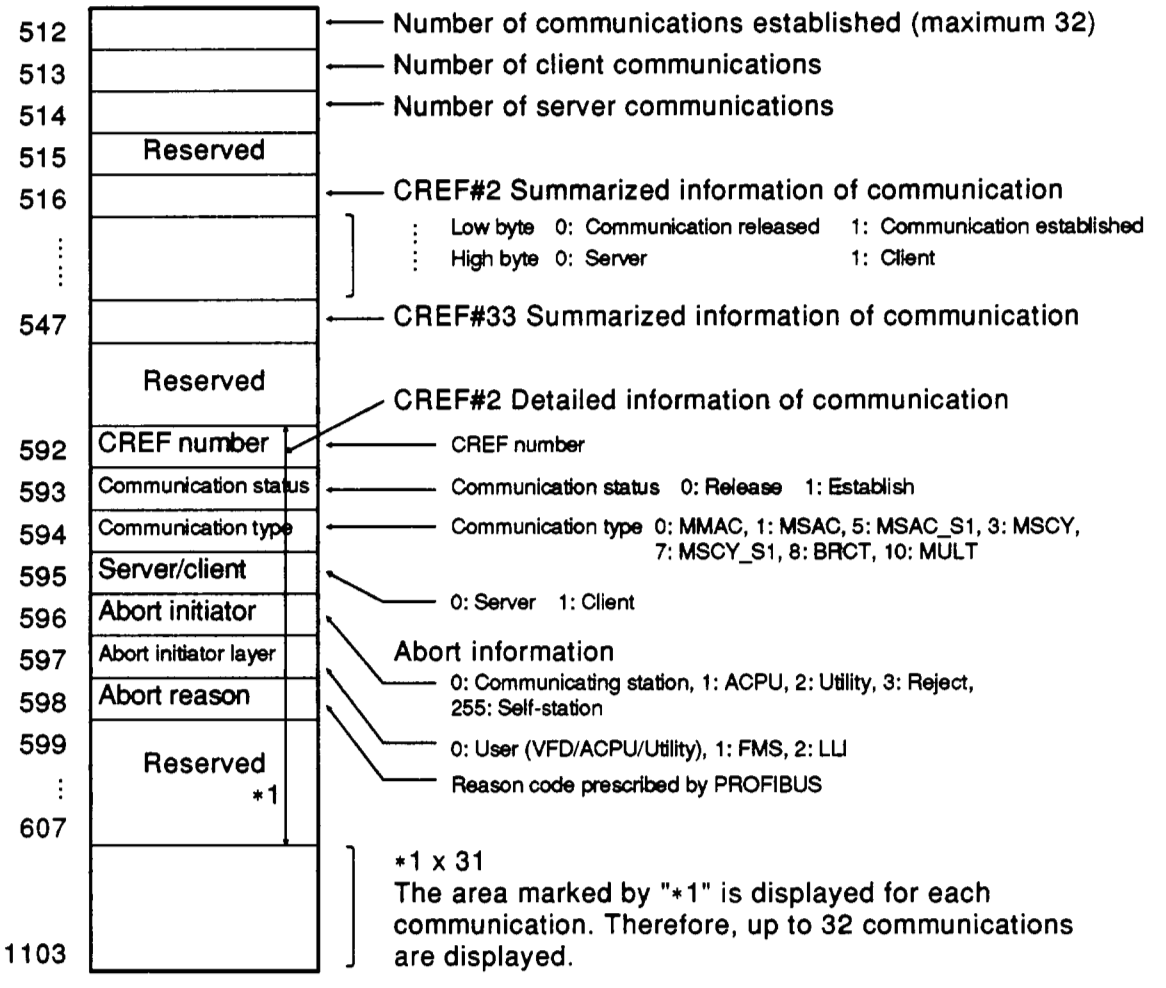
*3 The following values are set:

