

MELSEC A Series

Programmable Logic Controller

User's Manual

Profibus DP Slave Module A1SJ71PB93D

• SAFETY PRECAUTIONS •

(Read these precautions before using.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.

The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the CPU module user's manual.


In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".



Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.



Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Note that the  CAUTION level may lead to a serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

Please save this manual to make it accessible when required and always forward it to the end user.

[DESIGN PRECAUTIONS]

DANGER

- When a communication error occurs in the PROFIBUS network, the status of the faulty station is as follows. Configure an interlock circuit in the sequence program using the communication status information (input X1) so that the system can operate safely.
Erroneous outputs and mis-operation could cause accidents.
 - (1) The input data from the master station remains unchanged from the data prior to the communication error.
 - (2) When the master station becomes faulty, the output status of the A1SJ71PB93D will be as in the parameter settings of the master station.
 - (3) When any A1SJ71PB93D is down, the output state of other slave stations will be in accordance with the parameter settings of the master station.
- Do not output the "prohibited to use" signal as the output signal to a special function module from the PLC CPU.
Writing data into the "system area" or outputting a signal for "prohibited to use" may cause system malfunction in the PLC.

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 malfunctioning.

[INSTALLATION PRECAUTIONS]

CAUTION

- Use the PLC in the environment defined in the general specifications given in this manual. Using this PLC in an environment outside the range of the general specifications may cause electric shock, fire, malfunction, and damage to or deterioration of the product.
- Load the module by securely inserting the module fixing hook at the bottom of the module into the fixing hole of the base unit.
Always screw the module to the base unit to the specified torque.
- Tighten the screws within the range of specified torque.
If the screws are loose, it may cause the module to fallout, short circuits, or malfunction.
If the screws are tightened too much, it may cause damage to the screw and/or the module, resulting in fallout, short circuits or malfunction.
- Switch all phases of the external power supply off when mounting or removing the module.
Not doing so may cause electric shock or damage to the module.
- Do not touch the conductive area or electric parts of the module.
Doing so may cause module malfunctioning or breakdowns.

[WIRING PRECAUTIONS]

CAUTION

- Switch all phases of the external power supply of the PLC system off before connecting the PROFIBUS cable. If you do not switch off the external power supply, it will 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 malfunctioning.
- 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, 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 breakdowns or malfunction of the module.

[DISPOSAL PRECAUTIONS]

CAUTION

- When disposing of this product, treat it as industrial waste.

REVISIONS

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

Print Date	* Manual Number	Revision
Sep., 2001	SH (NA) 080195-A	First printing
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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.

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About Manuals

The following are manuals related to this product.

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

Related Manuals

Manual Name	Manual Number
Type AJ71PB92D/A1SJ71PB92D PROFIBUS-DP Interface module User's Manual Describes the system configuration, specifications, functions and programming of the AJ71PB92D/A1SJ71PB92D. (Option)	IB-66773 (13JL20)
PROFIBUS-DP Interface module User's Manual Describes the system configuration, specifications, functions and programming of the QJ71PB92D. (Option)	SH-080127 (13JR22)

About the Generic Terms and Abbreviations

Unless otherwise specified, this manual uses the following generic terms and abbreviations to describe the Type A1SJ71PB93D PROFIBUS-DP slave module.

Generic Term/Abbreviation	Description of the abbreviation/general terms
A1SJ71PB93D	Abbreviated name of Type A1SJ71PB93D PROFIBUS-DP slave module
QJ71PB92D	Abbreviated name of Type QJ71PB92D PROFIBUS-DP interface module
AJ71PB92D	Abbreviated name of Type AJ71PB92D PROFIBUS-DP interface module
A1SJ71PB92D	Abbreviated name of Type A1SJ71PB92D PROFIBUS-DP interface module
Base unit	Generic name of MELSEC-A series main base unit and extension base unit compatible with A1SJ71PB93D
PROFIBUS-DP	Abbreviated name of PROFIBUS-DP network
Class 1 master station	Abbreviated name of class 1 master station (master/device) in PROFIBUS-DP network
Class 2 master station	Abbreviated name of class 2 master station (master/device) in PROFIBUS-DP network
Master station	Generic name of class 1 and class 2 master stations
Slave station	Abbreviated name of slave station (slave device) inside PROFIBUS-DP network

Definitions of the Terms

The terms used in this manual have the following meanings and definitions.

Term	Definition
Station number	"FDL Address" in the PROFIBUS specification
Expansion trouble information	"Extended Diagnostic Information" in the PROFIBUS specification
I/O configuration information (Data module)	"Configuration Data" in the PROFIBUS specification
Input data	Data sent by the A1SJ71PB93D and received by the master station (data input by the master station)
Output data	Data sent by the master station and received by the A1SJ71PB93D (data output by the master station)
Communication WDT	Watchdog timer set in the slave parameter of the master station
Module WDT	Watchdog timer in the A1SJ71PB93D

Product Structure

The product structure of this product is given in the table below.

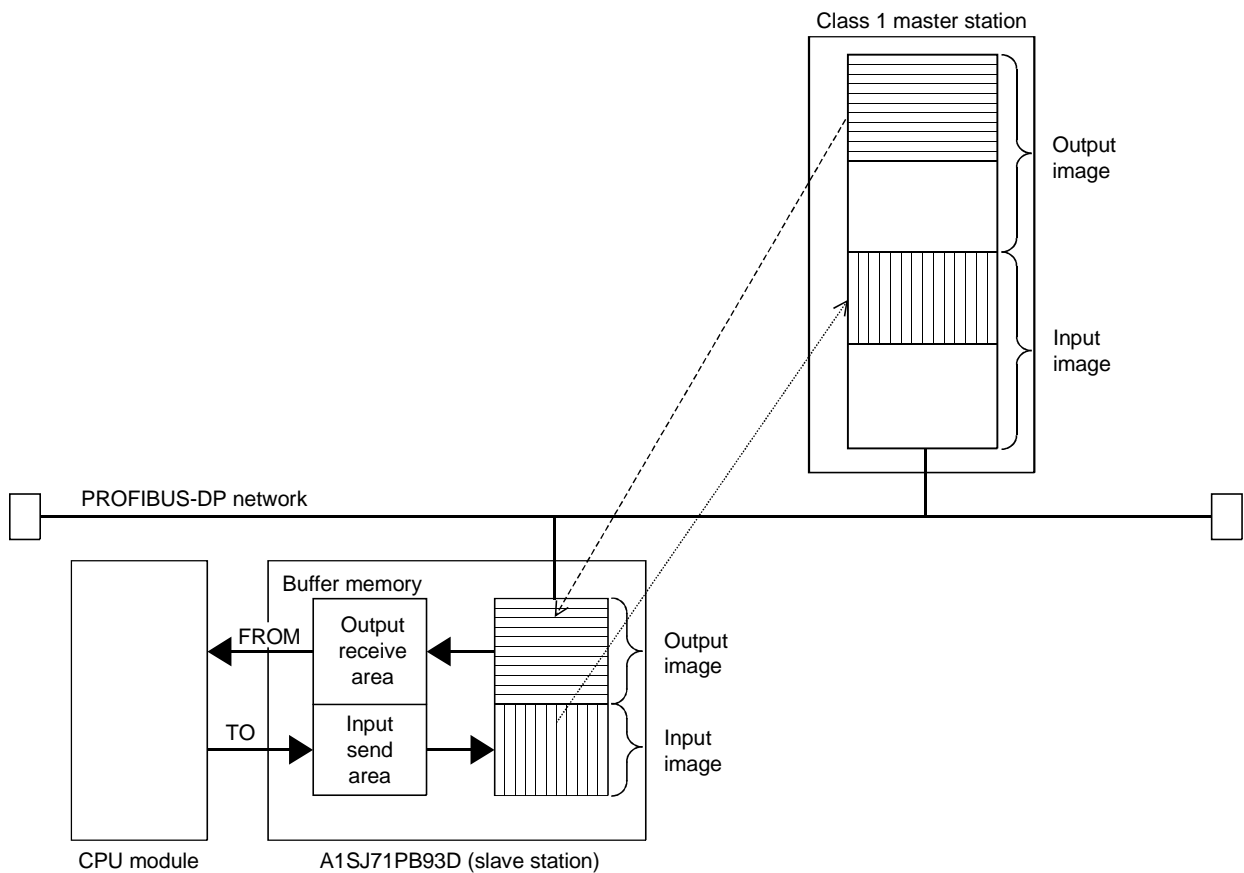
Model	Product Name	Quantity
A1SJ71PB93D	Type A1SJ71PB93D PROFIBUS-DP slave module	1

1 OVERVIEW

This is the user's manual for the A1SJ71PB93D PROFIBUS-DP slave module (hereafter abbreviated as "A1SJ71PB93D"), which is used to connect a MELSEC-A/QnA series programmable controller to a PROFIBUS-DP network. The A1SJ71PB93D operates as a slave station in the PROFIBUS-DP network.

1.1 A1SJ71PB93D Features

- (1) **Conformance with EN50170 Volume 2 (Part 1, 2, 3, 4, 8)**
 The module conforms with EN50170 Volume 2 (Part 1, 2, 3, 4, 8) and can communicate with the master station as a PROFIBUS-DP slave station.
- (2) **I/O data communication with class 1 master station**
 The module can communicate I/O data with the class 1 master station (master station that makes data communication cyclically with a slave station) of PROFIBUS-DP.
 One A1SJ71PB93D can communicate up to 122 words of input or output data or a total of 192 words of input and output data.



(3) Swapping of I/O data

When I/O data is sent/received from/to the master station, their upper and lower bytes can be swapped.

Though PROFIBUS-DP handles the upper and lower bytes of I/O data differently depending on the master station type, the I/O data need not be swapped in a sequence program.

(4) Start/stop of refreshing the input send area

Refreshing of send data from the A1SJ71PB93D to the master station is controllable by an output signal (Y00).

Providing interlocks disables illegal data from being sent to the master station at error occurrence.

(5) Extended fault notification function

Data stored in the extended fault information area of the buffer memory can be sent to the master station as extended fault information * when the host is faulty, for example.

When the host is not faulty anymore, notify the master station that there is no fault.

* : Diagnostics Information (device-related fault information set by the user as desired)

(6) Compatibility with global control function

Compatibility with the global control function allows the updating of I/O data at the A1SJ71PB93D to be controlled from the class 1 master station using the command (SYNC, UNSYNC, FREEZE, UNFREEZE) sent by the class 1 master.

(7) Communication with class 2 master station

The following communications can be made with the class 2 master station (master station designed for network management to perform booting, maintenance and diagnostics) of PROFIBUS-DP.

- Read from input send area/output receive area
- Read of I/O configuration information
- Station number change

For the way to use each function, refer to the manual of the class 2 master station used.

2 SYSTEM CONFIGURATION

This chapter describes the system configuration of A1SJ71PB93D.

2.1 Adaptive System

(1) Adaptive CPU modules

- A1SCPU • A1SCPUC24-R2 • A1SJCPU(S3) • A1SHCPU
- A1SJHCPU • A2SCPU • A2SHCPU • A2ASCPU(S1)
- A2USHCPU-S1 • Q02CPU-A • Q02HCPU-A • Q06HCPU-A
- Q2ASCPU(S1) • Q2ASHCPU(S1)

(2) Number mountable

Any number of modules can be used, provided the number of I/O points of the applicable CPU is not exceeded.

(3) Available slots

Any slot in the base unit can be used, provided the following consideration is not a problem.

When mounting modules in an extension base unit that does not have a power supply (A1S52B(S1), A1S55B(S1), A1S58B(S1)), the power supply capacity may be insufficient.

When mounting an A1SJ71PB93D to an extension base unit, and extension base unit after carefully considering the following factors:

- 1) Current capacity of the power supply module on the main base unit
- 2) Voltage drop at the main base unit
- 3) Voltage drop at the extension base unit
- 4) Voltage drop in the extension cable

(4) Applicable cable

Use the following twisted pair cable provided with a shield that conforms to EN50170 Volume 2 : type A.

Item	Specifications
Impedance	135 to 160 Ω (f = 3 to 20 MHz)
Capacity	< 30 pF/m
Conductor resistance	< 110 Ω /km
Conductor sectional area	≥ 0.34 mm ² (22AWG)

(5) Termination resistor

Use the following termination resistor that conforms to EN50170 Volume 2 : type A.

- RtA = 220 Ω \pm 2%, min. 1/4 W
- Ru = Rd = 390 Ω \pm 2%, min. 1/4 W

※: The A1SJ71PB93D does not have a built-in termination resistor.
Refer to Section 5.5.1 for the wiring of the termination resistor.

REMARK

For the way to calculate the I/O point range and voltage drop, refer to the user's manual of the CPU module used.

2.2 Precautions for Configuring a System

- (1) When performing the following operations, ensure that the module READY signal X1D of A1SJ71PB93D is turned ON beforehand.
 - To switch over the operation mode with Y11/X11, using the sequence program. If the status of X1D is ignored and data is read from or written in the buffer memory, the CPU module may detect an error to stop the sequence calculation.
- (2) The A1SJ71PB93D cannot be used on a remote I/O station of MELSECNET(II) or MELSECNET/10.

3 SPECIFICATIONS

This chapter describes the general specifications, performance specifications, network configuration, I/O signals, buffer memory, parameters and operation modes of the A1SJ71PB93D.

3.1 General Specifications

The flowing table shows the general specifications of the A1SJ71PB93D.

Item	Specifications					
Operating ambient temperature	0 to 55 °C					
Storage ambient temperature	-20 to 75 °C					
Operating ambient humidity	10 to 90 % RH, No condensation					
Storage ambient humidity	10 to 90 % RH, No condensation					
Vibration resistance	Conforming to *JIS B 3501, IEC 1132-2	-----	Frequency	Acceleration	Amplitude	Sweep Count 10 times each in X, Y and Z axis (80 minutes)
		When there is intermittent vibration	10 to 57 Hz	---	0.075 mm	
			57 to 150 Hz	9.8 m/s ²	---	
		When there is continuous vibration	10 to 57 Hz	---	0.035 mm	
57 to 150 Hz	4.9 m/s ²		---			
Shock resistance	Conforming to JIS B3501, IEC 61131-2 (147 m/s ² , 3 times each in 3 directions)					
Operating environment	No corrosive gas present					
Operating height	2000 m (6562 ft) or less					
Installation area	On the control board					
Over-voltage category *1	II or less					
Pollution rate *2	2 or less					

*1: Indicates the distribution area where the device is assumed to be connected, from the public power distribution network to the local machine device.

Category II is applied to the devices to which the power is supplied from a fixed equipment.

The surge resistance voltage of a rated 300 V device is 2500 V.

*2: This is an index which indicates the occurrence rate of the conductive object in the environment where the device is used.

Pollution rate II indicates that only non-conductive pollution may occur with a possibility of generating temporary conductivity due to accidental condensation.

