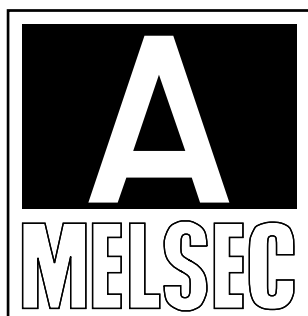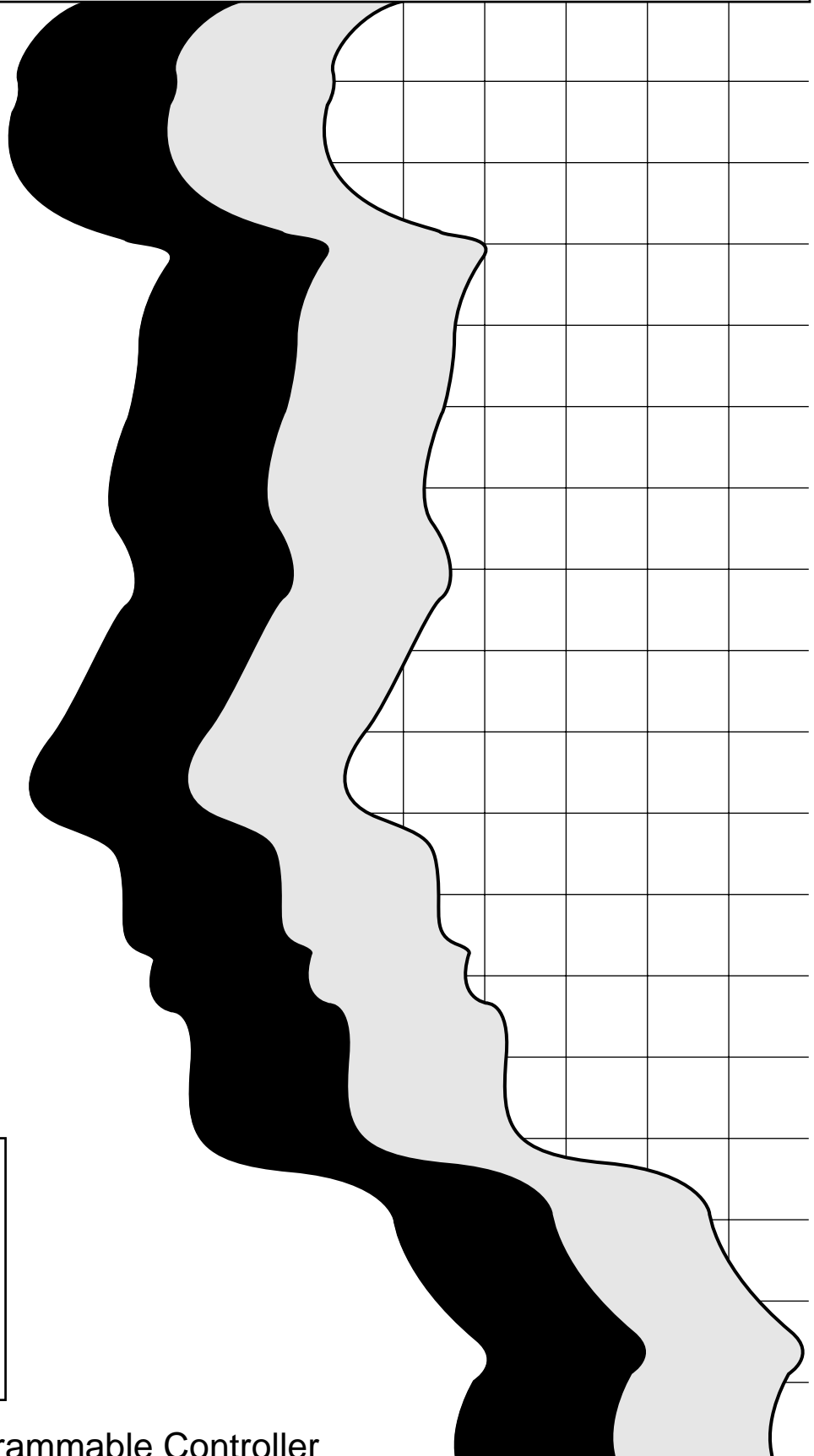# MITSUBISHI

PROFIBUS-FMS Interface Module
type AJ71PB96F/A1SJ71PB96F

User's Manual

A
MELSEC

Mitsubishi Programmable Controller

● SAFETY PRECAUTIONS ●

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.

These precautions apply only to Mitsubishi equipment. Refer to the CPU module user's manual for a description of the PC system safety precautions.

These ● SAFETY PRECAUTIONS ● classify the safety precautions into two categories: "DANGER" and "CAUTION".

◇DANGER	**Procedures which may lead to a dangerous condition and cause death or serious injury if not carried out properly.**
⚠CAUTION	**Procedures which may lead to a dangerous condition and cause superficial to medium injury, or physical damage only, if not carried out properly.**

Depending on circumstances, procedures indicated by ⚠ CAUTION may also be linked to serious results.

In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

[DESIGN PRECAUTIONS]

◇DANGER

● When controlling a PLC by connecting to another station via PROFIBUS for the purpose of changing the data, changing the program, or changing operation status (status control), an interlock circuit must be configured in the sequence program so that the entire system will always operate safely.
If a remote PLC is a controlled in the manner indicated above by another station, the system may fail to respond immediately even if trouble occurs at the remote PLC due to data communication error.
In addition to configuring the interlock circuit in the sequence program, determine the action to be taken by the system at the occurrence of the data communication error with regard to the processing between the other stations and PLC CPU.

⚠CAUTION

● When the PROFIBUS cable is laid, do not lay it close to main circuits or power lines.
They should be installed 100mm(3.9inch) or more from each other.
Not doing so could result in noise that would cause malfunction.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION
• Use the module in the environment given in the general specifications of the CPU module's User's Manual. Using the module outside the range of the general specifications may result in electric shock, fire or malfunction, or may damage or degrade the module. • Insert the tabs at the bottom of the module into the mounting holes in the base unit. (The AnS series module shall be fastened by screws in the base unit at the specified torque.) Not installing the module correctly could result in malfunction, breakdowns or pieces of the product falling. • Do not touch the conductive area or electric parts of the module. Doing so may cause module malfunction or breakdowns. • Tighten the screws with the specified torque. If the screws are loose, it could result in falling, breaks or malfunction of the module. If the screws are too tight, it could result in falling, breaks or malfunction due to damage of the screws or the module.

[WIRING PRECAUTIONS]

⚠ CAUTION
• Switch all phases of the external power supply of the PC system off before connecting the PROFIBUS cable. Not doing so could cause failure or malfunction of the module. • Be careful not to let foreign matter such as filings or wire chips get inside the module. These can cause fire, breakdowns and malfunction. • The PROFIBUS cable which is connected to the module must be protected with a duct or secured in position with clamps. Unless the cable is thus protected or secured, the module or the cable could be damaged when the cable swings, moves or it is strained with careless pulls, or it could cause malfunction when the cable contacts with any undesirable objects. • When disconnecting the PROFIBUS cable from the module, do not pull by holding the cable section. To disconnect the cable, make sure to hold the connector which is coupled with the module. Do not attempt to pull the cable to disconnect it from the module. It could damage the module or the cable, or cause malfunction due to a poor contact of the cable.

[STARTING AND MAINTENANCE PRECAUTIONS]

◇ DANGER
• Switch all phases of the external power supply off before cleaning. Not doing so could cause electric shock.

⚠CAUTION
• Never disassemble or modify the module. This may cause breakdowns, malfunction, injury and/or fire. • Switch all phases of the external power supply off before mounting or removing the module. If you do not switch off the external power supply, it will cause breakdowns or malfunction of the module.

[OPERATING PRECAUTIONS]

◇DANGER
• Do not write data into the "unused area" of the buffer memory of this modules. Also, do not output the "unused" signal as the output signal to this module from the PC CPU. Writing data into the "unused area" or outputting an "unused" signal may cause system malfunctions in the PC.

⚠CAUTION
• The online operations conducted for the CPU module being operated (especially when changing data or operation status), shall be conducted after the manual has been carefully read and a sufficient check of safety has been conducted. Operation mistakes could cause breakdowns to or malfunction of the module.

[DISPOSAL PRECAUTIONS]

⚠CAUTION
• When disposing of this product, treat it as industrial waste.

Revisions

Introduction

Thank you for purchasing the Mitsubishi Programmable Controller MELSEC-A Series.

Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of the graphic operation terminal you have purchased, so as to ensure correct use.

Please forward a copy of this manual to the end user.

Table of Contents

6.	COMMUNICATIONS THAT REQUIRE THE SEQUENCE PROGRAM	6-1 to 6-23

7.	COMMUNICATION THAT DO NOT REQUIRE THE SEQUENCE PROGRAM	7-1 to 7-38

8.	TROUBLESHOOTING	8-1 to 8-11

APPENDIX	A-1 to A-12

About This Manual

The following are manuals related to this product.

Request for the manuals as needed according to the chart below.

Related Manual

Manual Name	Manual No. (Model code)
Type SW0IX-PROFPE Operating Manual	IB-66772 (13JL20)

1. OVERVIEW

This manual explains the specifications, handling and communication services for type AJ71PB96F/A1SJ71PB96F PROFIBUS-FMS interface module (hereafter abbreviated as AJ71PB96F/A1SJ71PB96F, when explain separately, however, abbreviated as AJ71PB96F, A1SJ71PB96F.) for connecting the A Series PC to the PROFIBUS-FMS network.
The AJ71PB96F/A1SJ71PB96F operates as the master station in the PROFIBUS-FMS network and communicates with slave stations or other master stations.

1.1   Software Configuration

The AJ71PB96F/A1SJ71PB96F contains a Physical layer, Datalink layer, Application layer, and VFD (Virtual Field Device) that comply with PROFIBUS-FMS and conducts data communication with the PC CPU using a general data interface and buffer memory.
The software configuration is shown in the following diagram.

A Series PC		

FROM/TO   General data interface

Communication using buffer memory	PC CPU device read/write communication	
VFD		
FMS	FMA7	7th layer: Application
LLI		
empty		3rd layer to 6 th layer
FDL	FMA1/2	2nd layer:Datalink layer
PHY		1st layer:Physical layer
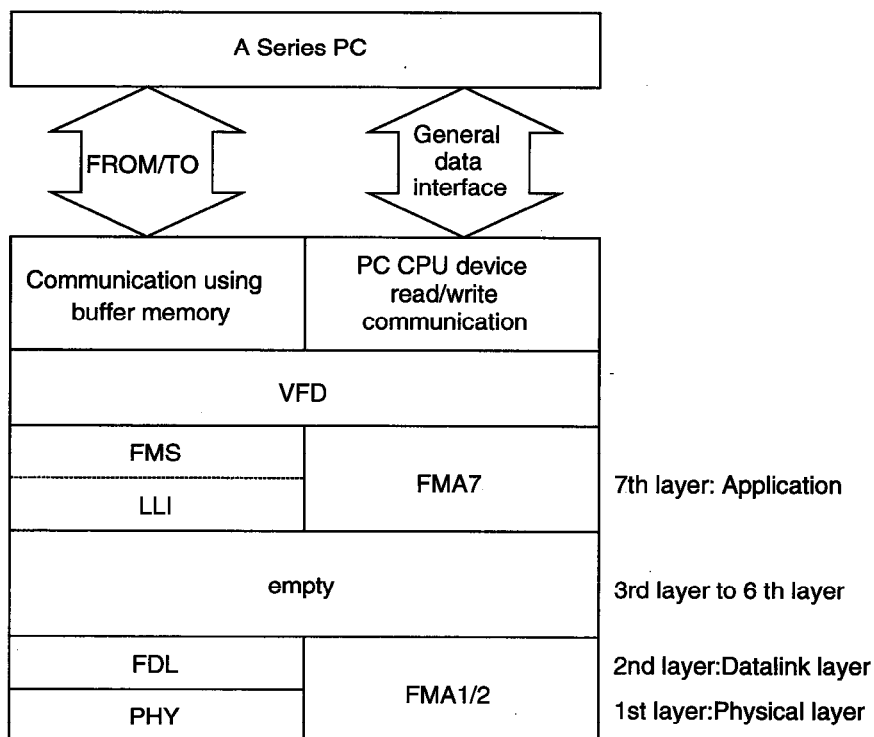
Table 1.1 Software configuration

*FMS, LLI, FDL, PHY, FMA7, FMA1/2...PROFIBUS Protocol

1.2   AJ71PB96F/A1SJ71PB96F Characteristics

The AJ71PB96F/A1SJ71PB96F general characteristics are explained below.

(1) Operates as a client or server in the PROFUBUS-FMS network.

   (a) When operating as a client:
      • The partner station variable can be read/written using the I/O signal X/Y and buffer memory.
      • The partner station status and ID information can be read using the I/O signal X/Y and the buffer memory.
      • The non-confirmation type service can be transmitted using the I/O signal X/Y and the buffer memory.

   (b) When operating as a server:
      • The PC CPU device can be read/written to from the client. (without sequence program)
      • The sequence program, parameters, comments, device memory, and buffer memory can be uploaded/downloaded from the client. (without sequence program)
      • The sequence program can be run, stopped, or paused from the client. (without sequence program)
      • The non-confirmation type service can be received using the I/O signal X/Y and the buffer memory.

The service that can actually be used depends on the connection type and partner station installed service, etc. For details refer to Item 4-4.

**(2) Operates as a master station in the PROFIBUS-FMS network.
In addition, the same operation as that of a slave station can be done using slave emulation.**

(3) When used in combination with MELSECNET (II), MELSECNET/B or MELSECNET/10 the client can access from the MELSECNET (II), MELSECNET/B or MELSECNET/10 station. For details refer to Item 2.3.2

(4) The client can read/set the OD (Object Dictionary), CRL (Connection Relationship List), and bus parameter via the PROFIBUS-FMS network.

(5) The utility software package SW0IX-PROFPE is used when the OD, CRL, and bus parameters are set in the AJ71PB96F/A1SJ71PB96F.

AJ71PB96F/
A1SJ71PB96F

Operation management terminal
IBM PC/AT or 100% compatible

RS-232C

PROFIBUS-FMS network

Utility Software Package

SW0IX-PROFPF
(Software version B or later)
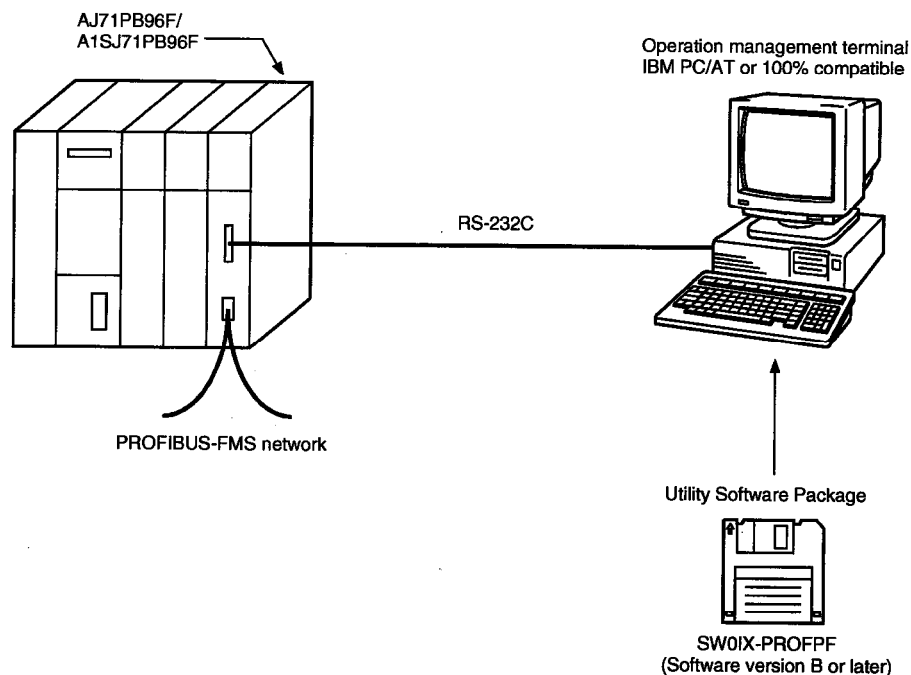
Table 1.2 System configuration example

2. SYSTEM CONFIGURATION

This section explains system configuration for the AJ71PB96F/A1SJ71PB96F.

2.1   Whole System Configuration

(1) For the A1SJCPU

```
┌─────────────────────┐                    ┌─────────────────────────┐
│                     │                    │ A1SJCPU (S3)            │
│   A1SJ71PB96F       │──────────────────▶│ A1SJHCPU                │
│                     │         │          └─────────────────────────┘
└─────────────────────┘         │                       ▲
                                │          ┌─────────────────────────┐
                                │          │ Extension cable         │
                                │          │    A1SC[ ]B             │
                                │          └─────────────────────────┘
                                │                       │
                                │          ┌─────────────────────────┐
                                │          │ Extension base          │
                                └─────────▶│    A1S6[ ]B(S1)/A1S5[ ]B(S1) │
                                           └─────────────────────────┘
```
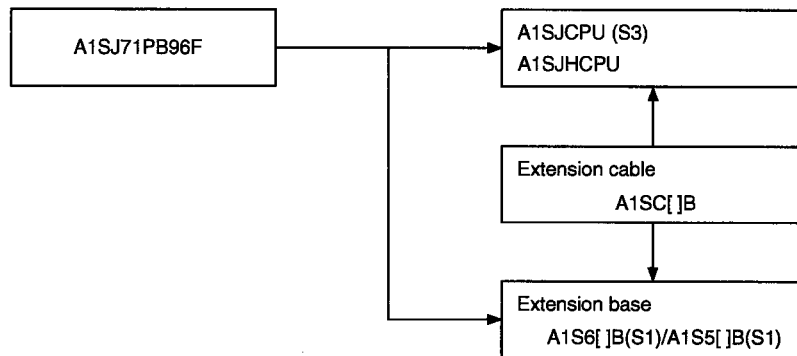
(2) For the compact building block type CPU

```
                                           ┌─────────────────────────┐
                                           │ Compact building block type │
                                           │ CPU                     │
                                           └─────────────────────────┘
                                                        │
                                                        ▼
┌─────────────────────┐                    ┌─────────────────────────┐
│                     │                    │ Basic base              │
│   A1SJ71PB96F       │──────────────────▶│    A1S3[ ]B/A1S38HB     │
│                     │         │          └─────────────────────────┘
└─────────────────────┘         │                       ▲
                                │          ┌─────────────────────────┐
                                │          │ Extension cable         │
                                │          │    A1SC[ ]B             │
                                │          └─────────────────────────┘
                                │                       │
                                │          ┌─────────────────────────┐
                                │          │ Extension base          │
                                └─────────▶│    A1S6[ ]B(S1)/A1S5[ ]B(S1) │
                                           └─────────────────────────┘
```
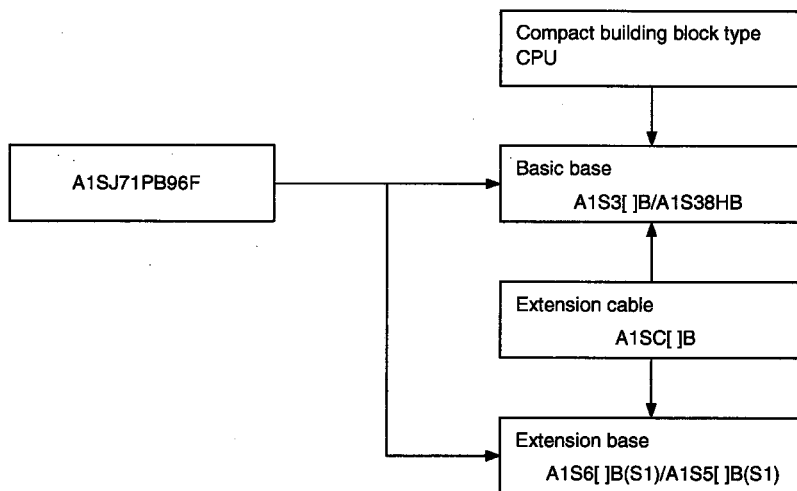
(3) For the building block type CPU(A Series)

```
                                    ┌─────────────────────────┐
                                    │  Building block type CPU │
                                    └─────────────────────────┘
                                                │
                                                ▼
┌──────────────────┐              ┌─────────────────────────┐
│    AJ71PB96F      │─────────┐    │  Basic base             │
└──────────────────┘         │    │      A3[ ]B/A38HB        │
                             │───▶└─────────────────────────┘
                             │                 ▲
                             │    ┌─────────────────────────┐
                             │    │  Extension cable        │
                             │    │      AC[ ]B             │
                             │    └─────────────────────────┘
                             │                 ▲
                             │    ┌─────────────────────────┐
                             └───▶│  Extension base         │
                                  │      A6[ ]B/A5[ ]B      │
                                  └─────────────────────────┘
```
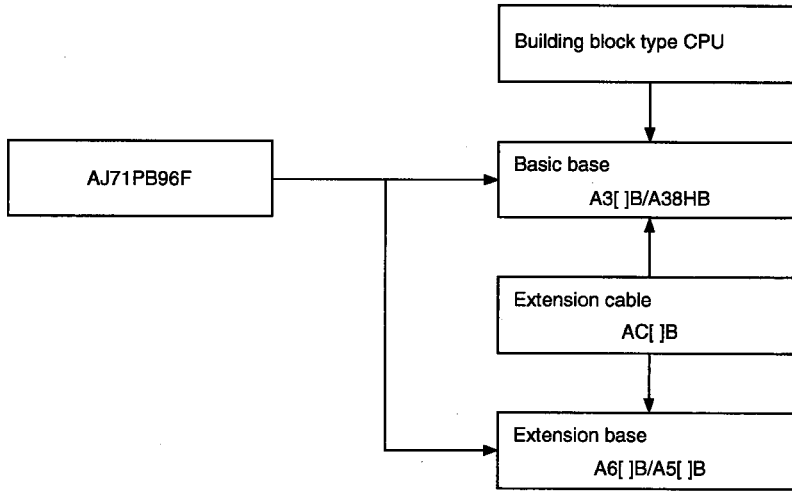
(4) Peripheral equipment configuration

```
┌──────────────────────────┐
│    AJ71PB96F/             │
│    A1SJ71PB96F            │
└──────────────────────────┘
            ▲
            │
┌──────────────────────────┐
│  Connection cable *1      │
└──────────────────────────┘
            │
            ▼
┌──────────────────────────┐
│ IBM PC/AT or 100% compatible │
└──────────────────────────┘
            ▲
            │
┌──────────────────────────┐
│ Utility software package  │
│       SW0IX-PROFPE        │
│ (Software version B or later) │
└──────────────────────────┘
```

*1 Provided by the user

Pin assignment IBM PC/AT RS-232C (9 pin)		AJ71PB96F/ A1SJ71PB96F RS-232C (9 pin)	
DCD	1	1	FG
RD	2	2	RD
SD	3	3	SD
DTR	4	4	DTR
SG	5	5	SG
DSR	6	6	DSR
RTS	7	7	RTS
CTS	8	8	CTS
RI	9	9	RI
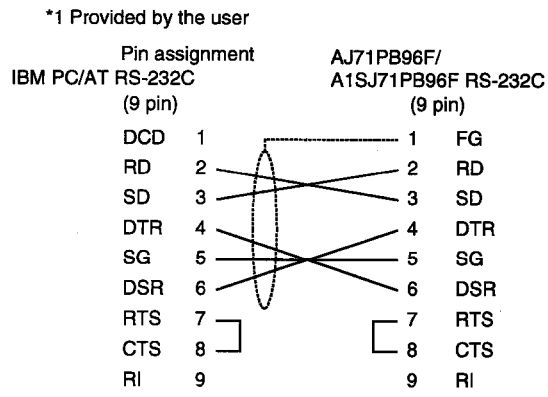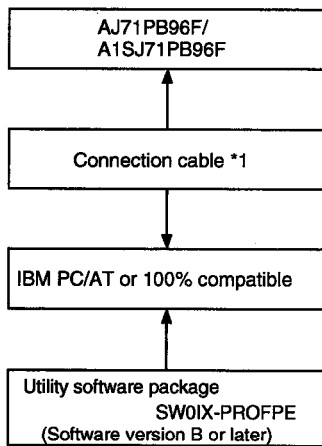
2.2   Applicable CPU Modules

The following table shows the CPUs that the AJ71PB96F/A1SJ71PB96F can use and the number that can be installed.

(1) AJ71PB96F

Applicable CPU Modules	Installable Number	Remarks
A1SCPUC24-R2	1	*2
A1SJCPU, A1SJCPU-S3, A1SCPU, A1SCPU-S1, A2SCPU, A2SCPU-S1, A1SJHCPU, A1SHCPU, A2SHCPU, A2SHCPU-S1, A1NCPU, A1NCPU P21/R21, A2NCPU, A2NCPU P21/R21, A2NCPU-S1, A2NCPU P21/R21-S1, A3NCPU, A3NCPU P21/R21	2	
A2ASCPU, A2ASCPU-S1, A2ASCPU-S30, A2ACPU, A2ACPU P21/R21, A2ACPU-S1, A2ACPU P21/R21-S1, A3ACPU, A3ACPU P21/R21, A2UCPU, A2UCPU-S1, A3UCPU, A4UCPU	6	
Q2ASCPU, Q2ASCPU-S1, *1 Q2ASHCPU, Q2ASHCPU-S1 Q2ACPU, Q2ACPU-S1, Q3ACPU, Q4ACPU, Q4ARCPU		

(2) A1SJ71PB96F

Applicable CPU Modules	Installable Number	Remarks
A1SCPUC24-R2	1	*2
A1SJCPU, A1SJCPU-S3, A1SCPU, A1SCPU-S1, A2SCPU, A2SCPU-S1, A1SJHCPU, A1SHCPU, A2SHCPU, A2SHCPU-S1	2	
A2ASCPU, A2ASCPU-S1, A2ASCPU-S30	6	
Q2ASCPU, Q2ASCPU-S1, *1 Q2ASHCPU, Q2ASHCPU-S1		

*1: The accessible range is the A2ACPU/A3ACPU range.
     Also, it is impossible to access to the file register R.
*2: When used with the special function modules (including the previous models such as the computer link module, Ethernet module, etc.) the total installable number of modules will include the number of these modules used.

- A1SJ71UC24-R2 (R4/PRF)   • A1SJ71E71-B2-S3 (-B5-S3)   • A1SD51S
- A1SD21-S1   • A1SJ61BT11: Only during intelligent mode
- AJ71UC24   • AJ71E71-S3   • AD51H-S3
- AD51-S3   • AD51FD-S3   • AD57G-S3
- A870GOT, A850GOT, A810GOT, A975GOT, A970GOT, A960GOT : Only when connected to bus
- A851GOT   • AJ71C21-S1: Only during the basic program mode
- AD22-S1   • AJ61BT11: Only during intelligent mode   • AJ71C23-S3

However, when the computer link module (A1SJ71UC24-R2, etc.) is used as a multiple drop link module, there is no limit to the above number of installable modules. Multiple modules can be installed within the number of I/O points in the PC CPU.

2. SYSTEM CONFIGURATION

2.3   System Configuration Precaution Items

2.3.1   Installable base units

The base modules that can be installed in the AJ71PB96F/A1SJ71PB96F are shown below.

(1) AJ71PB96F

Installable Base Units	
Basic base unit	Extension base unit
A32B, A32B-S1, A35B, A38B, A38HB	A52B, A55B, A58B, A62B, A65B, A68B

(2) A1SJ71PB96F

Installable Base Units	
Basic base unit	Extension base unit *1
A1S32B, A1S33B, A1S35B, A1S38B, A1S38HB	A1S52B (S1), A1S55B (S1), A1S58B (S1), A1S65B (S1), A1S68B (S1)

*1: The no power supply module extension base unit A1S5 [ ] B (S1) may not have sufficient power
supply capacity, so use the A1S6 [ ] B (S1) when installing a A1SJ71PB96F in the extension base
unit.
When the A1S5 [ ] B (S1) must be installed, do so after referring to the chapter covering power
supplies in the respective CPU Module User's Manual.

2.3.2 Combining with the MELSECNET (II), MELSECNET/B, or MELSECNET/10

Point
The AJ71PB96F/A1SJ71PB96F cannot be installed in a remote I/O station.

(1) For the MELSECNET (II) or MELSECNET/B

Installing the AJ71PB96F/A1SJ71PB96F in the PC CPU connected to the data link system makes it possible to read/write the other station PC CPU devices on MELSECNET (II) or MELSECNET/B from the PROFIBUS other station.

However, PROFIBUS communication requests from the other station PC CPU on the MELSECNET (II) or MELSECNET/B cannot be transmitted.

In addition, the A0J2CPUP23/R23 or A0J2P25/R25 cannot be accessed.
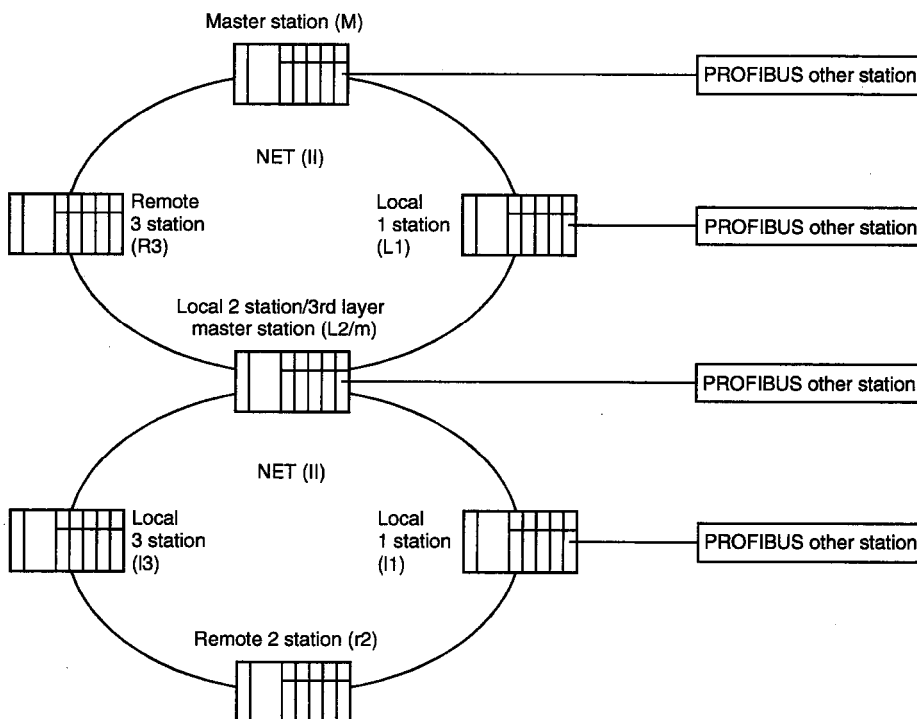
Stations that can be installed: Master and local stations. Cannot be installed in the remote I/O station.