Address	High order	Low order
3074	Second octet	First octet
3075	00	Third octet

5.3.4 Explanation of information area

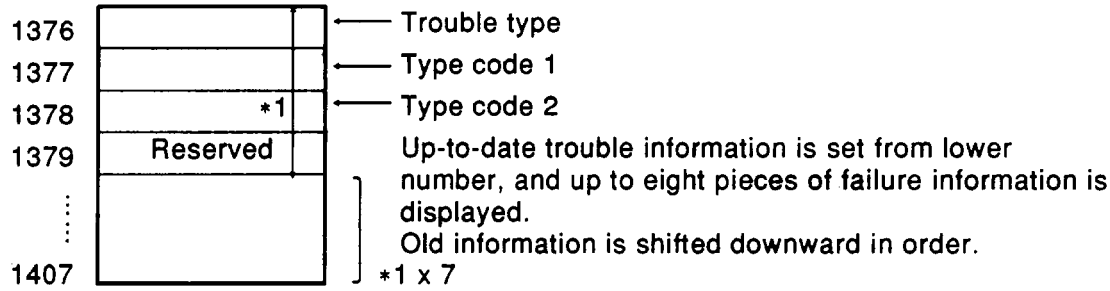
The PC CPU can obtain information such as the number of current communication of AJ71PB96 by referring to this area.

Configuration of this area is shown below.



5.3.5 Explanation of network trouble information area

The PC CPU can obtain network trouble information of the AJ71PB96 by referring to this area. Configuration of this area, detail code, corrective actions, and so forth are shown below.



(1) When a trouble type is 100h (initialization failure):

Type Code 1	Type Code 2	Problems	Corrective Actions
Initialization Phase	FMS/FMA7 Error Code		
3h	FFFFh	There are any abnormalities in the setting information of Simple Variable and Array.	Set the Simple Variable and Array correctly.
4h	FFFFh	There are any abnormalities in the setting information of remote OD.	Set the remote OD correctly.
Ah	Other than FFFFh	There are any abnormalities in the setting information of Simple Variable and Array.	Set the Simple Variable and Array correctly.
Bh	Other than FFFFh	There are any abnormalities in the setting information of bus parameters.	Set the bus parameters correctly.
Ch	Other than FFFFh	There are any abnormalities in the setting information of CRL.	See the CRL correctly.
Others	———	There are any abnormalities inside the module.	Please inform us.

(2) When a trouble type is 200h (network trouble):

Type Code 1	Type Code 2	Problems	Corrective Actions
FMA7 Event Instance ID	FMA7 Event Reason Code		
3h	1h	Address is duplicated.	Check address of each node in the network.
	3h	There is no master station on the network (excluding self station).	There is not any problem in particular.
	5h	Self station gets out of a ring of token passing.	Let the bus parameters such as the slot time fall in line at each node on the network.
Others	———	———	Others Perform examination of each parameter, self-diagnosis of the module, and so forth.

(3) When a trouble type is 210h (Reject is received)

Type Code 1	Type Code 2	Problems	Corrective Actions
CREF Number	(Don't care)		
CREF number	———	A "reject" service is received.	Carry out a general review of the CRL information, etc.

(4) When a trouble type is 300h (received Unconfirmed service PDU discarded):

Type Code 1	Type Code 2	Problems	Corrective Actions
CREF Number	Service Command		
CREF number	50h	Since the maximum receiving capacity of Unconfirmed service is exceeded on a connectionless communication, the PDU of Unsolicited Status is discarded.	Configure the system so as not to exceed the maximum receiving capacity of Unconfirmed service.
	1E0h	Since the maximum receiving capacity of Unconfirmed service is exceeded on a connectionless communication, the PDU of Unsolicited Status is discarded.	Configure the system so as not to exceed the maximum receiving capacity of Unconfirmed service.

6. TROUBLESHOOTING

6.1 Confirming Method of Abnormal Portions

It goes without saying that there occur less problems to start up the system earlier, but it is also important to find out the cause as soon as possible once there occur any problems. The following four basic confirming items should be observed for performing this troubleshooting.

(1) Making sure by visual inspection
The following items should be confirmed:

(a) ON/OFF of the power

(b) Condition of wiring

(c) Switch setting (rotary switch, DIP switch)

(d) Parameter setting

(e) LED indication

After checking the items (a) to (e), make sure of operation again.

(2) Making sure of portions where problems occur
Make sure of operations and or conditions which cause the module to be failed. For example, when the power is turned on, or when any service is performed, etc.

