MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-A

Reference Manual

FMS INTERFACE MANUAL

PROFIBUS interface module type AJ71PB96

JUM-459

MITSUBISHI ELECTRIC

REVISIONS

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

Print Date	*Manual Number	Revision
Apr., 1994	IB (NA) 66459-A	First edition

INTRODUCTION

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

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1. GENERAL DESCRIPTION

This manual describes the FMS (Fieldbus Message Specification) protocol of the PROFIBUS interface module (AJ71PB96) for use with programmable controllers, with the main emphasis on details of the services transmitted from the client (the station requesting the service) and the corresponding responses.
For details on how to transmit services from the AJ71PB96, refer to the User's Manual.
The AJ71PB96 has the following advantages:

(1) It features the VFD function.

The VFD (Virtual Field Device) is a function described in the PROFIBUS protocol which enables operation of a virtual MELSEC-A module that will respond to FMS functions.

(2) MELSECNET (II) local stations can be accessed.

Installing an AJ71PB96 at a MELSECNET (II) master station makes it possible to read, and write to, the devices of a local station.
An AJ71PB96 can only be installed at a master station or a local station: it cannot be installed at a remote I/O station.

[Cautions when using MELSEC-NET]

(a) An AJ71PB96 installed at a master station can access data in a local station, but an AJ71PB96 installed at a local station can only access the PC CPU of the station at which it is installed.

(b) It takes some time to access a device (such as a D register) in a local station from an AJ71PB96. In addition, if a local station accepts a service (FMS communication) to access one of its devices while another of its devices is already being accessed by a service, execution of the second service will be delayed until the first one is completed.

2. COMMUNICATIONG WITH AN AJ71PB96

There are three possible relationships between two stations that are communicating by means of FMS services:

(1) Initiator (station that sends a connection request to another station) and responder (station that sends a response to a request from another station).

(2) Client (station that sends a confirmed service request to another station) and server (station that sends the response to the confirmed service request from another station).

(3) Requester (station that sends an unconfirmed service request to another station) and receiver (station that receives unconfirmed service requests from another station).

The role of an AJ71PB96 is determined by the master/slave station operation mode selection.

(a) When operating as a master station, it can have the following roles:

- Initiator or responder.
- Client or server.
- Requester or receiver.

(b) When operating as a slave station, it can have the following roles:

- Responder only.
- Server only.
- Requester or receiver only.

Communication with an AJ71PB96 starts with the transmission of the initiate service from the client; then, after a normal connection has been made, data is exchanged with the PC CPU by using services such as VFD management, object management and variable access.
To release the connection and end communication, the Abort service is transmitted.

All the communication types below, which are regulated by PROFIBUS, can be used with the AJ71PB96.

Connection Oriented Communication

MMAC .....Master - master acyclic connection

MSAC .....Master - slave acyclic connection (with no slave initiative)

MSAC_SI ....Master - slave acyclic connection (with slave initiative)

MSCY .....Master - slave cyclic connection (with no slave initiative)

MSCY_SI ....Master - slave cyclic connection (with slave initiative)

Connection Less Communication

BRCT .....Broadcast communication

MULT .....Multicast communication

In addition, if both the AJ71PB96 and the communicating station are operating as master stations, master-master cyclic communication can be performed by using MSCY or MSCY_SI to communicate with the communicating station. This function is called "slave emulation".

Connection Oriented Communication can have one of the three connection attributes shown below, and an AJ71PB96 can use all of them within the ranges stipulated for PROFIBUS.

/D .....Defined connection

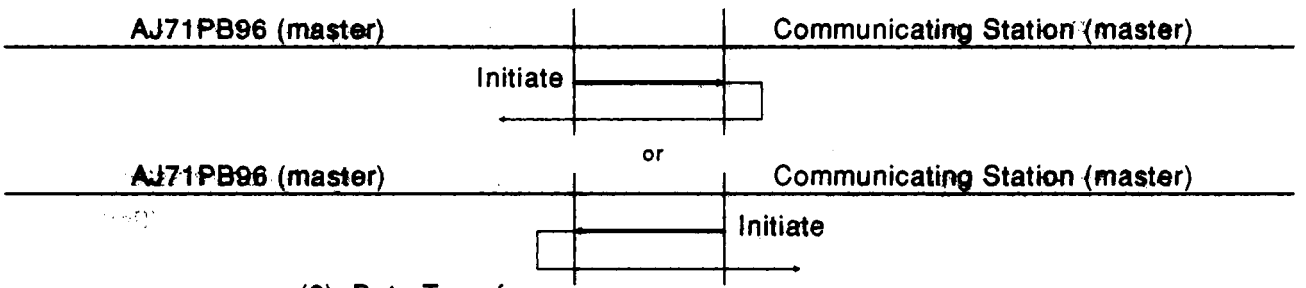
/I .....Open Connection as Requester

/O .....Open Connection as Responder

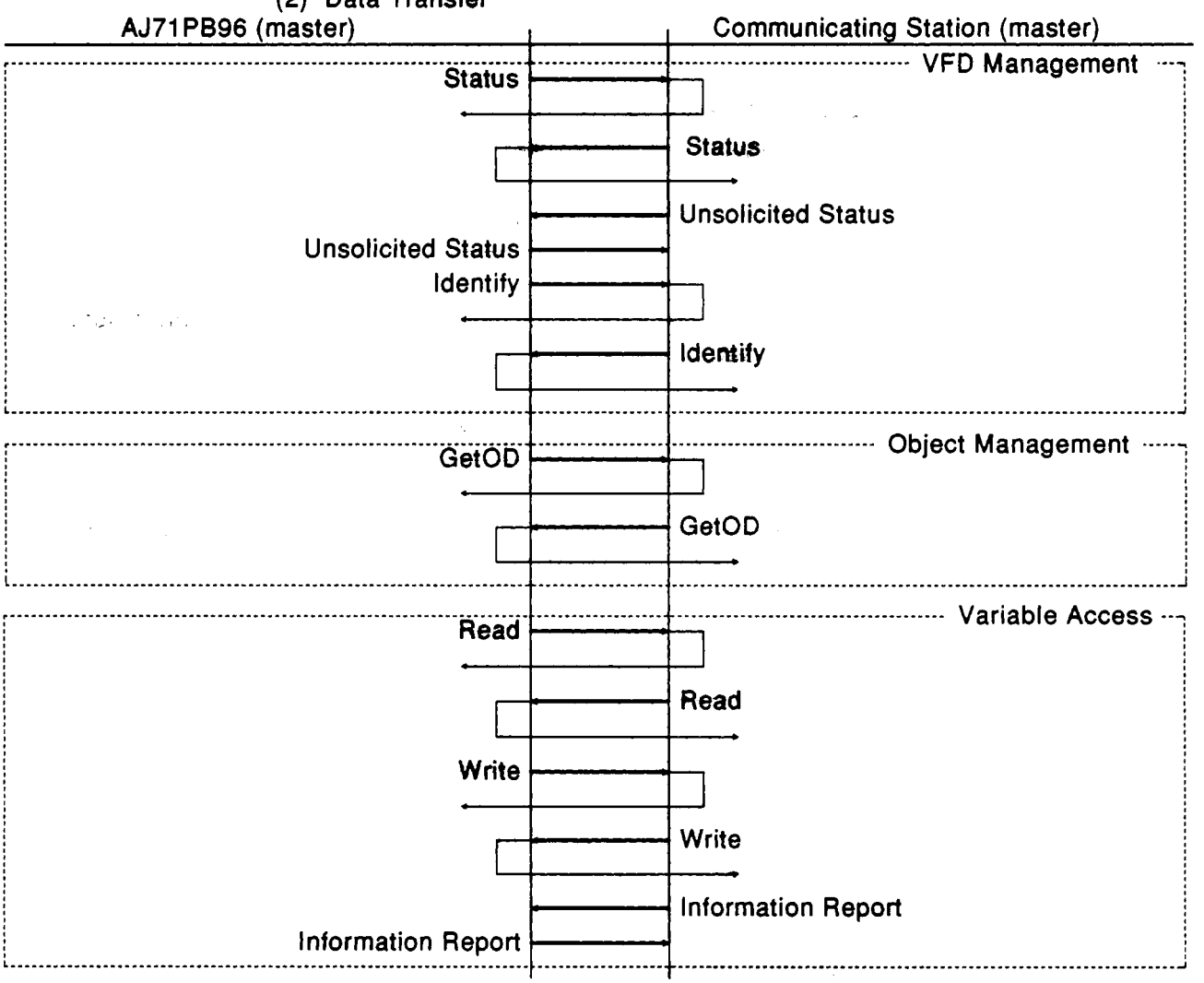
The FMS protocols that the AJ71PB96 can use are shown on the following pages.

[FMS protocol (MMAC/D)]