3.2 Performance Specifications

Item	Specifications		
Model	A1SJ71PB93D		
PROFIBUS-DP station type	Slave station		
Electrical standards and characteristics	Complies with EIA-RS485		
Medium	Shielded twisted cable (Type A)		
Network configuration	Bus (however, tree type when a repeater is used)		
Data link method	Polling method		
Transmission encoding method	NRZ		
Transmission speed/maximum transmission distance *1 *2	Transmission speed	Transmission distance [m/segment]	Maximum transmission distance when 3 repeaters are used
	9.6 [kbps]	1200	4800
	19.2 [kbps]		
	45.45 [kbps]		
	93.75 [kbps]	1000	4000
	187.5 [kbps]		
	500 [kbps]	400	1600
	1500 [kbps]	200	800
	3 [Mbps]	100	400
	6 [Mbps]		
12 [Mbps]			
Maximum number of repeaters/network	3 units *2		
Maximum number of stations/segment	32 stations (including repeaters)		
Number of connection nodes/segments	32		
Station numbers that may be set	0 to 125 *3		
Max. number of data that may be communicated	Number of I/O data is 192 words in total. (Number of input or output data is up to 122 words.)		
Flash ROM write count	Max. 10000 times		
Number of occupied I/O	32 points (I/O assignment : 32 special points)		
5VDC Internal power consumption (A)	0.36		
External dimensions (mm)	130(H) × 34.5(W) × 93.6(D)		
Weight (kg)	0.18		

*1 Transmission speed control within +/- 0.3% (EN50170 Volume 2 compliant)

*2 Distance that the transmission distance can be expanded by (m/network) using repeaters

Transmission distance (m/network) = (number of repeaters + 1) × transmission distance (m/segment)

*3 Factory-set to "126" (EN50170 Volume 2 compliant)

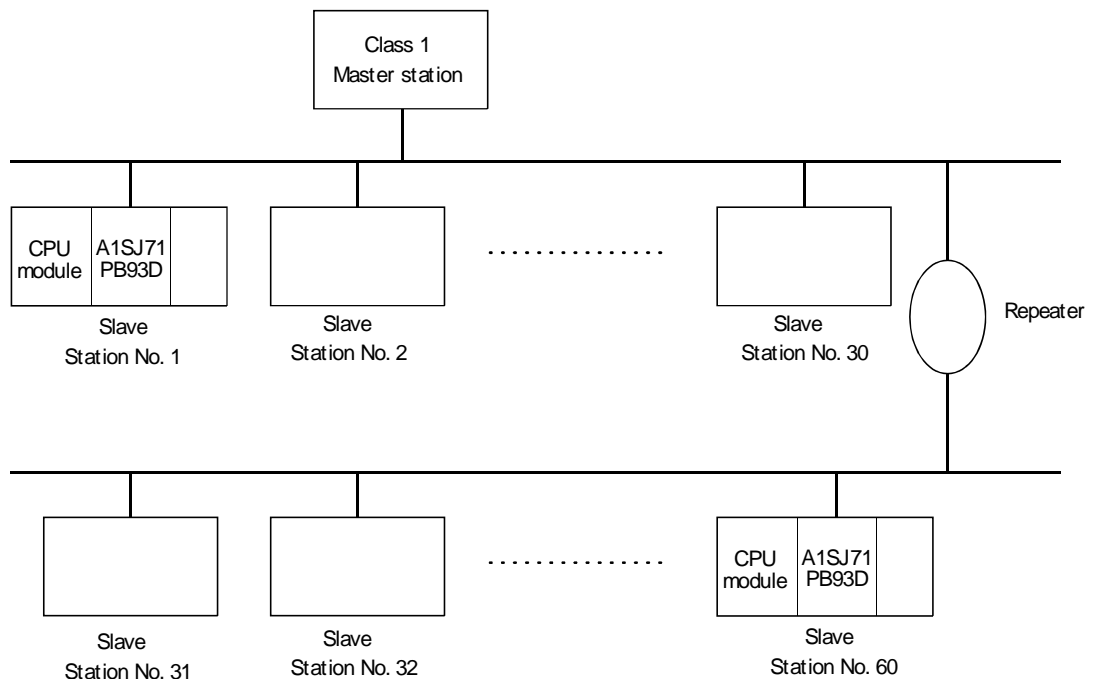
For the noise immunity, withstand voltage, insulation resistance and others in the PLC system using this module, refer to the power supply module specifications given in the used CPU module user's manual.

3.3 Network Configuration

This section provides the basic network configuration of PROFIBUS-DP using the A1SJ71PB93D.

3.3.1 Basic configuration

- 1) Equipment types
 - A1SJ71PB93D (slave station)
 - Class 1 master station
 - Repeater
- 2) Number of units that can be connected to the entire network (when repeaters are used)
 - Master+slave ≤ 126 units
- 3) Number that can be connected for 1 segment
 - Master+slave+repeaters ≤ 32 units
- 4) Communications can be conducted via a maximum of 3 repeaters from an arbitrary master or arbitrary slave to an arbitrary master or arbitrary slave (Not 3 units in the entire network).
- 5) The maximum number of slave stations that may be connected to one master station depends on the specifications of the master station.



- Prepare the PROFIBUS-DP cable and termination resistor on the user side.

3.4 I/O Signal

3.4.1 I/O signal list

The I/O signal configuration used in the A1SJ71PB93D and the data communications with the PLC CPU are described below.

The I/O numbers (X/Y) indicated in this chapter and later assume that 0 is set as the first I/O number of the A1SJ71PB93D.

Signal direction: A1SJ71PB93D → PLC CPU		Signal direction: PLC CPU → A1SJ71PB93D	
Device No.	Description	Device No.	Description
X00	Not usable	Y00	Input send area refresh directive
X01	I/O communication	Y01	Not usable
X02	Expansion trouble notification completion	Y02	Expansion trouble notification request
X03	Module error	Y03	Module error reset request
X04	Not usable	Y04	Not usable
X05	SYNC mode	Y05	
X06	SYNC receive	Y06	
X07	FREEZE mode	Y07	
X08	Not usable	Y08	
X09		Y09	
X0A		Y0A	
X0B		Y0B	
X0C		Y0C	
X0D	Module WDT error	Y0D	
X0E	Not usable	Y0E	
X0F		Y0F	
X10		Y10	
X11	Operation mode change completion	Y11	Operation mode change request
X12	Not usable	Y12	Not usable
X13	Station number setting completion	Y13	Station number setting request
X14	Not usable	Y14	Not usable
X15		Y15	
X16		Y16	
X17		Y17	
X18		Y18	
X19		Y19	
X1A		Y1A	
X1B		Y1B	
X1C		Y1C	
X1D		Module ready	
X1E	Not usable	Y1E	
X1F		Y1F	

POINT

If a device which is not usable is accidentally turned on and off in the sequence program, it cannot guarantee as the A1SJ71PB93D function.

3.4.2 I/O signal detail description

(1) I/O communication signal (X01)

- (a) This signal turns on when the module is ready to communicate with the master station properly.
- (b) While the I/O communication signal (X01) is on, the output receive area is updated to the output data sent from the master station.
(It is independent of the status of the input send refresh directive signal (Y00).)
- (c) This signal turns off when a communication time-out error occurs due to a stop of communication with the master station.
However, if the communication WDT setting in the master station side parameters is "invalid", the I/O communication signal does not turn off since a communication time-out error does not occur.
(The output data in the output receive area is held.)

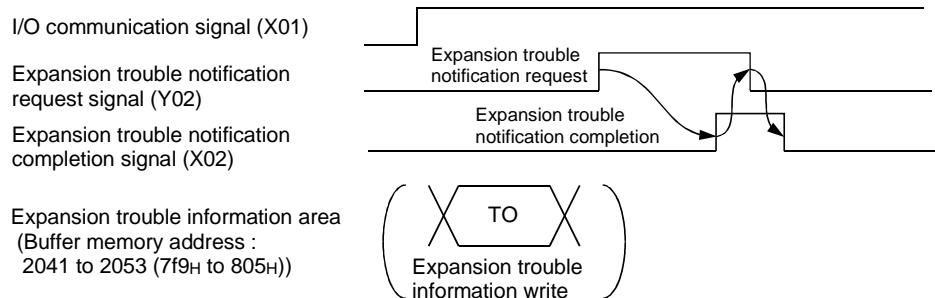
Communication WDT Setting in Master Station Side Parameters	Operation at Master Station Fault
0: Invalid	No error (I/O communication signal (X01) remains on)
1 to 65000: Valid	Communication time-out error occurrence (I/O communication signal (X01) turns off)

The communication WDT setting can be confirmed in the "Current communication WDT value (buffer memory address: 2257 (8D1H))" of the A1SJ71PB93D.

- (d) Use this signal as a signal for interlocking output receive area read performed with the FROM instruction.

(2) Expansion trouble notification completion signal (X02)

- (a) This signal turns on at completion of expansion trouble notification started by the expansion trouble notification request signal (Y02).
(While the I/O communication signal (X01) is off, the expansion trouble notification completion signal (X02) does not turn on since an expansion trouble notification request is ignored.)
- (b) Turning off the expansion trouble notification request signal (Y02) turns off the expansion trouble notification completion signal (X02).

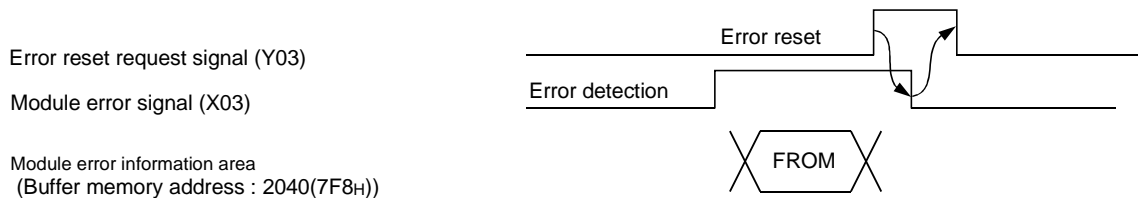


(3) Module error signal (X03)

(a) This signal turns on when an error occurs.

At this time, an error code is stored into the module error information area (buffer memory address: 2040 (7F8H)).

(b) This signal turns off when the error is reset by the error reset request signal, PLC CPU reset or like.



The error code is read from the buffer memory to the PLC CPU.

(4) SYNC mode signal (X05)

(a) This signal turns on when the A1SJ71PB93D is placed in the SYNC mode by a SYNC request from the master station.

(b) The SYNC mode signal (X05) turns off when the SYNC mode is terminated by an UNSYNC request from the master station, a communication stop or a CPU reset.

(c) The SYNC LED turns on/off in synchronization with the on/off of the SYNC mode signal (X05).

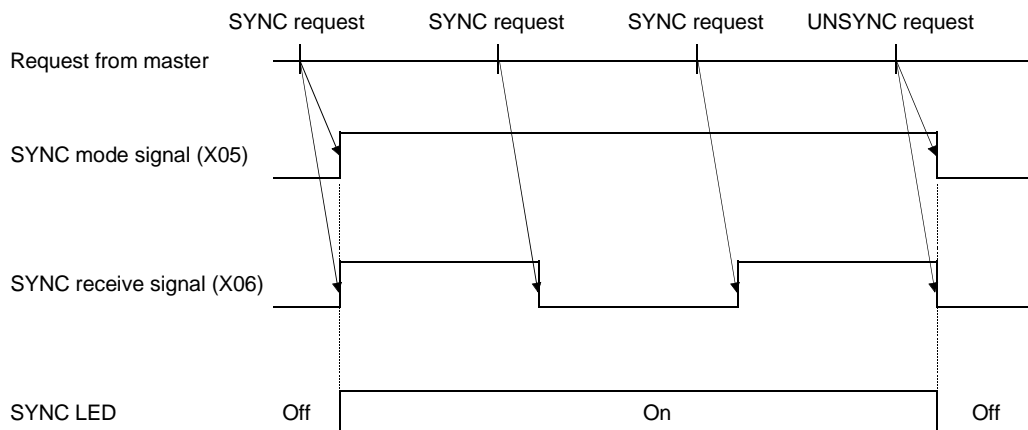
(5) SYNC receive signal (X06)

(a) The SYNC receive signal (X06) turns on on receipt of a SYNC request from the master station.

(b) While the SYNC mode signal (X05) is on, the receipt of a SYNC request from the master station changes the on/off state of the SYNC receive signal (X06).

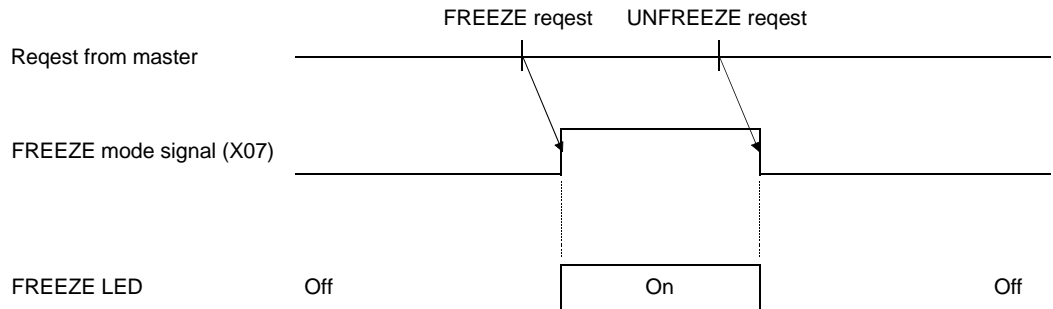
At this time, the SYNC mode signal (X05) remains on.

(c) The SYNC receive signal (X06) turns off when the SYNC mode is terminated by an UNSYNC request from the master station, a communication stop or a CPU reset.



(6) FREEZE mode signal (X07)

- (a) The FREEZE mode signal (X07) turns on when the A1SJ71PB93D is placed in the FREEZE mode by a FREEZE request from the master station.
- (b) The FREEZE mode signal (X07) turns off when the FREEZE mode is terminated by an UNFREEZE request from the master station, a communication stop or a CPU reset.
- (c) The FREEZE LED turns on/off in synchronization with the on/off of the FREEZE mode signal (X07).

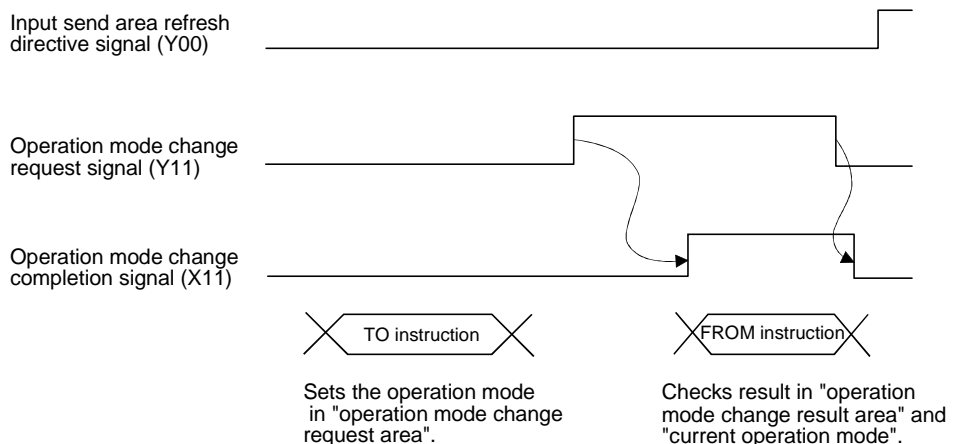


(7) Module WDT error signal (X0D)

- (a) This signal turns on when a module WDT error occurs.
- (b) This signal turns off when the PLC CPU is reset or the A1SJ71PB93D power is switched from OFF to ON. The module WDT error signal (X0D) is not turned off by an error reset made by the error reset request signal (Y03).

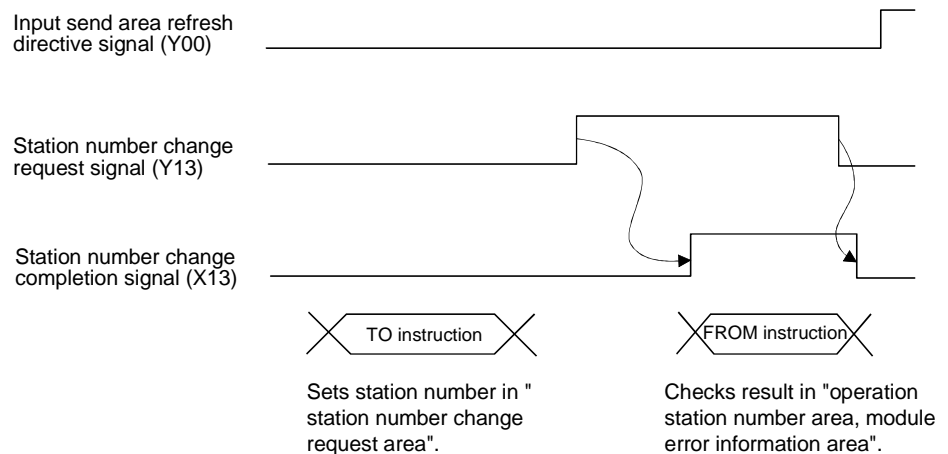
(8) Operation mode change completion signal (X11)

- (a) This signal turns on at completion of an operation mode change started by the operation mode change request signal (Y11). At this time, the result is stored into the operation mode change result area (buffer memory address: 2256 (8D0H)) of the buffer memory.
- (b) Turning off the operation mode change request signal (Y11) turns off the operation mode change completion signal (X11).
- (c) This signal turns on at either normal or abnormal completion of an operation mode change. At abnormal completion, the operation mode change request is made invalid and operation continues in the operation mode that had been used before the change request was given.