Installable	Stations accessible from the PROFIBUS other stations						
stations	M	L1	L2/m	R3	I1	r2	I3
M	O	O	O	△	×	×	×
L1	O	O	×	×	×	×	×
L2/m	O	×	O	×	O	△	O
I1	×	×	O	×	O	×	×

O: Access is possible to all devices of the specified CPU.

× : Access is not possible to the specified CPU.

△: Access is possible from the special function module buffer memory.

(2) MELSECNET/10 (for networks between PCs)

(a) MELSECNET/10 two-layer system
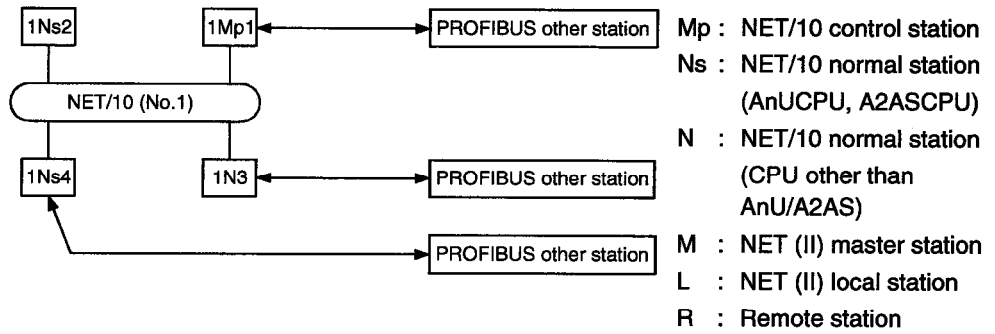
Mp : NET/10 control station
Ns : NET/10 normal station
     (AnUCPU, A2ASCPU)
N : NET/10 normal station
     (CPU other than
     AnU/A2AS)
M : NET (II) master station
L : NET (II) local station
R : Remote station

Installable stations	Stations accessible from the PROFIBUS other stations			
	1Mp1	1Ns2	1N3	1Ns4
1Mp1	○	○	○	○
1N3	○	×	○	×
1Ns4	○	○	○	○

(b) MELSECNET/10 multiple-layer station
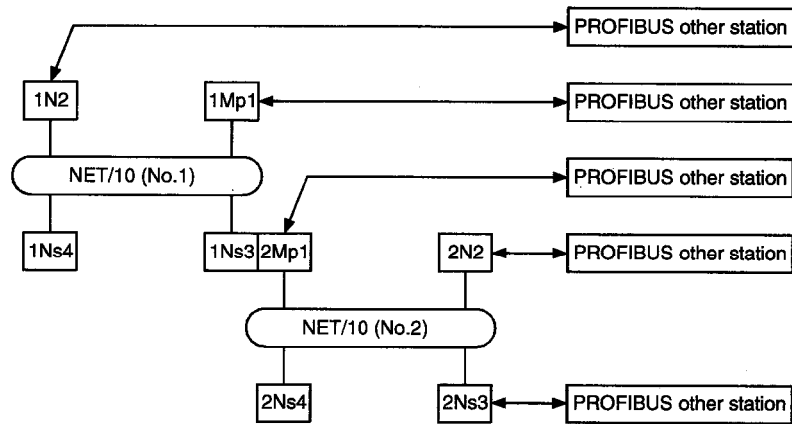
Installable stations	Stations accessible from the PROFIBUS other stations						
	1Mp1	1N2	1Ns3/ 2Mp1	1Ns4	2N2	2Ns3	2Ns4
1Mp1	○	○	○	○	○	○	○
1N2	○	○	×	×	×	×	×
1Ns3/2Mp1	○	○	○	○	○	○	○
2N2	×	×	○	×	○	×	×
2Ns3	○	○	○	○	○	○	○

(c) MELSECNET/10 and MELSECNET (II) mixed systems

• When the intermediate terminal is an AnUCPU/A2ASCPU
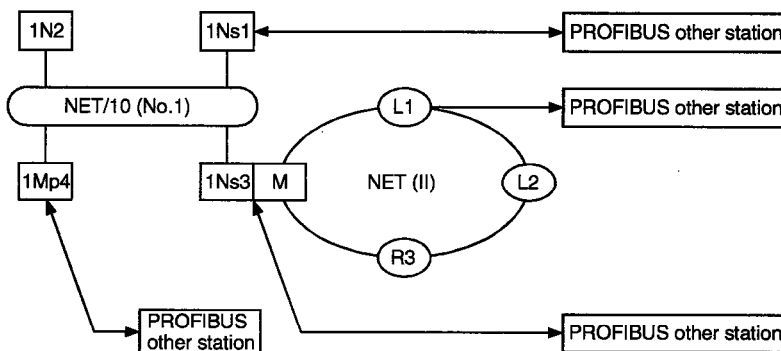
Installable stations	Stations accessible from the PROFIBUS other stations						
	1Ns1	1N2	1Ns3/M	1Mp4	L1	L2	R3
1Ns1	○	○	○	○	×	×	×
1Ns3/M	○	○	○	○	○	○	△
1Mp4	○	○	○	○	×	×	×
L1	×	×	○	×	○	×	×

• When the intermediate station is other than an AnUCPU/A2ASCPU
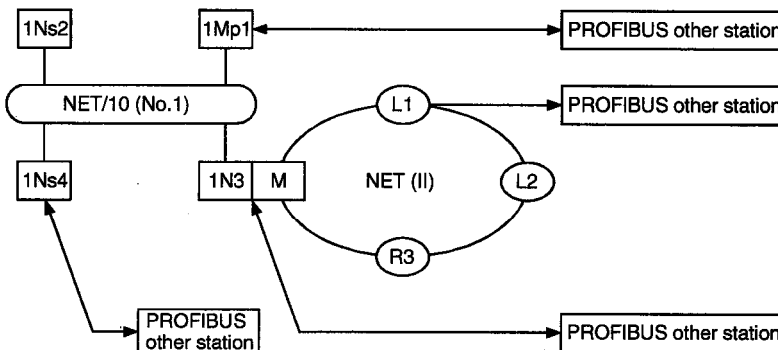
Installable stations	Stations accessible from the PROFIBUS other stations						
	1Mp1	1Ns2	1N3/M	1Ns4	L1	L2	R3
1Mp1	○	○	○	○	×	×	×
1N3/M	○	×	○	×	○	○	△
1Ns4	○	○	○	○	×	×	×
L1	×	×	○	×	○	×	×

(3) MELSECNET/10 (for remote I/O networks)

(a) MELSECNET/10 two-layer system
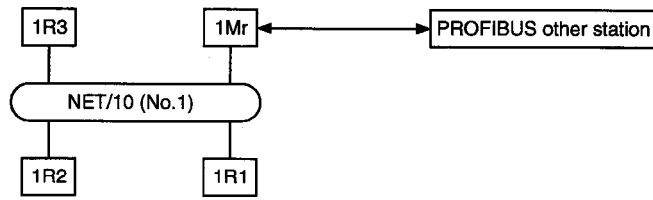
Mp : NET/10 control station
Ns : NET/10 normal station
      (AnUCPU, A2ASCPU)
N : NET/10 normal station
      (CPU other than
      AnU/A2AS)
Mr : NET/10 remote I/O master
M : NET (II) master station
L : NET (II) local station
R : Remote station

Installable stations	Stations accessible from the PROFIBUS other stations			
	1Mr	1R1	1R2	1R3
1Mr	○	△	△	△

(b) MELSECNET/10 multiple-layer system
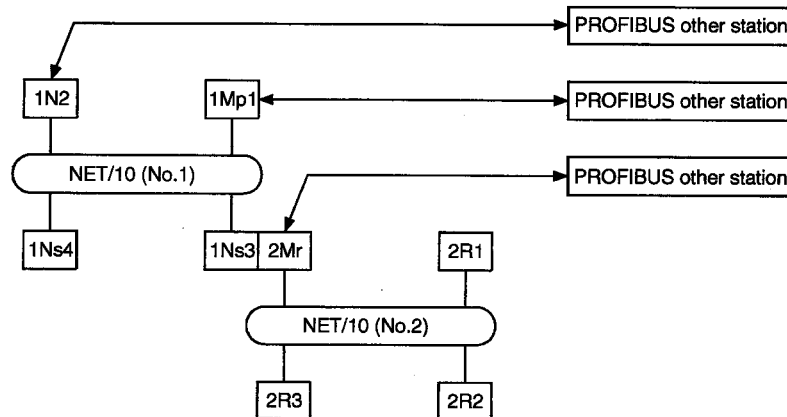
Installable stations	Stations accessible from the PROFIBUS other stations						
	1Mp1	1N2	1Ns3/ 2Mr	1Ns4	2R1	2R2	2R3
1Mp1	○	○	○	○	△	△	△
1N2	○	○	×	×	×	×	×
1Ns3/2Mr	○	○	○	○	△	△	△

(c)   MELSECNET/10 and MELSECNET(II) compound system

• When the intermediate station is an AnUCPU/A2ASCPU
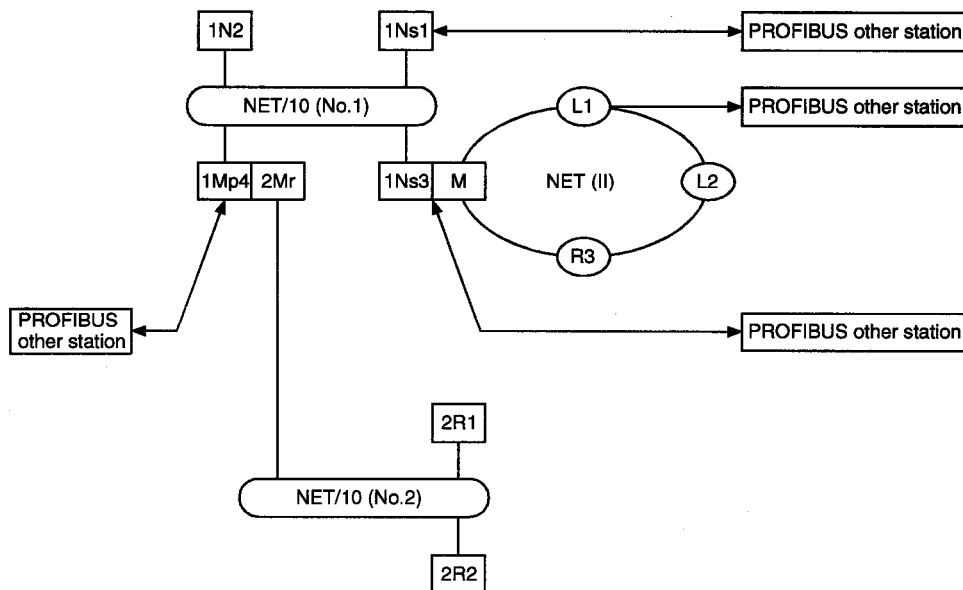
Installable stations	Stations accessible from the PROFIBUS other stations								
	1Ns1	1N2	1Ns3/ M	1Mp4/ 2Mr	2R1	2R2	L1	L2	R3
1Ns1	○	○	○	○	△	△	×	×	×
1Ns3/M	○	○	○	○	△	△	○	○	△
1Mp4/2Mr	○	○	○	○	△	△	×	×	×
L1	×	×	○	×	×	×	○	×	×

● When the intermediate station is other than the AnUCPU/A2ASCPU
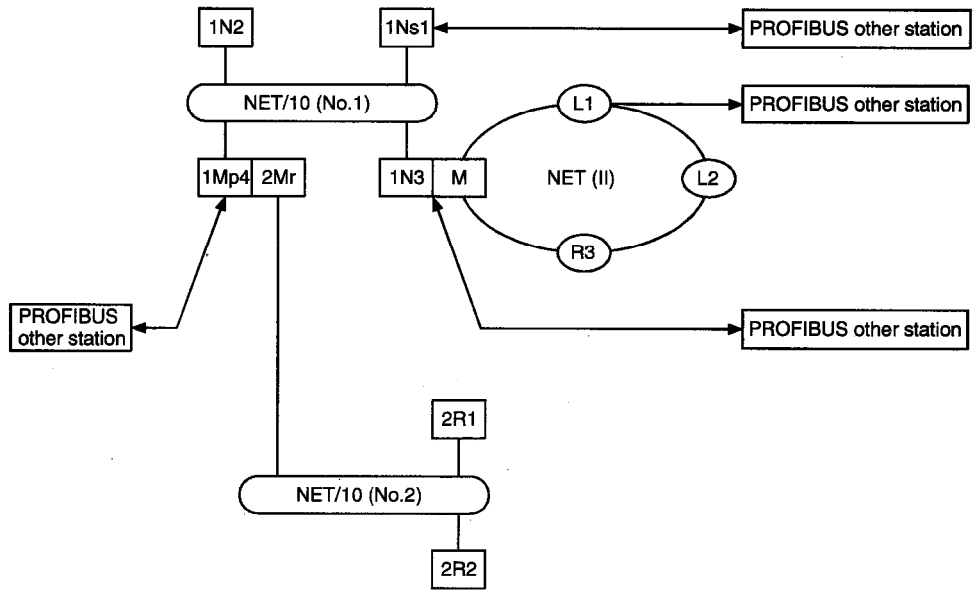
Installable stations	Stations accessible from the PROFIBUS other stations								
	1Ns1	1N2	1N3/ M	1Mp4/ 2Mr	2R1	2R2	L1	L2	R3
1Ns1	○	○	○	○	△	△	×	×	×
1Ns3/M	○	×	○	×	×	×	○	○	△
1Mp4/2Mr	○	○	○	○	△	△	×	×	×
L1	×	×	○	×	×	×	○	×	×

3. SPECIFICATIONS

This section explains the AJ71PB96F/A1SJ71PB96F the general specifications, performance specifications, and transmission specifications.

3.1 General Specification

This section explains the AJ71PB96F/A1SJ71PB96F general specifications.

Table 3.1 General Specification

Item	Specifications					
Ambient operating temperature	0 to 55°C					
Ambient storage temperature	-20 to 75°C					
Ambient operating humidity	10 to 90%RH, Non-condensing					
Ambient storage humidity	10 to 90%RH, Non-condensing					
Vibration resistance	Conforming to JIS B3501, IEC 1131-2			Frequency	Acceleration	Amplitude	No. of sweeps
		Under intermittent vibration	10 to 57Hz	—	0.075mm (0.003inch)	10 times each in X, Y, Z directions (for 80 min.)
			57 to 150Hz	9.8m/s² {1G}	—	
		Under continuous vibration	10 to 57Hz	—	0.035mm (0.001inch)	
			57 to 150Hz	4.9m/s² {0.5G}	—	
Shock resistance	Conforming to JIS B3501, IEC 1131-2 (147m/s² {15G}, 3 times in each of 3 directions X Y Z)					
Operating ambience	No corrosive gases					
Operating elevation	2000m (6562 feet) max.					
Installation location	Control panel					
Over voltage category [*1]	II max.					
Pollution level [*2]	2 max.					

*1: This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within the premises. Category II applies to equipment for which electrical power is supplied from fixed facilities. The surge voltage withstand level for up to the rated voltage of 300V is 2500V.

*2: This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used. Pollution level 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensation must be expected occasionally.

3.2   Performance Specifications
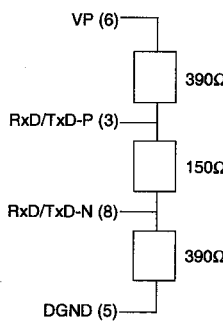
This section explains performance specifications for the AJ71PB96F/A1SJ71PB96F.

Table 3.2 Performance Specifications

Item		Specifications	
Model		AJ71PB96F	A1SJ71PB96F
Transmission speed		9.6, 19.2, 93.75, 187.5, 500, 1500kbps	
Coding method		NRZ	
Synchronization method		Asynchronous	
Electrical standards and characteristics		EIA-RS485 compliance	
Medium		Shield twisted cable	
Network configuration (topology)		Bus type (However, tree type when a repeater is used)	
Transmission distance	9.6kbps 19.2kbps 93.75kbps	1200m (3937ft.)	
	187.5kbps	600m (1969ft.)	
	500kbps	200m (656ft.)	
	1500kbps	100m (328ft.)	
Number of connection nodes		32, 62 (1 repeater), 9 (2 repeaters), 122 (3 repeaters)	
Number of repeaters/network *1		3 repeaters (max)	
Data link method		Token passing (between master-master), polling (between master-slave)	
Transmittable data		241 bytes (max)/1 time	
Number of occupied I/O points		32 points (I/O allocation: special 32 points)	
5VDC internal power consumption (A)		0.54	0.56
Withstand noise, withstand voltage, insulation resistance		According to the power supply module specifications of the system in which the AJ71PB96F/A1SJ71PB96F will be installed. (Refer to the CPU module's users manual.)	
External dimensions (mm)		250 (9.84in.) (H) × 37.5 (1.48in.) (W) × 106 (4.17in.) (D)	130 (5.12in.) (H) × 34.5 (1.36in.) (W) × 97.6 (3.84in.) (D)
Weight (kg)		0.37(0.81lb)	0.27 (0.59lb)

*1   The transmission distance (m/network) can be extended by using a repeater.
     Transmission distance (m/network) = (number of repeaters + 1) × transmission distance (m/segment)

*2   Transmission line

Items	Specifications	Remarks
PROFIBUS cable impedance Capacity Conductor resistance Conductor cross section area	Twisted pair cable 100 to 120Ω (>100kHz) <60nF/km <160Ω/km >0.22mm^2	User distribution

Terminal resistance	VP (6)
	    390Ω
	RxD/TxD-P (3)
	    150Ω
	RxD/TxD-N (8)
	    390Ω
	DGND (5)
		Set yes/no by the main module switch

3.3   Installation Specifications

This section explains installation specifications for the AJ71PB96F/A1SJ71PB96F.

Table 3.3 Installation Specifications

OSI layer name	PROFIBUS protocol		Compliance standards	
Application layer	FMS, LLI, FMA7		PROFIBUS proprietary (DIN19245)	
Presentation layer	—		—	
Session layer	—		—	
Transport layer	—		—	
Network layer	—		—	
Data link layer	FDL	FMA1/2	PROFIBUS proprietary (DIN19245)	PROFIBUS proprietary (DIN19245)
Physical layer	PHY		RS-485	

4. FUNCTIONS

4.1 Positioning in the PROFIBUS-FMS Network

The AJ71PB96F/A1SJ71PB96F in PROFIBUS-FMS network is positioned to the following.

(1) The AJ71PB96F/A1SJ71PB96F operates as a master station in the PROFIBUS-FMS network.

(2) The AJ71PB96F/A1SJ71PB96F contains both client and server functions.

4.2 Bus Parameters

The bus parameters are the communication parameters prescribed for the PROFIBUS protocol No. 2 layer operation. Bus parameters are set using the SW0IX-PROFPE.
The bus parameter rangers and default values that can be set in AJ71PB96F/A1SJ71PB96F are shown below.

Table 4.1 Bus Parameters Setting Items

Item	Unit	Setting range	Default value
Local address		0 to 126	0
Baud rate		9.6, 19.2, 93.75, 187.5, 500, 1500kbps	9.6kbps
Slot time	Bit Time	37 to 16383	100
Min Tsdr	Bit Time	11 to 1023	30
Max Tsdr	Bit Time	37 to 65535	50
Quiet Time	Bit Time	0 to 127	22
Setup Time	Bit Time	1 to 255	5
Target Rotation Time	Bit Time	256 to 16777215	10000
GAP Update Factor		1 to 100	1
Has		1 to 126	126
Max Retry Limit		0 to 7	1

> **Remark**

Following is an explanation of the terminology used for bus parameters.

Tsdr:	Station Delay Time as Responder
Bit Time:	The time required to transmit 1 bit = 1/baud rate
Slot Time:	The maximum time that the requester must wait for a response from the responder. Max Tsdr < Slot Time
Min Tsdr:	The minimum time required for the responder to respond. Quiet Time < Min Tsdr, Setup Time < Min Tsdr
Max Tsdr:	The maximum time required for the responder to respond.
Quiet Time:	The time required for the repeater to switch from the transmission mode to the receive mode.
Setup Time:	The time required for the requester to switch from the transmission mode to the receive mode.
Target Rotation Time:	If the actual token rotation time becomes larger than this time, cyclic communication will no longer be possible.
GAP Update Factor:	This shows how many times the station information can be updated for 1 token rotation. Station information update interval = G x Target Rotation Time
HSA:	Highest Station Address. The highest address of the stations connected to the network.
Max Retry Limit:	The maximum number of transmission retries when data transmission fails.

4.3   Communication Relationship

In PROFIBUS, all of the connection information must be written in CRL (Communication Relationship List) as communication relationships (hereafter abbreviated as communication). Communication contains connection oriented communication that is required for establishing logical circuits before communication and connection less list communication that does not have data communication certainty when establishing logical circuits before communication is not required. In addition, it also contains FMS communication and FMA7 communications.

The following communication types are prescribed for FMS communication.

MMAC	(Master to Master Acyclic Connection)
MSAC	(Master to Slave Acyclic Connection)
MSAC_SI	(Master to Slave Acyclic Connection/Slave Initiative)
MSCY	(Master to Slave Cyclic Connection)
MSCY_SI	(Master to Slave Cyclic Connection/Slave Initiative)
BRCT	(Broadcast)
MULT	(Multicast)

In addition, the communications other than BRCT and MULT have the following attributes:

/D : Defined connection

/I : Request open connection

/O : Responder open connection

However, MSxx's /O connections are not allowed. (PROFIBUS standard) Of these, BRCT and MULT are connectionless communications and the others are connection oriented communications. All FMA7 communications are connection oriented.

In AJ71PB96F/A1SJ71PB96F, the above all communications are enable to use by using the software package.

In AJ71PB96F/A1SJ71PB96F, when the following conditions are met the maximum number of communications including FMA7 communications can be set to 32. In other cases the maximum number of communications that can be set is 16.

(1) Communication type conditions

Communications are divided into the following two types.

Category I

MMAC	(Master to Master Acyclic Connection)
MSAC	(Master to Slave Acyclic Connection)
MSCA_SI	(Master to Slave Acyclic Connection/Slave Initiative)
SMA7 communication	

Category II

MSCY	(Master to Slave Cyclic Communication)
MSCY_SI	(Master to Slave Cyclic Communication/Slave Initiative)
BRCT	(Broadcast)
MULT	(Multicast)

The number of communications must satisfy the following formula.

Category I number of communications $\times$ 2 + Category II number of communications $\leq$ 32

(2) PDU size conditions

All of the PDU sizes for all communications shall be 200 or less.

4.3.1   CRL Setting Items and Default Values

The CRL setting items are shown below. At the time of shipment the default is set to 16 MMAC/O connections.

Table 4.2 CRL Setting Items

Item	Setting range	Default value
CREF	1 to 33	2 to 17
Symbol	Connection name (32 characters)	Connection_01 to Connection_16
Password	0 to 255	0
Access Group	0 to 255	0
Local LSAP (SSAP)	0 to 60, 63, 128	2 to 17
Remote Address	0 to 127, 255	255 (ALL)
Remote LSAP (DSAP)	0, 2 to 63, 128, 255	255 (ALL)
Connection Type	MMAC, MSAC, MSAC_SI, MSCY, MSCY_SI, BRCT, MULT	MMAC
Connection Attribute	/D, /I, /O	/O
Control Interval	0 to 4294967294	4096
Max SCC	0 to 1	1
Max RCC	0 to 2	2
Max SAC	0 to 1	1
Max RAC	0 to 1	1
Max send PDU (H)	0 to 241	241
Max send PDU (L)	0 to 241	241
Max receive PDU (H)	0 to 241	241
Max receive PDU (L)	0 to 241	241
Features Supported	00 00 00 00 00 00 to FF FF FF FF FF FF	00 30 00 F9 B0 81

The default connection contains the following restriction items.
(1) Connection establishment requests are only output from communication partner stations.
(2) Communication is only possible with stations that do not support access protection.
(3) Only for MMAC.
(4) The only services that can be output by the PC are read and write.

For other cases the setting must be conducted using the SW0IX-PROFPE.

| Remark |

Following is an explanation of the terminology used with CRL.

(a) Connection Type

- MMAC: Master to Master Acyclic Connection. Service requests can be sent from both stations.
- MSAC: Master to Slave Acyclic Connection. Service requests can only be sent from the master station.
- MSAC_SI: Master to Slave Acyclic Connection. (Service requests can be sent from the slave station.) In addition to the MSAC communication format InformationReport and UnsolicitedStatus can be sent from the slave station.
- MSCY: Master to Slave Cyclic Connection. Service requests can only be sent from the master station.
- MSCY_SI: Master to Slave Cyclic Connection: (Service requests can also be made from the slave station.) In addition to the MSCY communication format InformationReport and UnsolicitedStatus can be sent from the slave station.
- BRCT: Broadcast communication (connectionless). InformationReport and UnsolicitedStatus can be sent from master stations to all stations.
- MULT: Multicast communication (connectionless). InformationReport and UnsolicitedStatus can be sent to multiple stations within a certain group. The group consists of stations with the same Remote LSAP.

(b) Connection Attribute

- /D: Define Connection. This attribute securely fixes the connection partner.
- /I: Requester Open Connection. When establishing a connection multiple partner stations are connected to the LSAP of the receiving side. (However, the connections are not made at the same time.)
- /O: Responder Open Connection. When establishing a connection multiple partner stations are connected to the LSAP of the receiving side. (However, the connections are not made at the same time.)

(c) Control Interval: This is the monitoring interval during which the communication partner station to which the connection is established is monitored to see if it is operating correctly.

(d) Max SCC: Max Send Confirmed request Counter. The number of maximum confirmed services that can be sent by the confirmed service request side (client) before the response to the previously sent service is received.

(e) Max RCC: Max Receive Confirmed request Counter. The number of maximum confirmed services that can be received by the confirmed service request reception side (server) before the previously sent service is returned.

(f) Max SAC: Max Send Acknowledged request Counter. This is the number of unconfirmed services that can be sent by the unconfirmed service request sending side before the ACK of the previously sent service is received.

(g) Max RAC: Max Received Acknowledged request Counter. This is the number of unconfirmed services that can be received by the unconfirmed services receiving side before the response to the previously sent service is returned.

(h) Max send PDU(H): This is the maximum size of a packet sent by high priority. Acyclic communication data is sent by high priority.

(i)   Max send PDU(L):   This is the maximum size of a packet sent by low priority. Cyclic
                            communication data is sent by low priority.
(j)   Max Receive PDU(H):   This is the maximum size of a packet received by high priority. Acyclic
                            communication data is received at high priority.
(k)   Max Receive PDU(L):   This is the maximum size of a packet received at low priority. Cyclic
                            communications are received at low priority.
(l)   Features Supported: This shows whether or not each bit supports a service.

4.4 Support Service

4.4.1 FMS remote service

Symbol meanings

C: Contains client functions

For confirmed service, has the capability to transmit request primitives and receive confirmation primitives.

For unconfirmed service, has the capability of transmitting request primitives.

S: Contains server functions

For confirmed service, has the capability to receive instruction primitives and to transmit answer primitives.

For unconfirmed service, has the capability of receiving instruction primitives.

B: Has functions as both client and server.

x: Not supported

-: No combination

Service \ Communication type	MMAC/D	MMAC/I	MMAC/O	MSAC/D Master	MSAC/D Slave emulation	MSAC/O Master	MSAC/O Slave emulation
Initiate	B	C	S	C	S	—	S
Abort	B	B	B	B	B	—	B
Reject	S	S	S	S	S	—	S
Status	B	B	B	C	S	—	S
UnsolicitedStatus	B	B	B	C	S	—	S
Identify	B	B	B	C	S	—	S
GetOD (short form)	B	B	B	C	S	—	S
GetOD (long form)	B	B	B	C	S	—	S
InitiatePutOD	S	S	S	X	S	—	S
PutOD	S	S	S	X	S	—	S
TerminatePutOD	S	S	S	X	S	—	S
InitiateDownloadSequence	S	S	S	X	X	—	X
DownloadSegment	C	C	C	X	X	—	X
TerminateDownloadSequence	C	C	C	X	X	—	X
RequestDomainDownload	X	X	X	X	X	—	X
InitiateUploadSequence	S	S	S	X	S	—	S
UploadSegment	S	S	S	X	S	—	S
TerminateUploadSequence	S	S	S	X	S	—	S
RequestDomainUpload	X	X	X	X	X	—	X
CreateProgramInvocation	S	S	S	X	S	—	S
DeleteProgramInvocation	S	S	S	X	S	—	S
Start	S	S	S	X	S	—	S
Stop	S	S	S	X	S	—	S
Resume	S	S	S	X	S	—	S
Reset	S	S	S	X	S	—	S
Kill	X	X	X	X	X	—	X
Read	B	B	B	C	S	—	S
Write	B	B	B	C	S	—	S
ReadWithType	X	X	X	X	X	—	X
WriteWithType	X	X	X	X	X	—	X
PhysRead	X	X	X	X	X	—	X
PhysWrite	X	X	X	X	X	—	X
InformationReport	B	B	B	C	S	—	S
InformationReportWithType	X	X	X	X	X	—	X
DefineVariableList	X	X	X	X	X	—	X
DeleteVariableList	X	X	X	X	X	—	X
EventNotification	X	X	X	X	X	—	X
EventNotificationWithType	X	X	X	X	X	—	X
AcknowledgeEventNotification	X	X	X	X	X	—	X
AlterEventConditionMonitoring	X	X	X	X	X	—	X

Communication type / Service	MSAC_SI/D		MSAC_SI/O		MSCY/D		MSCY/O	
	Master	Slave emulation	Master	Slave emulation	Master	Slave emulation	Master	Slave emulation
Initiate	C	S	—	S	C	S	—	S
Abort	B	B	—	B	B	B	—	B
Reject	S	S	—	S	S	S	—	S
Status	C	S	—	S	—	—	—	—
UnsolicitedStatus	B	B	—	B	C	S	—	S
Identify	C	S	—	S	—	—	—	—
GetOD (short form)	C	S	—	S	—	—	—	—
GetOD (long form)	C	S	—	S	—	—	—	—
InitiatePutOD	X	S	—	S	—	—	—	—
PutOD	X	S	—	S	—	—	—	—
TerminatePutOD	X	S	—	S	—	—	—	—
InitiateDownloadSequence	X	X	—	X	—	—	—	—
DownloadSegment	X	X	—	X	—	—	—	—
TerminateDownloadSequence	X	X	—	X	—	—	—	—
RequestDomainDownload	X	X	—	X	—	—	—	—
InitiateUploadSequence	X	S	—	S	—	—	—	—
UploadSegment	X	S	—	S	—	—	—	—
TerminateUploadSequence	X	S	—	S	—	—	—	—
RequestDomainUpload	X	X	—	X	—	—	—	—
CreateProgramInvocation	X	S	—	S	—	—	—	—
DeleteProgramInvocation	X	S	—	S	—	—	—	—
Start	X	S	—	S	—	—	—	—
Stop	X	S	—	S	—	—	—	—
Resume	X	S	—	S	—	—	—	—
Reset	X	S	—	S	—	—	—	—
Kill	X	X	—	X	—	—	—	—
Read	C	S	—	S	C	S	—	S
Write	C	S	—	S	C	S	—	S
ReadWithType	X	X	—	X	—	—	—	—
WriteWithType	X	X	—	X	—	—	—	—
PhysRead	X	X	—	X	—	—	—	—
PhysWrite	X	X	—	X	—	—	—	—
InformationReport	B	B	—	B	C	S	—	S
InformationReportWithType	X	X	—	X	—	—	—	—
DefineVariableList	X	X	—	X	—	—	—	—
DeleteVariableList	X	X	—	X	—	—	—	—
EventNotification	X	X	—	X	—	—	—	—
EventNotificationWithType	X	X	—	X	—	—	—	—
AcknowledgeEventNotification	X	X	—	X	—	—	—	—
AlterEventConditionMonitoring	X	X	—	X	—	—	—	—

Communication type / Service	MSCY_SI/D		MSCY_SI/O		BRCT/ MULT
	Master	Slave emulation	Master	Slave emulation	
Initiate	C	S	—	S	—
Abort	B	B	—	B	—
Reject	S	S	—	S	S
Status	—	—	—	—	—
UnsolicitedStatus	B	B	—	B	B
Identify	—	—	—	—	—
GetOD (short form)	—	—	—	—	—
GetOD (long form)	—	—	—	—	—
InitiatePutOD	—	—	—	—	—
PutOD	—	—	—	—	—
TerminatePutOD	—	—	—	—	—
InitiateDownloadSequence	—	—	—	—	—
DownloadSegment	—	—	—	—	—
TerminateDownloadSequence	—	—	—	—	—
RequestDomainDownload	—	—	—	—	—
InitiateUploadSequence	—	—	—	—	—
UploadSegment	—	—	—	—	—
TerminateUploadSequence	—	—	—	—	—
RequestDomainUpload	—	—	—	—	—
CreateProgramInvocation	—	—	—	—	—
DeleteProgramInvocation	—	—	—	—	—
Start	—	—	—	—	—
Stop	—	—	—	—	—
Resume	—	—	—	—	—
Reset	—	—	—	—	—
Kill	—	—	—	—	—
Read	C	S	—	S	—
Write	C	S	—	S	—
ReadWithType	—	—	—	—	—
WriteWithType	—	—	—	—	—
PhysRead	—	—	—	—	—
PhysWrite	—	—	—	—	—
InformationReport	B	B	—	B	B
InformationReportWithType	—	—	—	—	—
DefineVariableList	—	—	—	—	—
DeleteVariableList	—	—	—	—	—
EventNotification	—	—	—	—	—
EventNotificationWithType	—	—	—	—	—
AcknowledgeEventNotification	—	—	—	—	—
AlterEventConditionMonitoring	—	—	—	—	—

4. FUNCTIONS

MELSEC-A

4.4.2 FMA7 remote service

Symbol meanings

C: Contains client functions
   For confirmed service, has the capability to transmit request primitives and receive confirmation primitives.
   For unconfirmed service, has the capability of transmitting request primitives.