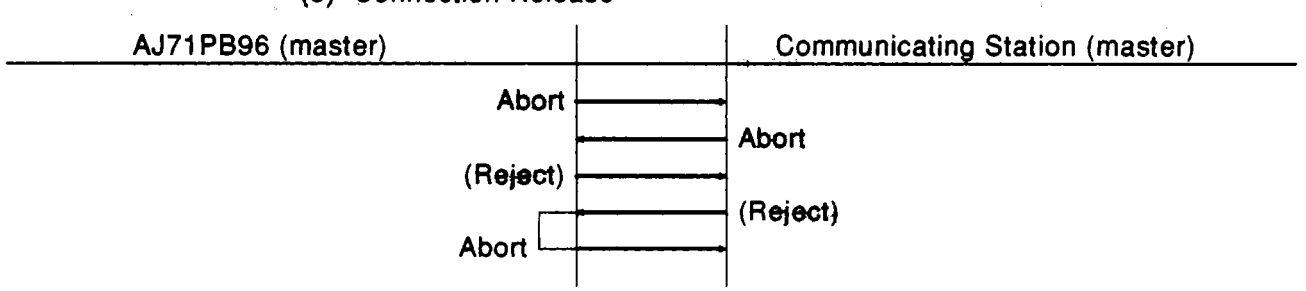
(1) Connection Establishment



(2) Data Transfer

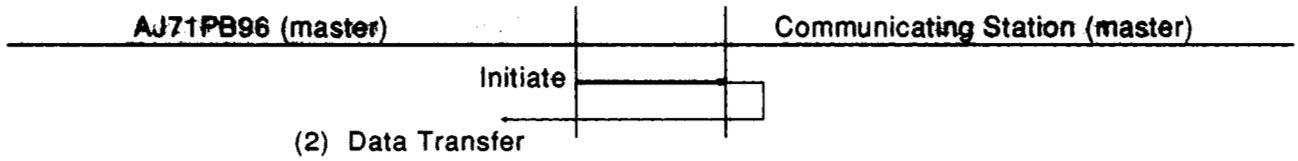


(3) Connection Release

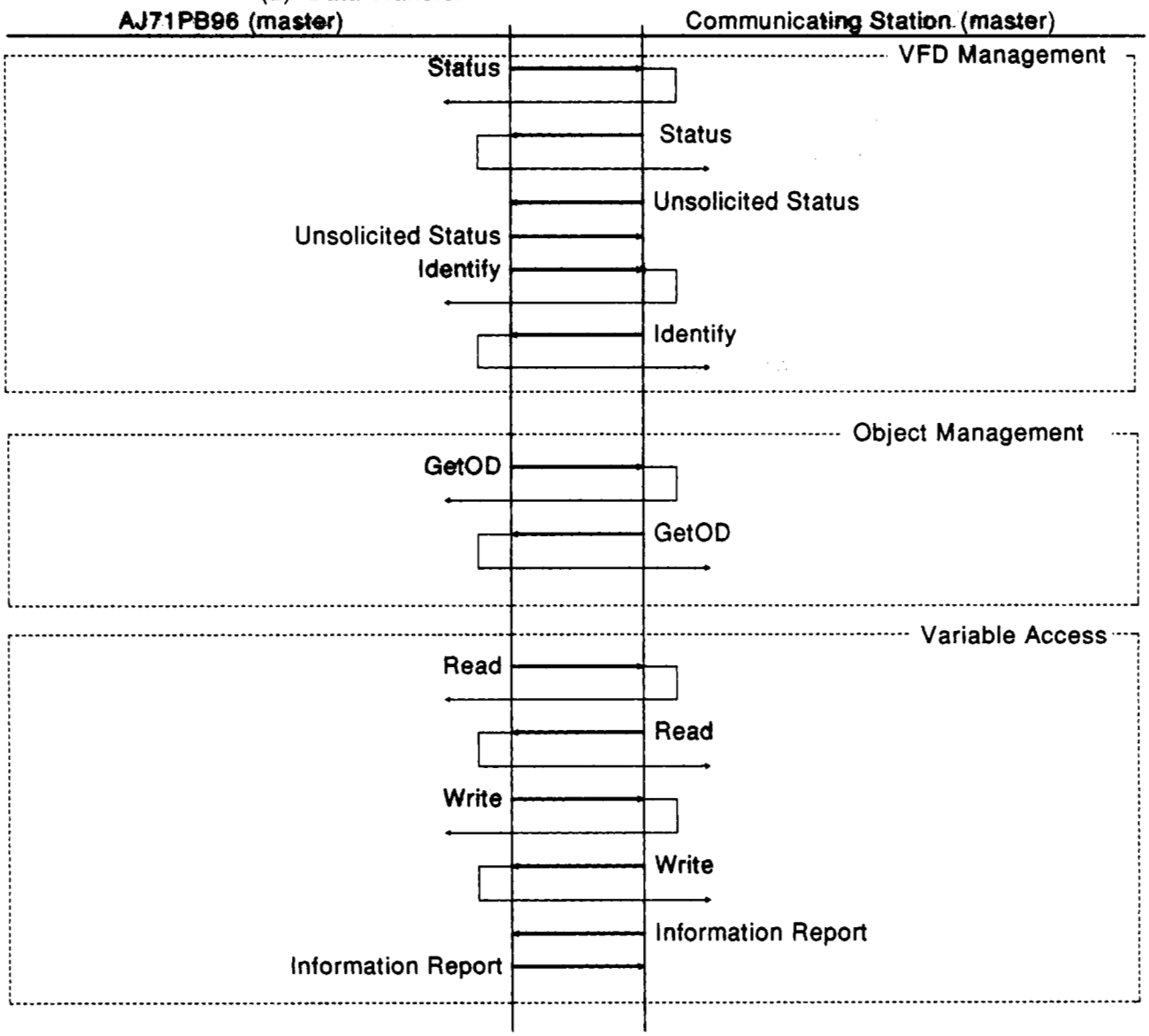


[FMS protocol (MMAC/I)]

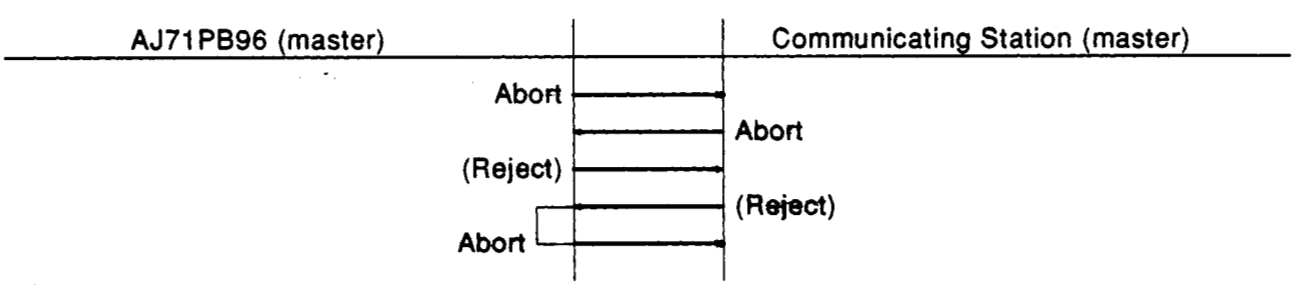
(1) Connection Establishment



(2) Data Transfer

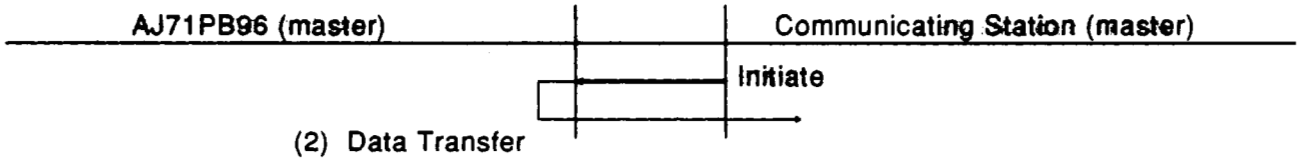


(3) Connection Release

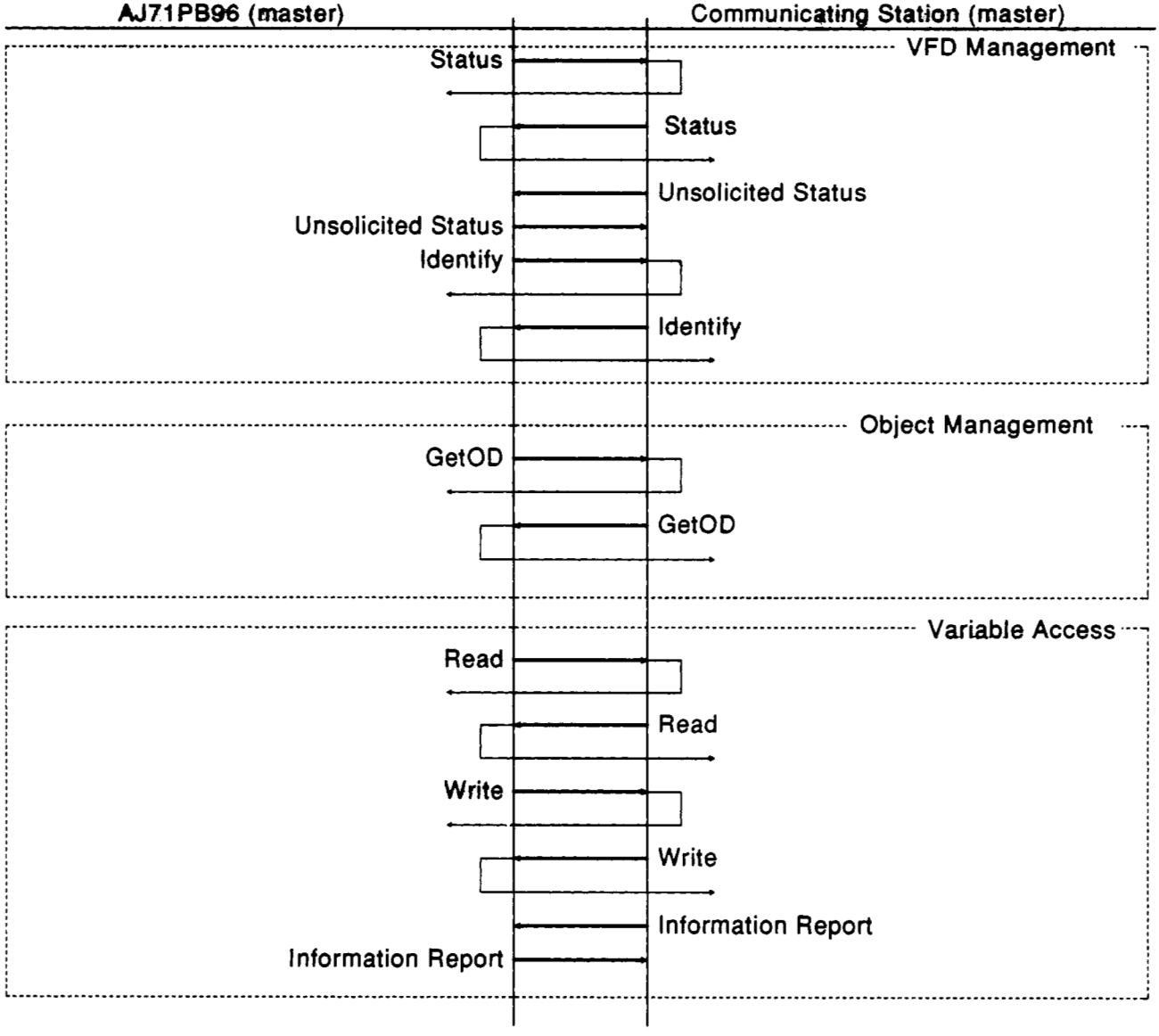


[FMS protocol (MMAC/O)]

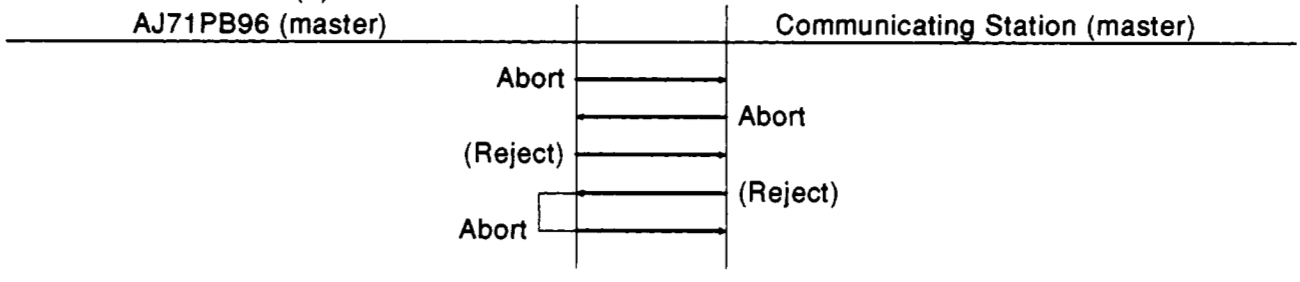
(1) Connection Establisment



(2) Data Transfer

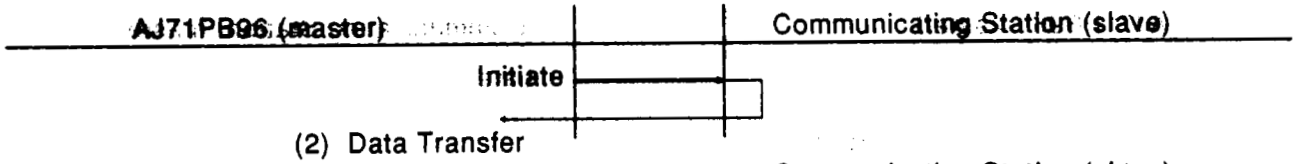


(3) Connection Release

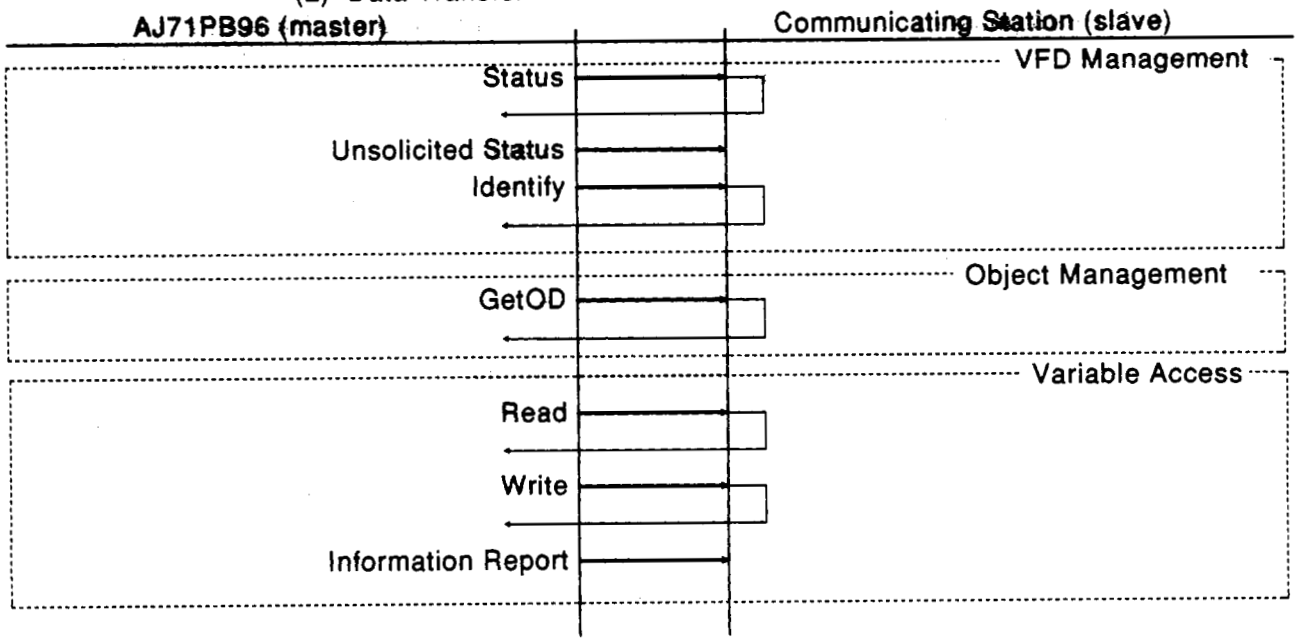


[FMS protocol (MSAC/D: Master station)]