(9) Station number setting completion signal (X13)

- (a) This signal turns on at completion of station number setting started by the station number setting request signal (Y13).
- (b) Turning off the station number setting request signal (Y13) turns off the station number setting completion signal (X13).
- (c) Check the setting result in the operation station number area (buffer memory address: 513 (201H)) and module error information area (buffer memory address: 2040 (7F8H)) of the buffer memory.
If a station number error (error code: 1002H) has occurred, the station number setting request is made invalid and operation continues with the station number that had been used before the change request was given.
- (d) Turning on the station number setting request signal (Y13) suspends I/O communication.
Turning on the station number setting completion signal (X13) resumes I/O communication.

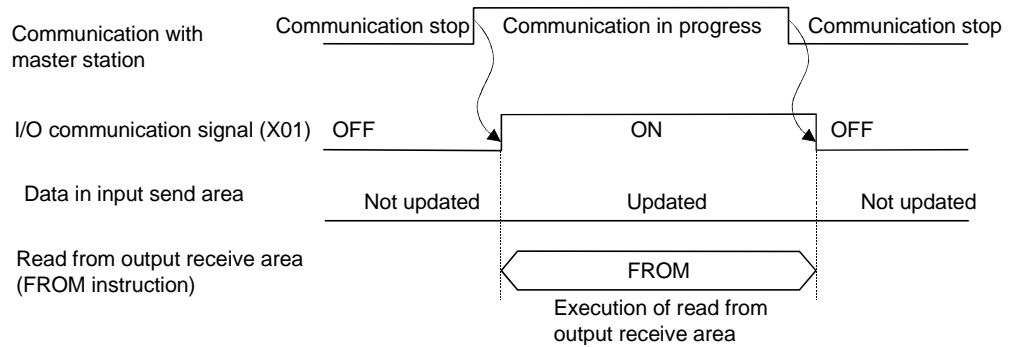


(10) Module ready signal (X1D)

- (a) This signal turns on when the A1SJ71PB93D is enabled for access from the PLC CPU. It is independent of the operation mode at a start.
- (b) This signal turns off when the A1SJ71PB93D is disabled for access from the PLC CPU due to a module WDT error, hardware fault or like.

(11) Input send area refresh directive signal (Y00)

- (a) Turning on this signal during communication with the master station (I/O communication signal (X01) = ON) resumes data communication of the input send area (buffer memory addresses: 256 to 447 (100H to 1BFH)) in the buffer memory.
- (b) Turning this signal off stops sending of the data in the input send area to the master station. (0 data are sent.)
- (c) While the I/O communication signal (X01) is off, ON of the input send area refresh directive signal (Y00) is invalid.



POINT		
The following are the relationships between data send and receive of the A1SJ71PB93D, which vary with the states of the I/O communication signal (X01) and input send area refresh directive signal (Y00).		
X01 State	Y00 State	Data in Output Receive Area/Input Send Area
OFF	ON/OFF	<p>Master station: Input area, Output area. A1SJ71PB93D: Input send area, Output receive area. Dashed arrows indicate 'No communication' from Input send area to Input area and 'Not updated' from Output area to Output receive area.</p>
ON	ON	<p>Master station: Input area, Output area. A1SJ71PB93D: Input send area, Output receive area. Solid arrows show 'Sent' from Input send area to Input area and 'Updated' from Output area to Output receive area.</p>
	OFF	<p>Master station: Input area, Output area. A1SJ71PB93D: Input send area, Output receive area. Solid arrows show '0 data sent' from Input send area to Input area and 'Updated' from Output area to Output receive area.</p>

(12) Expansion trouble notification request signal (Y02)

- (a) Turning this signal on sends the data set in the expansion trouble information area (buffer memory address: 2041 to 2053(7F9H to 805H)) to the master station as expansion trouble information. (The expansion trouble notification request is ignored while the I/O communication signal (X01) is off.)
- (b) When you have checked that the expansion trouble notification completion signal (Y02) is on, turn this signal off in the sequence program.
- (c) Refer to X02 for the on/off timing.

(13) Module error reset request signal (Y03)

- (a) Turning on the module error reset request signal (Y03) resets the error of the A1SJ71PB93D. (The module error signal (X03) turns off and the ERR. LED goes off.)
- (b) When you have checked that the module error signal (X03) is off, turn this signal off in the sequence program.
- (c) Making an error reset clears the error code in the module error information area (buffer memory address: 2040 (7F8H)).
- (d) Refer to X03 for the on/off timing.

(14) Operation mode change request signal (Y11)

- (a) Turning this signal on gives a request to change to the operation mode set in the operation mode change request area (buffer memory address: 2255 (8CFH)).
- (b) When you have checked that the operation mode change completion signal (X11) is on, turn this signal off in the sequence program.
- (c) Refer to X11 for the on/off timing.

(15) Station number setting request signal (Y13)

- (a) Turning this signal on gives a request to change to the station number set in the station number setting request area (buffer memory address: 515 (203H)) of the buffer memory.
- (b) When you have checked that the station number setting completion signal (X13) is on, turn this signal off in the sequence program.
- (c) Refer to X13 for the on/off timing.

POINT
When setting the station number from class 2 master station, specifying "TRUE" for "No_Add_Chg" disables the station number from being changed until the station number is cleared by a station number setting request.

3.5 Buffer Memory List

3.5.1 Buffer memory/configuration

The configuration of the buffer memory used to receive and send data with the A1SJ71PB93D and the PLC CPU is described below.

Buffer memory address decimal (Hexadecimal)	Area name	Description	Read/Write
0 (0 _H)	Output receive area	Stores the output data received from the master station. (Max. usable range 122 words)	Read
191 (BF _H)			
192 (C0 _H)	Not usable	—	—
255 (FF _H)			
256 (100 _H)			
447 (1BF _H)	Input send area	Used to set the input data to be sent to the master station. (Max. usable range 122 words)	Write
448 (1C0 _H)			
511 (1FF _H)	Not usable	—	—
512 (200 _H)			
513 (201 _H)			
514 (202 _H)	Station number set on flash ROM	Stores the station number saved on the flash ROM.	Read
515 (203 _H)	Station number setting request	Used to set a new station number to be set in response to the station number setting request signal (Y13).	Write
516 (204 _H)	Station number rewritable count to flash ROM	Stores the remaining number of times when the station number can be saved onto the flash ROM during continuous operation.	Read
517 (205 _H)	Not usable	—	—
2039 (7F7 _H)			
2040 (7F8 _H)	Module error information	Stores the error code detected by the A1SJ71PB93D.	Read
2041 (7F9 _H)	Expansion trouble information area	Used to set the expansion trouble notification data to the master station.	Write
2053 (805 _H)			
2054 (806 _H)	Expansion trouble information send result area	Stores the result of sending the expansion trouble result to the master station.	Read
2055 (807 _H)	Not usable	—	—
2253 (8CD _H)			
2254 (8CE _H)	Current operation mode	Stores the operation mode in current operation.	Read
2255 (8CF _H)	Operation mode change request	Used to set a new operation mode to be set in response to the operation mode change request signal (Y11).	Write
2256 (8D0 _H)	Operation mode change result	Stores the result of changing the operation mode in response to the operation mode change request signal (Y11).	Read
2257 (8D1 _H)	Current communication WDT value	Stores the communication WDT value in current operation.	Read
2258 (8D2 _H)	Not usable	—	—
2259 (8D3 _H)			
2260 (8D4 _H)	Swapping function setting status	Stores the setting status of the swapping function in current operation.	Read
2271 (8DF _H)			
2272 (8E0 _H)			
2283 (8EB _H)	Output receive area used status area	Stores the current used status of the output receive area.	Read
2284 (8EC _H)			
2287 (8EF _H)	Not usable	—	—
2288 (8F0 _H)			
2299 (8FB _H)			
2300 (8FC _H)	Input send area used status area	Stores the current used status of the input send area.	Read
2815 (AFF _H)			
2815 (AFF _H)	Not usable	—	—

POINT

Don't read and write to the buffer memory which is not usable.
If you perform it, it cannot guarantee as the A1SJ71PB93D function.

3.5.2 Buffer memory detail description

(1) Output receive area (buffer memory address: 0 (0H) to 191 (BFH))

Stores the output data received from the master station.

The structure varies with the data module setting and data assignment mode setting in the parameters. (Refer to Section 3.6.1, Section 3.6.2 and Section 3.6.3)

(2) Input send area

(buffer memory address: 256 (100H) to 447 (1BFH))

Used to store the input data to be sent to the master station.

The structure varies with the data module setting and data assignment mode setting in the parameters. (Refer to Section 3.6.1, Section 3.6.2 and Section 3.6.3)

(3) Operation baud rate (buffer memory address: 512 (200H))

Stores the baud rate in current operation.

Baud Rate	Stored Value
Baud rate not yet recognized	0000H
9.6 kbps	96E2H
19.2 kbps	19E3H
45.45 kbps	45E3H
93.75 kbps	93E3H
187.5 kbps	18E4H
500 kbps	05E5H
1500 kbps	15E5H
3 Mbps	03E6H
6 Mbps	06E6H
12 Mbps	12E6H

The stored value while the I/O communication signal (X01) is on is valid.

Use the master station parameter to set the baud rate of the PROFIBUS-DP.

(4) Operation station number (buffer memory address: 513 (201H))

Stores the station number of the A1SJ71PB93D in current operation.

The storage range is 0 to 126.

If the station number is not set (the station number is as set in the factory or has been cleared), "126" is stored.

I/O data cannot be communicated if the station number is not set.

When the station number setting request (buffer memory address: 515 (203H)) was used to write the station number to the flash ROM, switching power on or resetting the PLC CPU will store the value written to the flash ROM.

(5) Station number set on flash ROM
(buffer memory address: 514 (202H))

Stores the station number of the A1SJ71PB93D set to the flash ROM.
The storage range is 0 to 125.

If the station number is not set to the flash ROM (the station number is as set in the factory or has been cleared), "65535 (FFFFH)" is stored.

(6) Station number setting request
(buffer memory address: 515 (203H))

Used to set any of the following values when setting a new station number of the A1SJ71PB93D in response to the station number setting request signal (Y13).

Set Value	Description
0 (0000H) } 125 (007DH)	Sets a new station number. (Not saved onto the flash ROM)
256 (0100H) } 381 (017D0H)	Sets 256 (0100H) + new station number. (Saved onto the flash ROM) Example: To change to station No. 12 256 (0100H) + 12 (new station number) = 268 (010CH)
65535 (FFFFH)	Clears the station number. After clearing, the operation station number is "126". The station number set to the flash ROM is "FFFEH".

"65534 (FFFEH)" is stored at power-on or PLC CPU reset.

If a station number setting request is executed with a value other than any of the above, a station number error (error code: 1002H) occurs.

(7) Station number rewritable count to flash ROM
(buffer memory address: 516 (204H))

Stores the remaining number of times when the station number setting can be saved onto the flash ROM during operation.

When the PLC CPU is reset, the A1SJ71PB93D is powered on, or the station number is cleared, the remaining number of times is set to 60. Every time the station number is saved onto the flash ROM, the remaining number of times is decremented by 1.

If an attempt is made to rewrite the station number on the flash ROM at the remaining count of 0, a station number rewritable count excess error (error code: 2001H) occurs and the station number on the flash ROM is not changed.

If the station number rewritable count excess error has occurred, switch power on again, reset the PLC CPU, or clear the station number on the flash ROM using the station number setting request signal (Y13). (This returns the remaining count to 60 times.)

(When the station number for a station number setting request is the same as the one saved on the flash ROM (buffer memory address: 514 (202H)), the remaining count does not decrease.)

POINT
When a station number rewritable count excess error has occurred, the remaining count remains 0 if an error reset request (Y03) is given. (The module error signal (X03) and ERR. LED turn off.) After clearing the station number, make an error reset request (Y03).

(8) Module error information (buffer memory address: 2040 (7F8H))

Stores the error code of the error that occurred in the A1SJ71PB93D.

Refer to Section 8.4 for the error codes.

(9) Expansion trouble information area

(buffer memory address: 2041 (7F9H) to 2053 (805H))

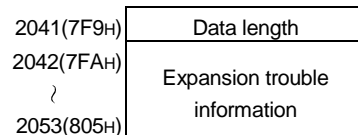
Used to set the expansion trouble information to be sent to the master station.

(The expansion trouble information sent by the A1SJ71PB93D is the Device Related Diagnostic specified in PROFIBUS.)

The expansion trouble information can be set in a sequence program.

Data length : Data length of the data to be sent as expansion trouble information (byte unit)

Expansion trouble information : Any data to be set to the master station (max. 24 bytes)



The extended fault information area is used as described below when an extended fault occurs and when the extended fault is removed.

(a) When extended fault occurs

When the host becomes faulty, for example, the data stored in the extended fault information area of the buffer memory is sent to the master station as extended fault information.

In the following procedure, the A1SJ71PB93D can notify the master station of the extended fault of the host.

- 1) In the buffer memory 2042 (7FAH), set the data to be sent to the master station.
- 2) In the buffer memory 2041 (7F9H), set the length of the data to be sent to the master station.
- 3) Turn ON the extended fault information notification request (Y02).
- 4) After the extended fault information notification completion (X02) has turned ON, turn OFF the extended fault information notification request (Y02).

(b) When extended fault is removed

When the host is not faulty anymore, notify the master station that there is no fault.

In the following procedure, the A1SJ71PB93D can notify the master station that the extended fault of the host has been removed.

- 1) In the buffer memory 2041 (7F9H), set the data length 0.
- 2) Turn ON the extended fault information notification request (Y02).
- 3) After the extended fault information notification completion (X02) has turned ON, turn OFF the extended fault information notification request (Y02).

(10) Current operation mode (buffer memory address: 2254 (8CEH))

Stores the current operation mode.

Refer to Section 3.7 for the operation mode.

Stored Value	Mode
0000H	Normal operation mode
0002H	Self-diagnostic mode

At power-on or PLC CPU reset, the module starts in the normal operation mode.

(11) Operation mode change request

(buffer memory address: 2255 (8CFH))

Set any of the following values when changing the operation mode of the A1SJ71PB93D with the operation mode change request signal (Y11).

Set Value	Description
0000H	Normal operation mode
0002H	Self-diagnostic mode

At power-on or PLC CPU reset, "FFFEH" is stored.

If an operation mode change request is executed with any value other than the set value, the operation cannot be guaranteed.

(12) Operation mode change result

(buffer memory address: 2256 (8D0H))

Stores the result of changing the operation mode in response to the operation mode change request signal (Y11).

0 : Normal completion

1 : Abnormal completion (A change request was made with an illegal value set in the operation mode change request area)

(13) Current communication WDT value

(buffer memory address: 2257 (8D1H))

Stores the communication WDT value set in the master side parameters.

The stored value is invalid if the I/O communication signal (X01) is off.

0 : Communication WDT setting invalid

Other than 0 : Communication WDT setting (in increments of 10ms)

When the communication WDT setting is invalid, the I/O communication signal (X01) does not turn off since the communication WDT does not count up if the master station becomes faulty during communication.

(14) Swapping function setting status

(buffer memory address: 2259 (8D3H))

Stores the setting status of the swapping function set in the master side parameter.

0 : Without swap setting

1 : With swap setting

The stored value while the I/O communication signal (X01) is on is valid.