S: Contains survey functions
   For confirmed service, has the capability to receive instruction primitives and to transmit answer primitives.
   For unconfirmed service, has the capability of receiving instruction primitives.

B: Has functions as both client and server.

X: Not supported

Service	Supported
FMA7_Initiate	S
FMA7_Abort	B
FMA7_Read_KBL_rem	S
FMA7_Init_load_KBL_rem	S
FMA7_Load_KBL_rem	S
FMA7_Term_load_KBL_rem	S
FMA7_Set_value_rem	S
FMA7_Read_value_rem	S
FMA7_LSAP_Status_rem	X
FMA7_Indent_rem	X

4.5 Object Dictionary (OD)

In PROFIBUS, a communication target on the side of the server accessed from the client is called an object, and the server must have a table called an object dictionary in which the object attribute information is recorded. The OD on the server side is called the local OD.

The client reads the server OD via communication and retains a copy and then conducts communication while referring to the read copy. The copy retained by the client is called the remote OD.

4.5.1 Local OD

In the AJ71PB96F/A1SJ71PB96F the memory areas shown in the table below can be registered in the local OD as objects. Setting is done by using the software package (excluding Program Invocation).

(1) AJ71PB96F/A1SJ71PB96F objects

Object type	Object	Number of objects registered	Supporting PC
ST-OD (Static Type OD)	Structured data type	32	None (AJ71PB96F/A1SJ71PB96F internal information)
S-OD (Static OD)	Simple variable array number of records	Maximum 128	Device memory, buffer memory (However, buffer memory cannot be allotted to the record variable.)
	Parameter domain Main sequence domain Subsequence domain Main microcomputer domain Submicrocomputer domain Comment domain Expansion comment domain Device memory domain Buffer memory domain		Parameter Main sequence program Subsequence program Main microcomputer program Submicrocomputer program Comment Expansion comment Device memory Buffer memory
DP-OD (Dynamic PI OD)	Program Invocation (PI) *1	Maximum 32	Main sequence program

*1: Can only be set via a communication from the client.

(2) Variables and data types

The following shows the relationship between the variables and data types that can be used by the AJ71PB96F/A1SJ71PB96F local OD and the device memory.

	Simple variable		Array variable		Record variable	
	Bit device	Word device	Bit device	Word device	Bit device	Word device
Boolean	○	×	○ *3	×	○ *7	×
Integer8	×	○	×	○ *3	×	×
Integer16	×	○	×	○ *4	×	○ *7
Integer32	×	○	×	○ *5	×	×
Unsigned8	×	○	×	○ *3	×	×
Unsigned16	×	○	×	○ *4	×	○ *7
Unsigned32	×	○	×	○ *5	×	×
Float	×	○	×	○ *5	×	×
VisibleStr	×	○ *2	×	○ *6	×	×
OcteStr	×	○ *2	×	○ *6	×	×
Date	×	×	×	×	×	×
TimeOfDay	×	×	×	×	×	×
TimeDiff	×	×	×	×	×	×
BitStr	○ *1	×	○ *6	×	×	×

*1: Maximum 128 bytes (1024 bits)   *2: Maximum 64 words
*3: Maximum 128 elements   *4: Maximum 64 elements
*5: Maximum 32 elements
*6: 1 element byte length x Number of elements <= 128 bytes, and 1 element is 128 bytes or less
*7: Maximum 10 elements

(3) Objects mapping data

Because the objects and PC memory area mapping shown above is set by the AJ71PB96F/A1SJ71PB96F, the following items must be set by the software package.

(a) Structured data types

   ● Index No.   ● Number of elements
   ● (Data type, data length) Maximum 10 unit combinations

(b) Simple variable

   ● Index No.   ● Variable name   ● Data type   ● Network No.   ● PC No.
     Head device

       For device: ● Device name   ● Device number
       For buffer memory: ● Y No.   ● Buffer memory address

(c) Array variable

   ● Index No.   ● Variable name   ● Data type   ● Network No.   ● PC No.
   ● Number of elements
     Head device

       For device: ● Device name   ● Device number
       For buffer memory: ● Y No.   ● Buffer memory address

(d) Record variable

   ● Index No.   ● Index name   ● Structured data type INDEX   ● Network No.
   ● PC No.
     Head device

       For device: ● (Device name, device number) Maximum 10 unit combination
       For buffer memory: ● (Cannot be used)

(e) Domain

   ● Index No.   ● Domain name   ● Network No.   ● PC No.
   ● Domain type (program, parameter, ...)   ● Data length
     Head device

       For device: ● Device name   ● Device number
       For buffer memory: ● Y No.   ● Buffer memory address

The following symbols are used for the above device names.

Device symbol	Device name	Device symbol	Device name
X	Input	TM	Timer setting value (main)
Y	Output	TS	Timer setting value (sub)
L	Latch relay	CM	Counter setting value (main)
M	Internal relay	CS	Counter setting value (sub)
SM	Special relay	A	Accumulator
F	Annunciator	Z	Index register
TT	Timer contact	V	Index register
TC	Timer coil	R	File register
CT	Counter contact	B	Link relay
CC	Counter coil	W	Link register
TN	Timer current value	1R	Expansion file register No. 1
CN	Counter current value	to	to
D	Data register	48R	Expansion file register No. 48
SD	Special register		

In addition, the variable name and the domain name length are 32 bytes (fixed), and any portion that used up to 32 bytes is filled with spaces. The symbols that can be used are as follows:
_, 0 to 9, A to Z, a to z,!@#$%^&*()_+l-= []{}:;" ""<>?,./

(4) Specifies objects to be accessed

The data mentioned in (3) is set in the local OD, but when it will be used by a domain or in accessing the MELSECNET/10 other terminal, the following data is stored in the expansion address table.

- Network No.   • PC No.   • Domain type   • Device name   • Device number
- Y No.   • Buffer memory address

The local OD abbreviation is shown below.

Local OD abbreviations

INDEX	Object type	Object dependent data				
		Name (32 characters)	Data structure (data type INDEX/length)			
1	Data type	Boolean				
3	Data type	Integer16				
14	Data type	BitStr				
15	Structured data type	------	(Boolean/1), (Interger16/2),........(Maximum 10 units)			
		Name (32 characters)	INDEX	Data length	Number of elements	Local address
100	Array variable	counter1	①1	1	16	Local station/D100
101	Simple variable	counter2	③3	2	----	NET10 other station
102	Record variable	Sensor1	⑮15	---	10	Local station/X0, local station/D40, ...
		Name (32 characters)	Data length	Local address		
103	Domain	mainP	12288			
104	Domain		1024			
		Name (32 characters)	INDEX			
500	PI	program 1	⑩3103			

The client uses either the object name registered in the local OD or the index No. (INDEX) uniquely assigned to each object to specify the object to be accessed. For the above example where a simple variable is accessed, either the access No. = 101 or the variable name = counter2 is specified.

4.5.2 Local OD default setting

The array variables are set as shown below in the default local OD.

Index	Number of registrations/1 array	Data Type	Registration device range
100 to 131	128	Boolean	M0 to M4096
132 to 147	64	Unsigned16	TN0 to TN1023
148 to 155	64	Unsigned16	CN0 to CN511
156 to 203	64	Unsigned16	D0 to D3071
204 to 219	64	Unsigned16	TM0 to TM1,023
220 to 228	64	Unsigned16	CM0 to CM511

The default array variable names are added as shown below.
   ccddddLeee

        cc: Device name ("M" if the device name is M)

        dddd: Device No.

        eee: Number of elements

        Example: A 64 unit array starting at D100 is D100L64

4.5.3   Remote OD

In the PROFIBUS the client reads the server local OD using the GetOD service and maintains this information in the local station to be used while communicating. This maintained information is called the remote OD.

(1) AJ71PB96F/A1SJ71PB96F remote OD management

The remote ODs managed by the AJ71PB96F/A1SJ71PB96F are divided into two types: Automatic management remote OD (hereafter automatic remote OD) and preload remote OD. In the AJ71PB96F/A1SJ71PB96F the remote OD is managed for each communication and a maximum of 26 remote ODs can be managed for one communication. However, this number is the total of the automatic remote ODs and preload remote ODs, and a maximum of 20 preload remote ODs can be set for one station. Preload remote ODs are set using the software package. Automatic remote ODs use vacant space in the preload remote ODs.

(a) Automatic remote OD

When the AJ71PB96F/A1SJ71PB96F issues a Read/Write service, if the specified variable remote OD is not stored in the AJ71PB96F/A1SJ71PB96F, the AJ71PB96F/A1SJ71PB96F automatically issues a GetOD to acquire the variable remote OD and this acquired remote OD is stored in the AJ71PB96F/A1SJ71PB96F.
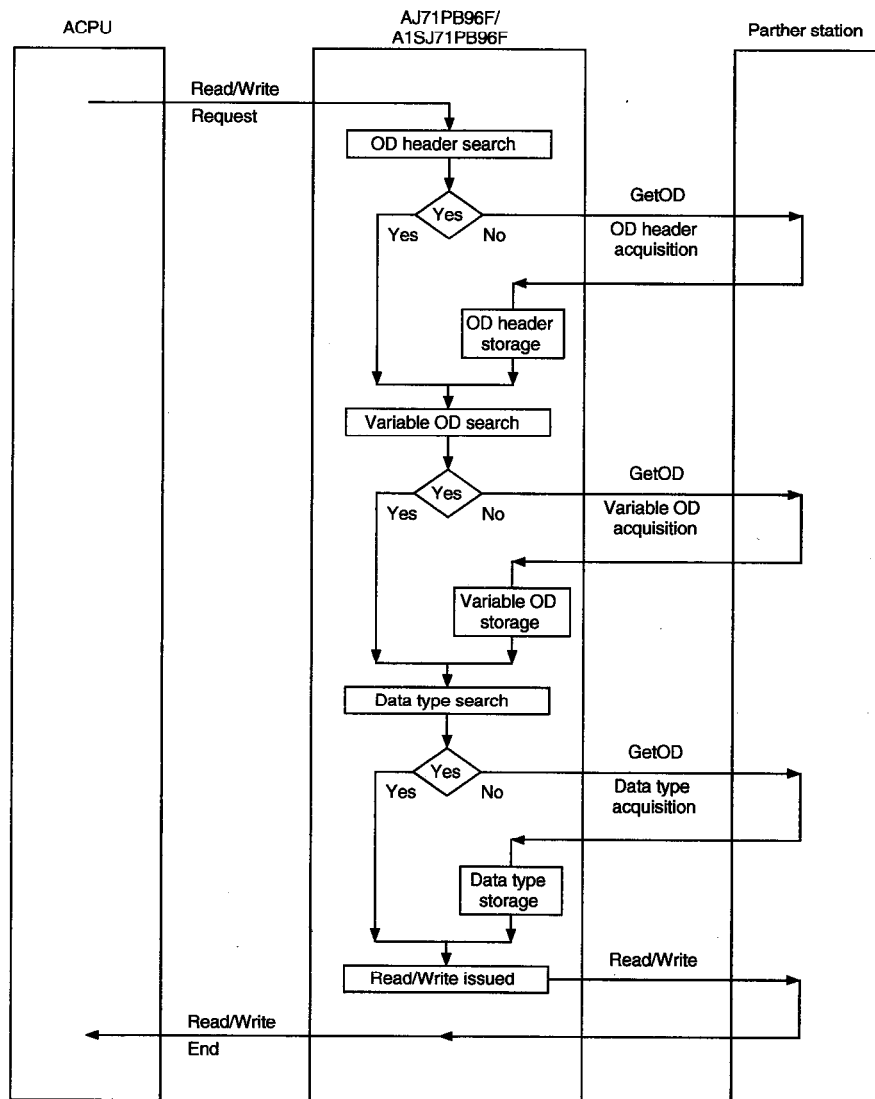
In the above diagram the OD header (OD Object Description) records the OD's own information.

If there is no vacant for the automatic remote OD when the remote OD is acquired, the automatic remote OD of past acquired automatic remote ODs with the lowest frequency of use is selected and overwritten.
When a connection is canceled, all the automatic remote ODs acquired by the canceled connection are deleted.

(b) Preload remote OD
The AJ71PB96F/A1SJ71PB96F has a function for automatically acquiring the remote ODs, but depending on the conditions there are times when this function cannot be used. In such a case the remote OD must be stored in advance in the AJ71PB96F/A1SJ71PB96F using the SW0IX-PROFPE.

The preload remote OD must be set in the following cases.
(1) When operating as a client using the MSCY or MSCY_SI connection, the variable OD Read/Write using this connection.
(2) The variable ODs for which there is a possibility of a notification from the partner station using Information Report for all "/D" and "/I" connections.

Even if the connection is canceled, the preload remote ODs will not be deleted.

(2) Variables and data types

The following shows the relationship between the variables and data types that can be used by the AJ71PB96F/A1SJ71PB96F remote OD and the device memory.
These can be thought of data that can be handled as a client by the AJ71PB96F/A1SJ71PB96F.

	Simple variable	Array variable	Record variable
Boolean	O	O *3	O *7
Integer8	O	O *3	O *7
Integer16	O	O *4	O *7
Integer32	O	O *5	O *7
Unsigned8	O	O *3	O *7
Unsigned16	O	O *4	O *7
Unsigned32	O	O *5	O *7
Float	O	O *5	O *7
VisibleStr	O *2	O *6	O *8
OcteStr	O *2	O *6	O *8
Date	×	×	×
TimeOfDay	×	×	×
TimeDiff	×	×	×
BitStr	O *1	O *6	O *8

*1: Maximum 232 bytes (1856 bits)   *2: Maximum 116 words
*3: Maximum 232 elements   *4: Maximum 116 elements
*5: Maximum 58 elements
*6: 1 element byte length x Number of elements ≤ 232 bytes, and 1 element is 232 bytes or less
*7: Maximum 8 elements
*8: Maximum 8 elements, however the total number of bytes is 232 bytes or less

4.6   I/O Signal List

The configuration of the I/O signal to be used to receive and send data with AJ71PB96F/
A1SJ71PB96F and the PC CPU is shown below.

Signal direction: AJ71PB96F/A1SJ71PB96F→PC CPU		Signal direction: PC CPU→ AJ71PB96F/A1SJ71PB96F	
Device No.	Description	Device No.	Description
X00	Request process end signal (Area No. 1)	Y00	Request request signal (Area No. 1)
X01	Request process end signal (Area No. 2)	Y01	Request request signal (Area No. 2)
X02	Request process end signal (Area No. 3)	Y02	Request request signal (Area No. 3)
X03	UCS receive signal (Receive only area)	Y03	UCS read end signal (Receive only area)
X04	Network trouble signal	Y04	Network trouble read out end signal
X05 ⋮ X0C	Usage not possible	Y05 Y06	Usage prohibited because used by system
		Y07 ⋮ YOF	Unused
X0D	PROFIBUS-FMS I/F WDT error signal		
X0E ⋮ X1A	Usage not possible	Y10	Usage not possible
		Y11 ⋮ Y19	Unused
X1B	PROFIBUS-FMS I/F communication Ready signal	Y1A ⋮ Y1F	Usage prohibited because used by the system
X1C	PROFIBUS-FMS I/F error signal		
X1D	PROFIBUS-FMS I/F module Ready signal		
X1E X1F	Usage not possible		

Remark
- WDT: Watchdog timer
- The Y unused area can be used in place of the internal relay M.
- Refer to the PC CPU User's Manual for information regarding the relationship between the I/O No. and slot.
- UCS: Unconfirmed Service

(1) A request process end signal (X00 to X02) and the request request signal (Y00 to Y02) are used as the handshake signals when the PC CPU matches PROFIBUS communication. Refer to the Section covering the usage method. X03 and Y03 are used as unconfirmed service receive only.

(2) **PROFIBUS I/F communication Ready signal (X1B)**
This is turned on when the AJ71PB96F/A1SJ71PB96F communication preparation ends. Program the PC CPU so that this signal turns on when PROFIBUS communication is conducted.

(3) **PROFIBUS I/F error signal (X1C)**
This turns on when the AJ71PB96F/A1SJ71PB96F detects an error.

(4) PROFIBUS I/F module Ready signal (X1D)

This turns on when the AJ71PB96F/A1SJ71PB96F module preparation ends. When self diagnostics is set this signal turns on when there is a self diagnostic normal end. Refer to the following flowchart for information regarding the difference with the communication Ready signal (X1B).

Differences between the X1B and X1D
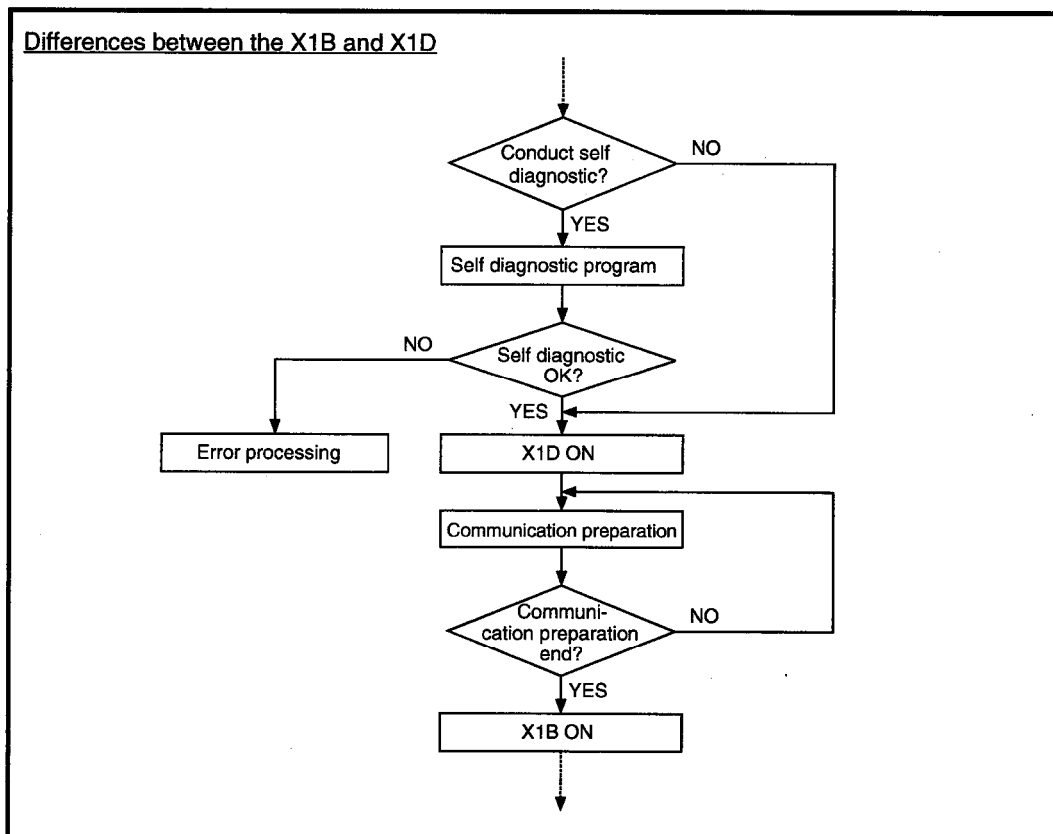
(5) PROFIBUS I/F watchdog timer error signal (X0D)

This turns on when the AJ71PB96F/A1SJ71PB96F detects a watchdog timer error.

(6) Network trouble signal (X04)

This turns on when a value is set in the buffer memory network trouble information area. To turn off the network trouble signal (X04), turn on the network trouble read out end signal (Y04).

4.7   Buffer Memory

The configuration of the buffer memory used to receive and send data with the AJ71PB96F/
A1SJ71PB96F and the PC CPU is shown below.
This buffer memory can be accessed using the FROM/TO instruction from the sequence program. As
shown in the following diagram, the AJ71PB96F/A1SJ71PB96F buffer memory is divided into 3
request areas, 3 request answer areas, 1 information area and receive area, and 3 data areas and
receive data area.

**Address
(decimal/hexadecimal)**   **The unit is word (16 bits).**

Decimal	Hex	Area
0/ to 63/	0h to 3Fh	Request area No. 1 (Description) This is the area in which the PC CPU sets the request data.
64/ to 127/	40h to 7Fh	Request answer area No. 1 (Description) This is the area in which the answer for the request area No. 1 request is returned.
128/ to 191/	80h to BFh	Request area No. 2 (Description) Same as No. 1.
192/ to 255/	C0h to FFh	Request answer area No. 2 (Description) Same as No. 1.
256/ to 319/	100h to 13Fh	Request area No. 3 (Description) Same as No. 1.
320/ to 383/	140h to 17Fh	Request answer area No. 3 (Description) Same as No. 1.
384/ to 447/	180h to 1BFh	Unused (Reserved)
448/ to 511/	1C0h to 1FFh	Receive area (Description) The unconfirmed service receive control information is set. The received data is set in the reception only data area.
512/ to 1152/	200h to 480h	Information area (Description) This area displays the association information.
		Unused
1376/ to 1407/	560h to 57Fh	Network trouble information area (Description) This area displays the media level trouble information.
		Unused
1536/ to 2047/	600h to 7FFh	Data area No. 1 (Description) This is the area in which the data to be read/write by the client function using the request area No. 1 is set.
2048/ to 2559/	800h to 9FFh	Data area No. 2 (Description) Same as No. 1
2560/ to 3071/	A00h to BFFh	Data area No. 3 (Description) Same as No. 1
3072/ to 3535/	C00h to DCFh	Receive data area (Description) This sets the data received by the unconfirmed service.

4.7.1   Information area explanation

Information, such as the AJ71PB96F/A1SJ71PB96F current number of communications, can be obtained when the PC CPU refers to this area. This area is configured as follows.

Adress
(decimal)

Address	Field	Description
512		← Number of communications set up (maximum 32)
513		← Number of client communications
514		← Number of server communications
515		← CREF#1 communication abbreviation information
516 ⋮		← : Low byte 0: Communication abort 1: Communication initiate : High byte 0: Server 1: Client
547		← CREF#33 communication abbreviation information
	Reserved	

CREF#1 communication detailed information

Address	Field	Description
576	CREF No.	← CREF No.
577	Communication status	← Communication status 0: abort, 1: initiate
578	Communication type	← Communication type 0: MMAC, 1: MSAC, 5: MSAC_SI, 3: MSCY, 7: MSCY_SI, 8: BRCT, 10: MULT
579	server/client	← 0: server, 1: client
580	Abort initiator	Abort information
581	Abort initiator layer	0: partner station, 1: ACPU, 2: Utility, 3: Reject, 255: Local station communication
582	Abort reason	0: User (VFD/ACPU/utility), 1: FMS/FMA7, 2: LLI, 3: FDL
583 ⋮ 591	Reserved *1	Reason code prescribed in PROFIBUS
1103		

*1 x 32
The *1 portion is displayed for one communication.
Therefore, a maximum of 33 are displayed.

4.7.2 Network trouble information area

The AJ71PB96F/A1SJ71PB96F network trouble information can be obtained when the PC CPU refers to this area. The area configuration, detailed code, and counter measures are shown below.

Adress
(decimal)

Address			
1376			← Trouble type
1377			← Code 1 in type
1378		*1	← Code 2 in type
1379	Reserved		
⋮			
1407			*1 x 7

The latest trouble information is given the smallest No., and a maximum of 8 trouble information can be displayed.
The old information is moved in numerical order downwards.
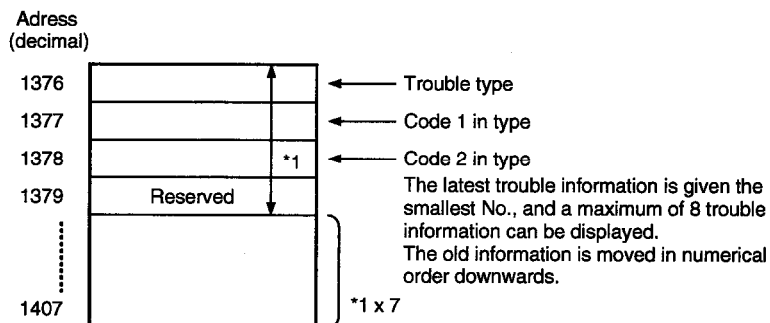
(1) When the trouble type is 100h (initialization trouble):

Code 1 in type	Code 2 in type		
Initialization phase	FMS/FMA7 error code	Description	Counter measure
4h	FFFFh	There is an error with the remote OD setting information.	Correctly set the remote OD.
Ah	Other than FFFFh	There is an error with the local OD setting information.	Correctly set the local OD.
Bh	Other than FFFFh	There is an error with the bus parameter setting information.	Correctly set the bus parameter information.
Ch	Other than FFFFh	There is an error with the CRL setting information.	Correctly set the CRL.
Other	—	There is an error in the module.	Contact Mitsubishi Electric.

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

Code 1 in type	Code 2 in type	Description	Counter measure
FMA7 event instance ID	FMA7 event cause code		
3h	1h	The same address has been defined twice.	Check the addresses of the network nodes.
	5h	The local station has separated from the token passing ring.	Make the slot time and other bus parameters match those of the nodes on the network.
Other	—	—	Conduct an investigation of each parameter, conduct a module self-diagnosis, etc.

(3) When the trouble type is 300h (receive unconfirmed service PDU discard):

Code 1 in type	Code 2 in type	Description	Counter measure
CREF number	Service command		
CREF number	50h	The Unsolicited Status PDU is discarded when the unconfirmed service maximum receive capacity was exceeded in connectionless communication.	Configure the systems so that the unconfirmed service maximum receive capacity is not exceeded.
	1E0h	The information report PDU was discarded because the unconfirmed service maximum receive capacity was exceeded during connectionless communication.	Configure the system so that the unconfirmed service maximum receive capacity is not exceeded.

(4) When the problem type is 310h (parameter setting error):

Code 1 in type	Code 2 in type	Description	Counter measure
—	—	Communication failed due to an incorrect parameter.	Carefully check the compatibility of all parameters.

4.8 Timing Chart

(1) **When a request is output by the AJ71PB96F/A1SJ71PB96F:**

This is shown when the request area No. 1 is used.

> The command is set in request area No. 1 by the PC CPU's TO instruction.
> When necessary it is set in the request area No. 1.

⬇

> Y00 is turned on to notify the AJ71PB96F/A1SJ71PB96F that the command has been set.

⬇

> The PC CPU waits for an answer from the AJ71PB96F/A1SJ71PB96F.
> After X00 is turned on, if necessary the FROM instruction is read from the answer area No. 1 and data area No. 1.

⬇
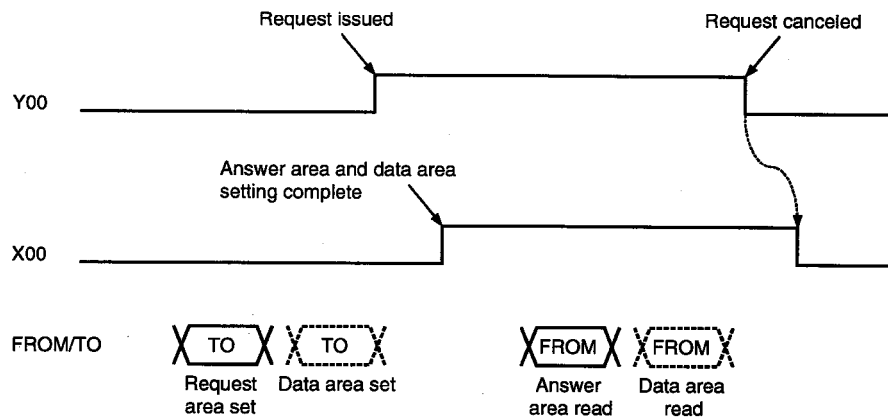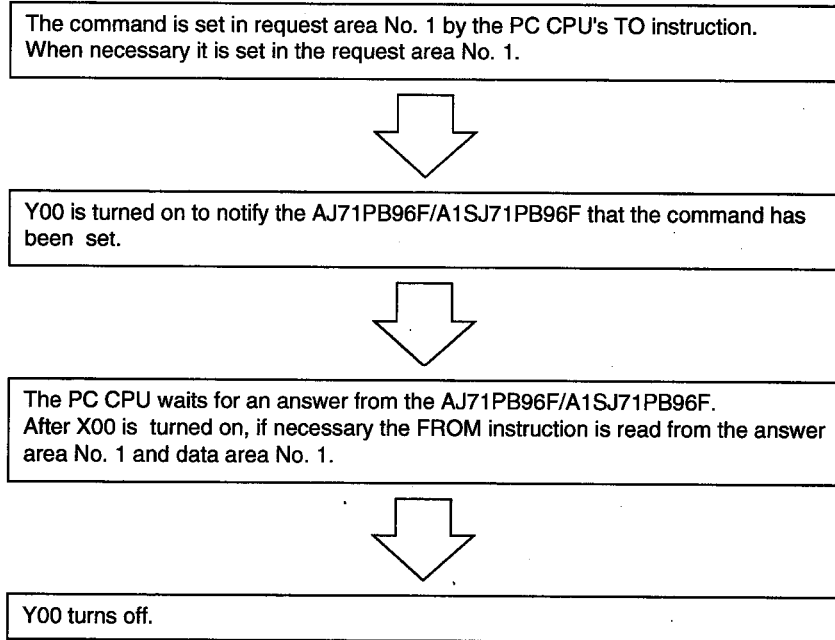
> Y00 turns off.