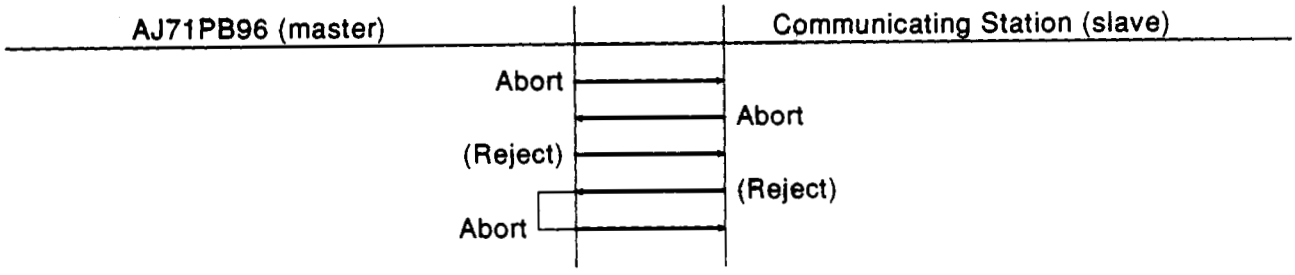
(1) Connection Establishment



(2) Data Transfer

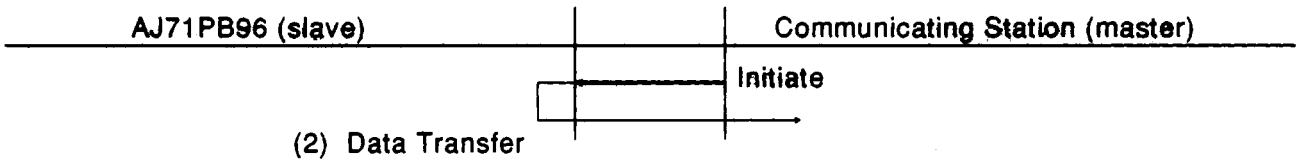


(3) Connection Release

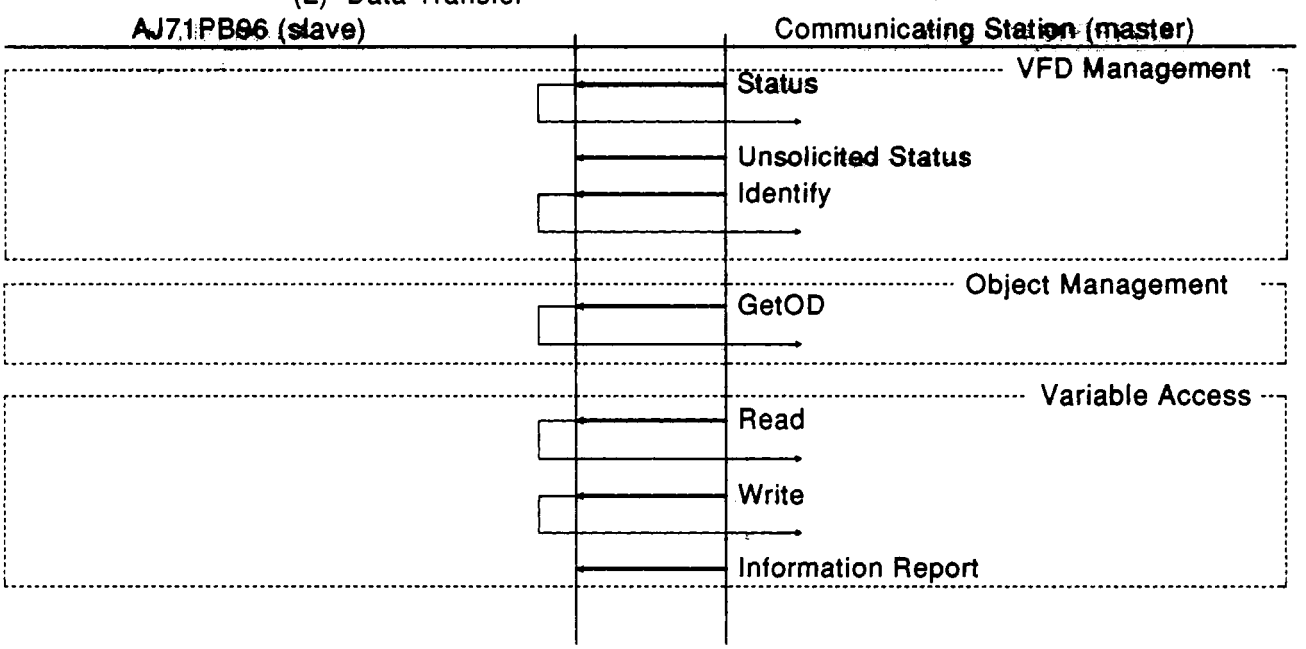


[FMS protocol (MSAC/D, /O: Slave station)]

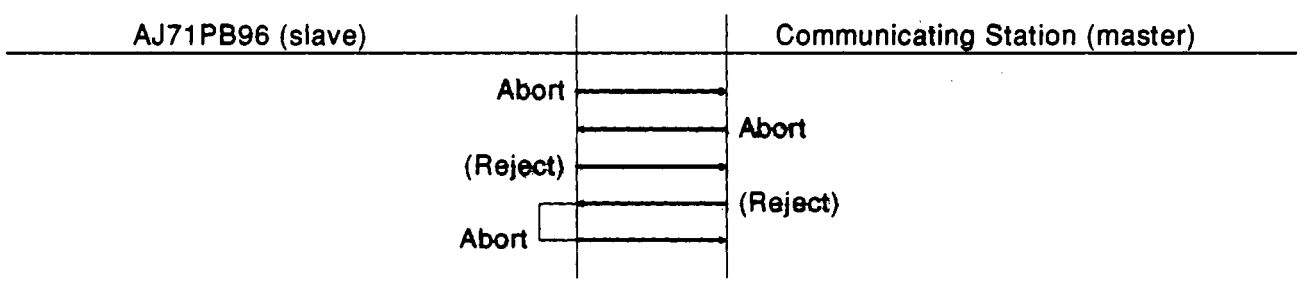
(1) Connection Establishment



(2) Data Transfer

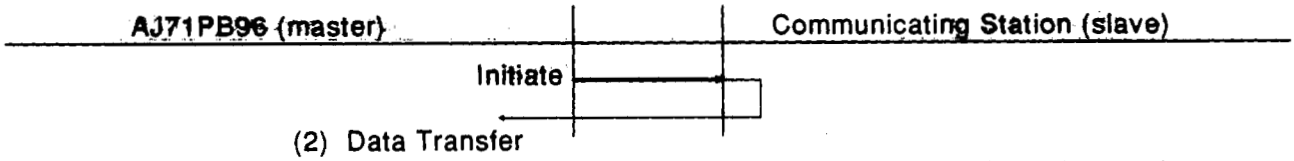


(3) Connection Release

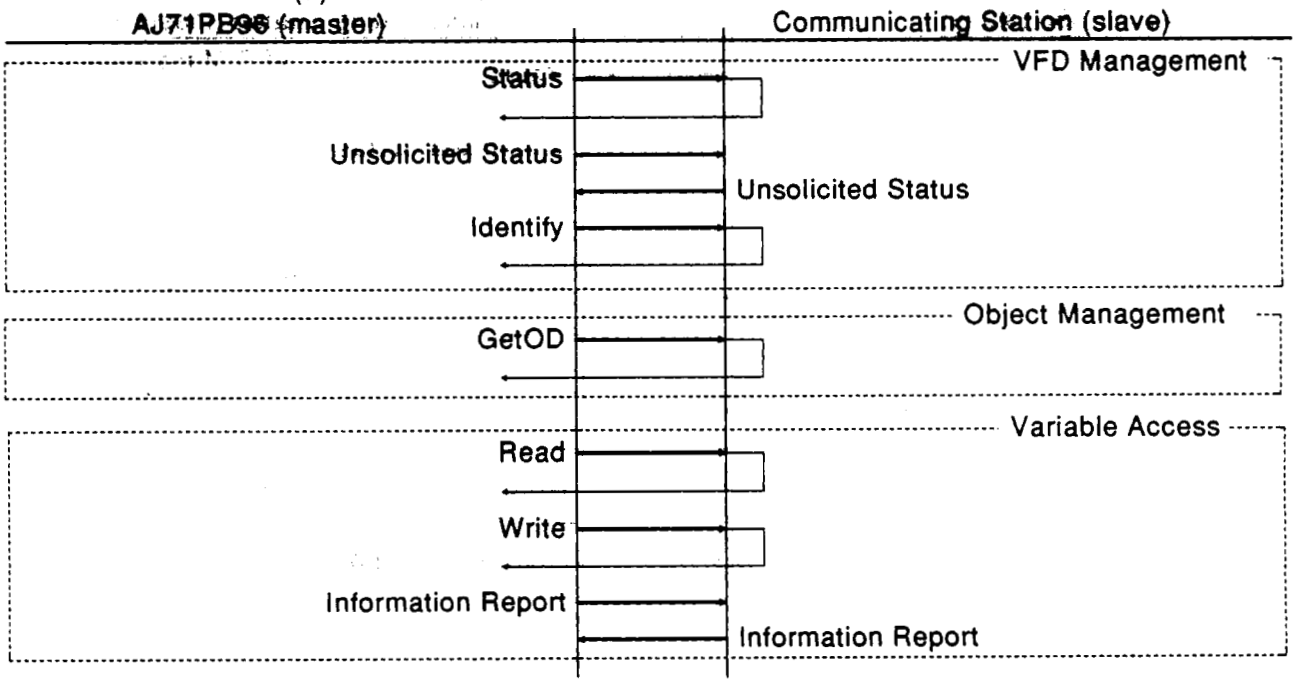


[FMS protocol (MSAC_SI/D: Master station)]