(15) Output receive area used status area
 (buffer memory address: 2272 to 2283 (8E0H to 8EBH))

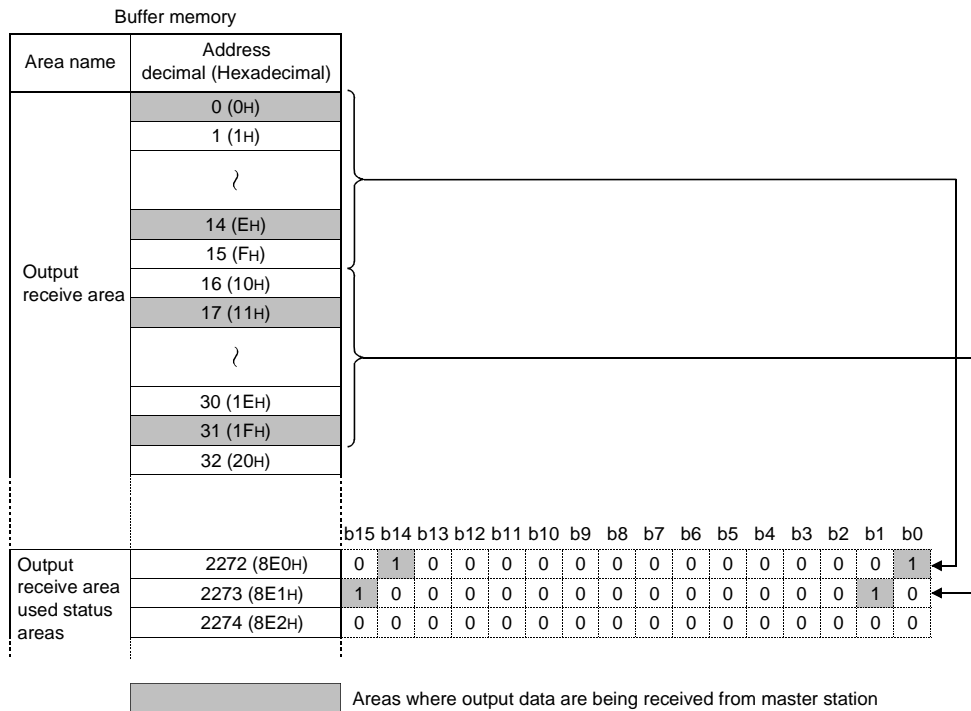
Stores the used status of the output receive area.

The bits corresponding to the buffer memory addresses in use turn on.

The stored value while the I/O communication signal (X01) is on is valid.

Buffer Memory Address Decimal (Hexadecimal)	Corresponding Buffer Memory Addresses															
	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
2272(8E0H)	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2273(8E1H)	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
2274(8E2H)	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
2275(8E3H)	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
2276(8E4H)	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
2277(8E5H)	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
2278(8E6H)	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96
2279(8E7H)	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112
2280(8E8H)	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128
2281(8E9H)	159	158	157	156	155	154	153	152	151	150	149	148	147	146	145	144
2282(8EAH)	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161	160
2283(8EBH)	191	190	189	188	187	186	185	184	183	182	181	180	179	178	177	176

• Example of output receive area used status



(16) Input send area used status area
 (buffer memory address: 2288 to 2299 (8F0H to 8FBH))

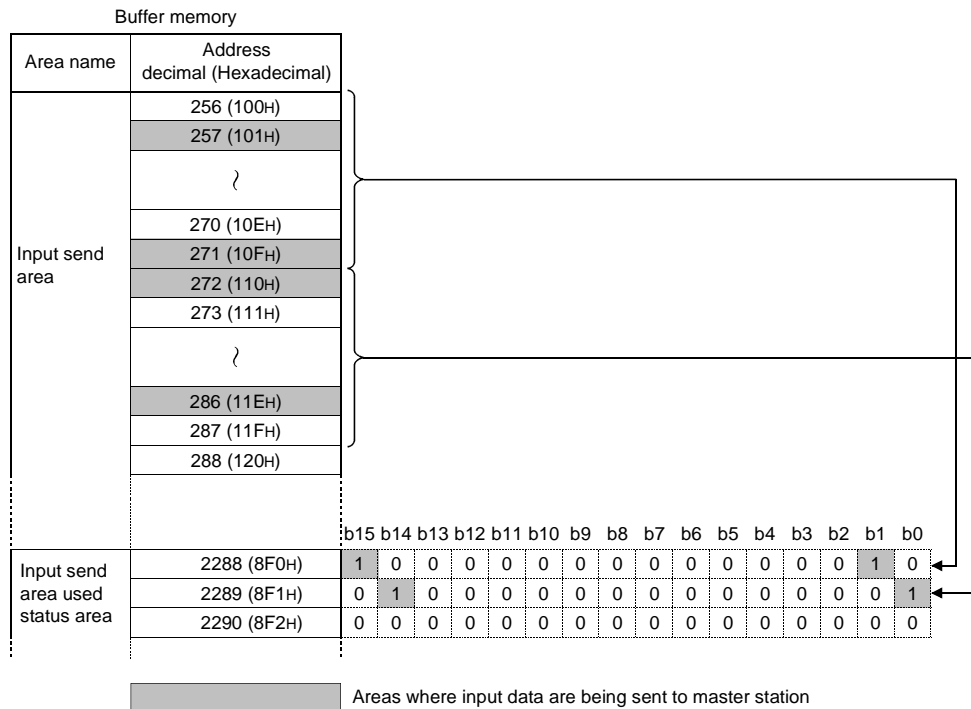
Stores the used status of the input send area.

The bits corresponding to the buffer memory addresses in use turn on.

The stored value while the I/O communication signal (X01) is on is valid.

Buffer Memory Address Decimal (Hexadecimal)	Corresponding Buffer Memory Addresses of Input Send Area (Decimal)															
	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
2288(8F0H)	271	270	269	268	267	266	265	264	263	262	261	260	259	258	257	256
2289(8F1H)	287	286	285	284	283	282	281	280	279	278	277	276	275	274	273	272
2290(8F2H)	303	302	301	300	299	298	297	296	295	294	293	292	291	290	289	288
2291(8F3H)	319	318	317	316	315	314	313	312	311	310	309	308	307	306	305	304
2292(8F4H)	335	334	333	332	331	330	329	328	327	326	325	324	323	322	321	320
2293(8F5H)	351	350	349	348	347	346	345	344	343	342	341	340	339	338	337	336
2294(8F6H)	367	366	365	364	363	362	361	360	359	358	357	356	355	354	353	352
2295(8F7H)	383	382	381	380	379	378	377	376	375	374	373	372	371	370	369	368
2296(8F8H)	399	398	397	396	395	394	393	392	391	390	389	388	387	386	385	384
2297(8F9H)	415	414	413	412	411	410	409	408	407	406	405	404	403	402	401	400
2298(8FAH)	431	430	429	428	427	426	425	424	423	422	421	420	419	418	417	416
2299(8FBH)	447	446	445	444	443	442	441	440	439	438	437	436	435	434	433	432

• Example of input send area used status



3.6 Parameters

PROFIBUS-DP requires the slave station parameters to be set to the master station as slave parameters.

The following table indicates the slave parameters for the A1SJ71PB93D to be set to the master station.

Setting Destination	Item	Description	Refer To
AISJ71 PB93D	FDL Address	Set the station number of the A1SJ71PB93D. • Setting range 0 to 125	—
Master station	Watchdog	Set the watchdog timer period of the communication WDT. • Setting range 0 : Communication WDT setting invalid 2 to 65000 : Communication WDT setting valid (set value 10ms)	—
	Min T_sdr	Set the minimum response time until the reply frame can be sent to the master station. • Setting range 0 to 125	—
	Group identification number	Set the group to which the module belongs. The module can belong to multiple groups (Grp1 to Grp8).	—
	Data module setting	Set the I/O configuration information (set to "Cfg_Data" of the master station). • Setting type 96 pattern • Number of setting 1 to 40	Section 3.6.1
	Data assignment mode setting	Set the data layout of the output send area/input receive area of the buffer memory (set to "User_Prm_Data" of the master station). • Setting range 0 : Batch assignment mode (default) 1 : Split assignment mode	Section 3.6.2
	Swap setting	Set whether the word data sent/received on the A1SJ71PB93D side will be swapped or not (set to "User_Prm_Data" of the master station). • Setting range 0 : Without swap (default) 1 : With swap	Section 3.6.3

Set the parameters to the master station with the configurator corresponding to the master station used. (Refer to Section 5.1.1.)

3.6.1 Data module setting

Set the I/O configuration information of the master station and A1SJ71PB93D.

(1) Number of data modules to be set

Set the data modules per A1SJ71PB93D within the following range.

- Number of data modules: Max. 40 modules
- Total data size

Input data: Max. 122 words Output data: Max. 122 words	}	Total max. 192 words
---	---	----------------------

(2) Data module setting pattern

For data module setting, choose the corresponding one from among 96 patterns made available by combining I/O designation (3 types), data size (16 types) and separation prevention setting (2 types).

Setting Item	Types
I/O designation	Input, output, input/output
Data size	1 to 16 words
Separation prevention setting	Word unit, data module unit

(3) Data module setting example

The data module setting example given here assumes the following configuration.

• Configuration example

		Data module 0	Data module 1	Data module 2
CPU module	A1SJ71PB93D	Input module 64 points (4 words) X20 to X5F	Output module 64 points (4 words) Y60 to Y9F	I/O module 32 points (2 words) XA0 to XBF YA0 to YBF

• Setting example

Data Module Setting	A1SJ71PB93D Buffer Memory
Data module 0 (Input, 4 words, word unit)	Data module 0 area (4 words) is reserved in the input send area.
Data module 1 (Output, 4 words, word unit)	Data module 1 area (4 words) is reserved in the output receive area.
Data module 2 (Input/output, 2 words, word unit)	Data module 2 areas (2 words each) are reserved in the output receive area and input send area.

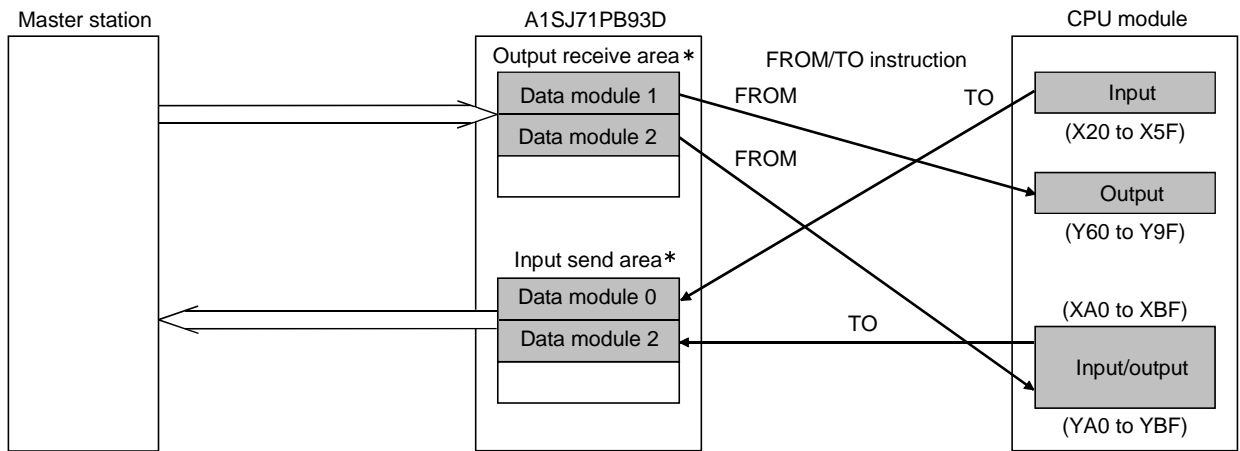
(a) Total data size

The total data size of the data modules 0 to 2 is as follows.

- Input date size: Data module 0 (input, 4 words)
+ data module 2 (input, 2 words)
= 6 words
- Output date size: Data module 1 (output, 4 words)
+ data module 2 (output, 2 words)
= 6 words
- Total date size: Input date size (6 words)
+ output data size (6 words)
= 12 words

(b) Flows of data

The following indicates the flows of data between the modules.



*: Use the data assignment mode setting to set the layout on the buffer memory. (Refer to Section 3.6.2)

3.6.2 Data assignment mode setting

Set how to assign the modules in the output receive area/input send area of the buffer memory.

Data Assignment Mode	Description
0 : Batch assignment mode	Input data and output data are assigned to the input send area and output receive area, respectively, in order of the data modules from top to bottom, starting with the top address.
1 : Split assignment mode	Input data and output data are assigned to the input send area and output receive area as-is in order of the data modules. Data in the I/O and special function modules can be batch-read/written.

The following is the example of the used status of the output receive area and input send area in the following data module setting.

Data Module Setting		Output Data	Input Data
Data module 0	1 word, input		1 word
Data module 1	2 words, output	2 words	
Data module 2	1 word, input/output	1 word	1 word
Data module 3	1 word, output	1 word	
Data module 4	2 words, input		2 words
Data module 5	1 word, output	1 word	

• Batch assignment mode

Buffer memory address

	Output receive area		Input send area
0			256
1	Used by data module 1		257
2	Used by data module 2		258
3	Used by data module 3		259
4	Used by data module 5		260
5			261
6			262
7			263
8			264
9			265
?			?
191			447

• Split assignment mode

Buffer memory address

	Output receive area		Input send area
0			256
1	Used by data module 1		257
2			258
3	Used by data module 2		259
4	Used by data module 3		260
5			261
6			262
7	Used by data module 5		263
8			264
9			265
?			?
191			447

3.6.3 Swap setting

Set whether the word data swapping function will be used or not.

Set Value	Description
0 : Not swapped	At the time of data transfer to/from the master station, the I/O data are transferred as-is.
1 : Swapped	At the time of data transfer to/from the master station, the I/O data are transferred with their upper and lower bytes exchanged.

Refer to Section 4.1.3 for the word data swapping function.

3.7 Operation Mode

The A1SJ71PB93D has two operation modes, normal operation mode and self-diagnostic mode.

The modes will be described.

Operation Mode	Description	Refer To
Normal operation mode	In this mode, communication is made as in the slave parameters set to the master station. Communication can be made if the slave parameters are within the setting ranges. (Set only the station number in a sequence program.)	Section 4.1.1
Self-diagnostic mode	In this mode, the A1SJ71PB93D is tested alone to diagnose a hardware fault. No communication is made with the master station.	Section 5.4

Set the operation mode using the operation mode change request signal (Y11).

After power is switched on or the PLC CPU is reset, the A1SJ71PB93D operates in the normal operation mode.

4 FUNCTIONS

4.1 Functions for Communication with Class 1 Master

This section explains the functions provided for communication between the A1SJ71PB93D and class 1 master station.

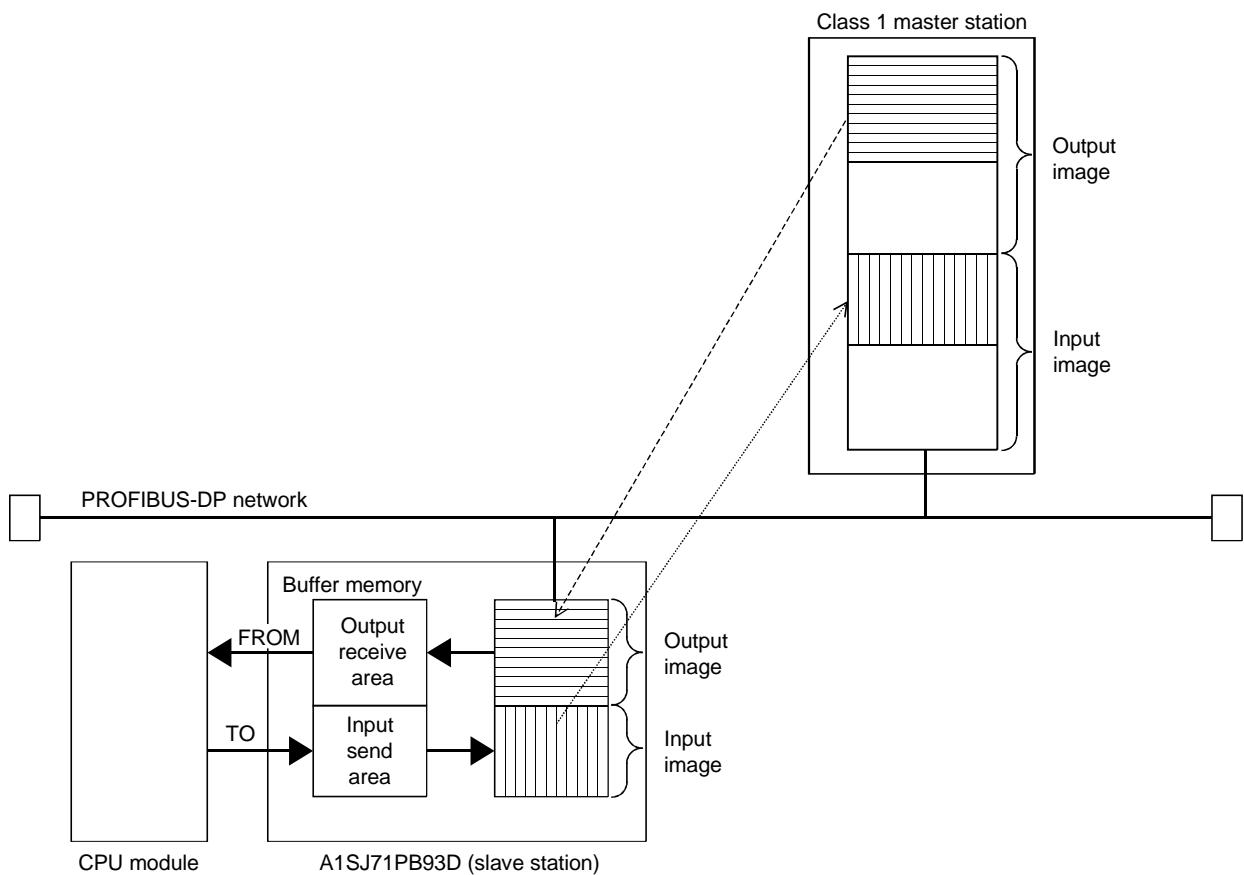
4.1.1 I/O data communication function

The chief function of the A1SJ71PB93D is to communicate I/O data with the master station connected to the PROFIBUS-DP network.