A minimum of 30ms is required from when Y00 turns on to when the data is actually transmitted.
A minimum of 30ms is required from when Y00 turns off till the X00 turns off.
Leave Y00 on until reading of the answer area and data area is completed.

(2) When unconfirmed service is received:

```
┌─────────────────────────────────────────────────────────────┐
│ X03 is turned on to notify the PC CPU that the AJ71PB96F/A1SJ71PB96F has │
│ received an unconfirmed service.                              │
└─────────────────────────────────────────────────────────────┘
```

⬇

```
┌─────────────────────────────────────────────────────────────┐
│ The PC CPU reads the data from the received area and received data area │
│ using the FROM instruction, and when reading is completed, Y03 turns on │
│ to notify such to the AJ71PB96F/A1SJ71PB96F.                  │
└─────────────────────────────────────────────────────────────┘
```

⬇

```
┌─────────────────────────────────────────────────────────────┐
│ The AJ71PB96F/A1SJ71PB96F turns off X03.                      │
└─────────────────────────────────────────────────────────────┘
```

⬇

```
┌─────────────────────────────────────────────────────────────┐
│ The PC CPU turns off Y03.                                     │
└─────────────────────────────────────────────────────────────┘
```
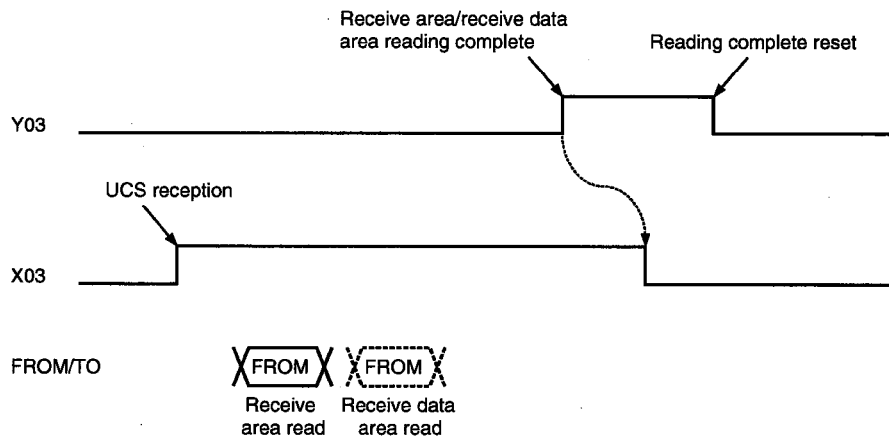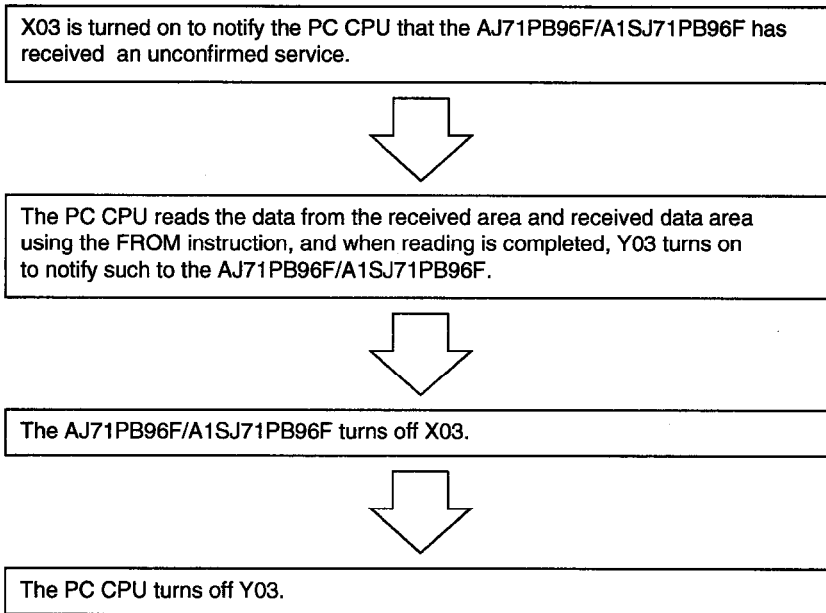
A minimum of 30ms is required from when Y03 tuns off till X03 turns off.

Turn off Y03 after confirming that X03 has turned off.

(3) When network trouble is detected:

X04 is turned on to notify the PC CPU that network trouble was detected in the AJ71PB96F/A1SJ71PB96F.

⬇

The PC CPU uses the FROM command to read the network trouble information area and then Y04 is turned on to notify the AJ71PB96F/A1SJ71PB96F that the read has ended.

⬇

The AJ71PB96F/A1SJ71PB96F turns off.

⬇

The PC CPU turns off Y04.

FROM/TO

Network trouble information read out

5. PROCEDURES BEFORE SYSTEM OPERATION

5.1 Procedures before Operation

The procedure for newly connecting AJ71PB96F/A1SJ71PB96F to an existing PROFIBUS-FMS network is explained below.

```
                    ┌─────────────────────────┐
                    (          Startup          )
                    └─────────────────────────┘
                                  │
          ┌───────────────────────────────────────────┐
          │ Install the AJ71PB96F/A1SJ71PB96F in the PC │
          │ base unit. Connect the AJ71PB96F/A1SJ71PB96F│
          │    and the network with a twisted pair cable.│
          └───────────────────────────────────────────┘
                                  │
          ┌───────────────────────────────────────────┐
          │        Turn the PC CPU key switch to stop.   │
          └───────────────────────────────────────────┘
                                  │
          ┌───────────────────────────────────────────┐
          │ Put the AJ71PB96F/A1SJ71PB96F in self-diagnosis│
          │ mode and turn onthe PC power supply to conduct│
          │ a self-diagnosis of the AJ71PB96F/A1SJ71PB96F.│
          │              (refer to Section 5.4.)          │
          └───────────────────────────────────────────┘
                                  │
                       ╱───────────────────╲          No
                      ╱  Is the AJ71PB96F/   ╲────────────────┐
                      ╲  A1SJ71PB96F normal?  ╱                │
                       ╲───────────────────╱                  │
                                  │ Yes                        │
                                                    ┌─────────────────────────────┐
* Parameter                                         │ This is a hardware error, so  │
                                                    │ contact the nearest Mitsubishi│
  ┌ Bus parameter                                   │ Electric dealer and explain   │
  └ CRL information                                 │ the symptoms to the dealer.   │
    Local OD                                        └─────────────────────────────┘
                       ╱───────────────────╲          No
                      ╱  Is parameter*       ╲────────────────┐
                      ╲  setting required?    ╱                │
                       ╲───────────────────╱                  │
                                  │ Yes                        │
          ┌───────────────────────────────────────────┐       │
          │ Set the AJ71PB96F/A1SJ71PB96F to the         │      │
          │        parameter setting mode.               │      │
          └───────────────────────────────────────────┘       │
                                  │                            │
          ┌───────────────────────────────────────────┐       │
          │ Reset the PC CPU and set the AJ71PB96F/      │      │
          │ A1SJ71PB96F parameter. When setting the      │      │
          │      SW0IX-PR0FPE is required.               │      │
          └───────────────────────────────────────────┘       │
                                  │◄───────────────────────────┘
                       ╱───────────────────╲          No
                      ╱  Acquire the         ╲────────────────┐
                      ╲  partner station OD   ╱                │
                       ╲ information online? ╱                 │
                       ╲───────────────────╱                   │
                                  │ Yes                         │
          ┌───────────────────────────────────────────┐        │
          │ Set the AJ71PB96F/A1SJ71PB96F in online mode │       │
          │           and reset the PC CPU.              │        │
          └───────────────────────────────────────────┘        │
                                  │                             │
          ┌───────────────────────────────────────────┐        │
          │ Establish a connection between the AJ71PB96F/│       │
          │ A1SJ71PB96F and the partner station using the │      │
          │ SW0IX-PROFPE and acquire the partner station  │      │
          │ OD. At this time, the acquired OD information │      │
          │ is not stored In the AJ71PB96F/A1SJ71PB96F,   │      │
          │              so be careful.                   │      │
          └───────────────────────────────────────────┘        │
                                  │◄────────────────────────────┘
                                  ▼
```

```
                        │
                        ▼
              ╱─────────────────╲
             ╱   Preloaded the    ╲         No
            ╱ partner station OD    ╲──────────────┐
            ╲  information in the    ╱              │
             ╲    AJ71PB96F/        ╱               │
              ╲  A1SJ71PB96F?     ╱                 │
               ╲───────────────╱                    │
                        │ Yes                        │
                        ▼                            │
   ┌────────────────────────────────────────┐       │
   │ Set the AJ71PB96F/A1SJ71PB96F in the     │      │
   │ parameter setting mode and reset the PC  │      │
   │ CPU.                                     │      │
   └────────────────────────────────────────┘       │
                        │                            │
                        ▼                            │
   ┌────────────────────────────────────────┐       │
   │ Store the partner station OD information │      │
   │ in the AJ71PB96F/A1SJ71PB96F using the   │      │
   │ utility SW0IX-PROFPE.                    │      │
   └────────────────────────────────────────┘       │
                        │◄───────────────────────────┘
                        ▼
   ┌────────────────────────────────────────┐
   │ Set the AJ71PB96F/A1SJ71PB96F in online  │
   │ mode and reset the PC CPU.               │
   └────────────────────────────────────────┘
                        │
                        ▼
   ┌────────────────────────────────────────┐
   │ Create the PC CPU program. *             │
   └────────────────────────────────────────┘
                        │
                        ▼
   ┌────────────────────────────────────────┐
   │ Turn the PC CPU to run.                  │
   └────────────────────────────────────────┘
                        │
                        ▼
              (        Operate        )
```

Point

* : Creation of a sequence program is required when the PC launches communication or when the PC is used as a client. Creating a sequence program is not required when the PC is used as a server or when answering a request from a client.

5.2   Handling Precautions

This section explains handling precautions for AJ71PB96F/A1SJ71PB96F.

⚠ **CAUTION**

• Use the module in the environment given in the general specifications of the CPU module's User's Manual. Using the module outside the range of the general specifications may result in electric shock, fire or malfunctioning, or may damage or degrade the module.

• Do not touch the conductive area or the electronic parts of the module. Doing so may cause malfunctioning or breakdowns.

• Switch all phases of the external power supply of the PC system off before connecting the PROFIBUS cable. Not doing so could cause failure or malfunction of the module.

• Be careful not to let foreign matter such as filling or wire chips get inside the module. These can cause fire, breakdowns and malfunctioning.

• Never disassemble or modify the module.
  This may cause breakdowns, malfunctioning, injury and/or fire.

• Insert the tabs at the bottom of the module into the mounting holes in the base unit.
  (The AnS series module shall be fastened by screws in the base unit at the specified torque.)
  Not installing the module correctly could result in malfunctioning, breakdown or pieces of the product falling.

• Switch all phases of the external power supply off before mounting or removing the module. If you do not switch off the external power supply, it will cause breakdowns or malfunction of the module.

• Tighten the screws with the specified torque. If the screws are loose, it could result in falling, breaks or malfunction of the module.
  If the screws are too tight, it could result in falling, breaks or malfunctions due to damage of the screws or the module.

---

(1)   The AJ71PB96F/A1SJ71PB96F's case is made of resin, so be careful not to drop it or strike it hard.

(2)   The module fixing screw (M4) fastening torque should be tighten within the range of 78.4 to 117.6N•cm {8 to 12kg•cm}

5.3   Part Names and Settings

Following is an explanation of the AJ71PB96F/AISJ71PB96F part names and settings.
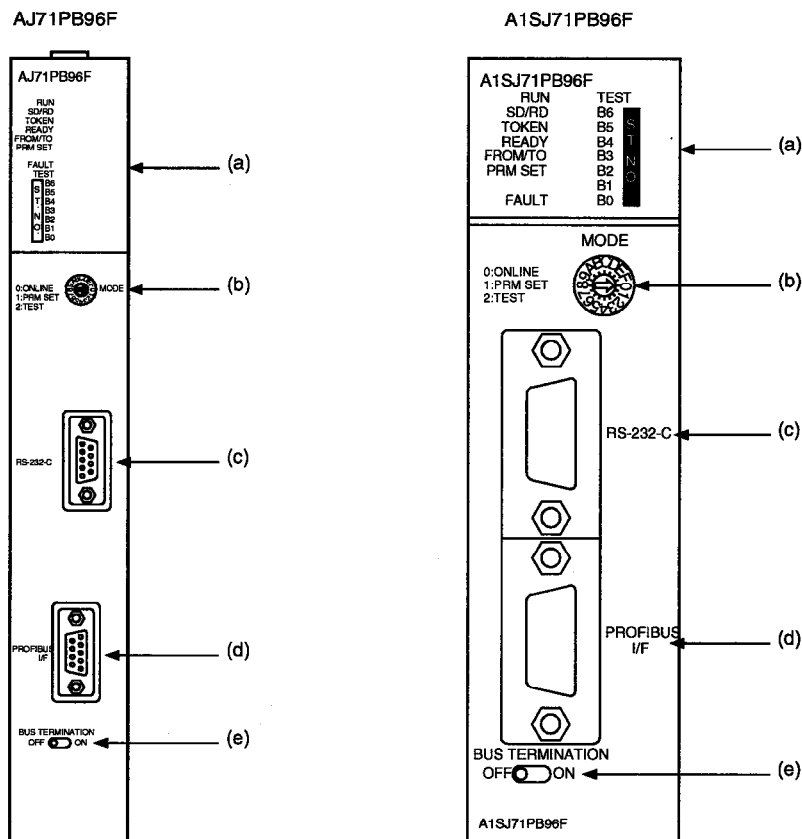
No.	Name	Description		Remark
(a)	LED	Displays the AJ71PB96F/A1SJ71PB96F status.		
		Name	Display description	
		RUN	Displays the AJ71PB96F/A1SJ71PB96F operation status. Turned on: During normal operation Turned off: When there is an error	
		SD/RD	Turns on when data is transmitted/received on the PROFIBUS-FMS network.	
		TOKEN	Turns on when token is maintained.	
		READY	Turns on when the PROFIBUS-FMS network subscription preparation is completed and during subscription.	
		FROM/TO	Turns on when a FROM/TO instruction from the PC CPU is executed.	
		PRM.SET	Turns on during the parameter setting mode.	
		FAULT	Turns on when an error occurs.	
		TEST	Turns on when a self-diagnosis is executing.	
		B0 to B6	Displays the station address during normal operation (binary). Displays the test type during a self-diagnosis.	

No.	Name	Description	Remark
(b)	Mode setting switch	This sets the AJ71PB96F/A1SJ71PB96F operation status. (at time of shipment: 0)	
		<table><tr><td>Switch No.</td><td>MODE</td></tr><tr><td>0</td><td>Online mode</td></tr><tr><td>1</td><td>Parameter setting mode</td></tr><tr><td>2</td><td>Self-diagnosis mode (refer to section 4.5)</td></tr><tr><td>3 to F</td><td>Not usable</td></tr></table>	
(c)	RS-232C interface connector	Connector for connecting the peripheral equipment that conduct the AJ71PB96F/A1SJ71PB96F operation.	*1
(d)	PROFIBUS interface connector	Connector for connecting the table for the PROFIBUS-FMS network.	*2
(e)	PROFIBUS network terminal resistance setting switch	This sets whether or not there is terminal resistance inside the AJ71PB96F/A1SJ71PB96F. (at time of shipment: OFF) ON: has terminal resistance OFF: no terminal resistance	Always ON for both ends of the station on the PROFIBUS-FMS network.

*1: For the connector type, use a male B-Sub 9 pin. The user makes the RF-232C cable. (for information regarding cable wiring, refer to SW0IX-PROFPE Operating Manual.)

*2: For the connector type, use a male D-Sub 9 pin. The user creates the PROFIBUS cable. (for information regarding the cable wiring, refer to Item 5.5.1.)

5.4   Self-diagnosis Execution Method

(1) Self-diagnosis method

The AJ71PB96F/A1SJ71PB96F self-diagnosis method is conducted using the following procedure.

(a)   Set the mode setting switch to "2."

(b)   The PC CPU will stop.

(c)   The PC power will turn on. In addition, the PC CPU will be reset.

(d)   The AJ71PB96F/A1SJ71PB96F self-diagnosis will be executed, and results will be displayed using the LEDs (B0 to B6).

(2) Test results

The results of the executed test are displayed as shown below (LED B0 to B6 display status).

Test item		LED							
		B6	B5	B4	B3	B2	B1	B0	TEST
(a) MPU test	During test	O	O	O	O	O	●	●	●
	Error	●	O	O	O	O	●	O	●
(b) Timer test	During test	O	O	O	O	●	O	●	●
	Error	●	O	O	O	●	O	O	●
(c) Interrupt test	During test	O	O	O	O	●	●	●	●
	Error	●	O	O	O	●	●	O	●
(d) DRAM test	During test	O	O	O	●	O	●	●	●
		O	O	O	●	●	O	●	●
	Error	●	O	O	●	●	●	O	●

O: Turned off   ●: Turned on

When the test results are normal, tests (a) to (d) are repeated. If an error is detected, then the LED status at the tie the error occurs for that test will be displayed.

5.5   Wiring

5.5.1   PROFIBUS Cable Wiring

This section explains the wiring to PROFIBUS connector for AJ71PB96F/A1SJ71PB96F

(1) Pin assignments for the connector

Pin No.	Symbol	Name	Application
1		SHIELD*1	Shield, Protective Ground
2		RP*1	Reserved for Power
3	A/A'	RxD/TxD-P	Receive/Transmit Data-P
4		CNTR-P*1	Control-P
5	C/C'	DGND	Data Ground
6		VP*2	Voltage-Plus
7		RP*1	Reserved for Power
8	B/B'	RxD/TxD-N	Receive/Transmit Data-N
9		CNTR-N*1	Control-N

*1   Signal is optional.

*2   Signal is only necessary at a station at the end of the bus cable.

(2) Wiring
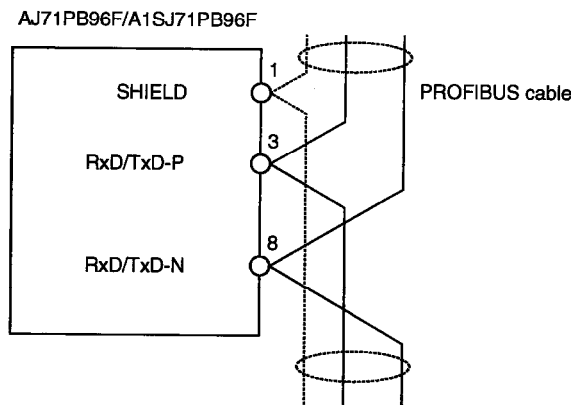
Remark

- To apply to the EMC standard:
  Read the Section for the Installation in the A1S/A2SCPU User's Manual (Hardware). (after the Ib-66468-E)

- Please use the PROFIBUS cable with braided shield.

5.5.2 Terminal switch

Whether or not to set the built-in module terminal resistance (1/2W 150Ω × 2 units) can be selected by connecting a switch. (The stations on both ends of the PROFIBUS segment must be connected with terminal resistor.)

Silk display	ON	OFF
TERMINATOR	Connects terminals resistor	Disconnects terminal resistor (setting at time of shipment)

When the AJ71PB96F/A1SJ71PB96F's bus termination switch is set to on (has terminal resistor), do not remove the PROFIBUS cable from the AJ71PB96F/A1SJ71PB96F during PROFIBUS-FMS network operation. If the cable is removed, then the terminal resistor in the network will disappear, causing an error and bringing down the network.

5.5.3 Precautions Against Wiring

As one of the requirements to give full play to AJ71PB96F/A1SJ71PB96F'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 AJ71PB96F/A1SJ71PB96F is described below.

(1) **Do not route the wire of AJ71PB96F/A1SJ71PB96F close to or bundle it together with the main circuit and high-tension lines, or the load-carrying lines from other than the PC. Otherwise, the module may be susceptible to an influence of noise and surge induction.**

(2) **The wires from the input/output modules of the PC should be away from the communication cable of PROFIBUS-FMS interface module as far as possible as shown in the figure below.**
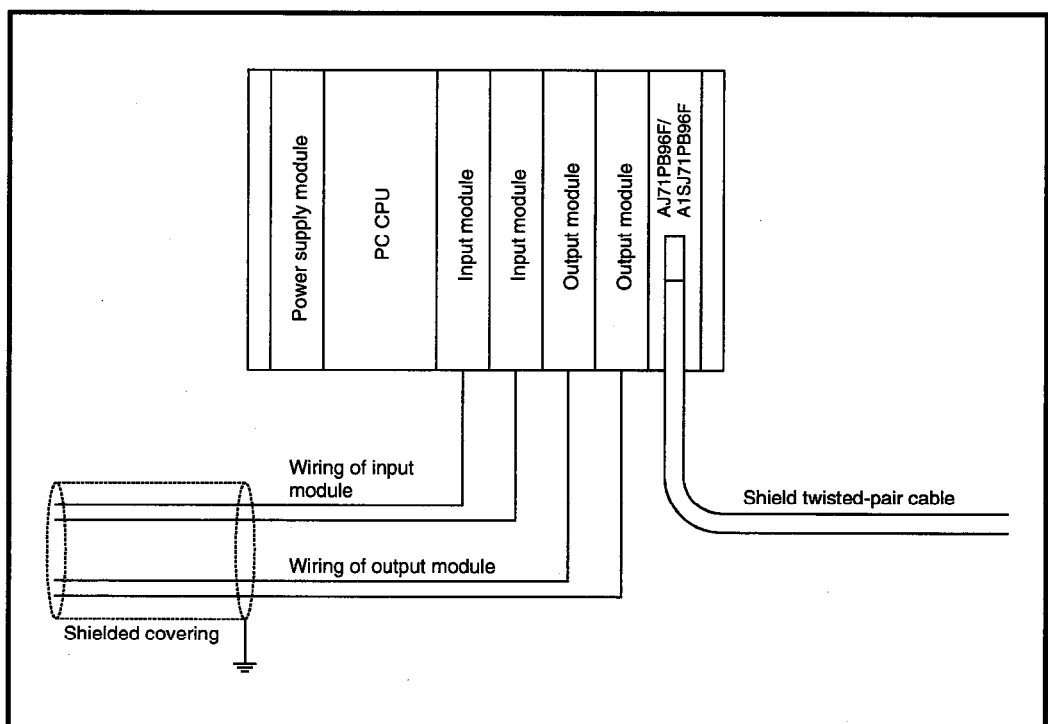
(3) Grounding

    (a)   When the PROFIBUS-FMS interface module is used, the FG and LG terminals of the power supply module of the PC 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.

5.6   Maintenance and Inspection

For the AJ71PB96F/A1SJ71PB96F, eliminate the check of cable connection and looseness and do not include it as an inspection item. Otherwise, follow the inspection item instructions in the PC CPU User's Manual to always use the system in good condition.

◇DANGER

- Switch all phases of the external power supply off before cleaning. Not doing so could cause failure or malfunction of the module.

⚠CAUTION

- Never disassemble or modify the module.
  This may cause breakdowns, malfunctioning, injury and/or fire.

- Switch all phases of the external power supply off before mounting or removing the module. If you do not switch off the external power supply, it will cause failure or malfunction of the module.

- Do not touch the conductive area or the electronic parts of the module.
  Doing so may cause malfunctioning or breakdowns.

6. COMMUNICATIONS THAT REQUIRE THE SEQUENCE PROGRAM

This chapter explains the communication services that require the sequence program when the AJ71PB96F/A1SJ71PB96F conducts the communication services.

6.1 FMS Service and Command No.

Use the following command Nos. to identify the communication services used when the receive area is used to execute a communication service or an unconfirmed service is received by the receive area.

Communication service name	Command	Description
Initiate	0010h	Connection initiated
Abort	0020h	Connection aborted
Status	0040h	Partner station status information acquired
UnsolicitedStatus	0050h	PC CPU status notification
Identify	0060h	Identification information acquired
Read	01a0, 01a1h	Data read
Write	01c0, 01c1h	Data write
InformationReport	01e0, 01e1h	Arbitrary data transmitted
FMA7 Abort	2020h	FMA7 connection aborted

6.2 Program Example

A programming example is shown below.
In the following example, the AJ71PB96F/A1SJ71PB96F is installed in the basic base unit No. 0 slot. Examples of the Write service that uses the request area and the Information Report that uses the receive area are shown.

6.2.1 Write

An example for the execution of the write service that uses the request area No. 1 is shown.
In the following example, D100 to D123 are used to set the write control data and D300 is used to set the write data. In addition, the execution results are stored in D200 to D202.

(1) Request data set (TO instruction)

```
    X0C1B X001D M103  X0000                          P H
 0 ──┤├────┤├────┤├────┤/├─────────────────────[MOV 01C0  D100 ]   Write command

                                                  P H
                      ─────────────────────────[MOV 0003  D101 ]   Connection identification No.

                                                  P H
                      ─────────────────────────[MOV 0001  D103 ]   Access mode = INDEX

                                                  P H
                      ─────────────────────────[MOV 0123  D106 ]   INDEX = 123h

                                                  P K
                      ─────────────────────────[MOV   6   D123 ]   Subindex = 6

                                      P H    H         K
                      ───────────────[TO 0000 0001 D100 24 ]       Write control data set

                                                  P H
                      ─────────────────────────[MOV 1234  D300 ]   Write data settig

                                      P H    H         K
                      ───────────────[TO 0000 0600 D300  1  ]       Write data set

                      ─────────────────────────────────[SET Y0000 ]   Request issue

  CIRCUIT END
```

(2) Answer data storage (FROM instruction)

```
      X001B X001D M100  Y0000 X0000                  P H     H        K
    0 ┤├────┤├────┤├─────┤├────┤├──────────────┬[FROM 0000  0040  D200  3 ]┤  Execution result write
                                               │
                                               ├────────────────────[RST  Y0000 ]┤  Request cancel
                                               │
                                               └────────────────────[RST  M100  ]┤  Request command OFF
      CIRCUIT END
```

6.2.2   Information Report

The following shows an example of using the reception area to execute the Information Report service reception processing.

(1) Receive data storage (FROM instruction)

```
      X001B X001D X0000 Y0003                    P H    H         K
    0 ┤├────┤├────┤├────┤/├──────┬────────────[FROM 0C00  01C0  D100  23 ]┤  Receive area read
                               │              P H    H         K
                               ├────────────[FROM 0000  0C00  D200  123 ]┤  Receive data area read
                               │
                               └────────────────────────────[SET  Y0003 ]┤  Read end signal set
      X001B X001D X0003 Y0003
   23 ┤├────┤├────┤/├────┤├──────────────────────────[RST  Y0003 ]┤  Read end signal reset
      CIRCUIT END
```
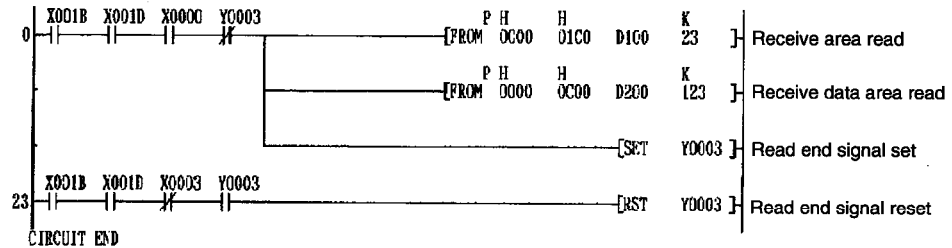
6.3   FMS Communication Circuit Initiate With Partner Station (Initiate: Initiator)

The previously determined communication conditions are set and a communication path is established with the partner station. When a communication path is established, the CRL parameters need to be set using the software package.

(1) Request area

0	*
1	0010h	◄──── Initiate commands
2	▢▢▢▢	◄──── CREF (communication information) No.
3	*
4	*
⋮	
63	*

(2) Request answer area

```
64  │  *  │
65  │  *  │
66  │ □□□□ │ ◄──── If successful 0 and if unsuccessful
67  │ □□□□ │            an error code is set.
68  │  *  │   ◄── Error code during communication
 ⋮  │  *  │        Don't Care when other than an error
127 │  *  │        during communication.
```

Explanation

For details regarding error codes, refer to Section 8.

- The * denotes Don't Care. The values set in the request area are ignored. The values set in the request answer area are undefined.

6.4   FMS Communication Circuit Abort With Partner Station (Abort: Requester)

This command aborts the connection.

(1) Request area

```
0  |    *     |
1  |  0020h   |  ◄─────── Abort command
2  | ☐ ☐ ☐ ☐ |  ◄─────── CREF No.
                          This specifies the CREF No. of the partner
3  |    *     |           with which the connection is aborted.
4  |    *     |
   ⋮
63 |    *     |
```
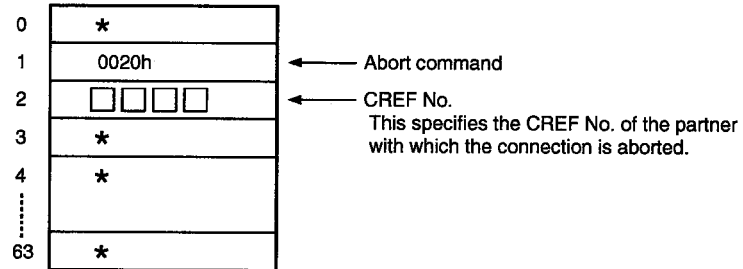
(2) Request answer area
Same as for Initiate.

6.5   Partner Station Status Read (Status: Client)

This command is used to acquire the server station status.

(1) Request area

0	*	
1	0040h	← Status command
2	☐☐☐☐	← CREF No.
3	*	
4	*	
63	*	
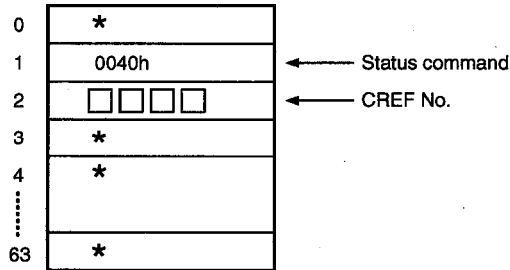
(2) Request answer area
Same as Initiate.