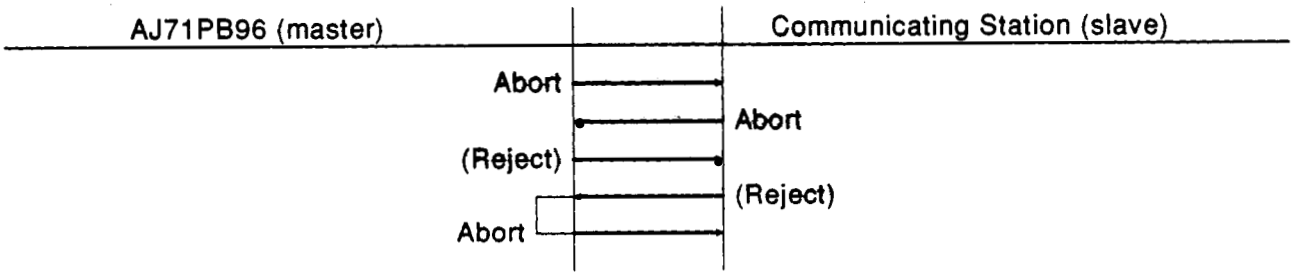
(1) Connection Establisment



(2) Data Transfer

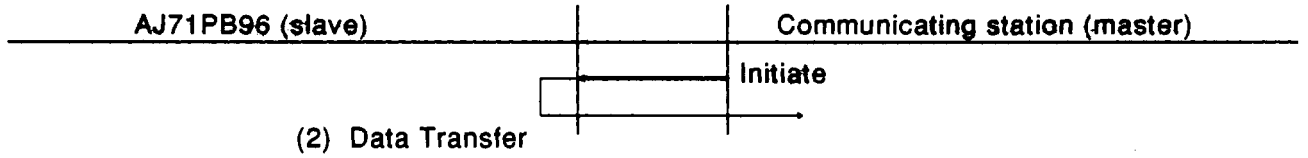


(3) Connection Release

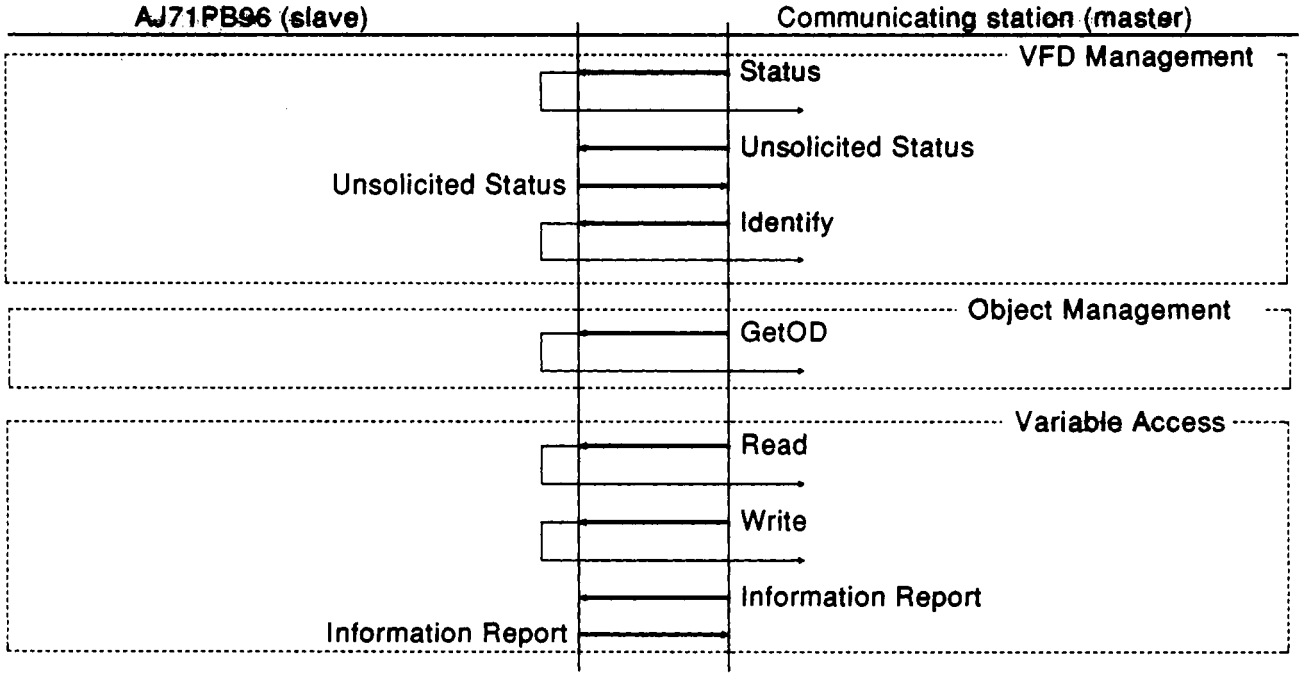


[FMS protocol (MSAC_SI/D, /O: Slave station)]

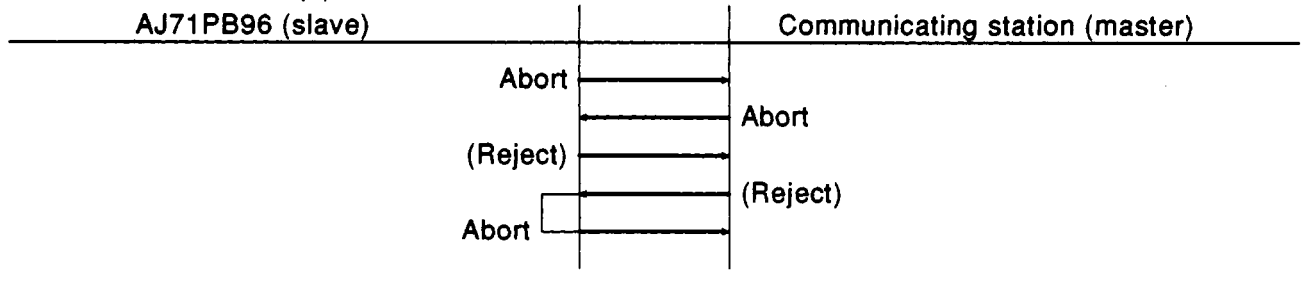
(1) Connection Establishment



(2) Data Transfer

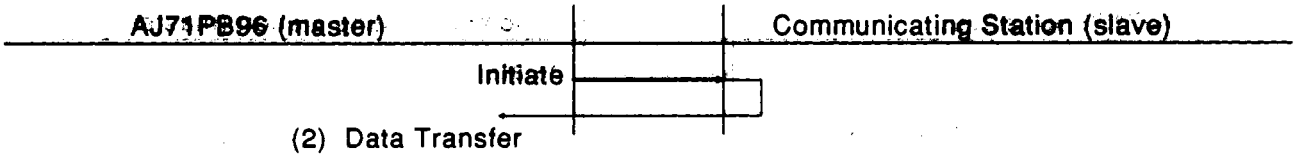


(3) Connection Release

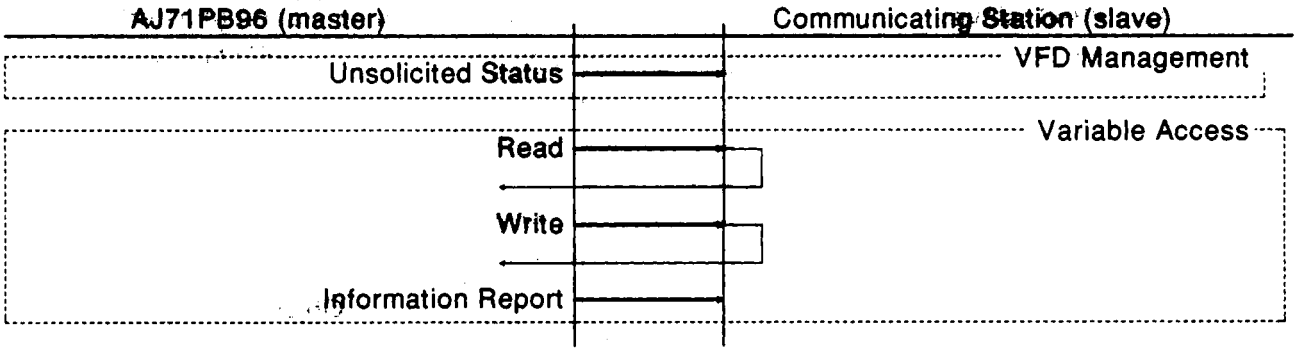


[FMS protocol (MSCY/D: Master station)]

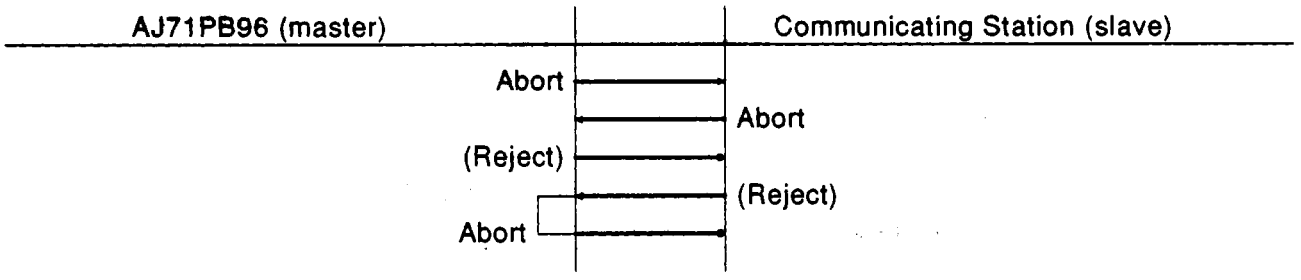
(1) Connection Establishment



(2) Data Transfer

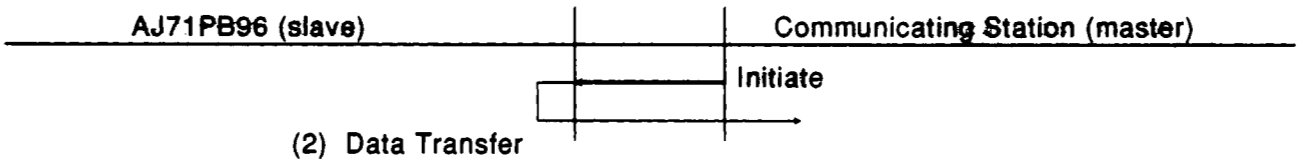


(3) Connection Release

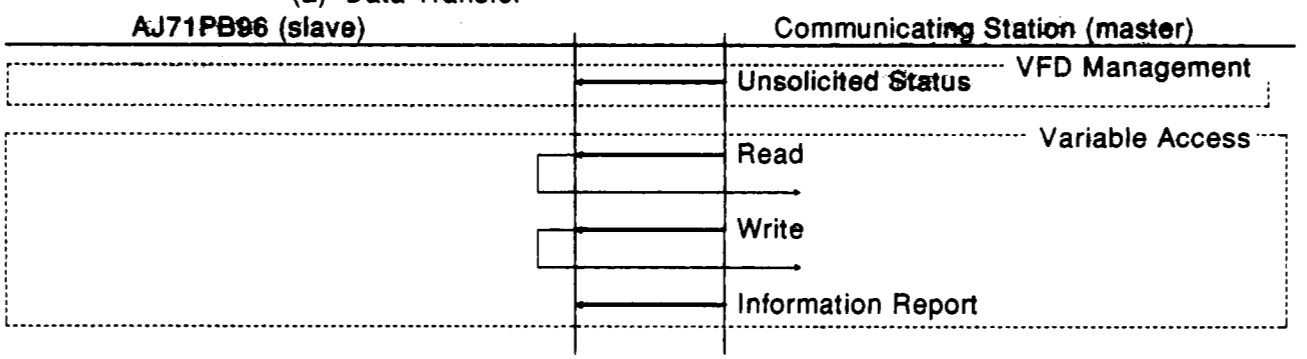


[FMS protocol (MSAC/D, /O: Slave station)]