The data received from the master station are stored into the output receive area of the buffer memory.

Using the TO instruction, the data written to the input send area of the buffer memory are sent to the master station.

The outline of this communication function is shown below.

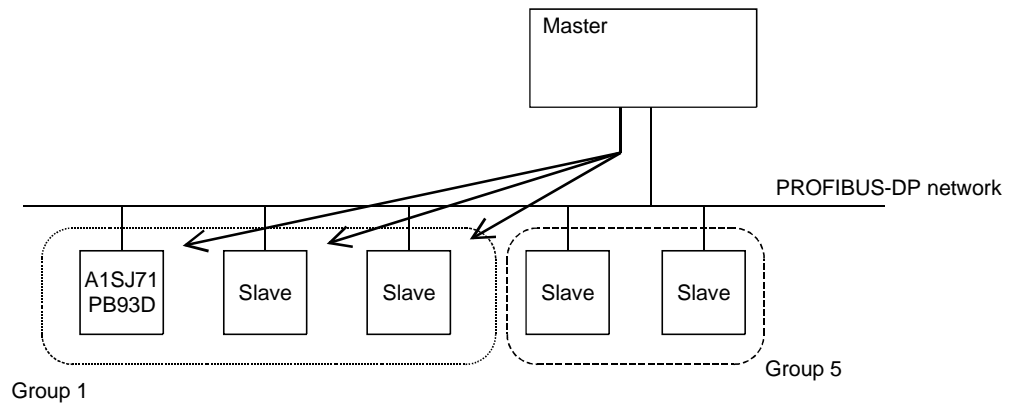


4.1.2 Global control functions

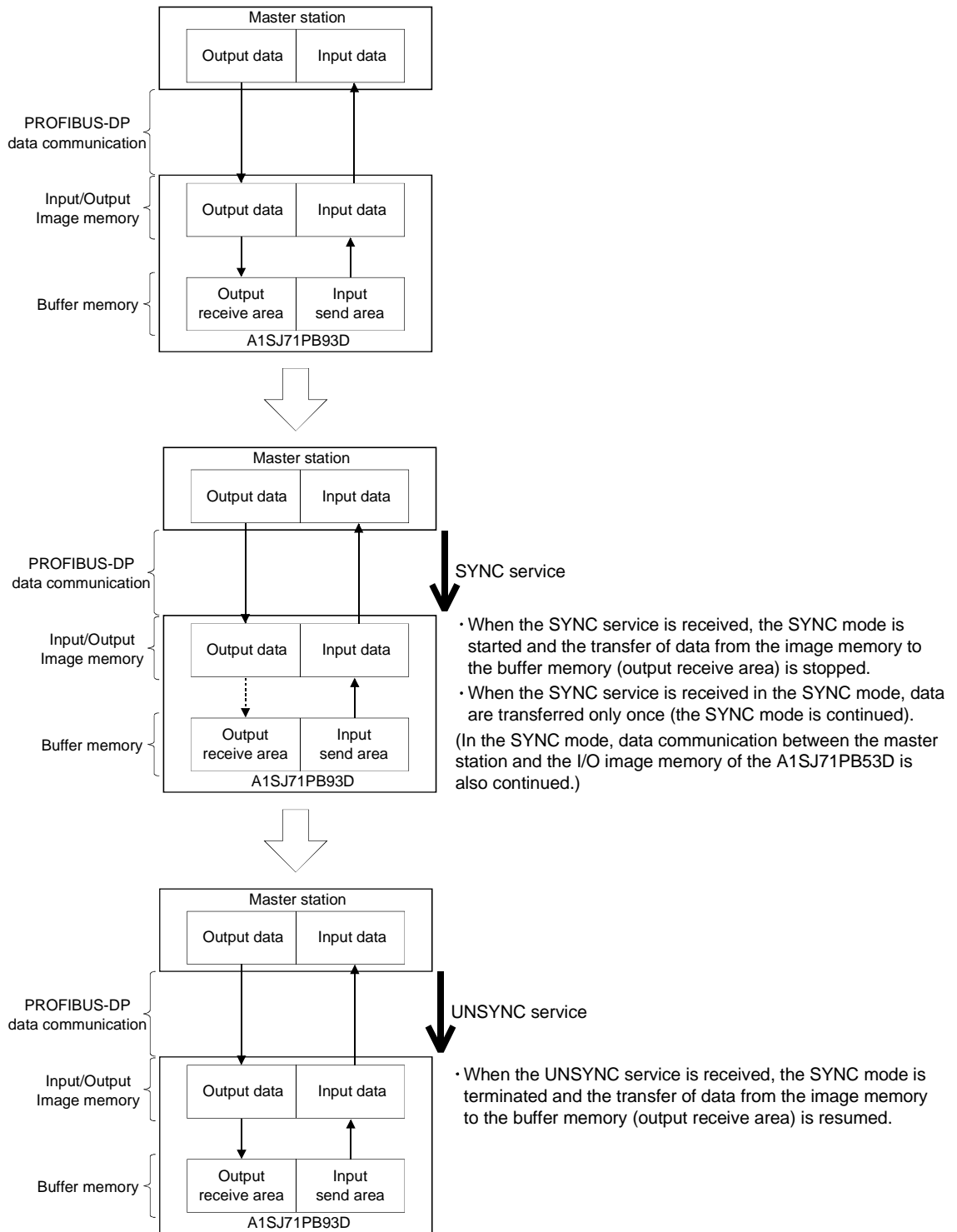
Global control has four functions: SYNC, UNSYNC, FREEZE and UNFREEZE. These functions are designed to maintain/cancel the I/O of each slave station on a group basis by multicast communication.

The A1SJ71PB93D that execute the global control function is those located in one or more groups of the eight groups.

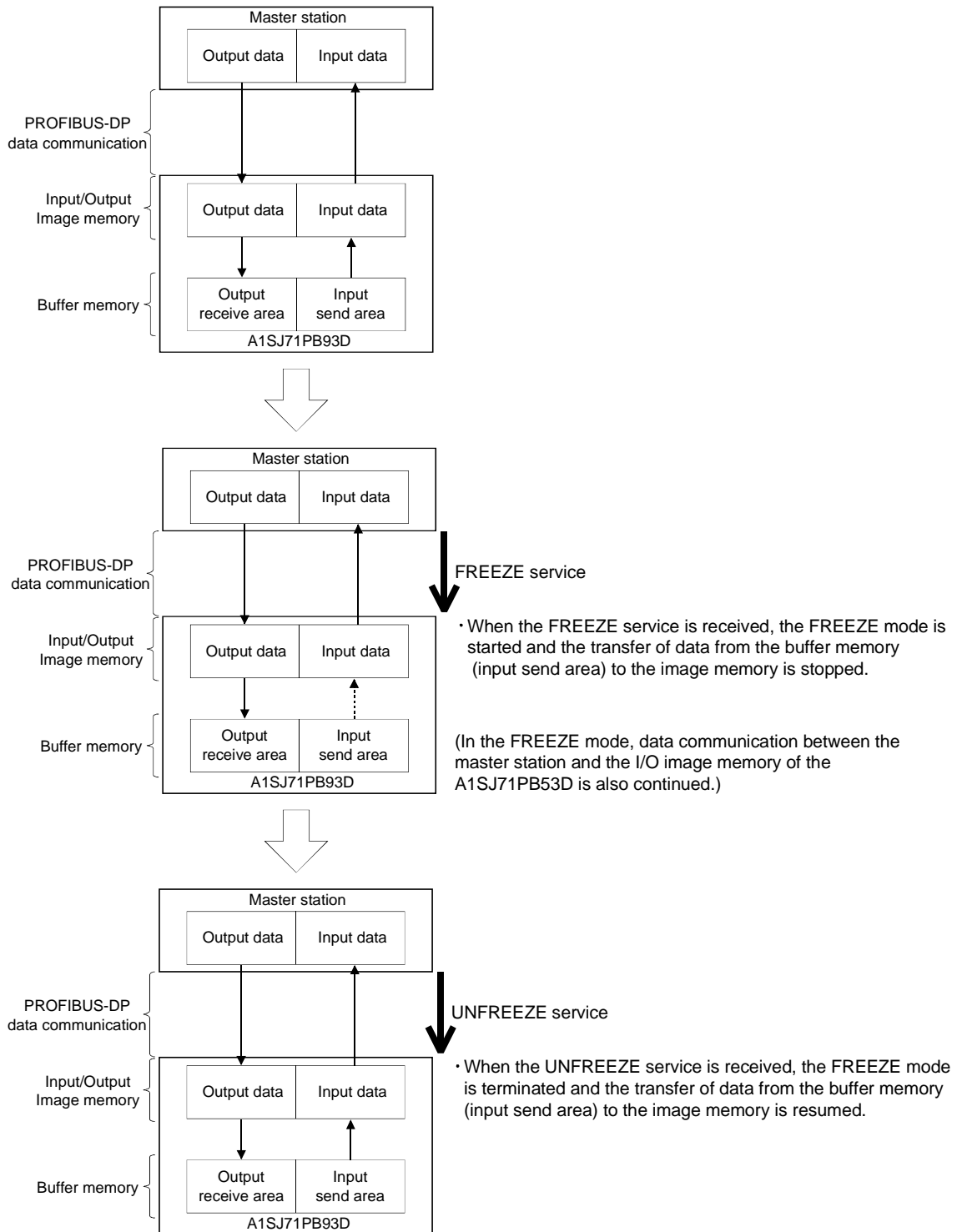
The group number of the A1SJ71PB93D is set to the slave parameters of the master station.



(1) At receive of SYNC and UNSYNC services

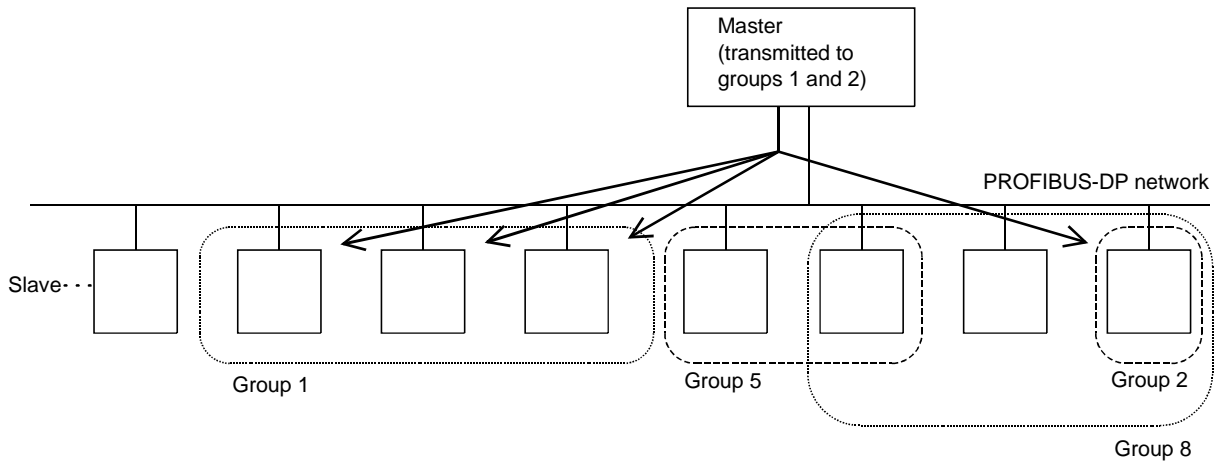


(2) At receive of FREEZE and UNFREEZE services



(3) Group selection

- The number of groups is from 1 to 8 if with a total of 8 groups.
- The A1SJ71PB93D can exist in arbitrary group of the 8 groups. They can also exist in multiple groups. (The configurator specifies in which group which slaves exist.)



4.1.3 Word data swapping function

This function is designed to exchange (swap) the upper and lower bytes of the word data transferred between the master station and A1SJ71PB93D.

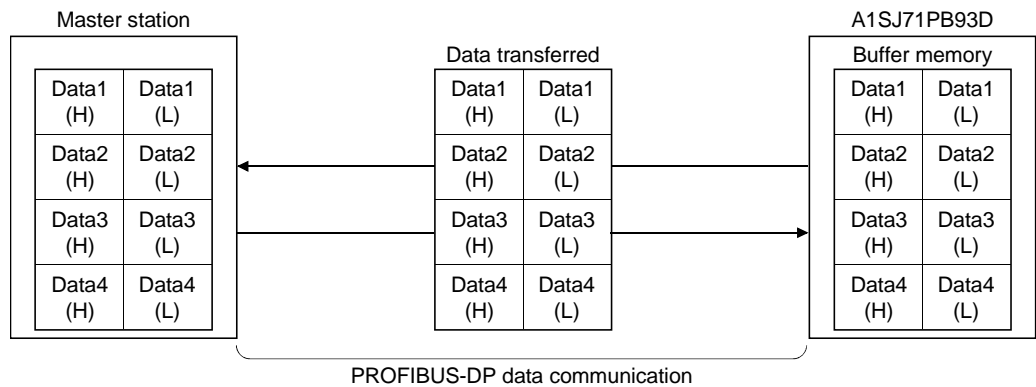
When Yes has been specified as swap setting, the received output data are stored into the output receive area after their upper and lower bytes have been swapped, and the data stored in the input send area are sent to the master station after their upper and lower bytes have been swapped.

If the A1SJ71PB93D is used with the master station whose upper and lower bytes are reversed in word data handling, using this function eliminates the need for swapping in a sequence program.

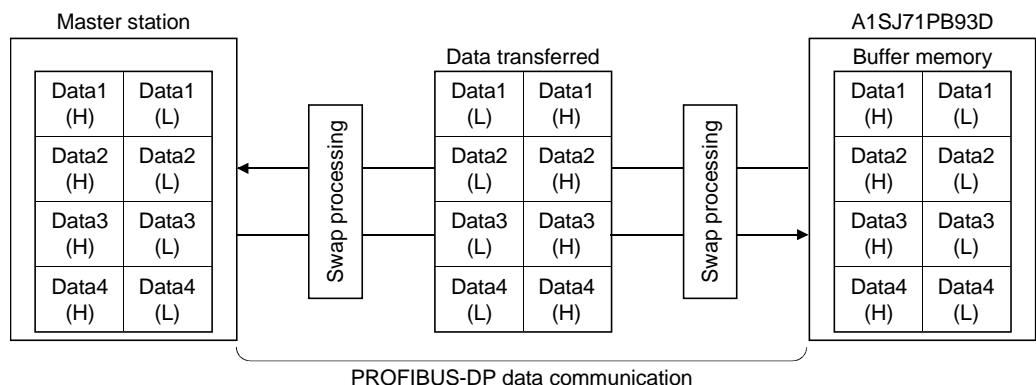
Guideline of Swapping Function Setting Depending on Master Station Type

Master Station Type		Setting of Swapping Function on A1SJ71PB93D
AJ71PB92D,A1SJ71PB92D		Not swapped
QJ71PB92D	When swap is not performed on the master station side (default setting)	Not swapped
	When swap is performed on the master station side	swapped
Master station other than above		Set according to the specifications of the used master station.