(3) Data area

1536	☐☐☐☐	← Logical Status*1
1537	☐☐☐☐	← Physical Status*2
1538	☐☐☐☐	← Local Detail*3
1539	☐☐☐☐	
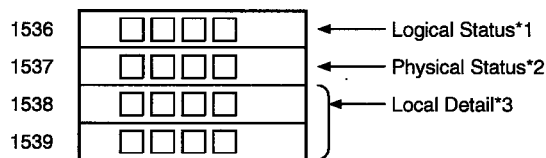
Explanation

*1 The following values are set.
Communicable status (all services can be used) → 0
Communicable status (some services can be used) → 2
OD loading → 4
OD loading → 5

*2 The following values are set.
Operational → 0
Partially operational → 1
Not operational → 2
Requires operation → 3

*3 The following values are set.

Address	Upper position	Lower position
1538	Second octet	First octet
1539	00	Therd octet

6.6   Partner Station Identification Information Read (Identify: Client)

This command is used to check the server station identification information.

(1) Request area

0	*
1	0060h
2	☐☐☐☐
3	*
4	*
⋮	
63	*

1 ← Identify command
2 ← CREF No.

(2) Request answer area

Same as for Initiate.

(3) Data area

1536	☐☐☐☐
1537	
⋮	
1552	
1553	☐☐☐☐
1554	
⋮	
1569	
1570	☐☐☐☐
1571	
⋮	
1586	

1536 ← Vendor name length — The length of the vendor name set from the 1537 address

1537–1552 ← Vendor name maximum 32 characters

1553 ← Model name length — The length of the model set from the 1554 address

1554–1569 ← Model name maximum 32 characters

1570 ← Revision name length — Revision name length set from the 1571 address

1571–1586 ← Revision name maximum 32 characters

6.7   Partner Station Variable Read (Read: Client)

This command is used when the PC CPU reads the server data (variable).

(1)   Request area (when the access mode is index)

(1-1) When the access mode is index

#	Value	Description
0	*	Read command (selected depending on the bit-String data storage method difference)
1	01a0 or 01a1 h	
2	□□□□	CREF No.
3	*	
4	0	Always set to 0. (access mode)
5	*	
6	*	
7	□□□□	Index No.
8	*	
⋮	*	
23	*	
24	□□□□	Subindex No. *1
25	*	
⋮		
63	*	
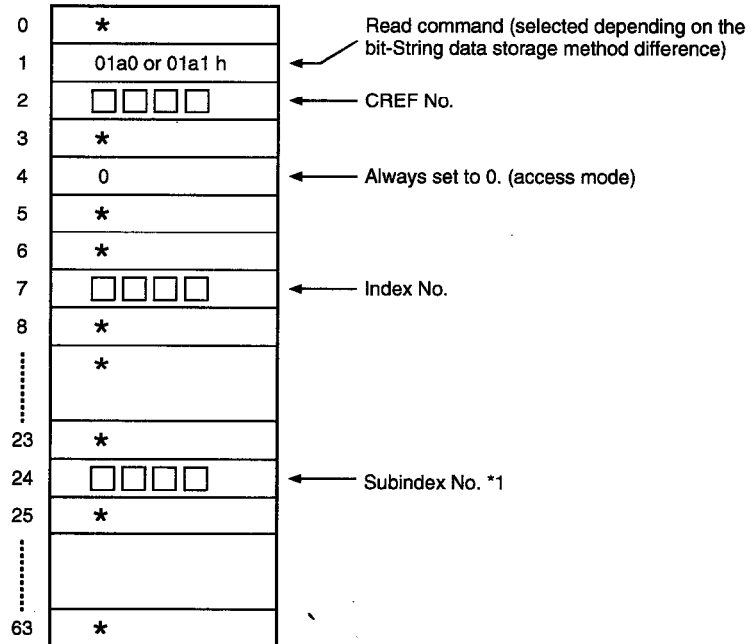
Explanation

*1   The subindex No. specifies which array and which element of that area is accessed when accessing an array label or record label.
Specify 0 when accessing all elements of an array or a record variable, and specify a new element No. (the first element is 1) when accessing one element of an array or record variable.

(1-2) When the access mode is name

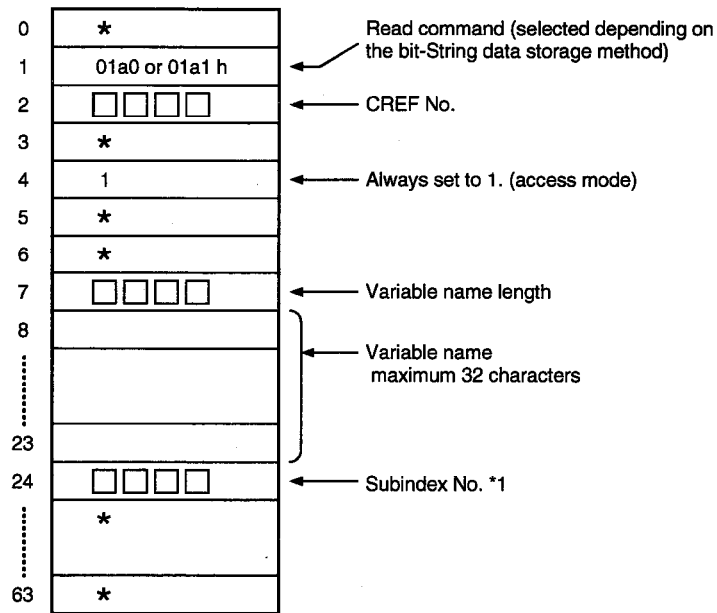| 0 | * | Read command (selected depending on the bit-String data storage method) |
1	01a0 or 01a1 h	
2	□□□□	CREF No.
3	*	
4	1	Always set to 1. (access mode)
5	*	
6	*	
7	□□□□	Variable name length
8		Variable name maximum 32 characters
23		
24	□□□□	Subindex No. *1
	*	
63	*	

Explanation

*1 Set the same as for (1).

Note

A name is not specified in the access mode when the Long form's GetOD client function is not supported by the specified connection.

(2) Request answer area

(2-1) When normal end (when the access mode is indexed)

64	*	
65	*	
66	0	
67	0	Access mode
68	□□□□	Index No.
69	*	
	*	
85	□□□□	Subindex *1
86	□□□□	Variable type *2
87	□□□□	Number of elements *3
88	□□□□	Data type *4
89	□□□□	Data length (byte value) *5
90	□□□□	Data length (word value) *6	First element
91	□□□□	Buffer memory address
	*	Several elements are repeated.
127	*	
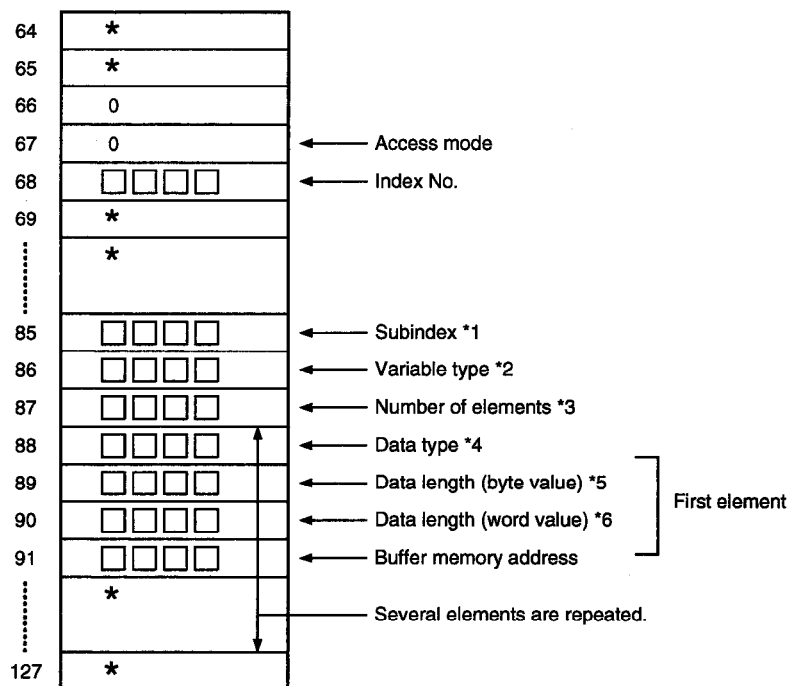
(2-2) During normal end (when the access mode is name)

64	*	
65	*	
66	0	
67	1	◀—— Access mode
68	☐☐☐☐	◀—— Variable name length
69		┐
⋮		├— Read variable name
		┘
85	☐☐☐☐	◀—— Subindex *1
86	☐☐☐☐	◀—— Variable type *2
87	☐☐☐☐	◀—— Number of elements *3
88	☐☐☐☐	◀—— Data type *4
89	☐☐☐☐	◀—— Data length (byte value) *5
90	☐☐☐☐	◀—— Data length (word value) *6
91	☐☐☐☐	◀—— Buffer memory address *7
⋮	*	—— Several elements are repeated.
127	*	

The variable name length set from the 69 address

First element
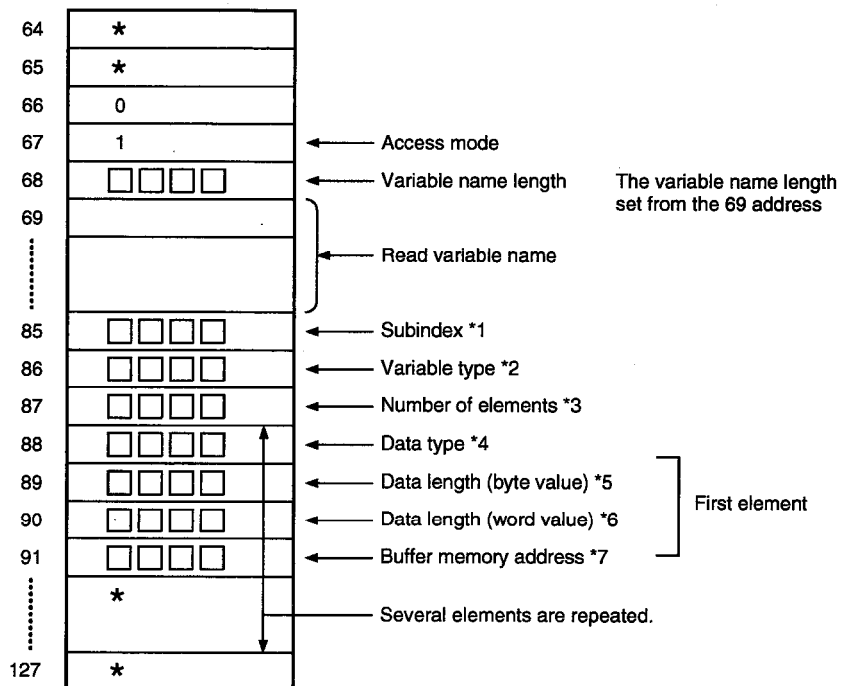
Explanation

*1 Subindex
This is set to the same value as the values set in the request area.

*2 Variable type (the following values are set.)
Simple variable --- > 0007h
Array --- > 0008h
Record -- > 0009h

*3 The following values are set.

*4 Data type (the following values are set)
Truth value (Boolean) -- > 0001h
Integer with sign (Integer8)--------------------------------------- > 0002h
Integer with sign (Integer16) ------------------------------------- > 0003h
Integer with sign (Integer32) ------------------------------------- > 0004h
Integer (Unsigned8)--- > 0005h
Integer (Unsigned16) --- > 0006h
Integer (Unsigned32) --- > 0007h
Floating point (FloatingPoint)------------------------------------- > 0008h
Character string (VisibleString) ----------------------------------- > 0009h
Octet string (OctetString) -- > 000Ah
Bit string (BitString) --- > 000Eh

*5 Data length (byte) (the following values are set)
Array, record ------ > This shows the byte length for the data length of the data in one element.
Simple variable--- > This shows the byte value for the data data length.

*6 Data length (word) (the following values are set)
Array, record ------ > This shows the word value for the data length of the data in one element.
Simple variable--- > This shows the word value for the data data length.

*7 Buffer memory address
The address of the buffer memory for reading this element is set.

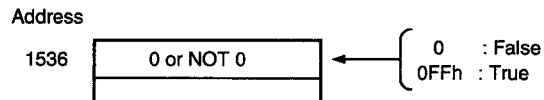| Note |
| --- |
| • Because in PROFIBUS-FMS bit strings are read in 8 bit units, the bit string read is set to the octet length (byte length).
• Data length (word) is used when reading from the buffer memory from the circuit program, and is to determine whether the first byte of the final word data in the data length (byte) value is valid/invalid.
   • When the data length (byte) is even, the final word data first byte is valid.
   • When the data length (byte) is odd, the final word data first byte is invalid. |

(2-3) During failure
The same as for Initiate.

(3) Data area

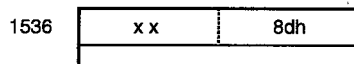During normal end, the read data is set following the variable type.

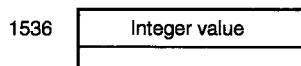(3-1) When the variable type is Simple Variable.
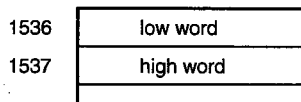
(a) Truth value (Boolean)

Address

1536	0 or NOT 0

$\leftarrow \begin{cases} 0 & : \text{False} \\ 0\text{FFh} & : \text{True} \end{cases}$

(b) Integer (Integer, Unsigned)
  - 8 bit example: when the value is 8dh

1536	x x	8dh

  - 16 bits

1536	Integer value

  - 32 bits

1536	low word
1537	high word

(c) Bit string (BitString)
    << When the command is 01a0h, 01c0h, 01e0h >>

The value is 10001101 01100111 10001001.

1536	01100111	10001101
1537	★★	10001001
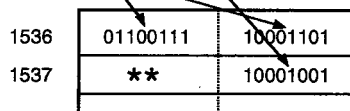
    << When the command is 01a1h, 01c1h, 01e1h >>

The value is 10001101 01100111 10001001.

1536	11100110	10110001
1537	★★	10010001
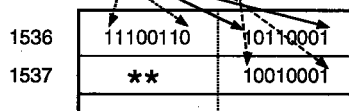
(d) Octet string (OctetString)
     When the value is 01h, 02h, 03h, 04h, 05h then the octet string is set as shown below.

1536	02h	01h
1537	04h	03h
1538	★★	05h

(e) Character string (VisibleString)
     When the value is "ABCDE," the visible string is set as shown below.

1536	'B'	'A'
1537	'D'	'C'
1538	★★	'E'

(f) Floating point (FloatingPoint)
     This is the same format as for the AnACPU or AnUCPU, and is set from the 1536 address.
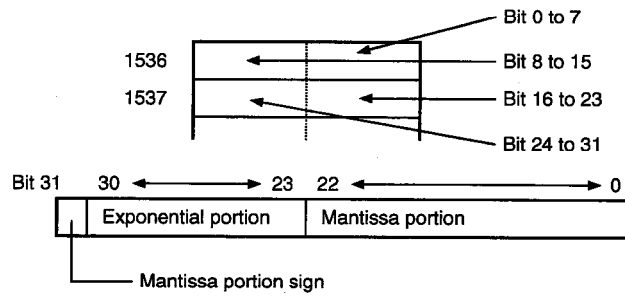
(3-2) When the variable type is Array or Record

The format data explained in SimpleVariable is divided into the number of elements. When the data length of one element is an odd number of bytes, a valid value is not set for the element's first byte.

Example: When the VariableString array value is "ABCDE," "FGHIJ," then the setting is as follows.

1536	'B'	'A'
1537	'D'	'C'
1538	★★	'E'
1539	'G'	'F'
1540	'I'	'H'
1541	★★	'J'

6.8   Partner Station Variable Write (Write: Client)

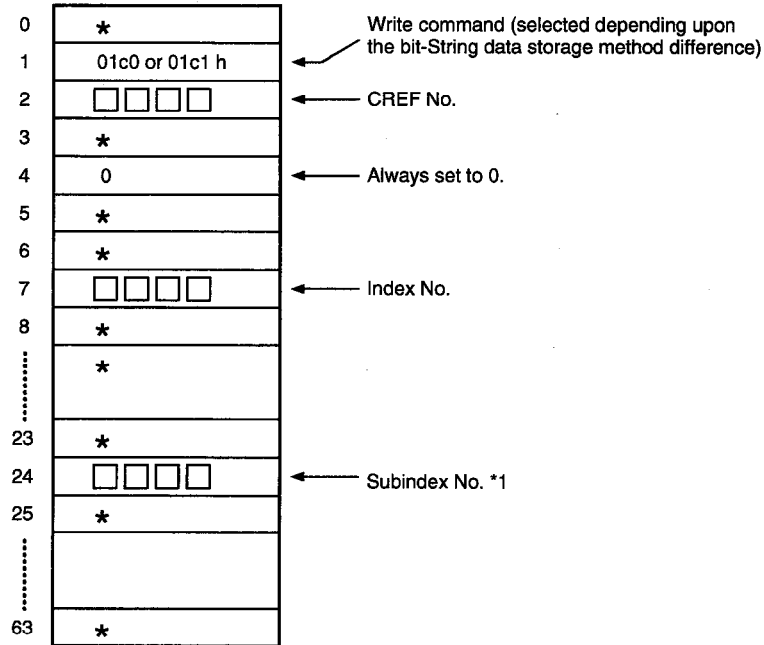This command is used when the PC CPU writes the server data (variable).

(1) Request area

(1-1) Request area (when the access mode is index)

Offset	Value	Description
0	*	Write command (selected depending upon the bit-String data storage method difference)
1	01c0 or 01c1 h	
2	□□□□	CREF No.
3	*	
4	0	Always set to 0.
5	*	
6	*	
7	□□□□	Index No.
8	*	
...	*	
23	*	
24	□□□□	Subindex No. *1
25	*	
...		
63	*	

Explanation

*1   Subindex No.
Same as for read.

(1-2) Request area (when the access mode is name)

Offset	Value	Description
0	*	Write command (selected depending on the bit-string data storage method difference).
1	01c0 or 01c1 h	
2	□□□□	CREF No.
3	*	
4	1	Always set to 1.
5	*	
6	*	
7	□□□□	Variable name length
8		Variable name maximum 32 characters
...		
23		
24	□□□□	Subindex No. *1
	*	
63	*	
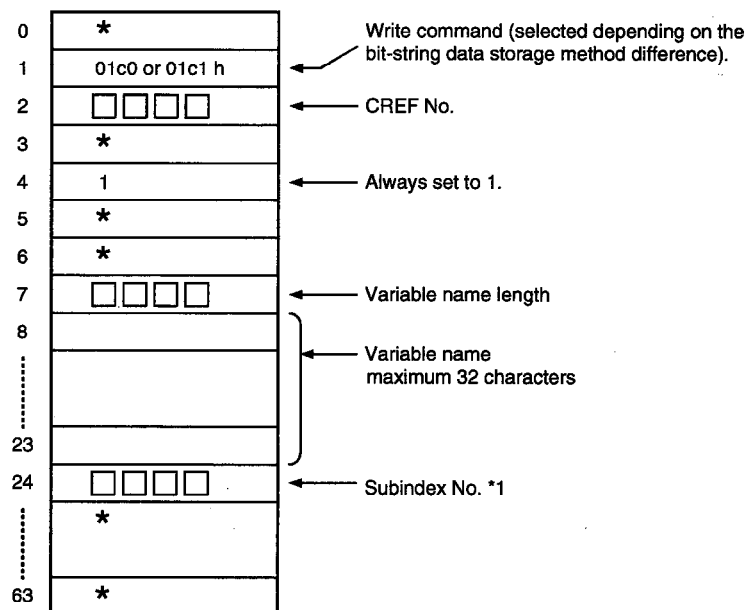
Explanation
*1   Set the same as in (1).

Note
The name is not set in the access mode when the Long form's GetOD client function is not supported by the specified connection.

(2)   Request answer area

The same as for Initiate.

(3)   Data area

Use the same format type for write data as that used for the Read data area.

6.9 PC CPU Variable Report (Information Report: Requester)

This command is used when arbitrary data, such as data registers, are transmitted.
The InformationReport can be sent in the following cases.

1) MMAC client and server
2) MSAC, MSAC_SI, MSCY, MSCY_SI clients
3) MSAC_SI, MSCY_SI server
4) BRCT/MULT requester

(1) Request area

(1-1) When the access mode is index

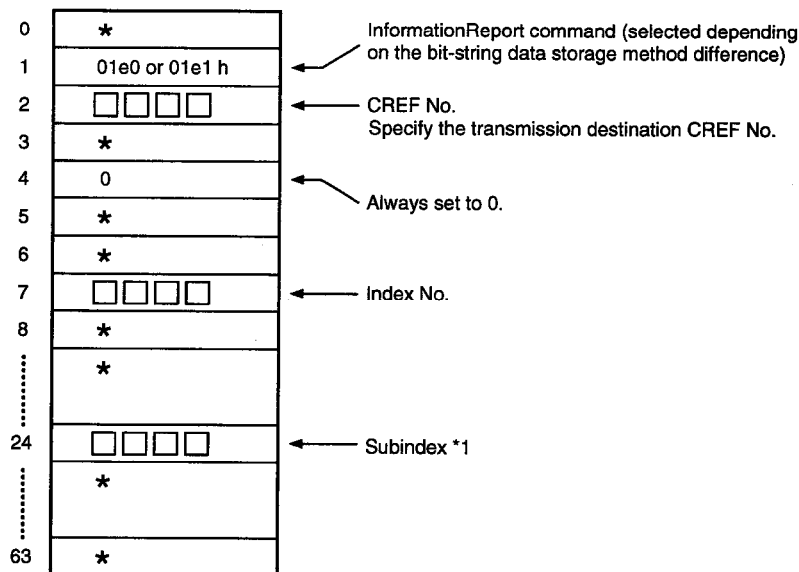|		
0	*	InformationReport command (selected depending on the bit-string data storage method difference)
1	01e0 or 01e1 h	
2	☐☐☐☐	CREF No. Specify the transmission destination CREF No.
3	*	
4	0	Always set to 0.
5	*	
6	*	
7	☐☐☐☐	Index No.
8	*	
⋮	*	
24	☐☐☐☐	Subindex *1
⋮	*	
63	*	

Explanation

*1 Subindex No.
Same as for Read.

(2-2) When the access mode is name

0	✱	InformationReport command (selected depending on the bit-String data storage method difference)
1	01e0 or 01e1 h	
2	☐☐☐☐	CREF No. Specify the transmission destination CREF No.
3	✱	
4	1	Always set to 1.
5	✱	
6	✱	
7	☐☐☐☐	Variable name length
8		
⋮		Variable name maximum 32 characters
23		
24	☐☐☐☐	Subindex *1
⋮		
63	✱	

Explanation

*1   Subindex No.
     The same as for Read.

(2) Request answer area
Same as for Initiate.

(3) Data area
The data area is not used with this function. The transmitted data is the same as the server function Read.

6.10   PC CPU Status Report (UnsolicitedStatus: Requester)

This command is used to report the PC CPU status (including special relays) to the partner.

UnsolicitedStatus can be transmitted in the following cases.
1)   MMAC client and server
2)   MSAC, MSAC_SI, MSCY, MSCY_SI client
3)   MSAC_SI, MSCY_SI server
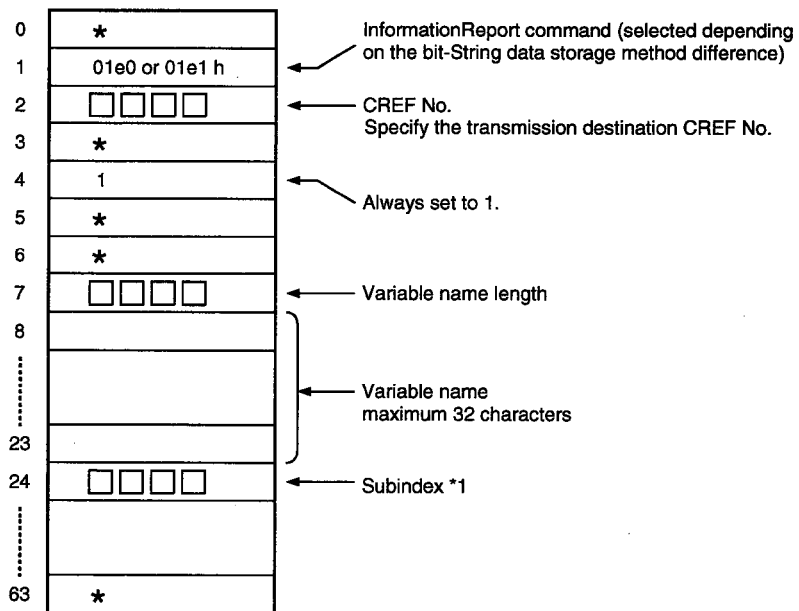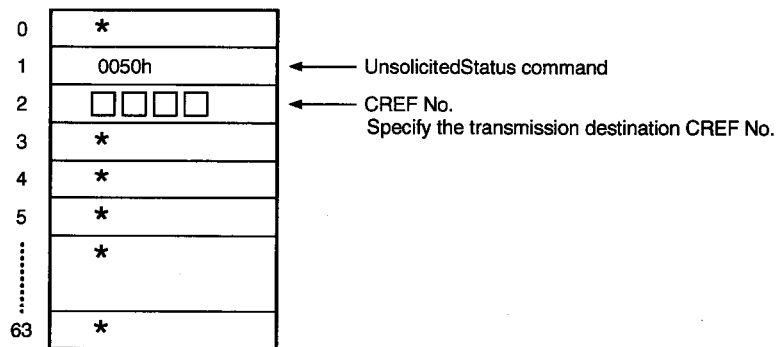4)   BRCT/MULT request

(1)   Request area

```
0   |  *       |
1   |  0050h   |  ◄──── UnsolicitedStatus command
2   |  ☐☐☐☐    |  ◄──── CREF No.
                        Specify the transmission destination CREF No.
3   |  *       |
4   |  *       |
5   |  *       |
    |  *       |
63  |  *       |
```

Explanation
*1   Set the same as for informationReport.

(2)   Request answer area
The same as for Initiate.

(3)   Data area
Data area is not used with this function.
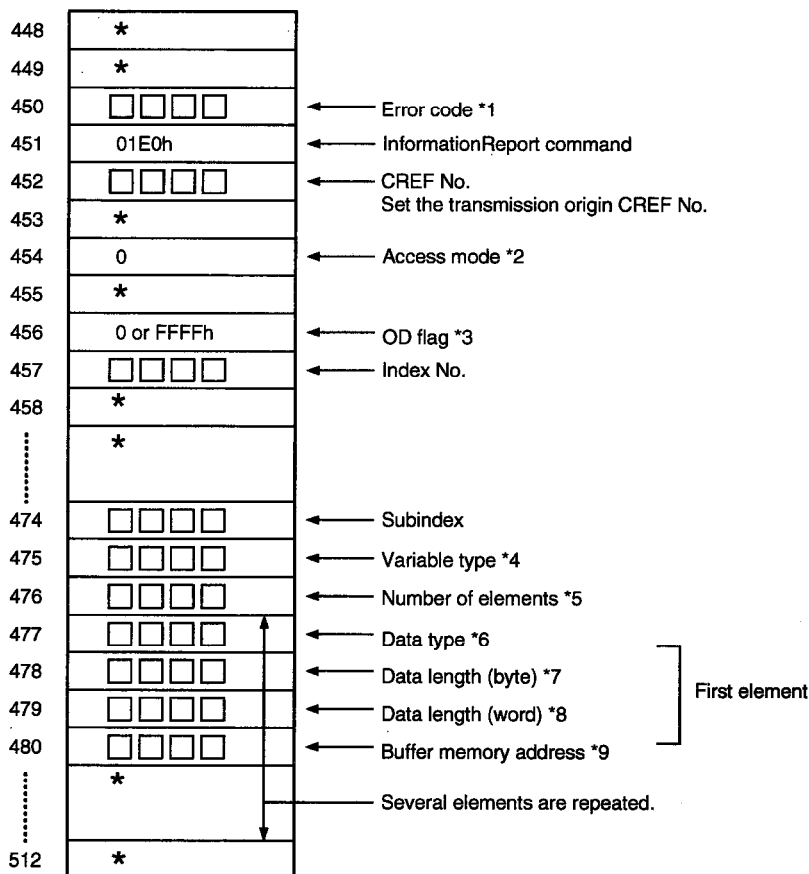The transmitted data is the same as the server function status.

6.11   Reporting the Partner Station Variable Data to the PC CPU (Information Report: Receiver)

The receive data and variable information is set in the receive area and receive data area.

Note
• Before the PC CPU reads the unconfirmed service data from the buffer memory, the number of following unconfirmed services that can be received by the AJ71PB96F/A1SJ71PB96F is one service per connection. When the second service is received, the AJ71PB96F/A1SJ71PB96F connection is forcefully aborted. For connectionless communication, the received service is discarded. • Communications that can receive unconfirmed services are listed below. 1)   MMAC client and server 2)   MSAC, MSAC_SI, MSCY_SI during slave simulation 3)   MSAC_SI, MSCY_SI client and server 4)   BRCT/MULT receiver

(1)   Reception area

(1-1) When the access mode is index

Address	Value	Description
448	*	
449	*	
450	□□□□	◄——— Error code *1
451	01E0h	◄——— InformationReport command
452	□□□□	◄——— CREF No. Set the transmission origin CREF No.
453	*	
454	0	◄——— Access mode *2
455	*	
456	0 or FFFFh	◄——— OD flag *3
457	□□□□	◄——— Index No.
458	*	
⋮	*	
474	□□□□	◄——— Subindex
475	□□□□	◄——— Variable type *4
476	□□□□	◄——— Number of elements *5
477	□□□□	◄——— Data type *6
478	□□□□	◄——— Data length (byte) *7
479	□□□□	◄——— Data length (word) *8
480	□□□□	◄——— Buffer memory address *9
⋮	*	——— Several elements are repeated.
512	*	

First element (477–480)

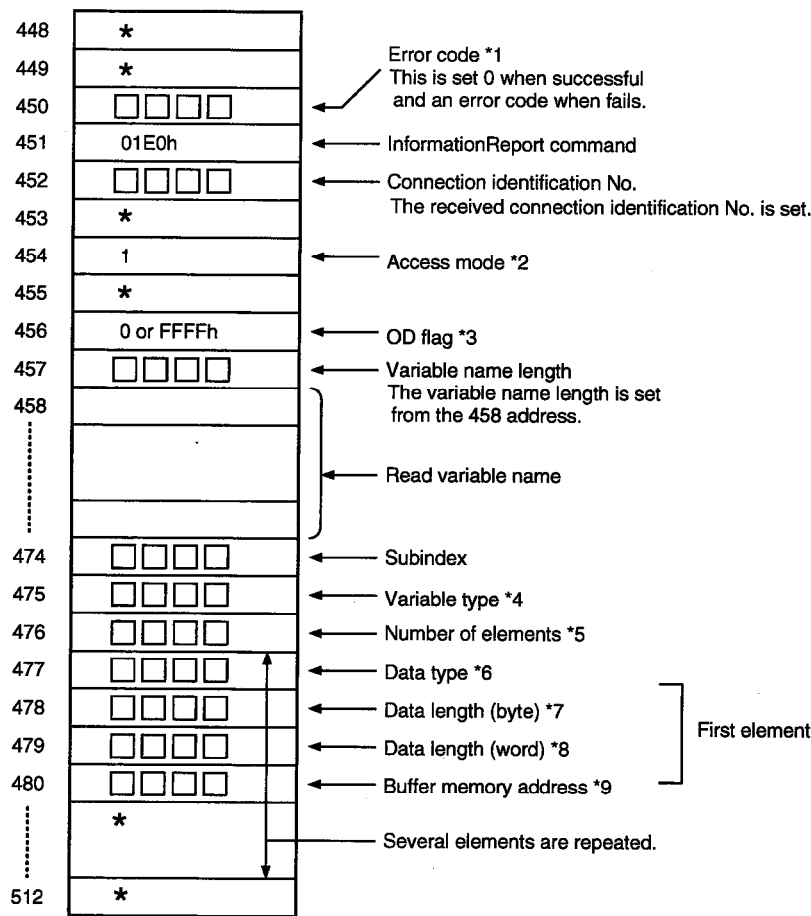| Explanation |
| --- |

*1   For details regarding the error codes, refer to the Appendix.