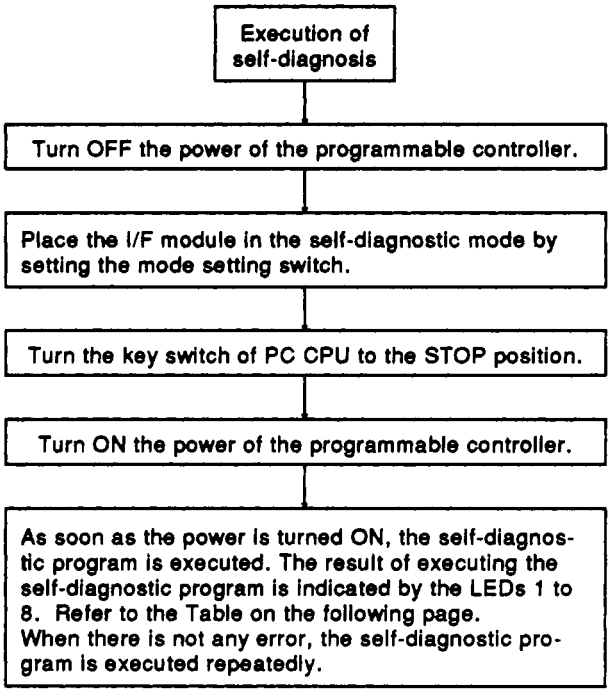
(3) Execution of self-diagnostic program
Execution of self-diagnostic program allows you to locate a failure inside the I/F module or an external cause. For the executing method of self-diagnostic program, refer to Appendix 1.

(4) Restriction of scope
On the basis of confirmation made in the items (1) to (3) above, it is assumed whether the I/F module or other component is failed.

APPENDICES

APPENDIX 1 EXECUTING METHOD OF SELF-DIAGNOSTIC PROGRAM

(1) Procedure
A procedure to execute the self-diagnostic program of the AJ71PB96 is described below.



NOTE

1. Be sure to turn the key switch of the PC CPU to the STOP position before executing the self-diagnostic program. At the positions other than STOP, the PC CPU may detect an "SP UNIT DOWN" error.
2. To return to normal operation after executing the self-diagnosis, turn OFF the power of the programmable controller and set the setting switch to "ONLINE", and then turn ON the power.

(2) Setting of self-diagnostic program and indication of the result

i) Internal diagnostic mode 1
When the self-diagnostic program is started with the rotary switch turned to "1" (silk: TEST1), the program serves to execute the testing items (a) through (d) as shown in the Table below and indicate the result by the LEDs.

ii) Internal diagnostic mode 2
When the self-diagnostic program is started with the rotary switch turned to "2" (silk: TEST2), the program serves to execute the testing items (a) through (c) and (e) as shown in the Table below and indicate the result by the LEDs.

Testing Item	Status	LED Indication										
		LED 8	LED 7	LED 6	LED 5	LED 4	LED 3	LED 2	LED 1	SD/ RD	TOK EN	COM. ERR
(a) MPU test	During testing	O	O	O	O	O	O	●	●	O	O	O
	Error	●	O	O	O	O	O	●	O	O	O	O
(b) Timer test	During testing	O	O	O	O	O	●	O	●	O	O	O
	Error	●	O	O	O	O	●	O	O	O	O	O
(c) Interrupt test	During testing	O	O	O	O	O	●	●	●	O	O	O
	Error	●	O	O	O	O	●	●	O	O	O	O
(d) Local memory test	During testing	O	O	O	O	●	O	O	●	O	O	O
	During testing	O	O	O	O	●	O	●	●	O	O	O
	During testing	O	O	O	O	●	●	O	●	O	O	O
	Error	●	O	O	O	●	O	O	O	O	O	O
		●	O	O	O	●	●	●	O	O	O	O
(e) Communication hardware test	During testing	O	O	O	●	●	O	●	●	●	O	O
	During testing	O	O	O	●	●	O	●	●	O	●	O
	During testing	O	O	O	●	●	O	●	●	O	O	●
	During testing	O	O	O	●	●	O	●	●	●	●	●
	During testing	O	O	O	●	●	O	●	●	O	O	O
	Error	●	O	O	●	●	O	●	O	O	O	O

"●" denotes ON and "O" denotes OFF in the Table above.