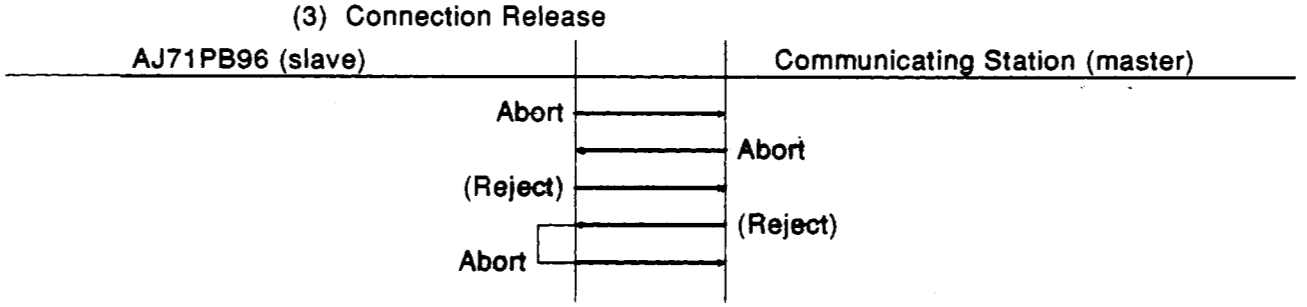
(1) Connection Establishment



(2) Data Transfer

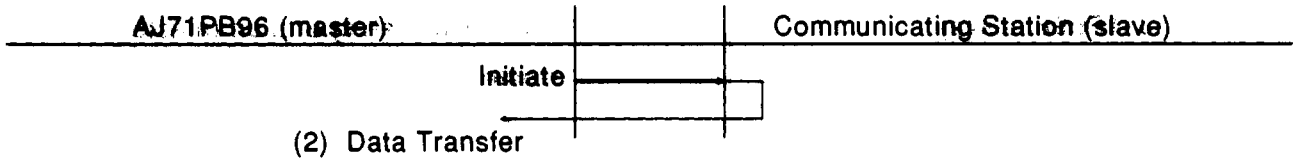


(3) Connection Release

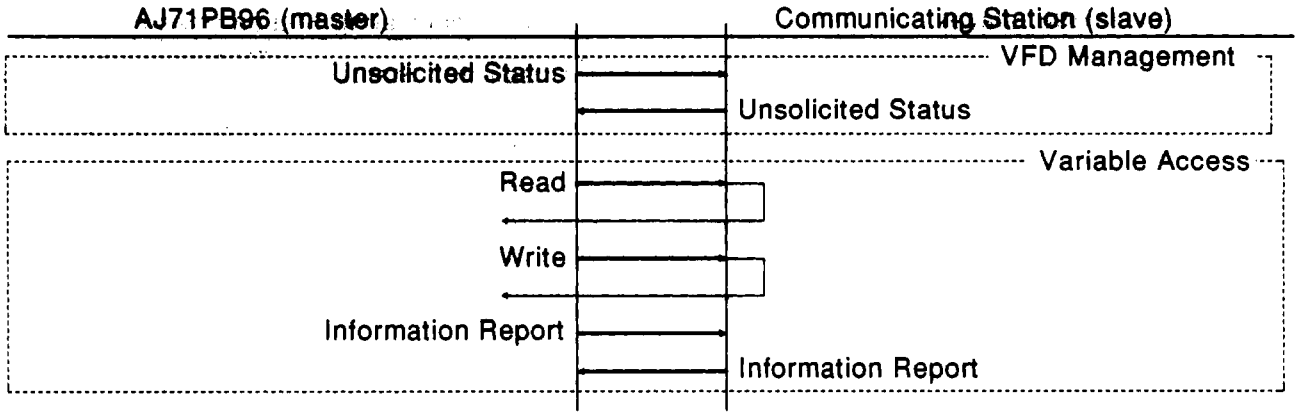


[FMS protocol (MSYC_SI/D: Master station)]

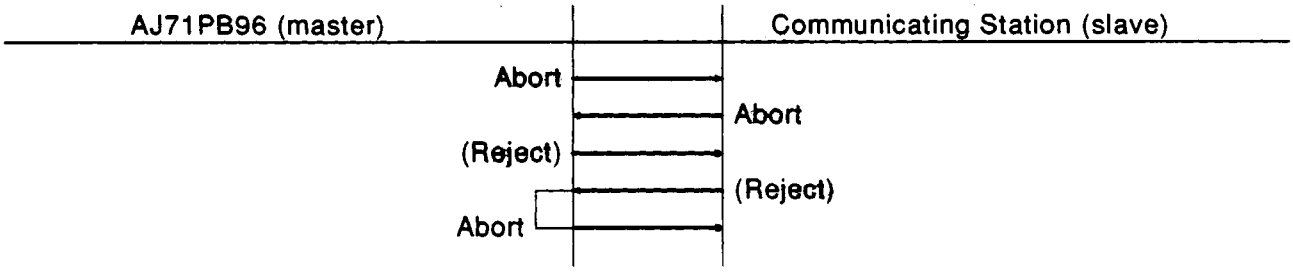
(1) Connection Establisment



(2) Data Transfer

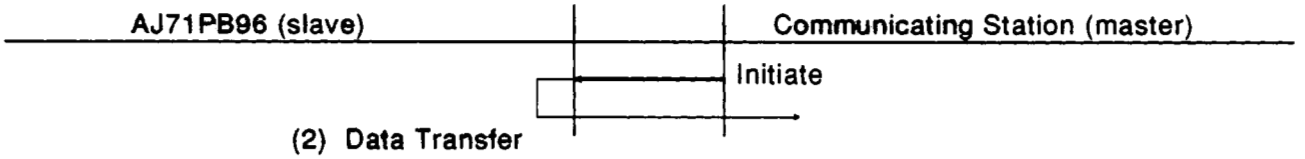


(3) Connection Release

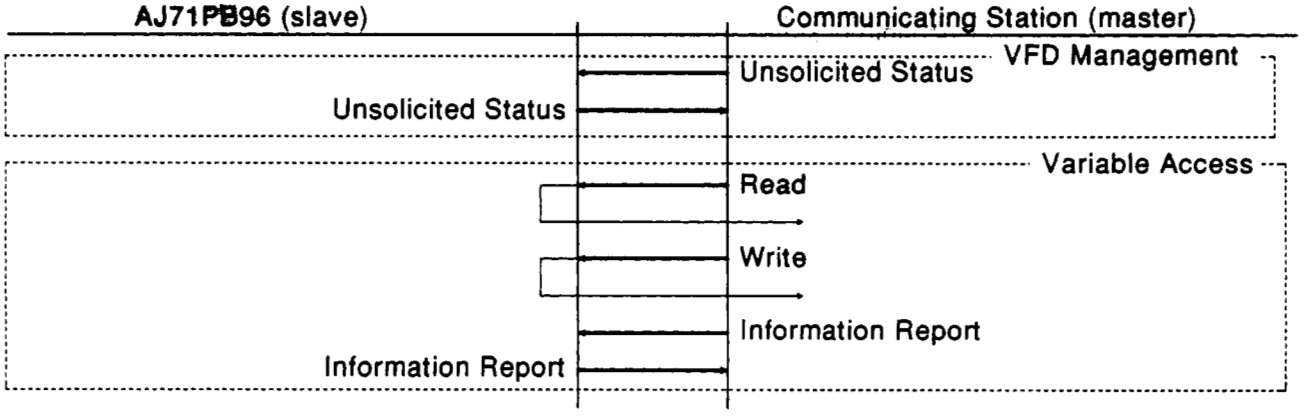


[FMS protocol (MSCY_SI/D, /O: Slave station)]

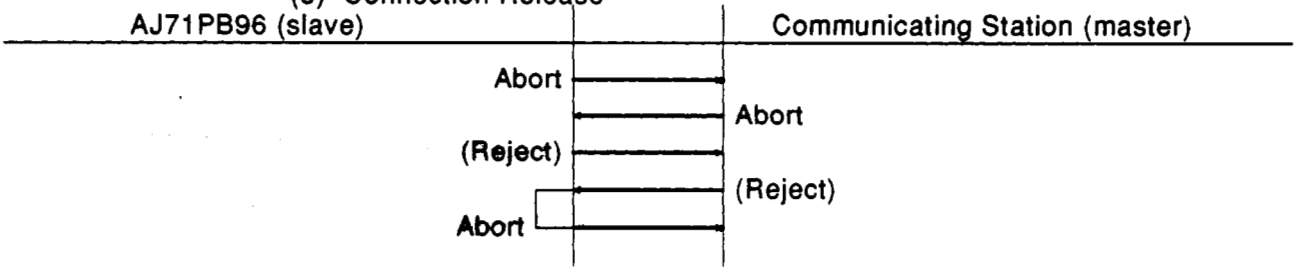
(1) Connection Establishment



(2) Data Transfer



(3) Connection Release

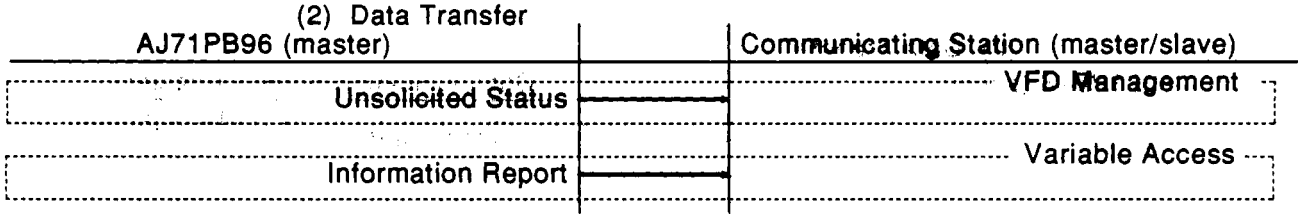


[FMS protocol (BRCT, MULT: Requester)]

(1) Connection Establishment

No connection is established for Connection Less Communication.

(2) Data Transfer



(3) Connection Release

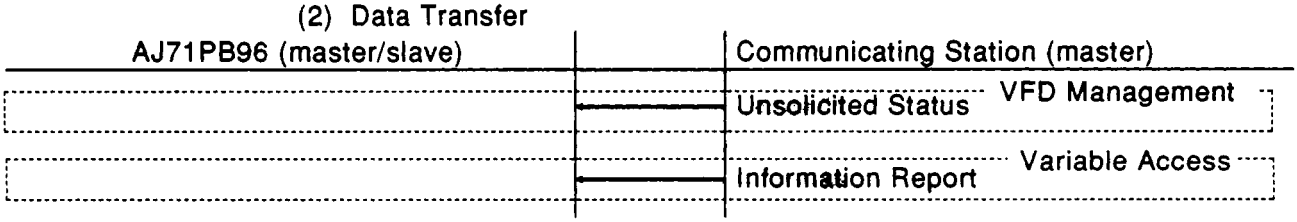
Connection release is not performed in the case of Connection Less Communication.

[FMS protocol (BRCT, MULT: Receiver)]

(1) Connection Establishment

Connection release is not performed in the case of Connection Less Communication.

(2) Data Transfer



(3) Connection Release

Connection release is not performed in the case of Connection Less Communication.

3. CONNECTING WITH AN AJ71PB96 (INITIATE: RESPONDER)

To communicate with an AJ71PB96, the master station (client) transmits an Initiate service to establish a logical connection.

Up to 32 connections can be established with a single AJ71PB96.

[Parameter settings required by the initiator (AJ71PB96)]

- Version OD

  Version number of the Object Dictionary

Version OD Value
Version OD

- Profile Number (Calling)

  Specifies the profile number.

Profile Number Value
Profile number supported by the initiator

- Access Protection Supported (Calling)

  Specifies whether or not access protection is supported.

Access Protection Value	Meaning
Fales = 0	Not supported
True = FF (HEX)	Supported

- Password (Calling)

  Passwords are allocated to individual connections.

Password Value
00 (HEX)

- Access Groups (Calling)

  Access groups are allocated to individual connections.