*2   Always set to 0 when the access mode is index.

*3   This displays whether or not the OD was referenced when setting the receive data in the receive data area.
Referenced -- > 0000h
Not referenced --- > FFFFh
The OD is not referenced for the respond to open connection (/0), broadcast, or multicast connection.

*4   The variable type (the following values are set)
Simple Variable -- > 0007h
Array --- > 0008h
Record-- > 0009h
When OD flag = FFFFh --- > FFFFh

Explanation

*5   Number of elements (the following values are set).
Simple Variable -- > 0001h
Array, Record--- > number of elements
When OD flag = FFFFh --- > 0001h

*6   Data type (the following values are set).
Truth value (Boolean) -- > 0001h
Integer with code (Integer8)--------------------------------------- > 0002h
Integer with code (Integer16)-------------------------------------- > 0003h
Integer with code (Integer32)-------------------------------------- > 0004h
Integer (Unsigned8)-- > 0005h
Integer (Unsigned16) -- > 0006h
Integer (Unsigned32) -- > 0007h
Floating point (FloatingPoint)-------------------------------------- > 0008h
Character string (VisibleString) ----------------------------------- > 0009h
Octet string (OctetString) -- > 000Ah
Bit string (BitString) -- > 000Eh
When OD flag = FFFFh --- > FFFFh

*7   Data length (byte) (the following values are set).
Array, Record----- > This shows the byte value for the data length of the data in one element.
Simple Variable -- > This shows the byte value for the data length.
When OD flag = FFFFh ------- > This shows the byte value for the data length.

*8   Data length (word) (the following values are set).
Array, Record----- > This shows the word value for the data length.
Simple Variable -- > This shows the word value for the data length
When OD flag = FFFFh ------- > This shows the word value for the data length.

*9   Buffer memory
The buffer memory address for reading the element is set.

Note
• In PROFIBUS-FMS, the bit string is read in 8 bit units, so the bit string read is set to the octet length (byte length).
• The data length (word) is used when reading from the buffer memory from the circuit program, and the data length (byte) value is used to determine whether the final word data first byte is valid/invalid.
• When the data length (byte) is even, the last word data first byte is valid.
• When the data length (byte) is odd, the final word data first byte is invalid.

(1-2) When the access mode is name

Address	Value	Description
448	*	Error code *1
449	*	This is set 0 when successful and an error code when fails.
450	□□□□	
451	01E0h	InformationReport command
452	□□□□	Connection identification No.
453	*	The received connection identification No. is set.
454	1	Access mode *2
455	*	
456	0 or FFFFh	OD flag *3
457	□□□□	Variable name length
458		The variable name length is set from the 458 address.
⋮		Read variable name
474	□□□□	Subindex
475	□□□□	Variable type *4
476	□□□□	Number of elements *5
477	□□□□	Data type *6
478	□□□□	Data length (byte) *7
479	□□□□	Data length (word) *8
480	□□□□	Buffer memory address *9
⋮	*	Several elements are repeated.
512	*	

First element (covers 477–480)

Explanation	
*1	For details regarding error codes, refer to the Appendix.
*2	Always set to 1 when the access mode is name.
*3	OD flag
*4	Variable type
*5	Number of elements
*6	Data type
*7	Data length (byte)
*8	Data length (word)
*9	Buffer memory address

(2) Receive data area

(2-1) When the receive area OD flag is FFFFh.

The data is set unchanged in this area without the receive data that used the OD being interpreted.

The data is set as follows. (The same as for OctetString.)

When the value is 01h, 02h, 03h, 04h, 05h, 06h, the settings are as follows.

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

(2-2) When the receive area OD flag is not FFFFh.
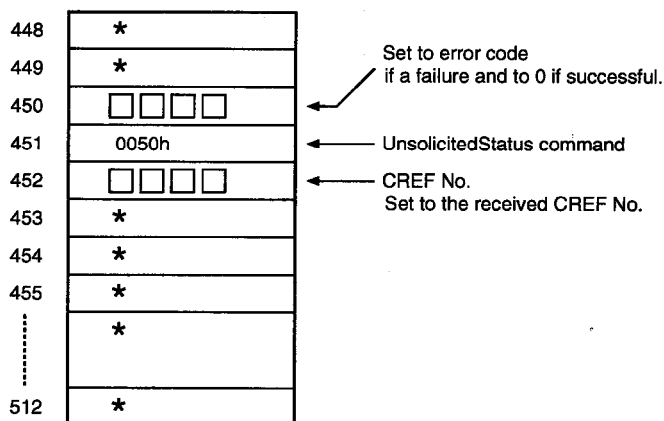
The same as for the Write data area.

6.12 Reports to the Partner Station Status PC CPU (Unsolicited Status: Receiver)

The received partner station status information is set in the receive area and receive data area.
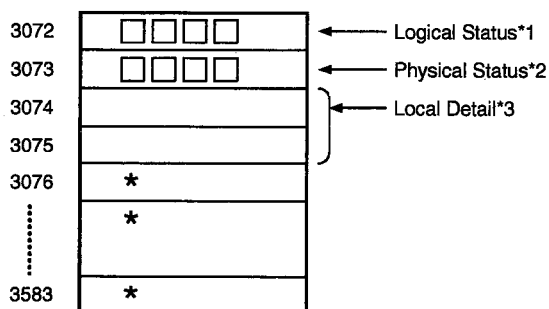
Note

• Before the received unconfirmed service data is read from the buffer memory by the PC CPU, the number of following unconfirmed services that can be received by the AJ71PB96F/A1SJ71PB96F is one service per connection. When the second service is received, the AJ71PB96F/A1SJ71PB96F forcefully aborts the connection. For connectionless connection, the received service is discarded.
• The communications that can receive unconfirmed services are as follows.
  1) MMAC client and server
  2) MSAC, MSAC_SI, MSCY, MSCY_SI during slave simulation
  3) MSAC_SI, MSCY_SI client and server
  4) BRCT/MULT receiver

(1) Receive area

```
448    *
449    *                      Set to error code
450    □□□□          ◄──────  if a failure and to 0 if successful.
451    0050h         ◄─────── UnsolicitedStatus command
452    □□□□          ◄─────── CREF No.
453    *                      Set to the received CREF No.
454    *
455    *
 ⋮     *
512    *
```

(2) Receive data area

```
3072   □□□□          ◄─────── Logical Status*1
3073   □□□□          ◄─────── Physical Status*2
3074              ┐  ◄─────── Local Detail*3
3075              ┘
3076   *
 ⋮     *
3583   *
```
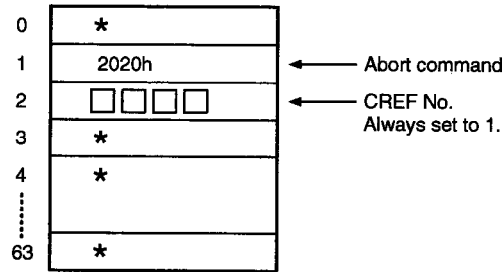
Explanation
*1, *2, and *3 : The same as for Status.

6.13   FMA7 Connection Abort (FMA7 Abort: Receiver)

This command is used when the PC CPU aborts the FMA7 connection.

(1) Receive area

0	*
1	2020h	← Abort command
2	☐☐☐☐	← CREF No. Always set to 1.
3	*
4	*
63	*

(2) Receive answer area

The same as for Initiate.

7. COMMUNICATION THAT DO NOT REQUIRE THE SEQUENCE PROGRAM

This chapter explains the communication service parameters that can be specified in the client when the AJ71PB96F/A1SJ71PB96F is operating as a server.

7.1 FMS Service

7.1.1 Connection with AJ71PB96F/A1SJ71PB96F (Initiate: Responder)

When communicating with the AJ71PB96F/A1SJ71PB96F, the client issues an Initiate service to establish a connection.

[Parameters required by the client]

- Version 0D (Calling)
  OD version number

Version OD value
Client OD version

- Profile Number (Calling)
  Specify the profile number.

Profile Number value
Profile number supported by the client

- Access Protection Supported (Calling)
  Specify whether or not the access protection is supported.

Access Protection value	Meaning
False = 0	Not supported
False = FF (hex)	Supported

- Password (Calling)
  Password allocated to each connection

Password value
00 (hex)

- Access Groups (Calling)
  Access group allocated to each connection

Access Group's value
00 00 (hex)

- Max Send PDU Size (High Priority) (Calling)
  FMS communication packet size that can be transmitted during High Priority use

Max Send PDU Size (H) value
PDU size

- Max Send PDU Size (Low Priority) (Calling)
  FMS communication packet size that can be transmitted during Low Priority use

Max Send PDU Size (L) value
PDU size

- Max Receive PDU Size (High Priority) (Calling)
  FMS communication packet size that can be received during High Priority use

Max Receive PDU Size (H) value
PDU size

- Max Receive PDU Size (Low Priority) (Calling)
  FMS communication packet size that can be received during Low Priority use

Max Receive PDU Size (L) value
PDU size

- Feature Supported (Calling)
  Service types that can be used

Features Supported value
Features supported octet string

Point

When establishing a connection using PROFIBUS-FMS, the receive side capability must be greater than or equal to the transmission side visibility.

When a connection is established, make the following settings between the two stations.

Station A		Station B
MaxSendPDUSize (High Priority)	$\leq$	MaxReceivePDUSize (High Priority)
MaxSendPDUSize (Low Priority)	$\leq$	MaxReceivePDUSize (Low Priority)
MaxReceivePDUSize (High Priority)	$\geq$	MaxSendPDUSize (High Priority)
MaxReceivePDUSize (Low Priority)	$\geq$	MaxSendPDUSize (Low Priority)
Feature Supported (n)th bit	$\leq$	Feature Supported (n+24)th bit $(0 \leq m \leq 23)$
Feature Supported (m+24)th bit $(0 \leq m \leq 23)$	$\geq$	Feature Supported (m)th bit

---

Note

In the AJ71PB96F/A1SJ71PB96F, the value from the logical sum for each bit is the value set by the software package of C0 30 81 F9 D0 81 (hex) is used.

[Server (AJ71PB96F/A1SJ71PB96F) return parameters]

- Version 0D (Calling)
    OD version number

Version OD value
AJ71PB96F/A1SJ71PB96F OD version

- Profile Number (Calling)
    This sets the station attributes and device identification.

Profile Number value
00 00 (hex)

- Access Protection Supported (Calling)
    This specifies whether or not access protection is supported.

Access Protection value	Meaning
False = 0	Not supported

- Password (Calling)
    Password allocation for each connection

Password value
Set by the utility

- Access Groups (Calling)
    Access group allocated to each connection

Access Group's value
Set by the utility

7.1.2 AJ71PB96F/A1SJ71PB96F connection abort (Abort: Receiver)

An "Abort" service from client is issued to abort the connection with the AJ71PB96F/A1SJ71PB96F.
When the AJ71PB96F/A1SJ71PB96F receive an abort, then a logical connection abort status is entered.
An "Abort" is automatically issued when there is a PROFIBUS-FMS protocol or parameter error.

[Parameters required by the client]

● Abort Identifier
    This shows from which communication level an abort can be issued.

Abort Identifier	Explanation
0 (USER)	When aborted by the application
1 (FMS)	Aborted by FMS
2 (LLI)	Aborted by LLI
3 (Layer 2)	Aborted by layer 2

Point
When the abort is executed by the user created application program, 0 (User) is suitable for the Abort Identifier value. Other values are used by the communicating device side that is actually conducting the communication.

● Reason Code
    This shows the reason for the abort.

Reason Code
Reason code prescribed by PROFIBUS

● Abort Detail
    This sets the abort detail report.
    This parameter usage method is prescribed by the profile supported by the request.

Abort Detail
Abort detail information (maximum 16 octet)

[Server (AJ71PB96F/A1SJ71PB96F) return parameter]

None

7.1.3   Service reject (Reject)

A "Reject" service is issued when there is a problem in the FMS protocol, so this cannot be controlled by the user.

7.1.4   PC CPU status information (Status: Server)

A "Status" service is issued from the client to acquire in the PC CPU status information.
The AJ71PB96F/A1SJ71PB96F that received the service returns the data to the PC CPU special relay
M9000 to M9008 (excluding M9001, M9003).

[Parameters required by the client]

None

[Server (AJ71PB96F/A1SJ71PB96F) return parameters]

● Logical Status

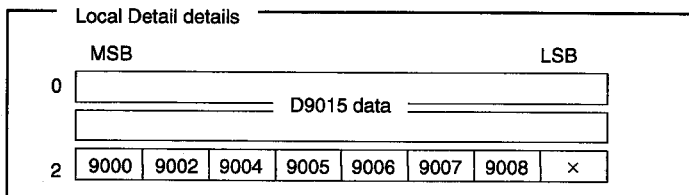| Value	Name	Explanation
0	Ready for communication	All operations are possible from the client.
2	Limited number of services	(Not used)
4	OD-LOADING-NON-INTERACTING	Loading ODs not used in common between connections.
5	OD-LOADING-INTERACTING	Loading ODs not used in common between connections. All connections that are not loading ODs are forcefully aborted.

● Physical Status
This shows the VFD status.

Value	Name	Explanation
0	Operational	Operation is possible from the client.
1	Partially Operational	Operation is possible from the client. However, self-diagnostic error generation (N9008 is on).
2	Inoperable	Operation is not possible from the client.
3	Needs Commissioning	Operation is possible from the client. However, the PC CPU cannot be run. In addition, there is a possibility that a self-diagnosis error will occur.

For details, refer to Appendix 2 VDF Physical Status Criteria Table.

● Local Detail
M9000 to M9008, D9015 actual information (excluding M9001, M9003)

```
 Local Detail details
     MSB                                    LSB
  0 ┌──────────────────────────────────────────┐
    │ ───────────── D9015 data ───────────── │
    │                                            │
  2 │ 9000 │ 9002 │ 9004 │ 9005 │ 9006 │ 9007 │ 9008 │ × │
```

Note

The × mark is an undefined value. (Not set to either 0 or 1.)

There are special relays (M9000 number level) that are not used by the PC CPU. In this case, the value is undefined.

7.1.5   AJ71PB96F/A1SJ71PB96F identification information (Identify: Server)

An "Identify" service is issued from the client to obtain AJ71PB96F/A1SJ71PB96F identification information.

[Parameters required by the client]

None

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

- The following character strings are returned.

Item	Character string
Vendor Name	MITSUBISHI ELECTRIC
Model Name	MELSEC-A A1SJ71PB96F
Revision	VER XXX*[1] YYMMDD *[2]

*1: This shows the version of model.
*2: This shows the date of issue.

7.1.6 Object attribute acquisition (GetOD: Server)

A "GetOD" service is issued from the client to acquire the object attributes defined in AJ71PB96F/
A1SJ71PB96F. In PROFIBUS-FMS the object attributes are registered in the OD (Object Dictionary).
One object attribute data is called an OD entry.
This service is also use to learn the PI (Program Invocation) status.

[Parameters required by the client]

- All Attributes

    This specifies the acquisition format of the object attributes to be acquired.

All Attributes value	Meaning
False = 0	Acquisition of specific attributes (minimum required)
True = FF (hex)	Acquisition of all attribute

Point	

The following attributes cannot be acquired when "All Attributes = False" is specified. To acquire
these attributes specify "True."

- Password
- Access Groups
- Access Rights
- Local Address
- Name

- Local Address-OD-ODES
- Local Address-ST-OD
- Local Address-S-OD
- Local Address-DV-OD
- Local Address-DP-OD
- Extension

- Access Specification

    Specify the required specific values for the following cases.

Access Specification	Setting value
Index	Index of the OD entry to be acquired.
Variable Name	Name of the variable object to be acquired.
Domain Name	Name of the domain object to be acquired.
PI Name	Name of the PI object to be acquired.
Start Index	Index of the object for which acquisition will begin.

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

- List of Object Description
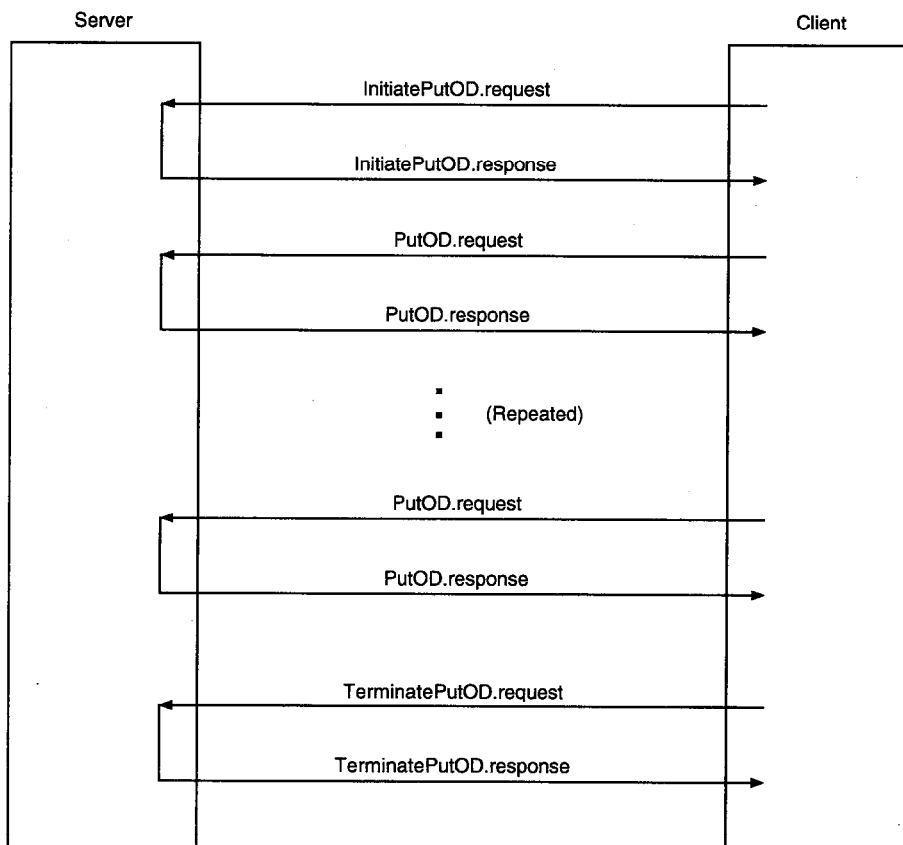   This sets the acquired OD entry data.

- More Follows
    This informs whether or not OD entries still remain.

More Follows value	Meaning
False = 0	No more objects status
True = FF (hex)	More objects status

Note

The correct values for the program domain, command domain, and expansion command domain acquired using the GetOD service are not displayed. For information on the method to use to learn the correct domain size refer to Section 7.1.12 Reading Program Capacity and Comment Capacity, Etc."

7.1.7 Initiate objects attribute setting (InitiatePutOD: Server)

The three services of InitiatePutOD, PutOD, and TerminatePutOD are used by the AJ71PB96F/A1SJ71PB96F to set the object attributes in the OD.

```
        Server                                              Client
     ┌────────┐                                          ┌────────┐
     │        │◄──────── InitiatePutOD.request ──────────│        │
     │        │                                          │        │
     │        │───────── InitiatePutOD.response ────────►│        │
     │        │                                          │        │
     │        │◄──────────── PutOD.request ──────────────│        │
     │        │                                          │        │
     │        │───────────── PutOD.response ────────────►│        │
     │        │                                          │        │
     │        │              ∙                           │        │
     │        │              ∙   (Repeated)              │        │
     │        │              ∙                           │        │
     │        │                                          │        │
     │        │◄──────────── PutOD.request ──────────────│        │
     │        │                                          │        │
     │        │───────────── PutOD.response ────────────►│        │
     │        │                                          │        │
     │        │◄──────── TerminatePutOD.request ─────────│        │
     │        │                                          │        │
     │        │───────── TerminatePutOD.response ───────►│        │
     └────────┘                                          └────────┘
```

> **Note**
>
> As far as possible, make the write OD the OD acquired using GetOD from the AJ71PB96F/A1SJ71PB96F.
>
> If there is a error with the write OD at worst communication cannot be conducted.
>
> If this happens, use the software package to rewrite the OD.

InitiatePutOD is used to announce the start of OD setting.

[Parameters required by the client]

- Consequence (importance)

   This shows the impact that changing the OD will have on other connections.

Consequence	Meaning
Loading free of Interacting	• This means that ODs that are unused in other connections will be overwritten. • The VFD LogicalStatus will be changed to OD-LOADING-NON-INTERACTING.
Reload, not free of Interacting	• This means that ODs that are unused in other connections will be overwritten. • The A1SJ71PB96F will forcefully abort other connections. • The VFD LogicalStatus will be changed to OD-LOADING-NON-INTERACTING.
Newload, not free of Interacting	• This means that the entire OD will be overwritten. • The A1SJ71PB96F will forcefully abort other connections. • The VFD LogicalStatus will be changed to OD-LOADING-INTERACTING.

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.1.8   Object attribute setting (PutOD: Server)

This sets the actual OD data after InitiatePutOD is successful.

[Parameters required by the client]

- List of Object Description
    Set the data to be written in the OD.

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.1.9   Object attribute setting termination (TerminatePutOD: Server)

This is used to announce that OD setting is being terminated.

[Parameters required by the client]

None

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.1.10 Reading device memory and buffer memory (Read: Server)

A "Read" service is issued by the client to read the PC CPU device memory and special functions module buffer memories.

The device memories to be read must be registered in advance in the OD as an Array, Simple Variable, or Record using the software package. In addition, the buffer memory must be registered in the OD as an Array or Simple Variable.

[Parameters required by the client]

• Access Specification

Read device specifications are executed by Index or Name.

Access Specification	Setting value
Index	Index of the variable to be read
Variable Name	Name of the variable to be read

• Subindex

This specifies which element will be read when an Array or Record is read.
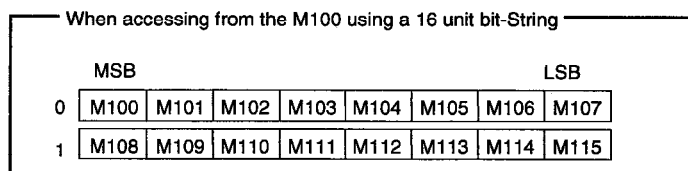If a Subindex is not specified then all the elements will be read.
The Array or Record header element Subindex is 1.

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

• Data

This sets the value of the variable to be read.

The data arrangement when a bit-String is conducted using the following specifications, so be careful.

```
┌─ When accessing from the M100 using a 16 unit bit-String ─┐
│                                                           │
│   MSB                                          LSB        │
│ 0 │M100│M101│M102│M103│M104│M105│M106│M107│               │
│                                                           │
│ 1 │M108│M109│M110│M111│M112│M113│M114│M115│               │
│                                                           │
└───────────────────────────────────────────────────────────┘
```

In addition, in PROFIBUS-FMS the unit used to read Bit-String data is 8 bits. In other words, bit lengths that do not equal multiples of 8, such as 3 bits or 4 bits, are not read.

7.1.11 Writing device memory and buffer memory (Write: Server)

A "Write" services is issued from the client to write the data in the PC CPU device memory and special functions module buffer memories.

The device memories to be written must be registered in the OD in advance as an Array, Simple Variable, or Record using the software package. In addition, the buffer memory must be registered in the OD as an Array or Simple Variable.

[Parameters required by the client]

- Access Specification

    The device to be written is specified using the index or name.

Access Specification	Setting value
Index	Index of the variable to be read
Variable Name	Name of the variable to be read

- Subindex

    This specifies which element will be written when an Array or Record write is conducted.
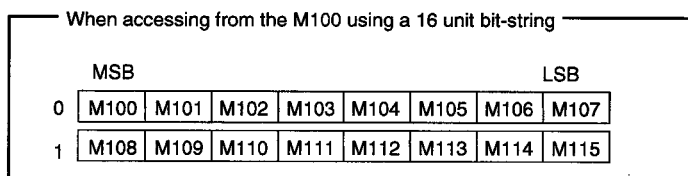   If a Subindex is not specified then all the elements will be written.
    The Array or Record header element Subindex is 1.

- Data

    This sets the data that will actually be written.

    The data arrangement for a bit-String is conducted using the following specifications, so be careful.

```
┌── When accessing from the M100 using a 16 unit bit-string ────┐
│                                                                 │
│    MSB                                          LSB             │
│  0 │M100│M101│M102│M103│M104│M105│M106│M107│                    │
│  1 │M108│M109│M110│M111│M112│M113│M114│M115│                    │
│                                                                 │
└─────────────────────────────────────────────────────────────┘
```

In addition, in PROFIBUS-FMS the unit used to write Bit-String data is 8 bits. In other words, bit lengths that do not equal multiples of 8, such as 3 bits or 4 bits, are not read.

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.1.12 Reading program capacity and comment capacity, etc. (Read: Server)

The client issues a "Read" service to read the PC CPU program capacity, comment capacity, extension comment capacity, and file register capacity.

To read these capacities they must be registered ahead of time in the OD as special array variables using the software package.

[Parameters required by the client]

• Access Specification

Specify the index or name of the special array index registered in the OD.

Access Specification	Setting value
Index	Index of the special array variable
Variable Name	Name of the special array variable

• Subindex

This specifies which element will be read.
When a Subindex is not specified all of the elements will be read.
The Array header element Subindex is 1.
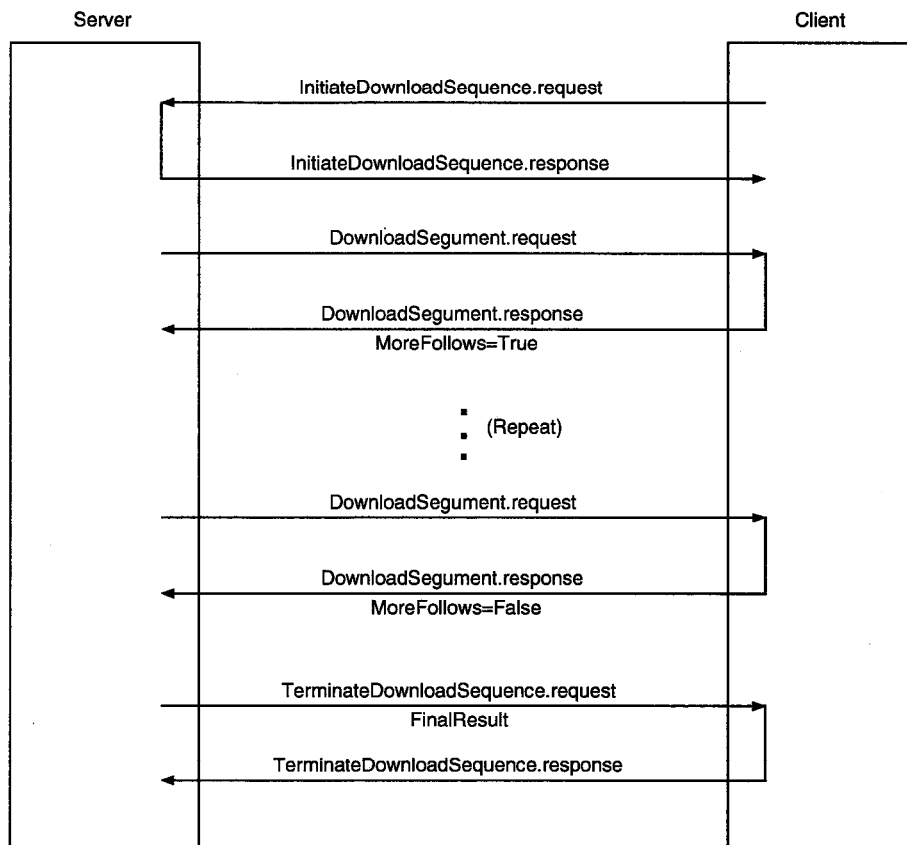
[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

• Data

The special array variable data format is as follows.

Element	Meaning	Data type
1	Main sequence program capacity	Unsigned16
2	Sub sequence program capacity	
3	Sub sequence program 2 capacity	
4	Sub sequence program 3 capacity	
5	Main microcomputer program capacity	
6	Sub microcomputer program capacity	
7	Comment capacity	
8	Extension comment capacity	
9	File register capacity	

7.1.13 Initiating program, parameter, and comment, device buffer memory download (InitiateDownloadSequence: Server)

InitiateDownloadSequence, DownloadSegument, and TerminateDownloadSequence are used to batch download program, parameter, comment, extension comment, device, and special functions module buffer memory data. The sequential processing flow is shown below.

```
          Server                                                  Client
            ┌──┐                                                  ┌──┐
            │  │◄──────── InitiateDownloadSequence.request ───────┤  │
            │  │                                                  │  │
            │  │───────── InitiateDownloadSequence.response ─────►│  │
            │  │                                                  │  │
            │  │───────────── DownloadSegument.request ──────────►│  │
            │  │                                                  │  │
            │  │◄──────────── DownloadSegument.response ──────────┤  │
            │  │                MoreFollows=True                  │  │
            │  │                                                  │  │
            │  │                    ▪                             │  │
            │  │                    ▪  (Repeat)                   │  │
            │  │                    ▪                             │  │
            │  │                                                  │  │
            │  │───────────── DownloadSegument.request ──────────►│  │
            │  │                                                  │  │
            │  │◄──────────── DownloadSegument.response ──────────┤  │
            │  │                MoreFollows=False                 │  │
            │  │                                                  │  │
            │  │────────── TerminateDownloadSequence.request ────►│  │
            │  │                   FinalResult                    │  │
            │  │◄───────── TerminateDownloadSequence.response ────┤  │
            └──┘                                                  └──┘
```

The program, parameter, comment, extension comment, device, and special functions module buffer memory must be defined in the OD as domains using the SW0IX-PROFPE.
The same domain cannot be downloaded from multiple connections at the same time. In addition, a domain that is being uploaded cannot be downloaded. When the PC CPU is running only the device or buffer memory download can be conducted.

[Parameters required by the client]

• Access Specification
    Specify the Index and Name of the domain to be registered in the OD.

Access Specification	Setting value
Index	Domain Index
Variable Name	Domain Name

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.1.14 Program, parameter, comment, device and buffer memory downloads (DownloadSegument: Server)

DownloadSegument is conducted from the AJ71PB96F/A1SJ71PB96F after normal end of the InitiateDownloadSequence.