REMARK

When finished normally, the self-diagnostic program serves to repeat the prescribed tests continuously. The program stops execution when any error occurs.
Since it is supposed that the I/F module hardware is at fault when any errors are indicated, please contact us.

APPENDIX 2 LIST OF FMS SERVICES

FMS services supported by the AJ71PB96 are shown below.

The markings in the Table below stand for as follows:

○ : Request send function　　△ : Response send function
● : Indication receive function　　▲ : Confirm receive function

• Master/client

Classification	Service	Connection Type											
		MMAC		MSAC		MSAC_SI		MSCY		MSCY_SI		BT/MT
Connection control	Initiate	○	▲	○	▲	○	▲	○	▲	○	▲	
	Abort	○	●	○	●	○	●	○	●	○	●	
	Reject	●		●		●		●		●		●
VFD control	Status	○	▲	○	▲	○	▲					
	UnsolicitedStatus	○	●	○		○	●	○		○	●	○
	Indentify	○	▲	○	▲	○	▲					
OD	GetOD	○	▲	○	▲	○	▲					
Variable control	Read	○	▲	○	▲	○	▲	○	▲	○	▲	
	Write	○	▲	○	▲	○	▲	○	▲	○	▲	
	InformationReport	○	●	○		○	●	○		○	●	○

• Master/server

Classification	Service	Connection Type											
		MMAC		MSAC		MSAC_SI		MSCY		MSCY_SI		BT/MT
Connection control	Initiate	●	△	●	△	●	△	●	△	●	△		
	Abort	○	●	○	●	○	●	○	●	○	●		
	Reject	●		●		●		●		●		●
VFD control	Status	●	△	●	△	●	△						
	UnsolicitedStatus	○	●	●		○	●	●		○	●	●
	Indentify	●	△	●	△	●	△						
OD	GetOD	●	△	●	△	●	△						
Variable control	Read	●	△	●	△	●	△	●	△	●	△		
	Write	●	△	●	△	●	△	●	△	●	△		
	InformationReport	○	●	●		○	●	●		○	●	●

• Slave/server

Classification	Service	Connection Type											
		MMAC	MSAC		MSAC_SI		MSCY		MSCY_SI		BT/MT		
Connection control	Initiate		●	△	●	△	●	△	●	△			
	Abort		○	●	○	●	○	●	○	●			
	Reject		●		●		●		●		●		
VFD control	Status		●	△	●	△							
	UnsolicitedStatus		●		○	●	●		○	●	●		
	Indentify		●	△	●	△							
OD	GetOD		●	△	●	△							
Variable control	Read		●	△	●	△	●	△	●	△			
	Write		●	△	●	△	●	△	●	△			
	InformationReport		●		○	●	●		○	●	●		

APPENDIX 3 LIST OF ERROR CODES

Error codes set in the request answer area and receive area of the buffer memory are shown below.

(1) Error codes

Request answer area No.1 ----------> Address 66
Request answer area No.2 ----------> Address 194
Request answer area No.3 ----------> Address 322
Receive area ----------> Address 450

Initiate

Error Code	Description	Corrective Actions
2055h	FMS Error confirmation is received.	Examine data set in the buffer memory with reference to an error information.
2061h	An Initiate request is issued to the communicating station that has a connection already established.	Set a correct connection number.
2062h	Incorrect CREF number is specified.	Set the defined CREF number in the CRL information.
2067h	Request sending error.	Examine the sending parameters, error information, and so forth comprehensively.
2071h	A connection establish request is issued from other than the master station.	Establish connection from the master station.

Abort

Error Code	Description	Corrective Actions
2209h	Request sending error.	Examine the sending parameters, error information, and so forth comprehensively.
220Bh	A release prohibit connection is specified.	In case of releasing, carry out from the utility package.

Status

Error Code	Description	Corrective Actions
2067h	Request sending error.	Examine the sending parameters, error information, and so forth comprehensively.
2055h	An FMS error confirmation is received.	Examine data set in the buffer memory with reference to the error information.
205Fh	Time-out occurs by means of timer monitoring.	Check the conditions of media or operating conditions of the communicating station.