Access Groups Value
00 00 (HEX)

- Max. Send PDU Size (High Priority) (Calling)

  Size of the largest transmissible FMS communication packet when High Priority is used.

Max. Send PDU Size (H) Value
PDU size

- Max. Send PDU Size (Low Priority) (Calling)
  Size of the largest transmissible FMS communication packet when Low Priority is used.

Max. Send PDU Size (L) Value
PDU size

- Max. Send PDU Size (High Priority) (Calling)
  Size of the largest receivable FMS communication packet when High Priority is used.

Max. Receive PDU Size (H) Value
PDU size

- Max. Recieve PDU Size (Low Priority) (Calling)
  Size of the largest receivable FMS communication packet when Low Priority is used.

Max. Receive PDU Size (L) Value
PDU size

- Features Supported (Calling)
  Types of service that can be used.

Value of Features Supported
Features Supported octet string

POINT

In order to establish a connection using PROFIBUS the following condition must be satisfied: Capability of receiving station ≥ Capability of sending station.
In order to establish a connection, the settings made at the two stations must be as follows:

Station A		Station B
Max. Send PDU Size (High Priority)	≤	Max. Receive PDU Size (High Priority)
Max. Send PDU Size (Low Priority)	≤	Max. Receive PDU Size (Low Priority)
Max. Receive PDU Size (High Priority)	≥	Max. Send PDU Size (High Priority)
Max. Receive PDU Size (Low Priority)	≥	Max. Send PDU Size (Low Priority)
(n)th bit of Feature Supported	≤	(n + 24)th bit of Feature Supported (0 ≤ n ≤ 23)
(m + 24)th bit of Feature Supported (0 ≤ m ≤ 23)	≥	(m)th bit of Feature Supported

NOTE

AJ71PB96 uses the logical product of each bit of the value set using Utility (SW0IX-PB96PE) and each bit of:

C0 30 81 C0 30 81 (HEX)

[Response from the server (AJ71PB96)]

- Version OD (Called)

  Version number of the Object Dictionary

Version OD Value
Version OD

- Profile Number (Called)

  Specifies the station attribute and device identity.

Profile Number Value
00 00 (HEX)

- Access Protection Supported (Called)

  Specifies whether or not access protection is supported.

Access Protection Value	Meaning
Fales = 0	Not supported

- Password (Called)

  Passwords are allocated to individual connections.

Password Value
Set by using utility package

- Access Groups (Called)

  Access groups are allocated to individual connections.

Access Groups Value
Set by using utility package

4. PC CPU STATUS INFORMATION (STATUS: SERVER)

In order to obtain the PC CPU status information, the client transmits the Status service.
The AJ71PB96 that receives the service returns the data contents of the PC CPU special relays M9000 to M9008 (excluding M9001 and M9003) to the client.

[Parameter settings required by the client]
- None

[Response from the server (AJ71PB96)]
- Logical Status

  Not used.

Logical Status value	0 (fixed)

- Physical Status

  Indicates the status of the VFD

Value	Status Name	Meaning
0	Operational	Operation from the client is possible.
1	Partially Operational	Operation from the client is possible but there is a self-diagnosis error (M9008 is ON).
2	Inoperable	Operation from the client is not possible.
3	Needs Commissioning	Operation from the client is possible. However, the PC CPU cannot be set to the RUN status. In addition, a self diagnosis error may occur.

For details, refer to the PHYSICAL STATUS CRITERIA TABLE in APPENDIX 2.

- Local Detail

  Data contents of M9000 to M9008 (excluding M9001 and M9003).

Contents of Local Detail

	MSB							LSB
0	Data of D9015							
2	9000	9002	9004	9005	9006	9007	9008	x

NOTE

x indicates indefinite values (either 0 or 1). Depending on the model of PC CPU, there may be special relays (M9000 and higher) that are not used. In such cases, these values are indefinite.

5. AJ71PB96 IDENTIFICATION INFORMATION (IDENTIFY: SERVER)

In order to obtain the AJ71PB96 identification information, the client transmits the Identify service .

[Parameter settings required by the client]
• None

[Response from the server (AJ71PB96)]
• The character strings tabled below are returned from the server.

Item	Character String
Vendor Name	MITSUBISHI ELECTRIC
Model Name	MELSEC-A AJ71PB96
Revision	VER 10A YYMMDD Note 1

Note 1: Indicates the date of issue.

6. OBTAINING VARIABLE OBJECT ATTRIBUTES (GET OD: SERVER)

In order to obtain the attributes of the objects defined for use with an AJ71PB96, the client transmits the Get OD service. In PROFIBUS, the attributes of the objects are registered in the OD (object dictionary). The attribute data for one object is called an OD entry.

[Parameter settings required by the client]

- All Attributes (format in which the object attributes are obtained)

  Specify the format in which the object attributes are obtained.

All Attributes Value	Meaning
Fales = 0	Specific attributes (the minimum required) are obtained.
True = FF (hex)	All attributes are obtained.

POINT

If "All Attributes = False" is specified, the attributes listed below cannot be obtained. Specify "True" to obtain these attributes.

- 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 value in accordance with Access Specification, as shown below.

Access Specification	Set Value
Index	Index for the obtained OD entry
Variable Name	Name of the obtained variable object
Start Index	Index of the first object for which attributes obtained

[Response from the server (AJ71PB96)]

- List of Object Description (list of OD entries obtained)

  Indicates the data for the obtained OD entries.

- More Follows

  The response from the server indicates whether or not there are more OD entries remaining.

More Follows Value	Meaning
Fales = 0	No OD entries remaining
True = FF (hex)	OD entries remaining

7. READING THE DEVICE MEMORY (READ: SERVER)

In order to read data from the device memory of the PC CPU, the client transmits the Read service.

The AJ71PB96 that receives the Read service returns the specified data from the device memory.

The device memory to be read must be registered in the OD as array variables or simple variables by using an SW0IX-PB96PE. On shipment, an AJ7PB96 has the array variables listed in Appendix 1 registered in its OD.

[Parameter settings required by the client]

- Access specification

  The devices to be read can be specified by using either Index or Name.

Access Specification	Set Value
Index	Index of the variable to be read
Variable Name	Name of the variable to be read

- Subindex

  When reading Array Objects, the subindex is used to specify the element of the Array Object that is to be read.
  If no subindex is specified, all elements are read.

Example: SUBINDEX = 3 set when reading an Array..

Here, D2 is to be read from an Array assigned to D0 through D63.
To do this, SUBINDEX = 3 is specified.

D0	D1	D2	D3		D8	D9
(1)	(2)	(3)	(4)	.....	(9)	(10)

[Response from the server (AJ71PB96)]

- Data

  The read data is set in the response.

  Note that, in the case of a bit-string, the data will be arranged as indicated below.

Data arrangement on accessing using a 16-bit Bit-String starting at M100...

	MSB							LSB
0	M100	M101	M102	M103	M104	M105	M106	M107
1	M108	M109	M110	M111	M112	M113	M114	M115

In the PROFIBUS protocol, the units for reading Bit-String data are 8 bits. In other words, it is not possible to read data whose bit length is not a multiple of 8 (3 or 4 bits, for example).

8. WRITING TO THE DEVICE MEMORY (WRITE: SERVER)

In order to write data to the device memory of the PC CPU, the client transmits the Write service.

The AJ71PB96 that receives the Write service writes the specified data to the device memory.

The device memory to which data can be written must be registered in the OD as Array Variables or Simple Variables by using an SW0IX-PB96PE. On shipment, an AJ7PB96 has the array variables listed in Appendix 1 registered in its OD.

[Parameter settings required by the client]

- Access Specification

  The devices to be written can be specified by using either the Index or the Name.

Access Specification	Set Value
Index	Index of the variable to be read
Variable Name	Name of the variable to be read

- Subindex

  When writing Array Objects, the subindex is used to specify the element of the Array Object that is to be written.
  If no subindex is specified, all elements are written.

Example: SUBINDEX = 3 set when writing to an Array..

Here, data is to be written to D2 in the Array assigned to D0 through D63. To do this, SUBINDEX = 3 is specified.

D0	D1	D2	D3		D8	D9
(1)	(2)	(3)	(4)	.....	(9)	(10)

- Data

  Set the data to be written.

  Note that, in the case of a Bit-String, the data will be arranged as indicated below.

Data arrangement on accessing using a 16-bit Bit-String starting at M100..

	MSB							LSB
0	M100	M101	M102	M103	M104	M105	M106	M107
1	M108	M109	M110	M111	M112	M113	M114	M115

In the PROFIBUS protocol, the units for writing Bit-String data are 8 bits. In other words, it is not possible to write data whose bit length is not a multiple of 8 (3 or 4 bits, for example).

[Response from the server (AJ71PB96)]

- None

9. RELEASING CONNECTION WITH THE AJ71PB96 (ABORT: RECEIVER)

To release a connection with an AJ71PB96, the Abort service is transmitted. After receiving Abort service there is no longer a logical connection with the AJ71PB96.

If there is a mistake in the FMS protocol or the parameter settings, the Abort service will be transmitted, or received, automatically.

[Parameters required for the requester]

- Abort Identifier

  This indicates the communication layer in which the "Abort" service is issued.

Abort Identifier	Description
0 (USER)	Aborted from an application.
1 (FMS)	Aborted from the FMS.
2 (LLI)	Aborted from the LLI.
3 (Layer2)	Aborted from layer 2.

POINT

To abort from a user-created application program, the applicable Abort Identifier value is "0" (USER). All the other values are used at the communication unit that is actually involved in the communication.

- Reason Code (reason for aborting)

  This indicates the reason for aborting.

Reason Code
Reason Code regulated by PRIFIBUS

- Abort Detail

  Set detailed information on the "Abort" service.
  The method of use for this parameter is governed by the profile supported by the requester.

Abort Detail
Detailed information for Abort (max. 16 octets)

[Response from the receiver (AJ71PB96)]

- None

10. REJECTION OF A SERVICE (REJECT)

The Reject service is transmitted when an FMS protocol error occurs; it is not under the control of the user.

11. SENDING VFD STATUS INFORMATION TO THE AJ71PB96 (UNSOLICITED STATUS: RECEIVER)

To send self station VFD status information to the AJ71PB96 spontaneously, issue "Unsolicited Status".

The AJ71PB96 will set the received data in the buffer memory. (See the User's Manual for details on the buffer memory.)

[Parameters required for the requester]

- Priority

  Set the order of priority in accordance with which the Unsolicited Status is to be sent.

Priority	Description
Low	Issued with a low order of priority.
High	Issued with a high order of priority.

- Logical Status

  Indicates the logical status of the VFD.

Value	Meaning
0	Communication possible status (State Changes Allowed)
2	Communication possible status (Limited Services Permitted)
4	OD loading in progress (OD Loading Non Interacting)
5	OD loading in progress (OD Loading Interacting)

- Physical Status

  Indicates the physical status of the VFD.

Value	Meaning
0	Communication possible status (State Changes Allowed)
1	Communication possible status (Limited Services Permitted)
2	OD loading in progress (OD Loading Non Interacting)
3	OD loading in progress (OD Loading Interacting)

- Local Detail

  Set the detailed information for VFD status.
  The method of use for this parameter is governed by the profile supported by the requester.

Local Detail
Detailed information for VFD status (24 bits)

[Response from the receiver (AJ71PB96)]
- None

NOTE

(1) AJ71PB96 cannot receive this service under the following circumstances:
- When the connection type is MSAC or MSCY and the AJ71PB96 is operating as a master station.
- When the connection type is BRCT or MULT and the AJ71PB96 is operating as a requester.

(2) The Priority parameter set for the requester is not set in the AJ71PB96 buffer memory.

(3) The maximum number of unconfirmed services that the AJ71PB96 can receive before they are read by the programmable controller CPU is one per connection.
If more than one unconfirmed service is received, the A71PB96 releases the connection.