[Server (AJ71PB96F/A1SJ71PB96F) transmission parameters]

- Access Specification

  The Index or Name of the domain specified by InitiateDownloadSequence is specified.

Access Specification	Setting value
Index	Domain Index
Variable Name	Domain Name

[Parameters required by the client]

- Load Data

  Specify the data to be downloaded. Load Data must be 128 bytes or below.
  For the sequence program, the number of bytes must be even.

- More Follows

  This notifies whether or not data remains to be downloaded.

More Follows value	Meaning
False = 0	This shows that there is no more data to be downloaded.
True = FF (hex)	This shows that data remains to be downloaded.

7.1.15 Program, parameter, comment, device, and buffer memory download termination (TerminateDownloadSegument: Server)

When the MoreFollows parameter of the DownloadSegument.response is False, or the data received using DownloadSegument.response was not correctly written into the PC CPU, a TerminationDownloadSegument is transmitted from the AJ71PB96F/A1SJ71PB96F.

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

● Access Specification

The Index or Name of the domain specified by InitiateDownloadSequence is specified.

Access Specification	Setting value
Index	Domain Index
Variable Name	Domain Name

● Final Result

Final Result	Meaning
False = 0	An error occurred during the download.
True = FFh	The download terminated normally.

Explanation

When the Final Result is False, then is can be suspected that data that exceeds the capacity set by the PC CPU parameter was sent or that an error occurred in the PC CPU.

Also, in this case the domain data was only partially written. Redownload or rewrite using the PC peripheral equipment.

[Parameters required by the client]

None

7.1.16 Initiating program, parameter, comment, device, and buffer memory upload (InitiateUploadSequence: Server)

InitiateUploadSequence, UploadSequment, and TerminateUploadSequence are used to batch upload the program, parameter, comment, extension comment, device, and special functions buffer memory data. The sequential processing flow is as follows.
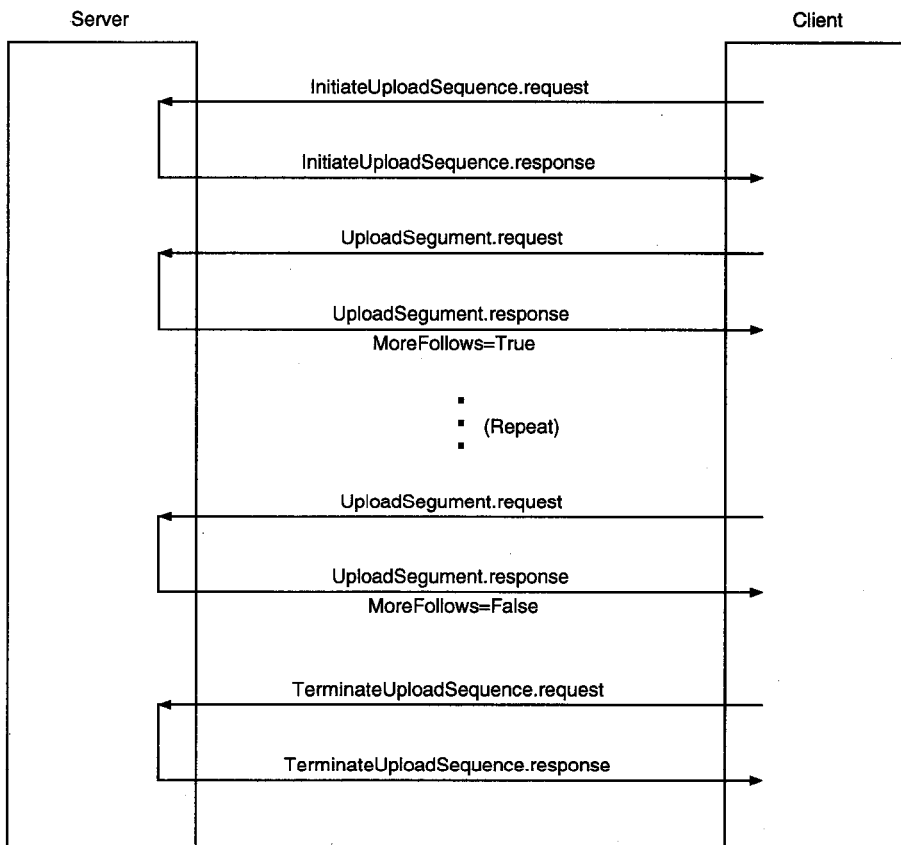
```
            Server                                                      Client
    ┌─────────────┐                                            ┌─────────────┐
    │             │        InitiateUploadSequence.request       │             │
    │          ◄──┼────────────────────────────────────────────┼──           │
    │             │        InitiateUploadSequence.response      │             │
    │          ──┼────────────────────────────────────────────┼──►          │
    │             │                                             │             │
    │             │           UploadSegument.request            │             │
    │          ◄──┼────────────────────────────────────────────┼──           │
    │             │           UploadSegument.response           │             │
    │          ──┼────────────────────────────────────────────┼──►          │
    │             │           MoreFollows=True                  │             │
    │             │                                             │             │
    │             │                 ■                           │             │
    │             │                 ▪ (Repeat)                  │             │
    │             │                 ■                           │             │
    │             │                                             │             │
    │             │           UploadSegument.request            │             │
    │          ◄──┼────────────────────────────────────────────┼──           │
    │             │           UploadSegument.response           │             │
    │          ──┼────────────────────────────────────────────┼──►          │
    │             │           MoreFollows=False                 │             │
    │             │                                             │             │
    │             │       TerminateUploadSequence.request       │             │
    │          ◄──┼────────────────────────────────────────────┼──           │
    │             │       TerminateUploadSequence.response      │             │
    │          ──┼────────────────────────────────────────────┼──►          │
    │             │                                             │             │
    └─────────────┘                                            └─────────────┘
```

The program, parameter, comment, extension comment, device, and special functions module buffer memories must be defined as domains in the OD using the software package.

The same domain cannot be uploaded from multiple connections at the same time. In addition, a domain that is being downloaded cannot be uploaded.

[Parameters required by the client]

● Access Specification
Specify the Index or Name of the domain registered in the OD.

Access Specification	Setting value
Index	Domain Index
Variable Name	Domain Name

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.1.17 Uploading program, parameter, comment, and device buffer memories (UploadSegument: Server)

The UpSegument is transmitted from the client after the InitiateUploadSequence terminates normally.

[Parameters required by the client]

- Access Specification

    Specify the Index or Name of the domain specified by InitiateUploadSequence.

Access Specification	Setting value
Index	Domain Index
Variable Name	Domain Name

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

- Load Data

    The read data is set.

Note
The AJ71PB96F/A1SJ71PB96F transmits the data in 128 byte units. For this reason, make the CRL Max send PDU (low) value 200 or more.

- More Follows

    This notifies whether or not data remains to be uploaded.

More Follows value	Meaning
False = 0	No more data remains to be uploaded.
True = FF (hex)	More data remains to be uploaded.

7.1.18 Termination of upload of program, parameter, comment, and device buffer memories (TerminateUploadSegument: Server)

When the MoreFollows parameter of UploadSegument.response is False, TerminateUploadSegument is transmitted from the client.

[Parameters required by the client]

*   Access Specification

    The Index or Name of the domain specified by InitiateUploadSequence is specified.

Access Specification	Setting value
Index	Domain Index
Variable Name	Domain Name

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.1.19 Execution program definition (Create Program Invocation: Server)

For the sequence program to be operated from the client the Program Invocation for the main sequence program domain is defined.
In the AJ71PB96F/A1SJ71PB96F only the Program Invocation can be allocated to the main sequence program domain. The sub sequence program cannot be allocated.

PI status change

	PI status before execution			
	NON-EXISTENT	IDLE	RUNNING	STOPPED
Status after execution	IDLE	×	×	×

[Parameters required by the client]

- Password

    The AJ71PB96F/A1SJ71PB96F does not have an access protection function. Always specify FFh.

Item	Value
Password	FFh

- Access Group

    The AJ71PB96F/A1SJ71PB96F does not have an access protection function. Always specify FFh.

Item	Value
Access Group	FFh

- Access Right

    The AJ71PB96F/A1SJ71PB96F does not have an access protection function. Always specify FFFFh.

Item	Value
Access Right	FFFFh

- Reusable

    Always specify True so that the sequence program can be run again after being stopped.

Item	Value
Reusable	True = FFh

- List of Domains

  Specify the sequence program domain INDEX or Name.
  In the AJ71PB96F/A1SJ71PB96F 1 domain can be allocated to 1 Program Invocation.

List of Domains	Setting value
Index	Domain Index
Domain Name	Domain Name

- PI Name

  Specify the Program Invocation name.

- Extension

  Not used by the AJ71PB96F/A1SJ71PB96F.

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

- Index

  The OD Index No. registered by the Program Invocation is returned.

Item	Description
Index	The OD Index number registered by the Program Invocation.

7.1.20 Execution program delete (Delete Program Invocation: Server)

This deletes the Program Invocation. The client will no longer be able to operate the sequence program.

PI status change

	PI status before execution			
	NON-EXISTENT	IDLE	RUNNING	STOPPED
Status after execution	×	NON-EXISTENT	×	NON-EXISTENT

[Parameters required by the client]

• Access Specification

Specify the Index or Name of the Program Invocation to be deleted.

Access Specification	Setting value
Index	PI Index
PI Name	PI Name

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.1.21 Program RUN (Start: Server)

Use "Start" service to Run the sequence program from the client.

This can only be executed when the PC CPU status is Operational or Partially Operational. (Use Status service to check the status.)
This can only be executed when the sequence program domain allocated by the CreateProgram Invocation is in the READY or IN-USE status. (Use GetOD to check the status.)

PI status change

	PI status before execution			
	NON-EXISTENT	IDLE	RUNNING	STOPPED
Status after execution	×	RUNNING	×	×

Use the GetOD service to check the PI status.

[Parameters required by the client]

* Access Specification
    Specify the Index or Name of the Program Invocation to be started up.

Access Specification	Setting value
Index	PI Index
PI Name	PI Name

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.1.22   Program pause (Stop: Server)

Use "Stop" service to PAUSE the sequence program from the client.

This can only be executed when the PC CPU status is Operational or Partially Operational. (Use Status service to check the status.)

PI status change

	PI status before execution			
	NON-EXISTENT	IDLE	RUNNING	STOPPED
Status after execution	×	×	STOPPED	×

Use the GetOD service to check the PI status.

[Parameters required by the client]

• Access Specification

Specify the Index or Name of the Program Invocation to be paused.

Access Specification	Setting value
Index	PI Index
PI Name	PI Name

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.1.23 Program pause cancel (Resume: Server)

Use "Resume" service to RUN the sequence program that is being paused by the client.

This can only be executed when the PC CPU status is Operational or Partially Operational. (Use Status service to check the status.)
This can only be executed when the sequence program domain allocated by the CreateProgramInvocation is in the READY or IN-USE status. (Use GetOD to check the status.)

PI status change

	PI status before execution			
	NON-EXISTENT	IDLE	RUNNING	STOPPED
Status after execution	×	×	×	RUNNING

Use the GetOD service to check the PI status.

[Parameters required by the client]

● Access Specification

    Specify the Index or Name of the Program Invocation to be RUN.

Access Specification	Setting value
Index	PI Index
PI Name	PI Name

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.1.24 Program stop (Reset: Server)

Use "Reset" service to STOP the sequence program from the client.

This can only be executed when the PC CPU status is Operational or Partially Operational. (Use Status service to check the status.)
This can only be executed when the ProgramInvocation is in the STOPPED status. (Use GetOD to check the status.)

PI status change

	PI status before execution			
	NON-EXISTENT	IDLE	RUNNING	STOPPED
Status after execution	×	×	×	IDLE

Use the GetOD service to check the PI status.

[Parameters required by the client]

- Access Specification
  Specify the Index or Name of the Program Invocation to be stopped.

Access Specification	Setting value
Index	PI Index
PI Name	PI Name

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.2   FMA7 Service

FMA 7 service is for reading and setting CRL (Communication Relationship List) for FMS on the
network. In PROFIBUS-FMS networks there exists a station dedicated to network management called
the Configurator, and the bus parameters and CRL for FMS are batched processed by that station.
Including the FMA7 service function now makes it possible to set on the network the bus parameters
and CRL for FMS that could previously only be done using the utility SW0IX-PROFPE.

To use the FMA7 service function the communication for FMA7 must be set in the AJ71PB96F/
A1SJ71PB96F using the SW0IX-PROFPE. The communication No. is fixed as No.1. (PROFIBUS-FMS
prescribed)

7.2.1   FMA7 communication

Specify the FMA7 communication parameters using the SW0IX-PROFPE. The setting items are as
follows.

Item	Setting range	Package initial value
Max Send PDU (low)	0 to 241	241
Max Receive PDU (low)	0 to 241	241

7.2.2   FMA7 service outline

The FMA7 service has the following services.

FMA7 Initiate	FMA7 connection initiation
FMA7 Abort	FMA7 connection abort
InitiateLoadCRL	
LoadCRL	CRL setting
TerminateLoadCRL	
ReadCRL	CRL read
SetValue	Bus parameter setting
ReadValue	Bus parameter read

7.2.3   FMA7 connection initiation (FMA7 Initiate: Responder)

When conducting communication between the AJ71PB96F/A1SJ71PB96F and the FMA7 "FMA7 Initiate" service is issued from the client and a logical connection is established.

[Parameters required by the client]

- Max Send PDU Size (Low Priority) (Calling)

  FMA7 communication packet size that can be used for transmission.

Max Send PDU Size (L) value
PDU size

- Max Receive PDU Size (Low Priority) (Calling)

  FMS communication packet size that can be used for reception.

Max Receive PDU Size (L) value
PDU size

- Features Supported (Calling)

  Types of services that can be used.

Features Supported value
Features Supported octet string

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

Point

To establish a connection in PROFIBUS-FMS the reception side capability must be equal to or exceed ($\geq$) the transmission side capability.

When establishing a connection, set the following between the two stations.

Station A		Station B
MaxSendPDUSize (Low Priority)	$\leq$	MaxReceivePDUSize (Low Priority)
MaxReceivePDUSize (Low Priority)	$\geq$	MaxSendPDUSize (Low Priority)
Feature Supported (n)th bit	$\leq$	Feature Supported (n+8)th bit $(0 \leq n \leq 8)$
Feature Supported (m+8)th bit $(0 \leq m \leq 8)$	$\geq$	Feature Supported (m)th bit

---

Note

The Feature Supported value in AJ71PB96F/A1SJ71PB96F is fixed to 00 78 00 00 00 00 (hex).

7.2.4   FMA7 Connection connection abort (FMA7 Abort: Receiver)

A "FMA7 Abort" service from is issued to abort the connection of the FMA7 connection.
When the AJ71PB96F/A1SJ71PB96F receives a FMA7 Abort the logical connection changes to the abort status.
"Abort" is automatically issued and received when there is an error in the FMA7 protocol or parameters.

[Parameters required by the client]

● Abort Identifier

   The communication layers from which an abort can issued are shown below.

Abort Identifier	Explanation
0 (USER)	When using the application to Abort.
1 (FMA7)	Aborted using FMA7.
2 (LLI)	Aborted using LLI.
3 (Layer 2)	Aborted using Layer 2.

Point

It is appropriate that 0 (USER) be used as the Abort Identifier value when aborting from a user-created application program. The other values are used by the communications equipment that actually conduct communications.

● Reason Code

   This shows the reason for the Abort.

Reason Code
Reason Code standardized in PROFIBUS.

● Abort Detail

   This sets the Abort detailed information.
   This parameter usage method is standardized by the profile supported by the client.

Abort Detail
Abort detailed information (max. 16 octets)

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.2.5   CRL setting initiate (InitiateLoadCRL: Server)

When the CRL is set in the AJ71PB96F/A1SJ71PB96F the 3 services of InitiateLoadCRL, LoadCRL, and TerminateLoadCRL.

Server
(A1SJ71PB96F)   Client

InitiateLoadCRL.request

InitiateLoadCRL.response

LoadCRL.request

LoadCRL.response

. (Repeat)

LoadCRL.request

LoadCRL.response

TerminateLoadCRL.request

TerminateLoadCRL.response
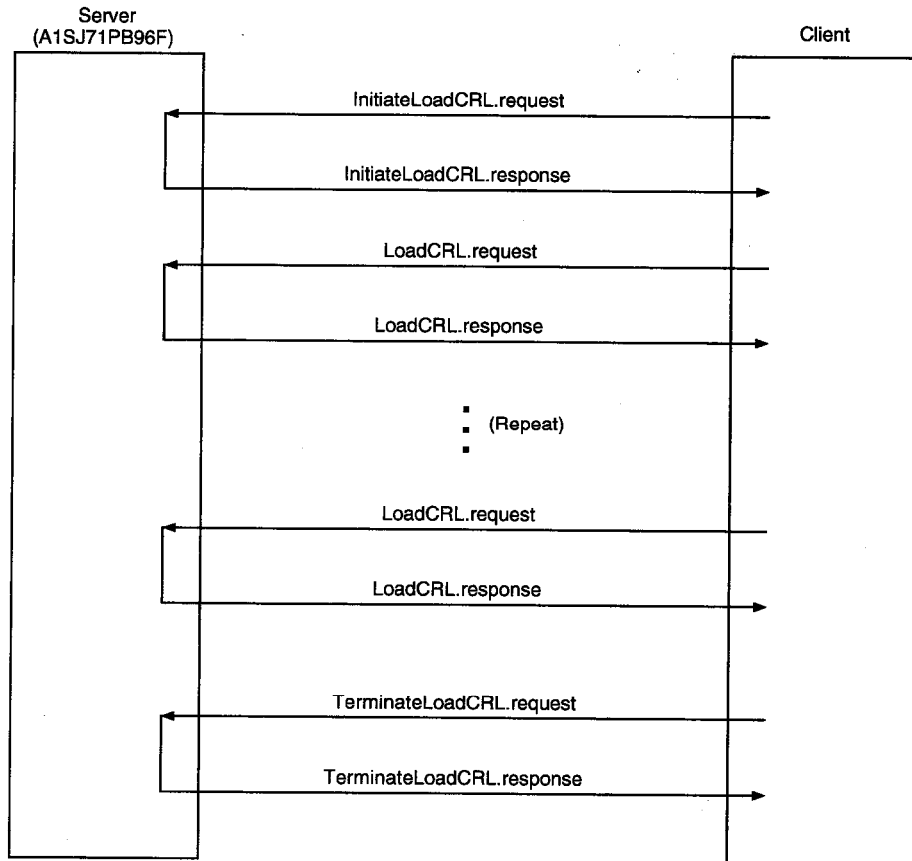
Note
As far as possible, use the CRL obtained using the GetOD from the AJ71PB96F/A1SJ71PB96F for the CRL to written.
If there is an error with the written CRL then a worst communication cannot be done.
In this case, use the SW0IX-PROFPE to rewrite the CRL.

InitiateLoadCRL is used to announce the initiation of the CRL setting.
When InitiateLoadCRL has ended all of the connections other than the FMA7 connection are forcefully aborted and an FMS connection cannot be established until TerminateLoadCRL has ended.

[Parameters required by the client]

None

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.2.6   CRL setting (LoadCRL: Server)

After the InitiateLoadCRL is successful the CRL static portion data is actually set.
The number of CRL static entry that can be loaded with 1 LoadCRL is 1. To load all of the CRLs
LoadCRL must be repeated once for each CRL to be loaded.

[Parameters required by the client]

•   CRL Entry static (CRL entry static portion)
        Set the CRL entry static portion.

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.2.7   CRL setting end (TerminateLoadCRL: Server)

This is used to announce that the CRL setting has ended.

[Parameters required by the client]

None

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

7.2.8 CRL read (ReadCRL: Server)

ReadCRL is used for the client to read the static portion or dynamic portion of the CRL.
The number of CRL entries than can be read with 1 ReadCRL is 1. To read all of the CRLs LoadCRL
must be repeated once for each CRL to be read.

[Parameters required by the client]

- Desired CREF

    Specify the No. of the CRL entry to be read.

Desired CREF	Explanation
0	Reads the CRL header.
No. of the CRL entry to be read.	CRL Entry No. to read

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

- CRL Entry

    This sets the CRL Entry data.

7.2.9   Bus parameter read (ReadValue: Server)

Use ReadValue to read the AJ71PB96F/A1SJ71PB96F bus parameters from the client.

[Parameters required by the client]

- Variable Identifier
  Parameters types for reading the Variable Identifier

	Vrlable Identifier	Explanation
1	Address	Address
2	Baud Rate	Baud rate
3	Medium Red	Transmission circuit redundant support
4	HW-Release	Hardware release number
5	SW-Release	Software release number
6	Tsl	Slot time
7	Min Tsdr	Minimum response delay time
8	Max Tsdr	Maximum response delay time
9	Tqui	Quiet time
10	Tset	Setup time
11	Ttr	Target token rotation time
12	G	Gap update rate
13	In Ring Desired	Token ring subscription allowed/not allowed
14	HSA	Master station maximum addresses
15	Max Retry Limit	Maximum number of retries.
16	LAS	Master station list

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

● Current Value
   The following values are set using the Variable Identifier value.

	Vriable Identifier	Current Value
1	Address	Addresses 0 to 126 set by the software package.
2	Baud Rate	Baud rate set by the SW0IX-PROFPE 0: 9.6Kbps 1: 19.2Kbps 2: 93.75Kbps 3: 187.5Kbps 4: 500Kbps 7: 1500Kbps
3	Medium Red	0: No redundancy
4	HW-Release	"FDL-V1.0"
5	SW-Release	"FDL-V5.02"
6	Tsl	Current slot time 37 to 16383.
7	Min Tsdr	Current minimum response delay time 11 to 1023.
8	Max Tsdr	Current maximum response delay time 0 to 65535.
9	Tqui	Current quiet time 0 to 127.
10	Tset	Current set up time 1 to 255.
11	Ttr	Current target token rotation time 256 to 1677215.
12	G	Current gap update rate. 1 to 100
13	In Ring Desired	TRUE = FFh fixed
14	HSA	Maximum addresses of the master stations set by the software package. 1 to 126.
15	Max Retry Limit	Current maximum retry count 0 to 7.
16	LAS	Master station address list (max. 127 stations' worth)
17	Frame sent count	Current data transmission count 0 to 2^{32}-1
18	Retry count	Current retry count 0 to 2^{16}-1
19	SD count	Current normal data observation count 0 to 2^{32}-1
20	SD error count	Current abnormal data observation count 0 to 2^{16}-1
21	Transmitter output	TRUE = FFh possible status (fixed)
22	Received signal source	0: Primary (fixed)
23	Loop	False = 00h non-loopback status (fixed)

7.2.10 Bus parameter setting (SetValue: Server)

Use the SetValue to set the parameter in the AJ71PB96F/A1SJ71PB96F from the client.

[Parameters required by the client]

- Variable Identifier

   Set the parameter type to be set as shown in the following table.

- Desired Value

   Set the value as shown in the following table.

	Vriable Identifier	Current Value
6	Tsl	Slot time 37 to 16383
7	Min Tsdr	Minimum response delay time 11 to 1023
8	Max Tsdr	Maximum response delay time 37 to 1023
9	Tqui	Quiet time 0 to 127
10	Tset	Setup time 0 to 255
11	Ttr	Target token rotation time 256 to 16777215
12	G	Gap update rate 1 to 100
13	In Ring Desired	Not specified by the A1SJ71PB96F
15	Max Retry Limit	Maximum retry count 0 to 7.

[Server (AJ71PB96F/A1SJ71PB96F) answer parameters]

None

8. TROUBLESHOOTING

The following explains troubleshooting and error codes when using the AJ71PB96F/A1SJ71PB96F.

8.1   Troubleshooting

Following is explained the check items for errors generated by the AJ71PB96F/A1SJ71PB96F.

(1) **When the PROFIBUS-FMS network does not communicate from the beginning**
Check the following items.

(a) Check the PROFIBUS Cable wiring.
Refer to Section 5.5.1 and check to make sure the PROFIBUS cable wiring is correct.

(b) Check the parameters set in the AJ71PB96F/A1SJ71PB96F.
Use the SW0IX-PROFPE to check if the parameters set in the AJ71PB96F/A1SJ71PB96F are correct.

(2) **When the PROFIBUS-FMS network stops communicating midway through**
Use the following method to check the error codes.

(a) Use the PC CPU of the programmable controller system in which the AJ71PB96F/A1SJ71PB96F is installed to read the AJ71PB96F/A1SJ71PB96F error codes using the FROM instruction.
Refer to Sections 4.7.2 and 8.2.1 to check the error code descriptions read from the AJ71PB96F/A1SJ71PB96F.

(b) Use the partner station with which the AJ71PB96F/A1SJ71PB96F is communicating to read the error codes returned from the AJ71PB96F/A1SJ71PB96F.
Refer to Section 8.2.2 and check the causes of the error codes returned by the AJ71PB96F/A1SJ71PB96F.

(3) **When the AJ71PB96F/A1SJ71PB96F's FAULT LED is turned on**
An AJ71PB96F/A1SJ71PB96F hardware error is suspected, so contact the nearest Mitsubishi Electric dealer and explain the symptoms to them.

8.2   Error Code

8.2.1   Answer area, receive area

Following is shown the error codes set in the buffer memory request answer area and receive area.

(1) Error codes

Request answer area No. 1 → buffer memory address 66 address

Request answer area No. 2 → buffer memory address 194 address

Request answer are No. 3 → buffer memory address 322 address

Reception area → buffer memory address 450 address

(a) Common

Error code	Description	Counter measure
206Ch	The specified service cannot be executed with the specified connection type.	The types of services that can be issued differ depending on the connection type. Check that the service can be issued for the connection type and then execute.
206Dh	An unsupported object has been specified in OD.	Check the object information set in OD.
2077h	The specified service cannot be executed with the specified connection attributes.	The types of services that can be issued differ depending on the connection attributes. Check that service can be issued for the connection attributes and then execute.
2100h	A connection No. that has not been established on a connection is specified.	Check the connection establishment.
2101h	There is a service during specified connection processing.	Output a service after the other service processing is completed.
2103h	A service that cannot be used has been specified.	The services that can be issued vary depending on the connection type and the connection attributes. Set service commands that can be issued in the various cases.
220Fh	The connection for which services remain is aborted during processing.	Re-establish the connection.
2258h	The connection was aborted.	Re-establish the connection. If this error code is set when the connection is re-established, then investigate the connection setting table parameters.
2259h	The service request was denied and the connection was aborted.	Comprehensively investigate the transmission parameters and initial setting parameters.

(b) Initiate

Error code	Description	Counter measure
2055h	A FMS refusal answer is received.	Refer to the error information and then check the data set in the buffer memory.
2061h	An initiate request to the partner station for which a connection has already been established was sent.	Set the correct connection No.
2062h	An incorrect connection No. was specified.	Set a connection No. that is defined in the connection setting table.
2067h	An error during the request transmission.	Comprehensively investigate the transmission parameters and error information.
2071h	A connection establishment request is sent from other than the master station.	Establish a connection from the master station.

(c) Abort

Error code	Description	Counter measure
2209h	An error during request transmission.	Comprehensively check the transmission parameters and error information.
220Bh	An abort prohibit connection is specified.	Use the SW0IX-PROFPE to abort the connection.

(d) Status

Error code	Description	Counter measure
2055h	A FMS refusal response is received.	Refer to the error information and then check the data set in the buffer memory.
205Fh	A time up occurs during the timer monitoring period.	Check the transmission route status and partner station operation status.
2067h	An error during request transmission.	Comprehensively check the transmission parameters and error information.

(e) Identify

Error code	Description	Counter measure
2055h	A FMS refusal response is received.	Refer to the error information and then check the data set in the buffer memory.
205Fh	A time up occurs during timer monitoring.	Check the transmission route status and partner station operation status.
2067h	An error during the request transmission.	Comprehensively check the transmission parameters and error information.

(f) UnsolicitedStatus

Error code	Description	Counter measure
2201h	Incorrect request transmission conditions.	Check the communication attributes and spatial attributes (master or slow) parameters.
2209h	An error occurs during request transmission.	Comprehensively check the transmission parameters and error information.
2259h	Before the received unconfirmed service, two or more unconfirmed services were received and the connection was aborted.	When an unconfirmed service is received, turn on Y03 for I/O signal to notify that the receive areas and receive data area read are terminated to the PC CPU.

(g) Read

Error code	Description	Counter measure
2053h	A data type incorrect for the remote OD is specified.	Set the correct data type.
2055h	A MMS refusal response is received.	Refer to the error information and check the data set in the buffer memory.
205Fh	A time up is occurred by the timer monitoring.	Check the transmission route status and partner station operation status.
2062h	An incorrect connection No. is specified.	Set the connection No. to the one defined in the connection setting table.
2065h	An incorrect partner station object is specified.	Set the correct OD index/name.
2067h	An error occurs during request transmission.	Comprehensively check the transmission parameters and error information.
2069h	An incorrect access mode is specified.	Set the correct access mode.
206Bh	The variable name length is incorrect.	Set the variable name length to 1 to 32.
2070h	Variable name access is specified even though variable name access is not supported.	Set an index specification.
2072h	An incorrect subindex is specified.	Set the correct subindex.
2073h	An undefined partner station object (NULL) is specified.	Set the correct OD index/name.
2074h	An incorrect read length is specified.	Set the partner station OD variable data length to 1 to 232 (bytes).
207Bh	Receive data size is smaller than the read length set in OD.	Check the object data size set in OD of the host station or partner station.
207Ch	A request is issued using name specification for a connection that does not support long form Get OD.	Set Features Supported or use index specification so that long form is supported.

(h) Write

Error code	Description	Counter measure
2053h	A data type incorrect for the remote OD is specified.	Set the correct data type.
2055h	A MMS refusal response is received.	Refer to the error information and check the data set in the buffer memory.
205Fh	A time up is occured by the timer monitoring.	Check the transmission route status and partner station operation status.
2062h	An incorrect connection No. is specified.	Set the connection No. to the one defined in the connection setting table.
2065h	An incorrect partner station object is specified.	Set the correct OD index/name.
2067h	An error occurs during request transmission.	Comprehensively check the transmission parameters and error information.
2069h	An incorrect access mode is specified.	Set the correct access mode.
206Bh	The variable name length is incorrect.	Set the variable name length to 1 to 32.
2070h	Variable name access is specified even though variable name access is not supported.	Set an index specification.
2072h	An incorrect subindex is specified.	Set the correct subindex.
2073h	An undefined partner station object (NULL) is specified.	Set the correct OD index/name.
2074h	An incorrect read length is specified.	Set the partner station OD variable data length to 1 to 232 (bytes).
207Ch	A request is issued using name specification for a connection that does not support long form Get OD.	Set Features Supported or use Index specification so that long form is supported.