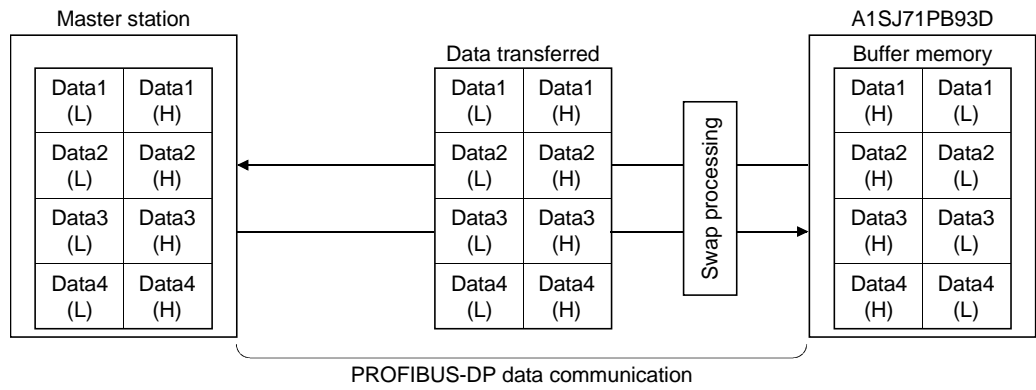
- When the master station is the A1SJ71PB92D/AJ71PB92D/QJ71PB92D (Not swapped)



- When the master station is the QJ71PB92D (Swapped)



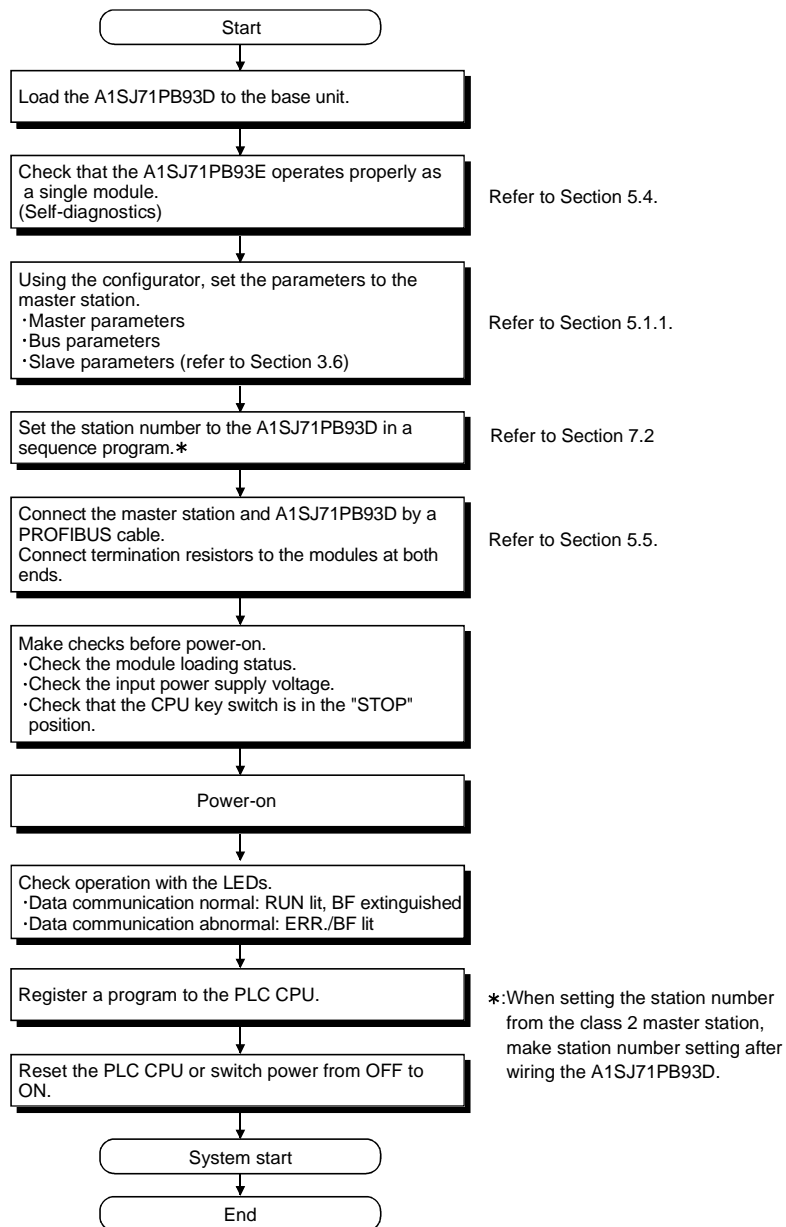
- When the upper and lower bytes of the word data are handled inversely between the master station and A1SJ71PB93D



5 PROCEDURES BEFORE SYSTEM OPERATION

5.1 Procedures before Operation

The procedure for newly connecting A1SJ71PB93D to an existing PROFIBUS-DP network is explained below.



REMARK

When setting the station number from class 2 master station, specifying "TRUE" for "No_Add_Chg" disables the station number from being changed until the station number is cleared by a station number setting request.

5.1.1 Parameter setting to master station

To use the A1SJ71PB93D, set the following parameters to the master station.

Parameters Set to Master Station		Refer To
Master parameters (parameters of master station itself)		— * 1
Bus parameters (communication parameters of PROFIBUS-DP network)		— * 1
Slave parameters (for A1SJ71PB93D)	FDL Address	Section 3.6
	Watchdog	
	Min t_sdr	
	Group identification number	
	Data module setting	Section 3.6.1
	Data assignment mode setting	Section 3.6.2
	Swap setting	Section 3.6.3

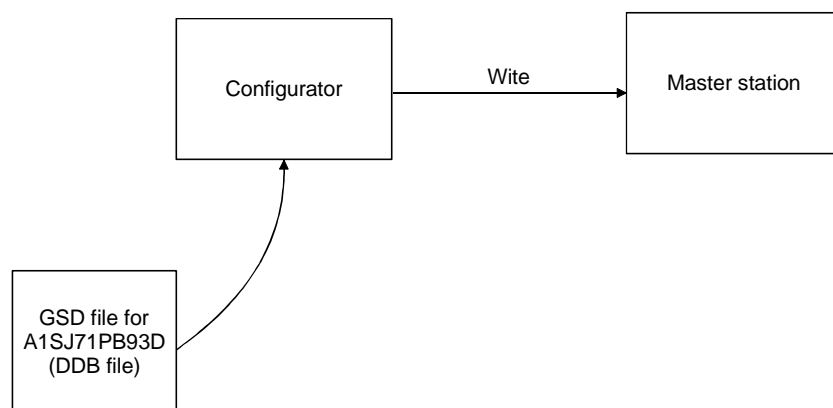
*1 : Refer to the manual of the master station for the setting items.
 Refer to the manual of the used configurator for the setting method.

(1) Procedure for setting the slave parameters for A1SJ71PB93D to the master station

1. Read the GSD (DDB) file of the A1SJ72PB93D to the configurator corresponding to the master station used.
2. Set the A1SJ71PB93D slave parameters using the configurator.
3. Write the parameters to the master station.

Refer to Section 3.6 for the items and data of the A1SJ71PB93D slave parameters.

Refer to the manual of the used configurator for the operation of the configurator.



(2) GSD (DDB) file

Consult the nearest system service or representative for the GSD (DDB) file of the A1SJ71PB93D.

The GSD (DDB) file is unnecessary when GX Configurator-DP Version 4.01B is used as the configurator.

5.2 Installation

The following section explains the precautions when handling the A1SJ71PB93D, from the time they are unpacked until they are installed.

For more details on the module installation, see the user's manual for the PLC CPU used.

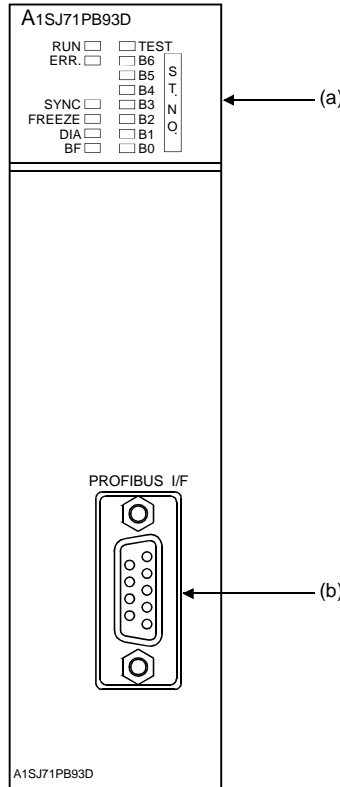
5.2.1 Handling precautions

- (1) Do not drop the module case or subject it to heavy impact since it is made of resin.
- (2) Do not remove the PCB of each module from its case. This may cause a failure in the module.
- (3) Be careful not to let foreign objects such as wire burrs enter the module during wiring. In the event any foreign object enters, remove it immediately.
- (4) Tighten the module mounting screws and connector mounting screws using torque within the following ranges.

Screw location	Tightening torque range
Module mounting screws (M4 screws)	78.4 to 117.6 N · cm
PROFIBUS cable connector mounting screws (#4 - 40UCN)	20 to 28 N · cm

5.3 Part Names and Settings

Following is an explanation of the A1SJ71PB93D part names and settings.



No.	Name	Description	Remark
(a)	LED	Displays the A1SJ71PB93D status.	
		Name	Display description
		RUN	Displays the A1SJ71PB93D operation status. On: Normal Off: Module WDT error occurrence
		ERR.	On: Parameter setting error or module error occurrence Off: Normal
		SYNC	On: During SYNC mode
		FREEZE	On: During FREEZE mode
		DIA	On: Extended fault information present Off: Extended fault information absent
		BF	On: Before data communication or communication error detected Off: During data communication
		TEST	On: During execution of self-diagnostics
	B6 to B0	Indicate the station number of the host in binary. Example: Station No. 85(55H) <div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; align-items: center; margin-bottom: 2px;"> B6</div> <div style="display: flex; align-items: center; margin-bottom: 2px;"> B5</div> <div style="display: flex; align-items: center; margin-bottom: 2px;"> B4</div> <div style="display: flex; align-items: center; margin-bottom: 2px;"> B3</div> <div style="display: flex; align-items: center; margin-bottom: 2px;"> B2</div> <div style="display: flex; align-items: center; margin-bottom: 2px;"> B1</div> <div style="display: flex; align-items: center;"> B0</div> </div>	
(b)	PROFIBUS interface connector	Connector for connecting the table for the PROFIBUS-DP network.	*1

*1: For the connector type, use a male D-Sub 9 pin. The PROFIBUS cable must be created by the user. (for information regarding the cable wiring, refer to Item 5.5.)

The size of the screw which can be used for the connector is #4-40 UNC.

5.4 Execution Method for Self-diagnosis

This section describes the procedure for self-diagnosis, status during self-diagnosis, and results after self-diagnosis.

(1) Procedure for self-diagnosis

The procedure for self-diagnosis is as follows.

- 1) Set the PLC CPU to STOP.
- 2) In the device test of the debugging mode of GX Developer (peripheral device), set 2H (self-diagnosis mode) in the operation mode change request area (buffer memory address: 2255 (8CFH)) and turn on the operation mode change request signal (Y11) to start the self-diagnosis automatically.
- 3) The TEST LED on A1SJ71PB93D will flash during the self-diagnosis.
- 4) When the results of the self-diagnosis are normal: The TEST LED and ERR. LED go off.

If the results of the self-diagnosis are abnormal (an error occurs): The TEST LED and ERR. LED will light up.

- 5) When the results of the self-diagnosis are normal, return the A1SJ71PB93D to the normal operation mode.

In the device test of the debugging mode of GX Developer (peripheral device), set 0H (normal mode) in the operation mode change request area (buffer memory address: 2255 (8CFH)) and turn on the operation mode change request signal (Y11) to place the A1SJ71PB93D in a wait status for parameters from the master station.

The following table indicates the LED indications provided when the result of self-diagnostics is an error.

Result of Self-diagnostics	Lit LEDs
Swap test error	[B0], [ERR.], [TEST]
Hardware fault	Any of [B1] to [B6], [ERR.], [TEST]

(2) Action to be taken at error occurrence

If the self-diagnostic result is an error, consult the nearest service center or representative.

(3) Instructions

During the self-diagnosis, do not monitor the A1SJ71PB93D buffer memory from the peripheral device.

Monitor may stop if the buffer memory is monitored during the self-diagnosis.

5.5 Wiring

5.5.1 PROFIBUS cable wiring

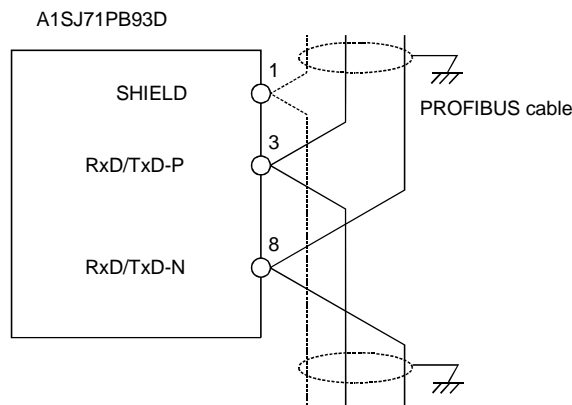
This section explains the wiring to PROFIBUS connector for the A1SJ71PB93D

(1) Pin assignments for the connector

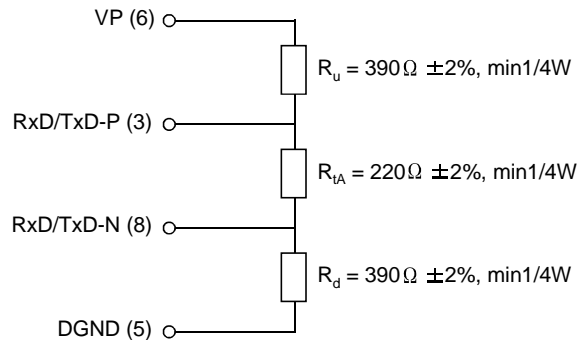
Pin No.	Name	Application
1	SHIELD	Shield, Protective Ground
2	Vacancy	—
3	RxD/TxD-P	Receive/Transmit Data-P
4	Vacancy	—
5	DGND *1	Data Ground
6	VP *1	Voltage-Plus
7	Vacancy	—
8	RxD/TxD-N	Receive/Transmit Data-N
9	Vacancy	—

*1 The signals are used when termination resistors are connected.

(2) Wiring



(3) Termination resistor



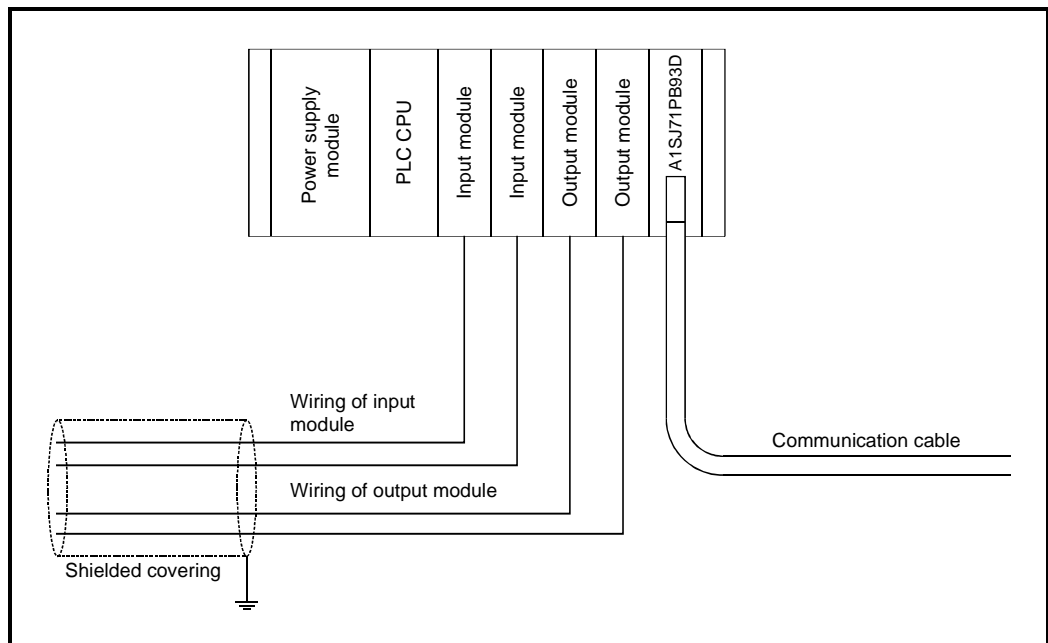
REMARK

- For details on making Mitsubishi PLC conform to the EMC directive and low voltage instruction when installing it in your product, please see Chapter 3, "EMC Directive and Low Voltage Instruction" of the PLC CPU User's Manual (Hardware).
- Please use the PROFIBUS cable (Type A) with braided shield.