12. SENDING ARBITRARY DATA TO AN AJ71PB96 (INFORMATION REPORT: RECEIVER)

To send self station variable values to the AJ71PB96 spontaneously, issue "Unsolicited Status".

The AJ71PB96 will set the received data in the buffer memory. (See the User's Manual for details on the buffer memory.)

[Parameters required for the requester]

- Priority

  Set the order of priority in accordance with which the Unsolicited Status is to be sent.

Priority	scription
Low	Issued with a low order of priority.
High	Issued with a high order of priority.

- Access Specificaion

  The variables to be sent can be specified by Index or by Name.

Access Specification	Set Value
Index	Index of the variable to be read
Variable Name	Name of the variable to be read

- Subindex

  Used to designate which element of an Array Object is sent.
  If no Subindex is designated, all elements will be sent.

- Data

  Set the data to be sent.

[Respense from the receiver (AJ71PB96)]

- None

NOTE

(1) The AJ71PB96 cannot receive this service under the following circumstances:

- When the connection type is MSAC or MSCY and the AJ71PB96 is operating as a master station.
- When the connection type is BRCT or MULT and the AJ71PB96 is operating as a requester.

(2) The Priority parameter set for the requester is not set in the AJ71PB96 buffer memory.

(3) If the AJ71PB96 receives this service using one of the following communication types, the AJ71PB96 will not interpret the received in accordance with the OD of the communicating station (remote OD):

MMAC/O, MSAC/O, MSAC_SI/O,MSCY/O, MSCY_SI/O
BRCT, MULT

13. ESTABLISHING A CONNECTION (INITIATE: INITIATOR)

When a connection is established from an AJ71PB96 operating as the Initiator, "Initiate" is transmitted using the I/Os (X, Y) of the PC CPU and the buffer memory.
For details on the transmission procedure, refer to the User's Manual.

The connection is established on reception of a normal response.

[Send data of the Initiator (AJ71PB96)]

- Version OD (Calling)

  Version number for the Object dictionary.

Version OD Value
1

- Profile Number (Calling)

Profile Number Value
00 00 (HEX)

- Access Protection Supported (Calling)

  Determines whether or not access protection is supported.

Protection Value	Meaning
False = 0	Not supported

- Password (Calling)

  A different password is allocated to each connection.

Password Value
Set by using utility package.

- Access Groups (Calling)

  An access group is allocated to each connection.

Access Groups Value
Set by using utility package.

- Max. Send PDU Size (High Priority) (Calling)

  Size of the largest transmissible FMS communication packet when High Priority is used.

Max. Send PDU Size (H) Value
Set by using utility package.

- Max. Send PDU Size (Low Priority) (Calling)
  Size of the largest transmissible FMS communication packet when Low Priority is used.

Max. Send PDU Size (L) Value
Set by using utility package.

- Max. Receive PDU Size (High Priority) (Calling)
  Size of the largest receivable FMS communication packet when High Priority is used.

Max. Receive PDU Size (H) Value
Set by using utility package.

- Max. Receive PDU Size (Low Priority) (Calling)
  Size of the largest receivable FMS communication packet when Low Priority is used.

Max. Receive PDU Size (L) Value
Set by using utility package.

- Features Supported (Calling)
  Types of service that can be used.

Value of Features Supported
Set by using utility For the names of services, see [FMS Protocol] in Chapter 2.

POINT

In order to establish a connection using PROFIBUS the following condition must be satisfied: capability of receiving station ≥ capability of sending station.
In order to establish a connection, the settings made at the two stations must be as follows:

Station A		Station B
Max. Send PDU Size (High Priority)	≤	Max. Receive PDU Size (High Priority)
Max. Send PDU Size (Low Priority)	≤	Max. Receive PDU Size (Low Priority)
Max. Receive PDU Size (High Priority)	≥	Max. Send PDU Size (High Priority)
Max. Receive PDU Size (Low Priority)	≥	Max. Send PDU Size (Low Priority)
(n)th bit of Feature Supported	≤	(n + 24)th bit of Feature Supported (0 ≤ n ≤ 23)
(m + 24)th bit of Feature Supported (0 ≤ m ≤ 23)	≥	(m)th bit of Feature Supported

NOTE

AJ71PB96 uses the logical product of each bit of the value set using utility (SW0IX-PB96PE) and each bit of:

C0 30 81 C0 30 81 (HEX)

14. VFD STATUS INFORMATION (STATUS: CLIENT)

When an AJ71PB96, operating as a client, obtains VFD status information, a Status service is transmitted using the I/Os (X, Y) of the PC CPU and the buffer memory.

For details of the transmission method, refer to the User's Manual.

[Client (AJ71PB96) send data]
- None

15. OBTAINING IDENTIFICATION INFORMATION (IDENTIFY: CLIENT)

When an AJ71PB96, operating as a client, obtains identification information, a Status service is transmitted by using the I/Os (X, Y) of the PC CPU and the buffer memory.

For details on the transmission procedure, refer to the User's Manual.

[Client (AJ71PB96) send data]
- None

16. OBTAINING OBJECT ATTRIBUTES (GET OD: CLIENT)

The variable object attribute acquisition request (Get OD service) is automatically transmitted from an AJ71PB96 when there is no OD information at the remote station during a Read/Write operation.

[Client (AJ71PB96) send data]

• All Attributes (acquisition format for object attributes)

The acquisition format for variable object attributes is specified as the "Long form" or the "Short form" in accordance with the first bit of CRL Feature Supported.

First Bit	All Attributes Value	Meaning
OFF	False = 0	Short: Specific attributes (the minimum required) are acquired.
ON	True = FF (hex)	Long: All attributes are acquired.

POINT

If "All Attributes = False" is specified, the attributes listed below cannot be acquired.

- Password
- Access Groups
- Access Right
- 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

Automatically set in accordance with the Access Specification value of the Read/Write service.

Read/Write Access Spec.	Get OD Access Spec.	Set Value
Index	Index	Index set in buffer memory
Name	Variable Name	Variable name set in buffer memory

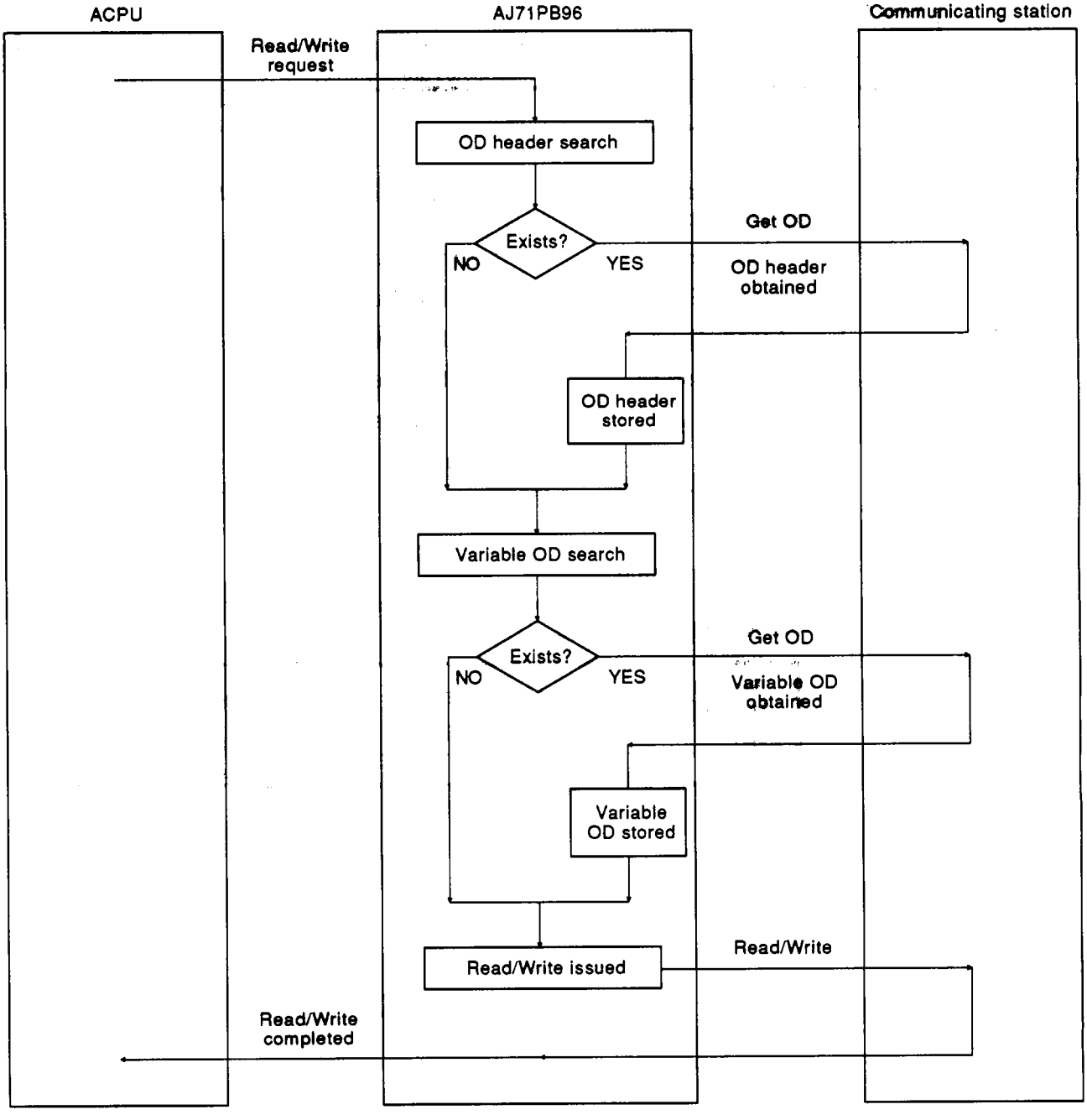
[AJ71PB96 remote OD management]

The remote ODs managed by the AJ71PB96 can be divided into two types.

These are called automatically managed remote ODs (abbreviated to "automatic remote ODs" hereafter) and manually managed remote ODs ("manual remote ODs" hereafter).

(1) Automatic remote ODs

When the AJ71PB96 issues a Read/Write service, if the remote OD for the specified variable is not stored in the AJ71PB96, the AJ71PB96 automatically issues a GetOD to obtain the remote OD for that variable, and stores this remote OD on obtaining it.



The "OD header" (OD Object Description) in the figure above contains information that describes the OD object itself.

An AJ71PB96 can manage a maximum of 1024 automatic remote ODs including OD headers. To obtain a 1025th remote OD, overwrite the previously obtained automatic remote OD that is least frequently used.

When the connection is released, all the automatic remote ODs that were obtained through that connection will be deleted.

(2) Manual remote ODs

The AJ71PB96 has a function for obtaining remote ODs automatically but it is not possible to use this function in some cases. In these cases the utility package (SW0IX-PB96PE) must be used to store the remote OD in the AJ71PB96 in advance.

The cases in which a manual remote OD has to be set are the following:

(a) ODs for variables read/written using an MSCY or MSCY_SI connection while the AJ71PB96 is operating as a client (master station).

(b) ODs for variables which the communicating station could notify in an Information Report through any "/D" or "/I" connection.

Manual remote ODs are not deleted when the connection is released.

An AJ71PB96 can control up to 100 manual remote ODs including OD headers.

17. READING VARIABLES (READ: CLIENT)

When an AJ71PB96 operating as a client reads variable data of server station, a Read service is transmitted using the I/Os of the PC CPU and the buffer memory.
For details on the transmission procedure, refer to the User's Manual.

If a normal response is received, the data read in the server station is sotred to the buffer memory.

[Client (AJ71PB96) send data]

- Access Specification

  The variables to be sent can be specified by Index or by Name.

Access Specification	Set Value
Index	Index of the variable to be read
Variable Name	Name of the variable to be read

- Subindex

  Used to designate which element of an Array Object is read.