Identify

Error Code	Description	Corrective Actions
2067h	Request sending error.	Examine the sending parameters, error information, and so forth comprehensively.
2055h	An FMS error confirmation is received.	Examine data set in the buffer memory with reference to the error information.
205Fh	Time-out occurs by means of timer monitoring.	Check the conditions of media or operating conditions of the communicating station.

UnsolicitedStatus

Error Code	Description	Corrective Actions
2201h	Request sending conditions are incorrect.	Examine the connection attribute and station attribute (master or slave) parameters.
2209h	Request sending error.	Examine the sending parameters, error information, and so forth comprehensively.
2259h	Prior to unconfirmed service received, two or more unconfirmed services are received. Therefore, the connection is released.	When receiving the unconfirmed services, turn ON the Y03 of I/O signal with reference to an example of sequence program, in order to notify AJ71PB96 that the receive area and receive data area have been read.

Read

Error Code	Description	Corrective Actions
2053h	Invalid data type is specified to the remote OD.	Set a valid data type.
2055h	An MMS error confirmation is received.	Examine data set in the buffer memory with reference to the error information.
205Fh	Time-out occurs by means of timer monitoring.	Check the conditions of media or operating conditions of the communicating station.
2062h	Incorrect CREF number is specified.	Set the CREF number defined in the CRL information.
2065h	Invalid object of communicating station is specified.	Set a valid object index/name.
2067h	Request sending error.	Examine the sending parameters, error information, and so forth comprehensively.
2069h	Incorrect access mode is specified.	Set a correct access mode.
206Bh	Length of variable name is incorrect.	Set the length of variable name to 1 to 32.
2070h	Variable name access is specified although variable name access is not supported.	Use accessing by index.
2072h	Incorrect subindex is specified.	Set a correct subindex.
2073h	Undefined object (NULL) of communicating station is specified.	Set a correct object index/name.
2074h	Incorrect reading length is specified.	Set the variable data length of communicating station OD to 1 to 128 bytes.
207Ch	Accessing by name is specified on the connection which doesn't support long form of client Get OD.	Modify the features supported so as to support long form of client Get OD. Otherwise, use accessing by index.

Write

Error Code	Description	Corrective Actions
2053h	Invalid data type is specified to the remote OD.	Set a valid data type.
2055h	An MMS error confirmation is received.	Examine data set in the buffer memory with reference to the error information.
205Fh	Time-out occurs by means of timer monitoring.	Check the conditions of media or operating conditions of the communicating station.
2062h	Incorrect CREF number is specified.	Set the CREF number defined in the CRL information.
2065h	Invalid object of communicating station is specified.	Set a valid object index/name.
	(to be continued)	

Write (continued)

Error Code	Description	Corrective Actions
2067h	Request sending error.	Examine the sending parameters, error information, and so forth comprehensively.
2069h	Incorrect access mode is specified.	Set a correct access mode.
206Bh	Length of variable name is incorrect.	Set the length of variable name to 1 to 32.
2070h	Variable name access is specified although variable name access is not supported.	Use accessing by index.
2072h	Incorrect subindex is specified.	Set a correct subindex.
2073h	Undefined object (NULL) of communicating station is specified.	Set a correct object index/name.
2074h	Incorrect writing length is specified.	Set the variable data length of communicating station OD to 1 to 128 bytes.
207Ch	Accessing by name is specified on the connection which doesn't support long form of client Get OD.	Modify the features supported so as to support long form of client Get OD. Otherwise, use accessing by index.

InformationReport

Error Code	Description	Corrective Actions
2201h	Request sending conditions are incorrect.	Examine the connection attribute and station attribute (master or slave) parameters.
2202h	Incorrect access mode is set.	Set a correct access mode.
2204h	Undefined object (NULL) of self station is specified.	Set a correct variable index/name.
2205h	Invalid object of self station is specified.	Set a correct variable index/name.
2209h	Request sending error.	Examine the sending parameters, error information, and so forth comprehensively.
220Ah	Incorrect device or type is registered in the variable information.	Set a correct parameter.
220Ch	Incorrect subindex is specified.	Set a correct subindex.
220Dh	Incorrect data length is specified.	Set the variable data length of self station to 1 to 128 bytes.
2251h	Incorrect access mode is specified.	Set a correct access mode.
	(to be continued)	