5.5.2 Precautions against wiring

As one of the requirements to give full play to A1SJ71PB93D'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 A1SJ71PB93D is described below.

- (1) Do not route the wire of A1SJ71PB93D close to or bundle it together with the main circuit and high-tension lines, or the load-carrying lines from other than the PLC. Otherwise, the module may be susceptible to an influence of noise and surge induction.
- (2) The wires from the input/output modules of the PLC should be away from the communication cable as far as possible as shown in the figure below.



- (3) Grounding
 - (a) When using the A1SJ71PB93D, basically ground the FG and LG terminals of the power supply module of the PLC.
 - (b) If communication cannot be made after grounding due to an abnormally high voltage applied to the FG terminal, the module may be used without grounding.

6 TRANSMISSION DELAY TIME

6.1 Transmission Delay Time of Output Receive

Transmission delay time of output receive = 1 sequence scan time + 0.2 [ms]

6.2 Transmission Delay Time of Input Send

Transmission delay time of input send = 1 sequence scan time + 0.2 [ms]

MEMO

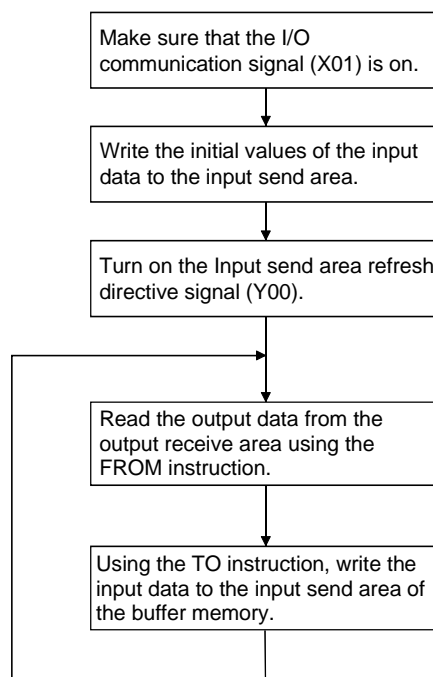
7 PROGRAMMING

This chapter gives program examples of station number setting, I/O data communication, and global control-driven program execution.

7.1 Communication Sequence

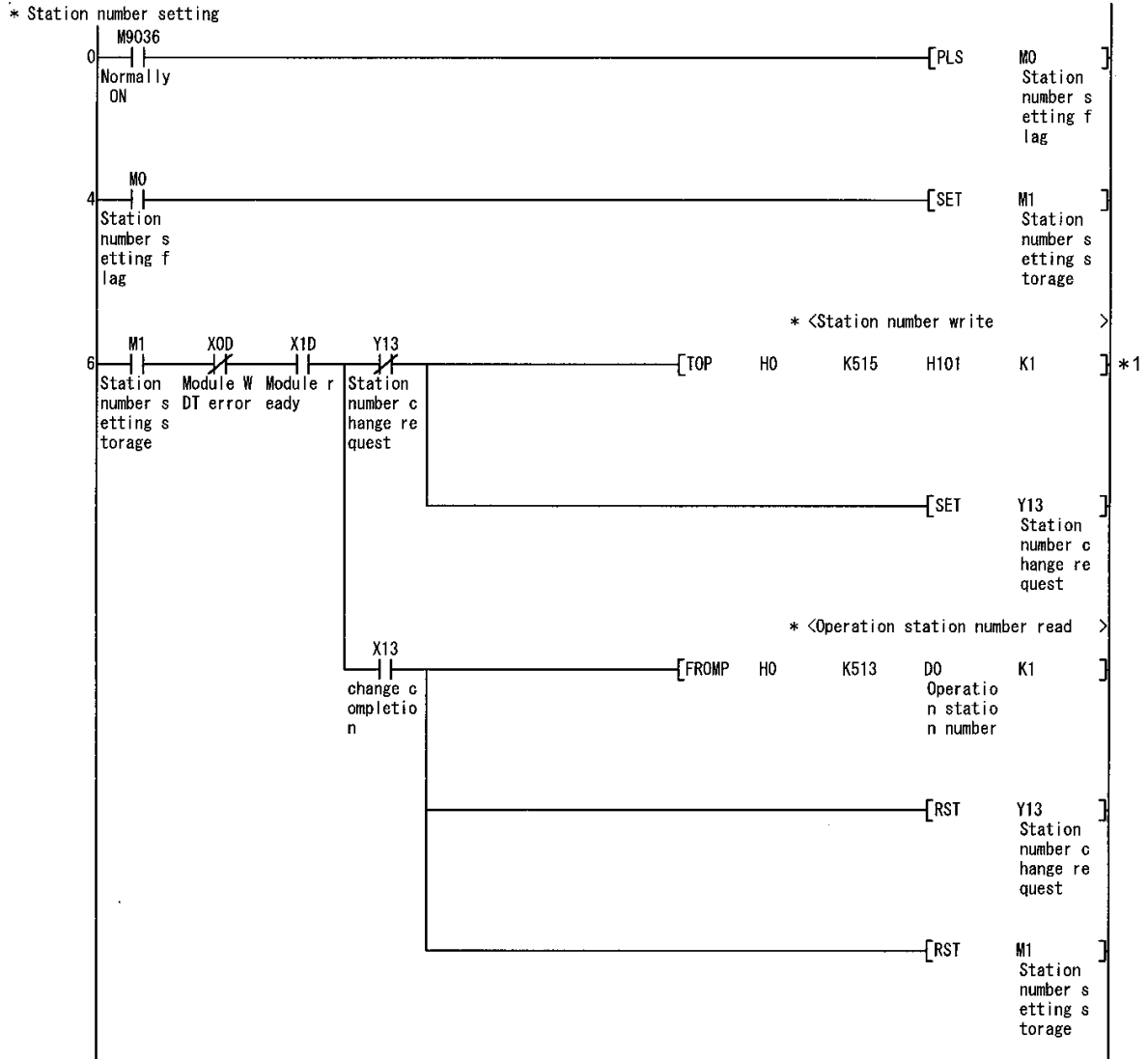
The following is the sequence of I/O data communication with the master station.

- Refresh between the PLC CPU and A1SJ71PB93D and refresh of the A1SJ71PB93D buffer memory (output receive area, input send area) are executed asynchronously.



7.2 Station Number Setting (Set to station number 1)

The following is the example of a station number setting program.



*1: When the station number is not written to the Flash ROM, read "H101" as "H1".

7.3 Communication of I/O Data

7.3.1 Batch assignment mode

The following is the example of an I/O data communication program for use in the batch assignment mode of the data assignment modes in the following configuration.

CPU	A1SJ71 PB93D	A1SX41	A1SY41	A1S64AD	A1S68DA
-----	-----------------	--------	--------	---------	---------

- Data module setting of A1SJ71PB93D

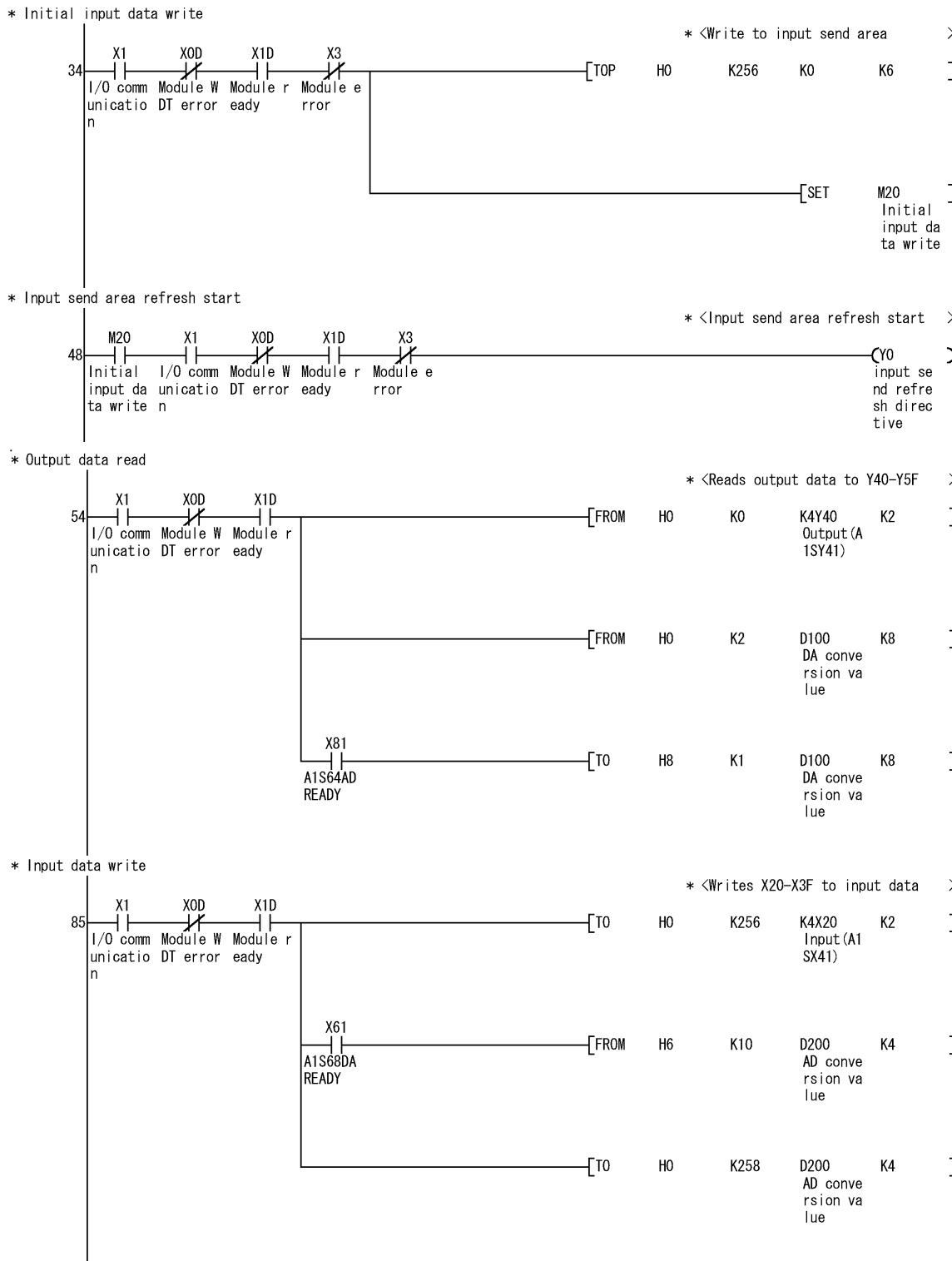
Data module 0	Input, 2 words, word unit
Data module 1	Output, 2 words, word unit
Data module 2	Input, 4 words, word unit
Data module 3	Output, 8 words, word unit

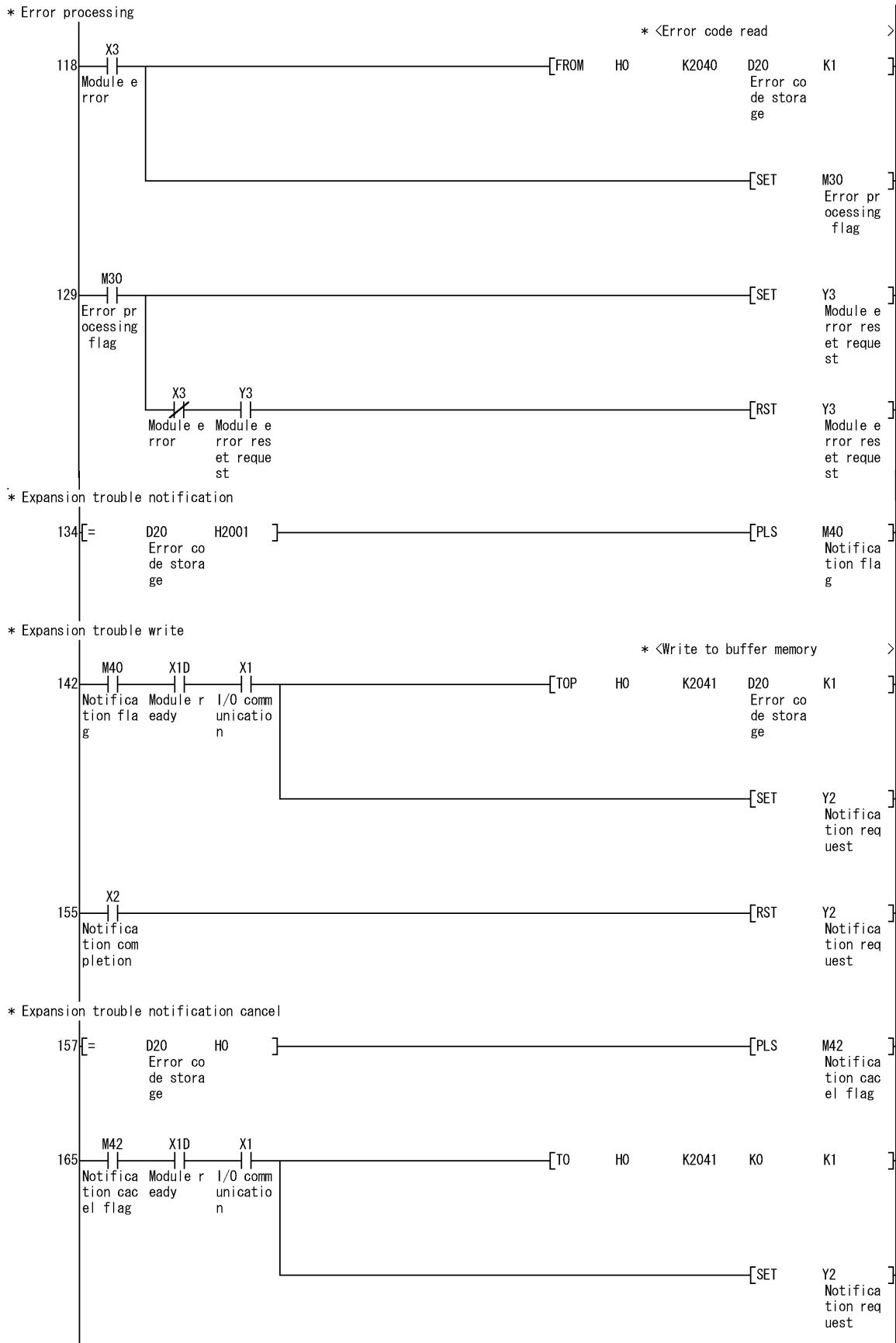
- Used states of A1SJ71PB93D output receive area and input send area