  If no subindex is designated, all elements will be read.

18. WRITING VARIABLES (WRITE: CLIENT)

When a AJ71PB96, operating as a client, writes data to the variables of a server station, a Write service is transmitted using the I/Os (X, Y) of the PC CPU and the buffer memory.
For details on the transmission procedure, refer to the User's Manual.

If a normal response is received, the data set in the buffer memory is written to the server station.

[Client (AJ71PB96) send data]

- Access Specification
  Refer to "Read" on page 17 – 1.
- Subindex
  Refer to "Read" on page 17 – 1.
- Data
  The data is set.

19. RELEASING A CONNECTION (ABORT: REQUESTER)

When a connection is released from either a client or server AJ71PB96, an Abort service is transmitted using the I/Os (X, Y) of the PC CPU and the buffer memory.
For details on the transmission procedure, refer to the User's Manual.

After the service is transmitted, the connection is released.

[AJ71PB96 send data]

- Abort Identifier
  Layer from which Abort is issued.

Abort Identifier
0 (USER)

- Reason Code
  Reason for Abort.

Reason Code
Disconnect

- Abort Detail
  Not used.

NOTE

The parameter values given here are those when Abort is executed by the sequence program. When Abort is executed by the communication protocol S/W due to a parameter error, any of the parameter values provided by PROFIBUS may be used.

20. ARBITRARY DATA TRANSMISSION (INFORMATION REPORT: REQUESTER)

When the device data is send from an AJ71PB96, an Information Report service is transmitted using the I/Os (X, Y) of the PC CPU and the buffer memory.

For details on the transmission procedure, refer to the User's Manual.

NOTE

In order to send an Information Report from a slave station, the connection type must be MSAC_SI, or MSCY_SI.

[AJ71PB96 send data]

- Priority

  The priority is set.

Priority Value
Set by using utility package

- Subindex

  Refer to "Read" as Server on page 7 – 1.

- Access Specification

  Refer to "Read" as Server on page 7 – 1.

- Data

  The send data is set.

21. SENDING PC CPU STATUS INFORMATION (UNSOLICITED STATUS: REQUESTER)

When the PCCPU status information, M9000, M9002, M9004 to M9008 is sent from an AJ71PB96, the Unsolicited Status service is transmitted using the I/Os of the PC CPU and the buffer memory.

For details on the transmission procedure, refer to the User's Manual.

NOTE

In order to send an Unsolicited Status from a slave station, the connection type must be MSAC_SI, or MSCY_SI.

[AJ71PB96 send data]

- Priority

  The priority is set.

Priority Value
Set by using utility package

- Logical Status

  Same as in [Response from the server (AJ71PB96)] in Chapter 4. PC CPU STATUS INFORMATION (Status)

- Physical Status

  Same as in [Response from the server (AJ71PB96)] in Chapter 4. PC CPU STATUS INFORMATION (Status)

- Local Detail

  Same as in [Response from the server (AJ71PB96)] in Chapter 4. PC CPU STATUS INFORMATION (Status)

22. POINTS TO NOTE

This chapter lists points to note in connection with use of the AJ71PB96.

22.1 Read/Write

The maximum accessible data size is as follows:

Octet-String .....128 bytes

Bit-String .....1024 bits

22.2 Service Transmission from PC CPU

The Information Report service is transmitted in 150 msec. after being requested from the PC CPU.

> Response to a service request from the client can be transmitted in 100 msec. on average. However, low priority of receipt of the request from the PC CPU and limited performance of the PC CPU may take more time.

22.3 Accessing MELSEC-NET Local Stations

Due to the performance of the PC CPU and that of MELSEC-NET, access to local stations may be delayed under some conditions. To minimize access time, transmit the local station information using MELSEC-NET data link devices (B, W).

(1) Service requests from the client

If another service request is received while a local station is being accessed, processing of the request will start after the service in progress has been completed.

(2) Service transmissions from the PC CPU

For the restriction given in (1)above, if there is a system-related restriction on the transmission time for event notification using the Information Report and Unsolicited Status service do not attempt large-volume data access to local stations.

22.4 Service Parameter Errors

When the AJ71PB96 receives or sends "Reject" due to a service parameter error, etc., it sends an "Abort" service immediately afterwards.

If this happens, re-establish the connection by issuing an "Initiate" service.

22.5 Limit on Number of Unconfirmed Services Received

The maximum number of unconfirmed services (Information Report, Unsolicited Status) that the AJ71PB96 can receive before they are read by the programmable controller CPU is one per connection.

If more than one unconfirmed service is received, if the communication is a Connection Oriented Communication the AJ71PB96 will send an Abort service to release the connection. In the case of a Connection Less Communication the received data will be lost.

APPENDIX 1 VARIABLE ACCESS SPECIFICATIONS

(1) Remote variables

The types of remote station and variables that can be hadnled by the AJ71PB96 are tabled below.

	Array	Simple Variable
Boolean	O	O
Integer8	O	O
Unsigned8	O	O
Integer16	O	O
Unsigned16	O	O
Integer32	O	O
Unsigned32	O	O
Floating Point	X	X
Visible String	X	X
Octet String	O	O
Date	X	X
Time of Day	X	X
Time Difference	X	X
Bit String	O	O

Record, Variable List and Data Type Structure are not supported.

(2) Self station variables

The AJ71PB96 can allocate programmable controller CPU devices to Arrays or Simple Variables. Up to 128 devices can be defined in this allocation. The AJ71PB96 uses the following codes to identify devices.

Device Code	Device Name	Device Code	Device Name
X	Input	TM	Timer set value, main
Y	Output	TS	Timer set value, sub
L	Latch relay	CM	Counter set value, main
M	Internal relay	CS	Counter set 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	|	|
D	Data register	48R	Expansion file register No.48
SD	Special register		

The table below shows the data types that can be used when allocating programmable controller CPU devices to each variable.

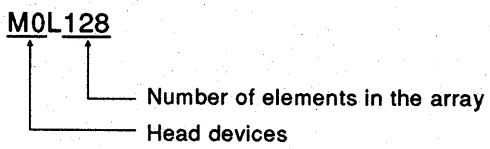
	Array		Simple Variable	
	Bit Device	Word Device	Bit Device	Word Device
Boolean	O	X	O	X
Integer8	X	X	X	O
Unsigned8	X	X	X	O
Integer16	X	X	X	O
Unsigned16	X	O	X	O
Integer32	X	X	X	O
Unsigned32	X	X	X	O
Floating Point	X	X	X	X
Visible String	X	X	X	X
Octet String	X	X	X	O
Date	X	X	X	X
Time of Day	X	X	X	X
Time Difference	X	X	X	X
Bit String	X	X	O	X

On shipment of an AJ71PB96, a 128-point array is allocated, as shown below.

Index	Registered Points/Array	Data Type	Registered 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

An example of a variable name on shipment is given below.

Example: Variable name for the Index = 100 array:



APPENDIX 2 VFD PHYSICAL STATUS CRITERIA TABLE

Value	VFD 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-Commisioning	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 unit error. The running/stopped status on occurrence of an error is determined by the PC CPU parameter settings.

APPENDIX 3 PICS (FMS PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT)

Limited Use Only

'94. 3. 31

Mitsubishi MELSEC-A PROFIBUS i/f unit, AJ71PB96
FMS Protocol Implementation Conformance Statement

This document describes the conformance of Mitsubishi's MELSEC-A AJ71PB96 to DIN 19245

PICS Part One: Implementation and System

Implementation's Vendor Name	Mitsubishi
Implementation's Model Name	MELSEC-A
Implementation's Revision Identifier	Ver 1.0
Vendor Name of FMS	
Controller Type of FMS	
Hardware Release of FMS	
Software Release of FMS	
Profile Number	
Calling FMS User (indicate "Yes" or "No")	Yes
Called FMS-user (indicate "Yes" or "No")	Yes

Limited Use Only

PICS Part Two: Service Service

Service	Primitive Supported?	
	.req, .con	.ind, .res
Initiate	Yes	
Status	Yes	
Identify	Yes	
Get OD	Yes	
Get OD (Long Form)	Yes	Yes
Unsolicited Status	Yes	Yes
Initiate Put OD Put OD Terminate Put OD	No	No
Initiate Download Sequence Download Segment Terminate Download Sequence	No	No
Initiate Upload Sequence Upload Segment Terminate Upload Sequence	No	No
Request Domain Download	No	No
Request Domain Upload	No	No
Create Program Invocation Delete Program Invocation	No	No
Start Stop Resume Reset	No	No
Kill	No	
Read	Yes	Yes
Write	Yes	Yes
Read with Type	No	No
Write with Type	No	No
Phys Read	No	No
Phys Write	No	No
Information Report	Yes	Yes
Information Report with Type	No	No
Define Variable List Delete Variable List	No	No
Event Notification	No	No
Event Notification with Type	No	No
Acknowledge Event Notification	No	No
Alter Event Condition Monitoring	No	No

Limited Use Only

PICS Part Three: FMS Parameters and Options

FMS Parameters and Options	Detail
Named Address	Yes
Maximum length for Names	32
Access Protection supported	No
Maximum length for Extension	0
Maximum length for Arguments	0

PICS Part Four: Local Implementation Values

Local Implementation Values	Detail
Maximum length for FMS PDU	241
Range of maximum Service Out Standing Calling	0 to 1
Maximum number of Service Out Standing Called	2
Syntax and semantics of the Extension-Argument	—
Syntax and semantics of Extensions	—

APPENDIX 4 ERROR CODES

1. Context

Initiate

CLASS	CODE	CAUSE
Initiate(0)	E_INIT_MAX_PDU_SIZE_INSUFF(1)	• The maximum number of services that can be processed simultaneously is invalid. • The support service setting is invalid.
Initiate(0)	E_INIT_USER_DENIED(4)	• An already established connection has been specified.

2. VFD Support

Status

CLASS	CODE	CAUSE
Access(6)	E_ACCESS_OBJ_INVALIDATED(1)	• Programmable controller CPU error

3. OD Management

GetOD

CLASS	CODE	CAUSE
Access(6)	E_ACCESS_OBJ_NON_EXIST(7)	• An undefined OD has been specified.
OD(7)	E_OD_OERFLOW(2)	• An undefined OD has been specified (it exceeds the maximum Index value registered in the set Index).

4. Variable Access

Common

CLASS	CODE	CAUSE
Access(6)	E_ACCESS_OBJ_ACCESS_UNSUPP(6)	• Data length exceeds 128 bytes.
	E_ACCESS_NAME_ACCESS_UNSUPP(9)	• A variable name has been specified although variable name access is not supported.
	E_ACCESS_OBJ_NON_EXIST(7)	• An undefined object has been specified. • An access mode other than an Index or Name has been specified.
	E_ACCESS_OBJ_ACCESS_DENIED(3)	• The specified Subindex exceeds the number of elements of the array variable.
	E_ACCESS_OBJ_INVALIDATED(1)	• Programmable controller CPU error.
Service(5)	E_SERV_ILLIGAL_PARAM(5)	• Invalid device information has been set in the variable information.
OD(7)	E_OD_OVERFLOW(2)	• An undefined OD has been specified (it exceeds the maximum Index value registered in the set Index).

Write

CLASS	CODE	CAUSE
Access(6)	E_ACCESS_OBJ_ACCESS_DENIED(3)	• The write data length and data length of the written object do not match.

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 to 1

Connection Type: MSAC

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

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 to 1

Connection Type: MSCY

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

Connection Type: MSCY_SI

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

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

IMPORTANT

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

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

(a) Ground human body and work bench.

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

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

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

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

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: MITSUBISHI DENKI BLDG MARUNOUCHI TOKYO 100 TELEX: J24532 CABLE MELCO TOKYO
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IB (NA) 66459-A (9404) MEE Printed in Japan

Specifications subject to change without notice.