InformationReport (continued)

Error Code	Description	Corrective Actions
2253h	Undefined object (NULL) of communicating station is specified.	Set a correct object index/name.
2255h	Incorrect data length is specified.	Set the variable data length of communicating station OD to 1 to 128 bytes.
2256h	Variable name access is specified although variable name access is not supported.	Use accessing by index.
2259h	Prior to unconfirmed service received, two or more unconfirmed services are received. Therefore, the connection is released.	When receiving the unconfirmed services, turn ON the Y03 of I/O signal with reference to an example of sequence program, in order to notify AJ71PB96 that the receive area and receive data area have been read.
225Ch	Invalid data type is specified to the remote OD.	Set a valid data type.

Common

Error Code	Description	Corrective Actions
2100h	Connection number is specified although connection is not established.	Confirm the establishment of a connection.
2101h	There is a service being processed at the connection specified.	Issue another service after one service has been processed.
2103h	A service that cannot be used is specified.	Service that can be issued differs depending on the connection type and connection attribute. Individually set a command of service that can be issued.
220Fh	A connection, with a service in process remaining, is released.	Establish a connection again.
2258h	A connection is released.	Establish a connection again. If this error code is set when establishing a connection, examine the parameter of the CRL information.
2259h	A connection is released, since service is rejected.	Examine the Bus parameter, CRL information and media comprehensively.

(2) Error information

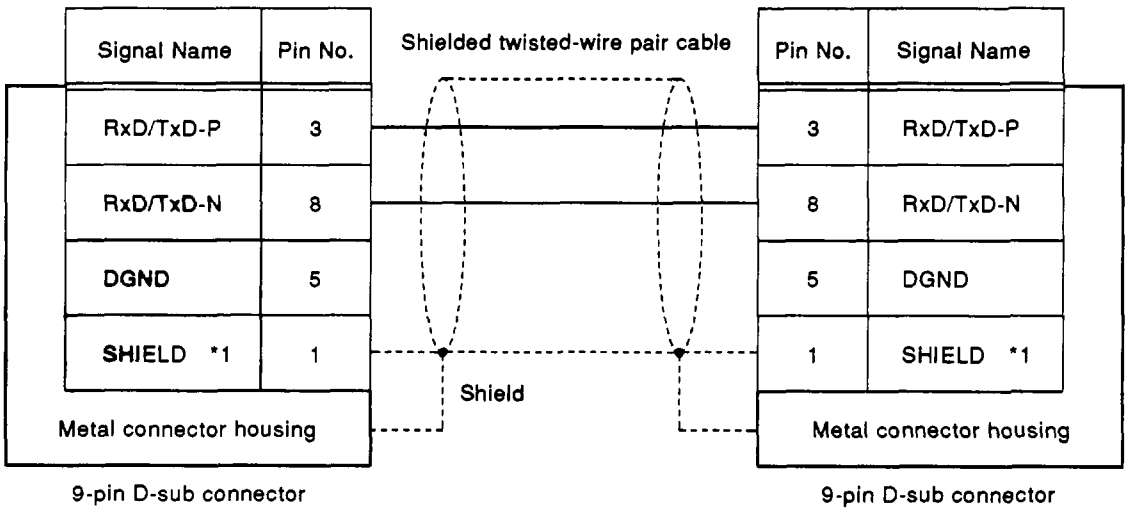
b. When receiving a negative acknowledge

When an error code is 2055h, a valid value is written at the following address in the buffer memory:

Address 67 in the request area No.1:
ErrorClass of FMS error confirmation
Address 195 in the request area No.2:
ErrorClass of FMS error confirmation
Address 323 in the request area No.3:
ErrorClass of FMS error confirmation

APPENDIX 4 COMMUNICATION CABLE

The communication cable specifications required by PROFIBUS are shown below.



IMPORTANT

(1) Design the configuration of a system to provide an external protective or safety inter locking circuit for the PCs.

(2) 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.

(a) Ground human body and work bench.

(b) Do not touch the conductive areas of the printed circuit board and its electrical parts with and 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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