(i) InformationReport

Error code	Description	Counter measure
2201h	The request transmission conditions are incorrect.	Check the connection attributes and station attributes (master and slow) parameters.
2202h	An incorrect access mode was specified.	Specify the correct access mode.
2204h	An undefined local station object (NULL) was specified.	Set the correct OD index/name.
2205h	An incorrect local station object was specified.	Set the correct OD index/name.
2209h	An error occurred during request transmission.	Comprehensively check the transmission parameters and error information.
220Ah	An incorrect device or type was registered in the local station OD.	Set the correct parameters.
220Ch	An incorrect subindex was specified.	Set the correct subindex.
220Dh	An incorrect data length was specified.	Set the local station OD variable data length to 1 to 128 (bytes).
2251h	An incorrect access mode was specified.	Set the correct access mode.
2253h	An undefined remote station object (NULL) was specified.	Set the correct OD index/name.
2255h	An incorrect data length was specified.	Set the partner station OD variable data length to 1 to 232 (bytes).
2256h	A variable name access was specified even though variable name access is not supported.	Set the index specification.
2259h	Before the received unconfirmed service, two or more unconfirmed services were received and the connection was aborted.	When an unconfirmed service is received, turn on Y03 for I/O signal to notify that the receive areas and receive data area read are terminated to the PC CPU.
225Ch	An incorrect data type was specified in the remote OD.	Set the correct data type.

(j) FMA7 Abort

Error code	Description	Counter measure
2209h	An error occurs during request transmission.	Comprehensively check the transmission parameters and error information.
220Bh	An abort prohibited connection was specified.	Use SW0IX-PROFPE to abort the connection.

(2) Error information

When a refusal response is received
   When the error code is 2055h, valid values are written in the following addresses of the buffer memory.

   Request area No. 1's 67 address: FMS refusal response Error Class
   Request area No. 2's 195 address: FMS refusal response Error Class
   Request area No. 3's 323 address: FMS refusal response Error Class

   Refer to the Communication Standard DIN 19245 Part 2 for information regarding the written numerical value details.

8.2.2   Communication circuits

Following is shown the error code that is returned to the partner station via the communication circuit.

(1)   Connection control

    (a)   Initiate

Class	Code	Cause
Initiate (0)	E_INIT_MAX_PDU_SIZE_INSUFF (1)	• The number of maximum simultaneous processing services is incorrect. • The support service setting is incorrect.
Initiate (0)	E_INIT_USER_DENIED (4)	• A connection that has already been established was specified.

(2)   VFD control

    (a)   Status

Class	Code	Cause
Access (6)	E_ACCESS_OBJ_INVALIDATED (1)	• An error has occurred in the PC CPU.

(3)   OD control

    (a)   GetOD

Class	Code	Cause
Access (6)	E_ACCESS_OBJ_NON_EXIST (7)	• An undefined OD was specified.
OD (7)	E_OD_OERFLOW (2)	• An undefined OD was specified (the value exceeded the maximum index value registered in the specified index).

    (b)   PutOD

Class	Code	Cause
OD (7)	E_OD_OERFLOW (2)	• The OD was defined to a value that exceeded the maximum number of registrations. • The index value is not in the OD header specification range.
DEFINITION (3)	E_DEF_OBJ_ATTR_INCONSIST (2)	• An object that is not supported was defined.

(4) Variable access

(a) Common

Class	Code	Cause
ACCESS (6)	E_ACCESS_OBJ_ACCESS_UNSUPP (6)	• A data length was exceeded 128 bytes.
	E_ACCESS_NAME_ACCESS_UNSUPP (9)	• A variable name was specified even though variable name access is not supported.
	E_ACCESS_OBJ_NON_EXIST (7)	• An undefined object was specified. • An access mode other than index or name was specified.
	E_ACCESS_OBJ_ACCESS_DENIED (3)	• The specified subindex exceeds the number of array variable elements.
	E_ACCESS_OBJ_INVALIDATED (1)	• An error occurred in the PC CPU.
Service (5)	E_SERV_ILLIGAL_PARAM (5)	• Incorrect device information was set in the variable information.
OD (7)	E_OD_OVERFLOW (2)	• An undefined OD was specified (a value that exceeds the maximum index value registered in the specified index).

(b) Write

Class	Code	Cause
ACCESS (6)	E_ACCESS_OBJ_ACCESS_DENIED (3)	• The write data length and the data length of the object to be written do not match.

(5) Domain control

(a) Download

Class	Code	Cause
RESOURCE (4)	E_RESOURCE_MEM_ UNAVAILABLE (1)	• An attempt was made to write data that is larger than the capacity specified in the CPU parameter.
SERVICE (5)	E_SERV_OBJ_STATE_CONFLICT (1)	• An attempt to download was made to a domain that is not in the EXISTENT status. • An attempt was made to download from a domain which is uploading.
ACCESS (6)	E_ACCESS_OBJ_INVALIDATED (1)	• An error occurred in the PC CPU.

(b) Upload

Class	Code	Cause
SERVICE (5)	E_SERV_OBJ_STATE_CONFLICT (1)	• An attempt was made to upload from the different connection while the domain was uploading.
ACCESS (6)	E_ACCESS_OBJ_INVALIDATED (1)	• An error occurred in the PC CPU.

(6) PI control

(a) Common

Class	Code	Cause
SERVICE (5)	E_SERV_OBJ_STATE_CONFLICT (1)	• The PI state is not in one such that it can issue a service. • The specified domain is not in a state where it can execute the service.
ACCESS (6)	E_ACCESS_OBJ_INVALIDATED (1)	• An error occurred in the PC CPU.

(7) FMA7 connection control

(a) FMA7 Initiate

Class	Code	Cause
Initiate (0)	E_INIT_USER_DENIED (4)	• An FMA7 connection has already been established.

(8) CRL control

(a) PutOD

Class	Code	Cause
RESOURCE (2)	E_FMA7_RESOURCE_MEM_ UNAVAILABLE (1)	• An attempt was made to write more than 32 CRLs.

(b) ReadOD

Class	Code	Cause
CRL (6)	E_FMA7_CRL_NO_CRL_ENTRY (3)	• The specified CRL entry does not exist.

(9) Bus parameter control

(a) SetValue

Class	Code	Cause
USER (6)	E_FMA7_USR_OTHERS (3)	• A value that is not used by the AJ71PB96F/A1SJ71PB96F was specified.

APPENDIX

Appendix 1 Differences From the AJ71PB96

Following is an explanation between the AJ71PB96F/A1SJ71PB96F and the AJ71PB96.

(1) Number of communications
    (a) AJ71PB96
        If all of the PDU sizes for all of the communications are 200 or less; 32 communications.
        Otherwise, 16 communications.
    (b) AJ71PB96F/A1SJ71PB96F (refer to Section 4.3)
        32 communications when the following conditions are met. Otherwise, 16 communications.
        (b.1) Communication type conditions
            Communications are divided into the following two categories.
              • Category I
                 MMAC, MSAC, MSAC_SI, FMA7 communications
              • Category II
                 MSCY, MSCY_SI, BRCT, MULT

            The number of communications must satisfy the following formula.
            Category I number of communications $\times$ 2 + Category II number of communications $\leq$ 32

        (b.2) PDU size conditions
            All of the PDU sizes for all of the communications are 200 or less.

(2) Remote OD management
    (a) AJ71PB96
        The total number of communications for the preload remote OD is 100.
        The automatic remote OD is not on the connection units, but has a total of 1024 connections.
    (b) AJ71PB96F/A1SJ71PB96F (refer to Section 4.5.3)
        The remote ODs are managed by each communication and they are a maximum of 26 per communication (total for automatic remote ODs and preload remote ODs).
        There is a maximum of 20 preload ODs per communication.
        Automatic remote ODs use the vacant area of the preload remote ODs.

(3) Station mode
    (a) AJ71PB96
        Operated as a master station or slave station.
    (b) AJ71PB96F/A1SJ71PB96F
        Operated as a master station. Has a slave emulation function for use as a slave station.

(4) Setting the station address and baud rate
    (a) AJ71PB96
        Set with the switch on the module.
    (b) AJ71PB96F/A1SJ71PB96F
        Set with SW0IX-PROFPE.

(5) The domain control, PI control, PutOD, FMA7 service
    (a) AJ71PB96
        Does not have these functions.
    (b) AJ71PB96F/A1SJ71PB96F
        Has these functions.

(6) The size of data that can be handled per single communication

    (a) AJ71PB96

         128 bytes (1024 bit)

    (b) AJ71PB96F/A1SJ71PB96F

         232 bytes (1856 bit)

The following three services are affected by the change in data size.
Specification for the other services remain unchanged.

O : Supports new data size   —: Spec not changed

Service \ Function	Client (requestor)	Server (Receiver)
Read	O	—
Write	O	—
Information Report	—	O *1

*1 Supports new data size only when receiving send information from the client (requestor).

The Boolean data service to be able to do the handling in each service is as follows.

a) Read service

As only data is contained in the response frame of the Read command, the size that can be handled is constant regardless of the access mode.

Sub-index \ Access mode	Index Unsigned 16 Bit	Variable-Name 1 to 32 Oct.
None	232 bytes	232 bytes
Provided	232 bytes	232 bytes

b) Write service

In the AJ71PB96F/A1SJ71PB96F, if variables are designated, the variable name is handled as 32 fixed characters. Thus, the size that can be handled is constant regardless of the variable size.

Sub-index \ Access mode	Index Unsigned 16 Bit	Variable-Name 1 to 32 Oct.
None	232 bytes	202 bytes
Provided	231 bytes	200 bytes

c) Information Report (Receive) service

In the AJ71PB96F/A1SJ71PB96F, if variables are designated , the variable name is handled as 32fixed characters. Thus, the size that can be handled is constant regardless of the variable size.

Sub-index \ Access mode	Index Unsigned 16 Bit	Variable-Name 1 to 32 Oct.
None	232 bytes	202 bytes
Provided	231 bytes	200 bytes

(7) **The data size can be used in the remote OD for each data type and variable type have been changed.**

Data type \ Variable type	simple variable	Array variable	Record variable
Boolean (B0)	O	O *4	O *8
Integer 8 (I8)	O	O *4	O *8
Integer 16 (I16)	O	O *5	O *8
Integer 32 (I32)	O	O *6	O *8
Unsigned 8 (U8)	O	O *4	O *8
Unsigned 16 (U16)	O	O *5	O *8
Unsigned 32 (U32)	O	O *6	O *8
Float (FL)	O	O *6	O *8
VisiblStr (VS)	O *3	O *7	O *9
OctetStr (OS)	O *3	O *7	O *9
Date	—	—	—
TimeOfDay	—	—	—
TimeDiff	—	—	—
BitStr(BS)	O *2	O *7	O *9

(a) AJ71PB96
*2 : Maximum 128 bytes (1024 bits)
*3 : Maximum 64 words
*4 : Maximum 128 elements
*5 : Maximum 64 elements
*6 : Maximum 32 elements
*7 : Bytes length per element × number of element $\leq$ 128 bytes and an element consists of 128 bytes or less
*8 : Maximum 8 elements
*9 : Maximum 8 elements, and total number of bytes must be 128 or less.

(b) AJ71PB96F/A1SJ71PB96F
*2 : Maximum 232 bytes (1856 bits)
*3 : Maximum 116 words
*4 : Maximum 232 elements
*5 : Maximum 116 elements
*6 : Maximum 58 elements
*7 : Bytes length per element × number of element $\leq$ 232 bytes and an element consists of 232 bytes or less
*8 : Maximum 8 elements
*9 : Maximum 8 elements, and total number of bytes must be 232 or less.

(8) **Software package used by parameter setting**
(a) AJ71PB96
● SW0IX-PB96PE
(b) AJ71PB96F/A1SJ71PB96F
● SW0IX-PROFPE(Ver. B or later)

Precautionary notes when using an AJ71PB96 and an AJ71PB96F/A1SJ71PB96F simultaneously
Precautionary notes when communicating between an AJ71PB96 and an AJ71PB96F/A1SJ71PB96F or a product of other manufacturer
The communication data size for a new product can exceed 128 bytes when the combination of products used are as follows:

Client (requestor \ Server (receiver)	AJ71PB96	AJ71PB96F A1SJ71PB96F	Product of other manufacturers *1
AJ71PB96	—	—	—
AJ71PB96F/A1SJ71PB96F	—	—	O
Product of other manufacturers *2	—	O *2	

*1: Must be a product capable of handling data exceeding 128 bytes.
*2 Supports new data size only when receiving send information via the information report service.

Appendix 2 Dissimilarities Between A1SJ71PB96F New Products (Software Version C or Later) and Conventional Products (Software Version B or Before)

2.1 Dissimilarities Between A1SJ71PB96F New Products (Software Version C or Later) and Conventional Products (Software Version B or Before)

(1) The size of data that can be handled per single communication has been changed.

New product	Conventional product
232 bytes (1856 bits)	128 bytes (1024 bits)

The following three services are affected by the change in data size.
Specifications for the other services remain unchanged.

O: Supports new data size —: Spec not changed

Service ＼ Function	Client (requestor)	Server (receiver)
Read	O	—
Write	O	—
Information Report	—	O *1

*1 Supports new data size only when receiving send information from the client (requestor).

The Boolean data service to be able to do the handling in each service is as follows.
a) Read service
As only data is contained in the response frame of the Read command, the size that can be handled is constant regardless of the access mode.

Sub-index ＼ Access mode	Index Unsigned 16 Bit	Variable-Name 1 to 32 Oct.
None	232 bytes	232 bytes
Provided	232 bytes	232 bytes

b) Write service
In the AJ71PB96F/A1SJ71PB96F, if variables are designated , the variable name is handled as 32 fixed characters. Thus, the size that can be handled is constant regardless of the variable size.

Sub-index ＼ Access mode	Index Unsigned 16 Bit	Variable-Name 1 to 32 Oct.
None	232 bytes	202 bytes
Provided	231 bytes	200 bytes

c) Information Report (Receive) service
In the AJ71PB96F/A1SJ71PB96F, if variables are designated, the variable name is handled as 32fixed characters. Thus, the size that can be handled is constant regardless of the variable size.

Sub-index ＼ Access mode	Index Unsigned 16 Bit	Variable-Name 1 to 32 Oct.
None	232 bytes	202 bytes
Provided	231 bytes	200 bytes

(2) The data sizes that can be used in the remote OD for each data type and variable type have been changed.

Variable type / Data type	Simple variable	Array variable	Record variable
Boolean (B0)	O	O *4	O *8
Integer8 (I8)	O	O *4	O *8
Integer16 (I16)	O	O *5	O *8
Integer32 (I32)	O	O *6	O *8
Unsigned8 (U8)	O	O *4	O *8
Unsigned16 (U16)	O	O *5	O *8
Unsigned32 (U32)	O	O *6	O *8
Float (FL)	O	O *6	O *8
VisiblStr (VS)	O *3	O *7	O *9
OctetStr (OS)	O *3	O *7	O *9
Date	—	—	—
TimeOfDay	—	—	—
TimeDiff	—	—	—
BitStr (BS)	O *2	O *7	O *9

New product	Conventional product
*2: Maximum 232 bytes (1856 bits)	*2: Maximum 128 bytes (1024 bits)
*3: Maximum 116 words	*3: Maximum 64 words
*4: Maximum 232 elements	*4: Maximum 128 elements
*5: Maximum 116 elements	*5: Maximum 64 elements
*6: Maximum 58 elements	*6: Maximum 32 elements
*7: Byte length per element × number of elements ≤ 232 bytes and an element consists of 232 bytes or less	*7: Byte length per element × number of elements ≤ 128 bytes and an element consists of 128 bytes or less
*8: Maximum 8 elements	*8: Maximum 8 elements
*9: Maximum 8 elements, and total number of bytes must be 232 or less.	*9: Maximum 8 elements, and total number of bytes must be 128 or less.

2.2   Precautionary Notes when Using an A1SJ71PB96F New Product (Software Version C or Later) and a Conventional Product (Software Version B or Later) Simultaneously

(1)   Precautionary notes when communicating between an A1SJ71PB96F new product (software version C or later) and an A1SJ71PB96F conventional product (software version B or before) or a product of other manufacturer
The communication data size for a new product can exceed 128 bytes when the combination of products used are as follows:

O: Supports communication data size exceeding 128 bytes —: Spec not changed

Server (receiver) / Client (requestor)	New product	Conventional product	Product of other manufacturers *1
New product	—	—	O
Conventional product	—	—	—
Product of other manufacturers *2	O *2	—	

*1: Must be a product capable of handling data exceeding 128 bytes.
*2: Supports new data size only when receiving send information via the information report service.

(2)   Precautionary notes when setting parameters using the SW0IX-PROFPE software package
In order to set parameters for A1SJ71PB96F using the SW0IX-PROFPE software package, A1SJ71PB96F must be combined with the software version of SW0IX-PROFPE as follows.
If the A1SJ71PB96F and SW0IX-PROFPE used are not compatible, communication data exceeding 128 bytes cannot be handled.

SW0IX-PROFPE / A1SJ71PB96F	Version B or later	Version A
New product	O	Setting of parameters exceeding 128 bytes is not possible.
Conventional product	An error occurs at runtime if the set parameter exceeds 128 bytes. *3	

*3: A data size error is detected during the A1SJ71PB96F transmission service processing.

Appendix 3　VDF Physical Status Criteria Table

Value	VDF Physical Status Name	PC CPU Status on Occurrence of Self-diagnosis Error	M9008 (Self-diagnosis Error)	Status of D9015			
				Key (CPU)	Parameter	Program	Remote
0	Operational	RUN	OFF	RUN	RUN	RUN	
1	Partially-Operational	RUN	ON	RUN	RUN	RUN	
2	Inoperable	STOP					
3	Needs-Commissioning	RUN		Other than RUN	RUN	RUN	
		RUN		RUN	Other than RUN	RUN	
		RUN		RUN	RUN	Other than RUN	

Note)　• The self-diagnosis errors are: blown fuse, I/O verification error, operation error, and special function module error. The running/stopped status on occurrence of an error is determined by the PC CPU parameter settings.

Appendix 4   DIN 19245 Part 2

Attribute FMS Features Supported

Service	Primitive bit [n]		Primitive bit [m]	
Get OD (Long form)	.req,.con	0	.ind,.res	24
UnsolicitedStatus	.req	1	.ind	25
InitiatePutOD	.req,.con	2	.ind,.res	26
PutOD	.req,.con	2	.ind,.res	26
TerminatePutOD	.req,.con	2	.ind,.res	26
InitiateDownloadSequence	.req,.con	3	.ind,.res	27
DownloadSegment	.ind,.res	3	.ind,.con	27
TerminateDownloadSequence	.ind,.res	3	.ind,.con	27
InitiateUploadSequence	.req,.con	4	.ind,.res	28
UploadSegment	.req,.con	4	.ind,.res	28
TerminateUploadSequence	.req,.con	4	.ind,.res	28
RequestDomainDownload	.req,.con	5	.ind,.res	29
RequestDomainUpload	.req,.con	6	.ind,.res	30
CreateProgramInvocation	.req,.con	7	.ind,.res	31
DeleteProgramInvocation	.req,.con	7	.ind,.res	31
Start	.req,.con	8	.ind,.res	32
Stop	.req,.con	8	.ind,.res	32
Resume	.req,.con	8	.ind,.res	32
Reset	.req,.con	8	.ind,.res	32
Kill	.req,.con	9	.ind,.res	33
Read	.req,.con	10	.ind,.res	34
Write	.req,.con	11	.ind,.res	35
ReadWithType	.req,.con	12	.ind,.res	36
WriteWithType	.req,.con	13	.ind,.res	37
PhysRead	.req,.con	14	.ind,.res	38
PhysWrite	.req,.con	15	.ind,.res	39
InformationReport	.req	16	.ind	40
InformationReportWithType	.req	17	.ind	41
DefineVariableList	.req,.con	18	.ind,.res	42
DeleteVariableList	.req,.con	18	.ind,.res	42
EventNotification	.req	19	.ind	43
EventNotificationWithType	.req	20	.ind	44
AcknowledgeEventNotification	.req,.con	21	.ind,.res	45
AlterEventConditionMonitoring	.req,.con	22	.ind,.res	46
Options	Primitive bit [n]		Primitive bit [m]	
Addressing with Name	.req	23	.ind	47
Explanation: [n]: 0 to 23 [m]: 24 to 47				

Attribute FMA7 Services Supported

Service	Primitive bit [n]		Primitive bit [m]	
reserved *)	.req,.con	0	.ind,.res	8
InitiateLoad-CRL-Rem	.req,.con	1	.ind,.res	9
Load-CRL-Rem,	.req,.con	1	.ind,.res	9
TerminateLoad-CRL-Rem	.req,.con	1	.ind,.res	9
Read-CRL-Rem	.req,.con	2	.ind,.res	10
SetValueRem	.req,.con	3	.ind,.res	11
ReadValueRem	.req,.con	4	.ind,.res	12
LSAP-StatusRem	.req,.con	5	.ind,.res	13
IdentRem	.req,.con	6	.ind,.res	14
reserved *)	.req,.con	7	.ind,.res	15
reserved *)	16 to 31		32 to 47	
Explanation: *) reserved bits shall be set to 0 n = 0 to 7, 16 to 31 m = 8 to 15, 32 to 47				

Symbol:

The symbolic name of the communication reference. The existence and the length are specified in the CRL header.

CREL State:

This attribute contains the state of the communication relationship.
The following states are possible:
• CONNECTION-NOT-ESTABLISHED
• CONNECTION-ESTABLISHING (CALLING)
• CONNECTION-ESTABLISHING (CALLED)
• CONNECTION-ESTABLISHED

Outstanding FMA7 Services Counter Req:

This attribute specifies how many confirmed services (remote FMA7 services) are pending at the requester on this communication relationship.

Outstanding FMA7 Services Counter Res:

This attribute specifies how many outstanding confirmed services (remote FMA7 services) are being handled at the responder on this communication relationship.

Appendix 5 Maximum Service Counter

The maximum service counter (SCC, RCC, SAC, RAC) is used with layer 7 (LLI).
The setting ranges for each connection type are shown below.

Connection Type : MMAC

	SCC	RCC	SAC	RAC
MASTER	0 to 1	0 to 2	0 to 1	0 to1

Connection Type : MSAC

	SCC	RCC	SAC	RAC
MASTER	0 to 1	0	0 to 1	0
SLAVE	0	0 to 2	0	0 to1

Connection Type : MSAC_SI

	SCC	RCC	SAC	RAC
MASTER	0 to 1	0	0 to 1	0 to 1
SLAVE	0	0 to 2	0 to 1	0 to1

Connection Type : MSCY

	SCC	RCC	SAC	RAC
MASTER	0	0	0 to 1	0
SLAVE	0	0	0	0 to1

Connection Type : MSCY_SI

	SCC	RCC	SAC	RAC
MASTER	0	0	0 to 1	0 to 1
SLAVE	0	0	0 to 1	0 to1

Connection Type : BRCT

	SCC	RCC	SAC	RAC
MASTER	0	0	0	0
SLAVE	0	0	0	0

Connection Type : MULT

	SCC	RCC	SAC	RAC
MASTER	0	0	0	0
SLAVE	0	0	0	0

Appendix 6 External Dimensions

(1) AJ71PB96F

4.2
(0.17)

2
(0.08)

AJ71PB96F

RUN
SD/RD
TOKEN
READY
FROM/TO
PRM SET

FAULT
TEST
S B6
T B5
B4
N B3
O B2
B1
B0

0:ONLINE   MODE
1:PRM SET
2:TEST

RS-232-C

PROFIBUS
I/F

BUS TERMINATION
OFF ⊙ ON

250 (9.84)

4.2
(0.17)

106 (4.17)

37.5 (1.48)
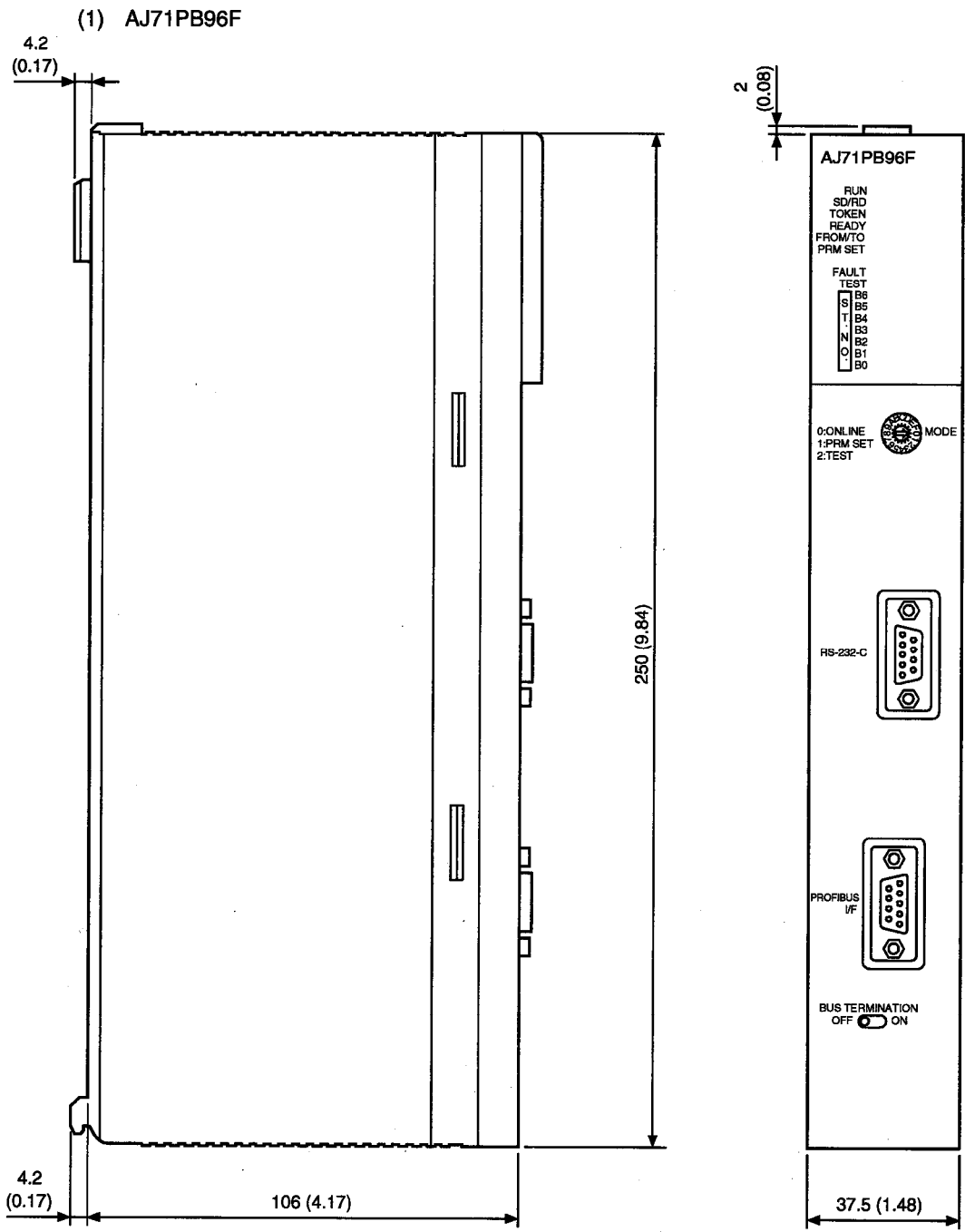
unit: mm (inch)

(2) A1SJ71PB96F

A1SJ71PB96F	
RUN	TEST
SD/RD	B6
TOKEN	B5
READY	B4
FROM/TO	B3
PRM SET	B2
	B1
FAULT	B0

MODE

0:ONLINE
1:PRM SET
2:TEST

RS-232-C

PROFIBUS
I/F

BUS TERMINATION
OFF ◯ ON

A1SJ71PB96F

130 (5.12)

6.5
(0.26)   93.6 (3.69)   4
                              (0.16)

34.5(1.36)
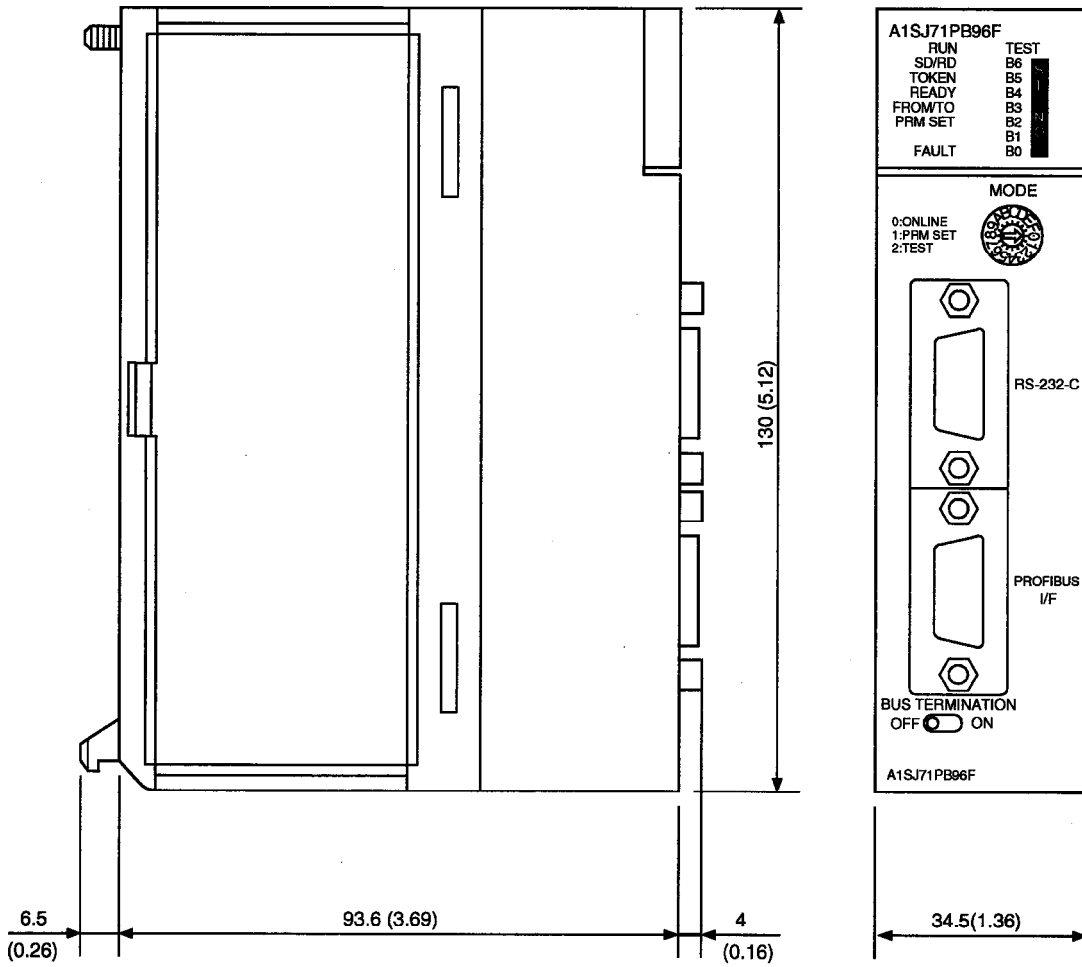
Unit : mm (inch)

PROFIBUS-FMS Interface Module
type AJ71PB96F/A1SJ71PB96F

User's Manual

MITSUBISHI ELECTRIC CORPORATION

When exported from Japan, this manual does not require application to the
Ministry of International Trade and Industry for service transaction permission.

Specifications subject to change without notice.