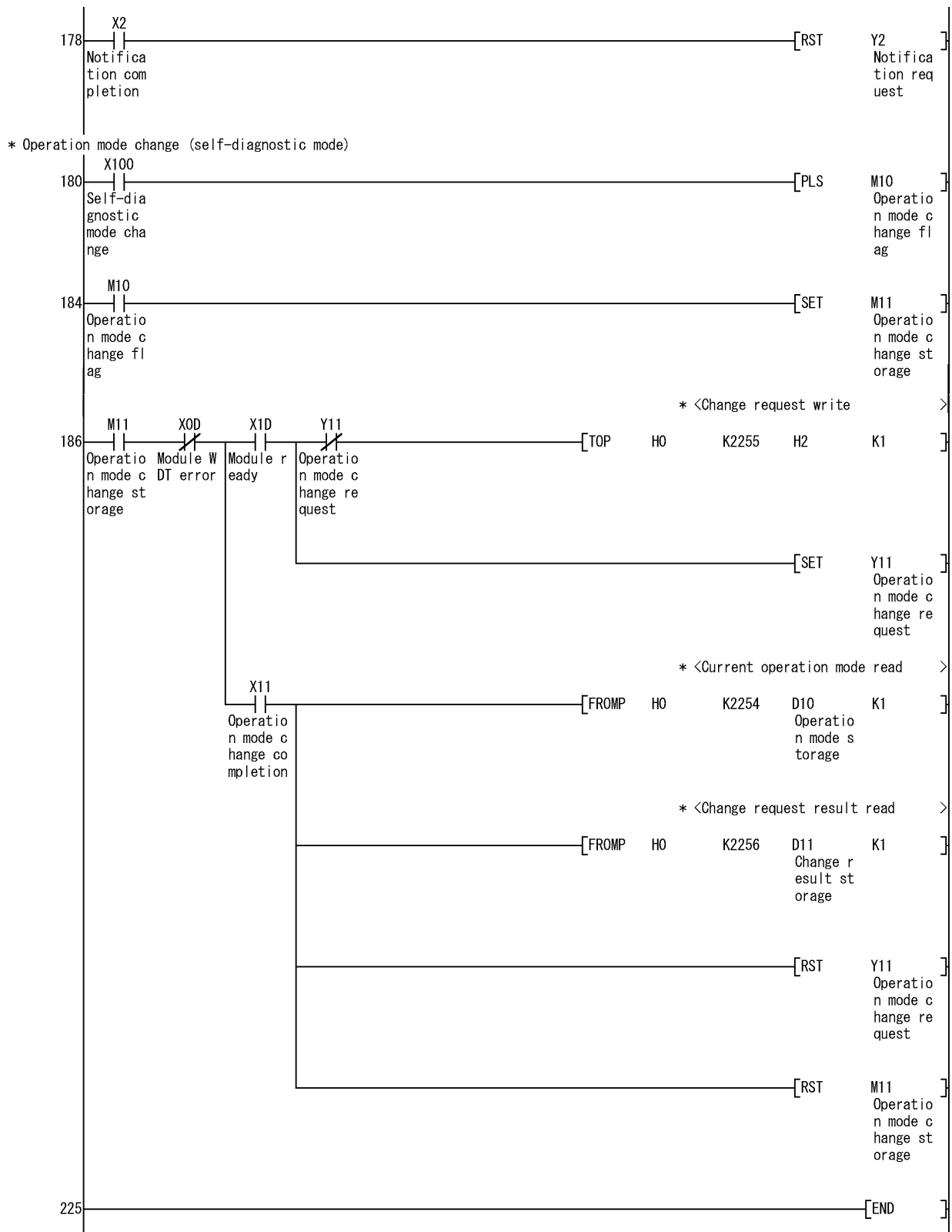
Address	Output receive area	Address	Input send area				
0	Data module 1 (Output, 2 words)	256	Data module 0 (Input, 2 words)				
1		257	(Input, 2 words)				
2		Data module 2 (Input, 4 words)	258	Data module 2 (Input, 4 words)			
3			259				
4			260				
5			261				
6	Data module 3 (Output, 8 words)	262	Free				
7		Free					
8	Free						
9				Free			
10					Free		
191						Free	
447							Free

- Device assignment

X00 to X1F	Y00 to Y1F	A1SJ71PB93D I/O signals
X20 to X3F	—	A1SX41 input signals
—	Y40 to Y5F	A1SY41 output signals
X60 to X7F	Y60 to Y7F	A1S64AD I/O signals
X80 to X9F	Y80 to Y9F	A1S68DA I/O signals
D10		Operation mode storage
D11		Operation mode change result
D20		Error code storage
D100 to D103		Digital-analog conversion values output to A1SD68DA (CH1. to 8)
D200 to D207		Analog-digital conversion values input from A1SD64AD (CH1. to 4)







7.3.2 Split assignment mode

The following is the example of an I/O data communication program for use in the split assignment mode of the data assignment modes in the following configuration.

CPU	A1SJ71 PB93D	A1SX41	A1SY41	A1SH42	A1SY41
-----	-----------------	--------	--------	--------	--------

• Data module setting of A1SJ71PB93D

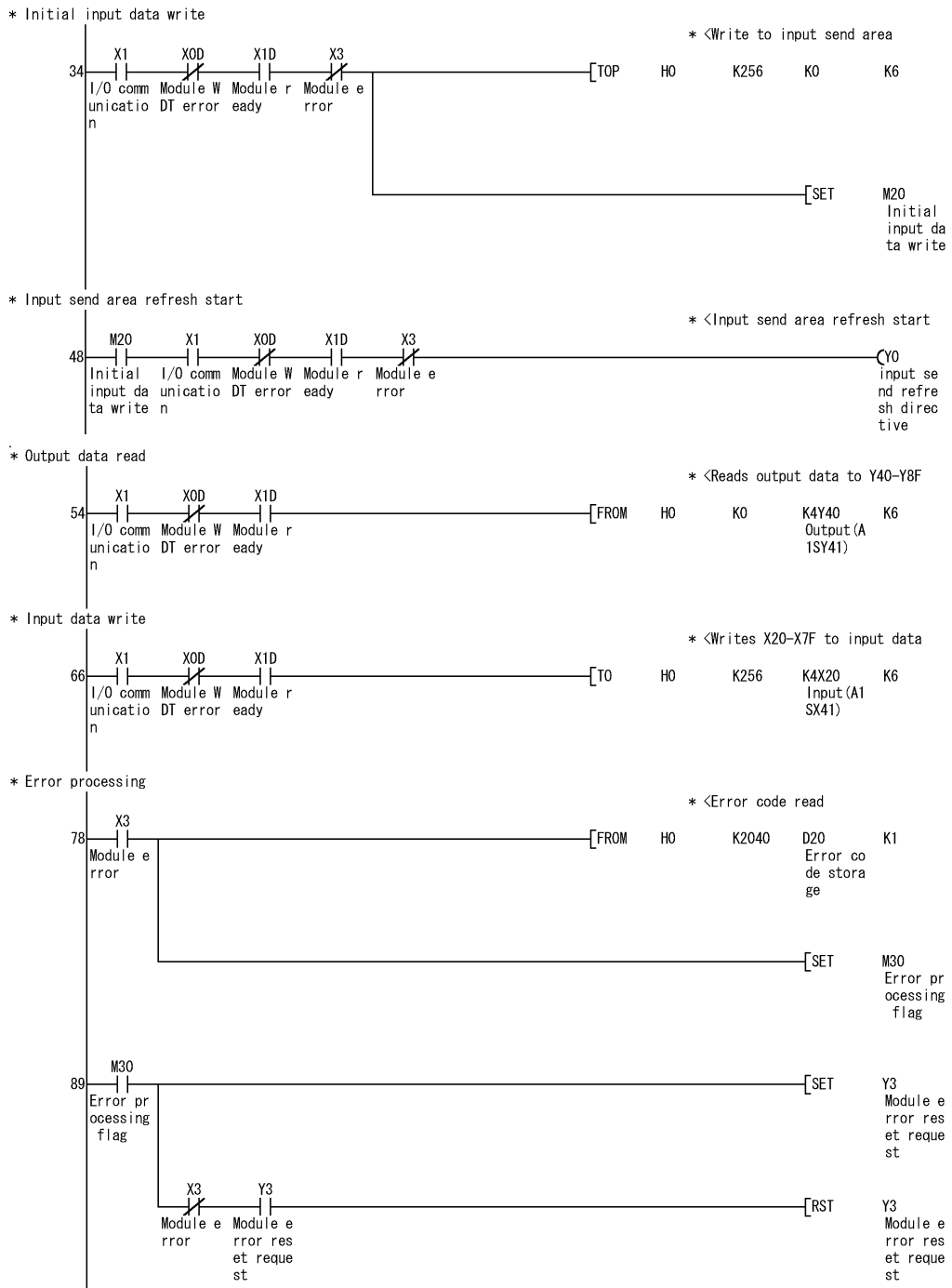
Data module 0	Input, 2 words, word unit
Data module 1	Output, 2 words, word unit
Data module 2	Input/output, 2 words, word unit
Data module 3	Output, 2 words, word unit

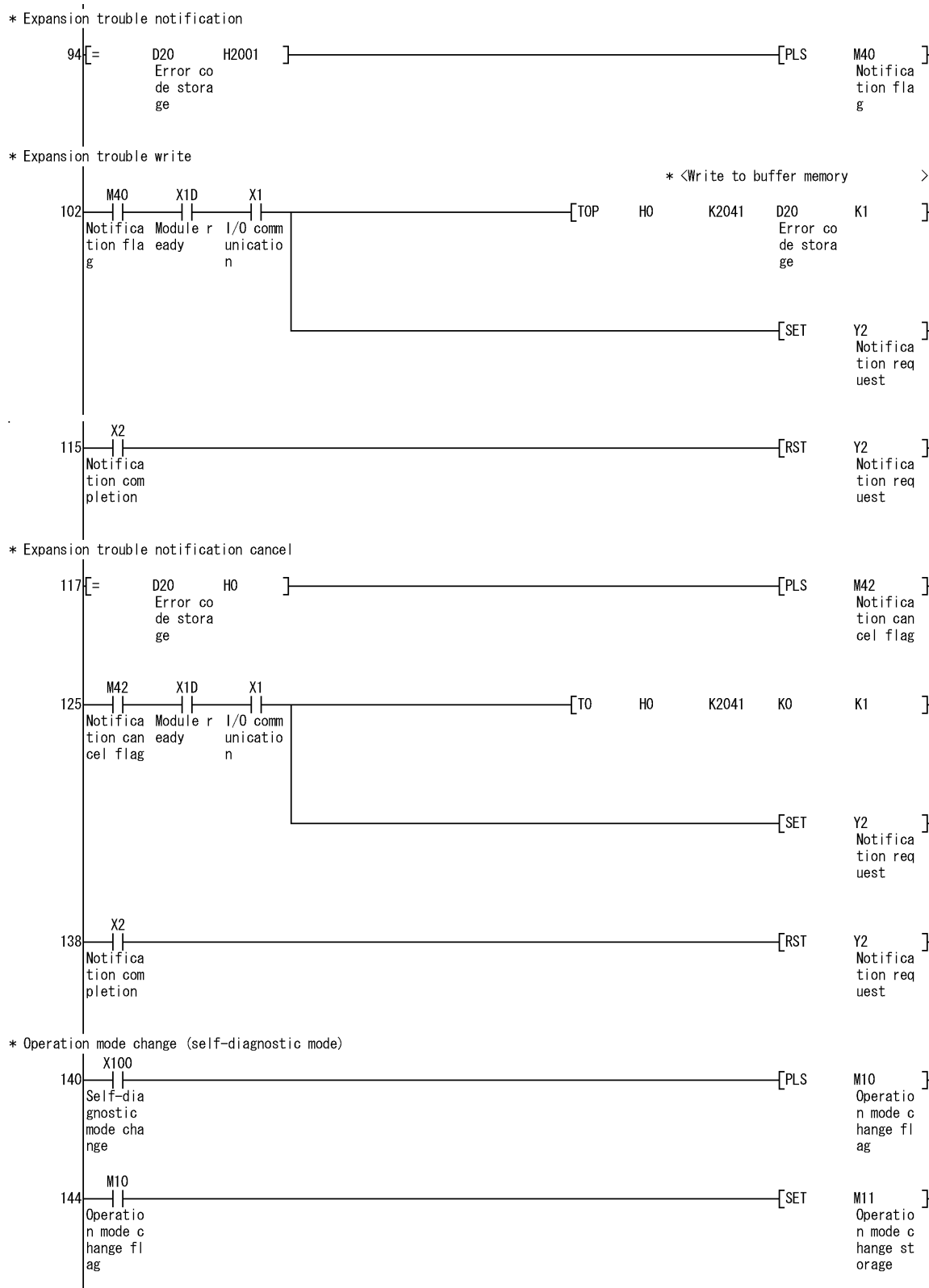
• Used states of A1SJ71PB93D output receive area and input send area

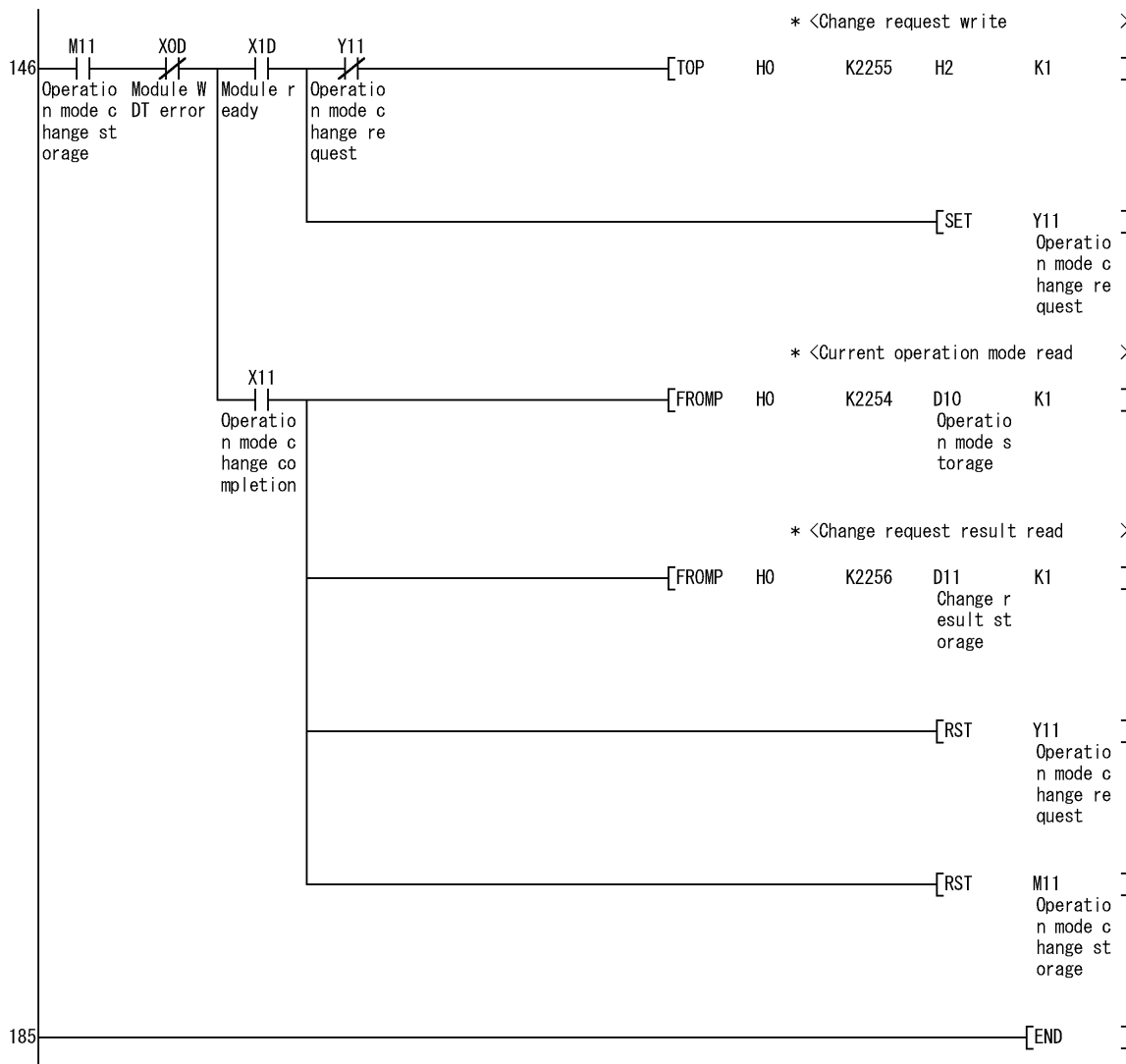
Address	Output receive area	Address	Input send area
0		256	Data module 0
1		257	(Input, 2 words)
2	Data module 1	258	
3	(Output, 2 words)	259	
4	Data module 2	260	Data module 2
5	(Output, 2 words)	261	(Input, 4 words)
6	Data module 3	262	
7	(Output, 2 words)		
8	Free		
9		}	Free
10			
}			
191		447	

• Device assignment

X00 to X1F	Y00 to Y1F	A1SJ71PB93D I/O signals
X20 to X3F	—	A1SX41 input signals
—	Y40 to Y5F	A1SY41 output signals
X60 to X7F	Y60 to Y7F	A1SH42 input/output signals
—	Y80 to Y9F	A1SY41 output signals
D10		Operation mode storage
D11		Operation mode change result
D20		Error code storage

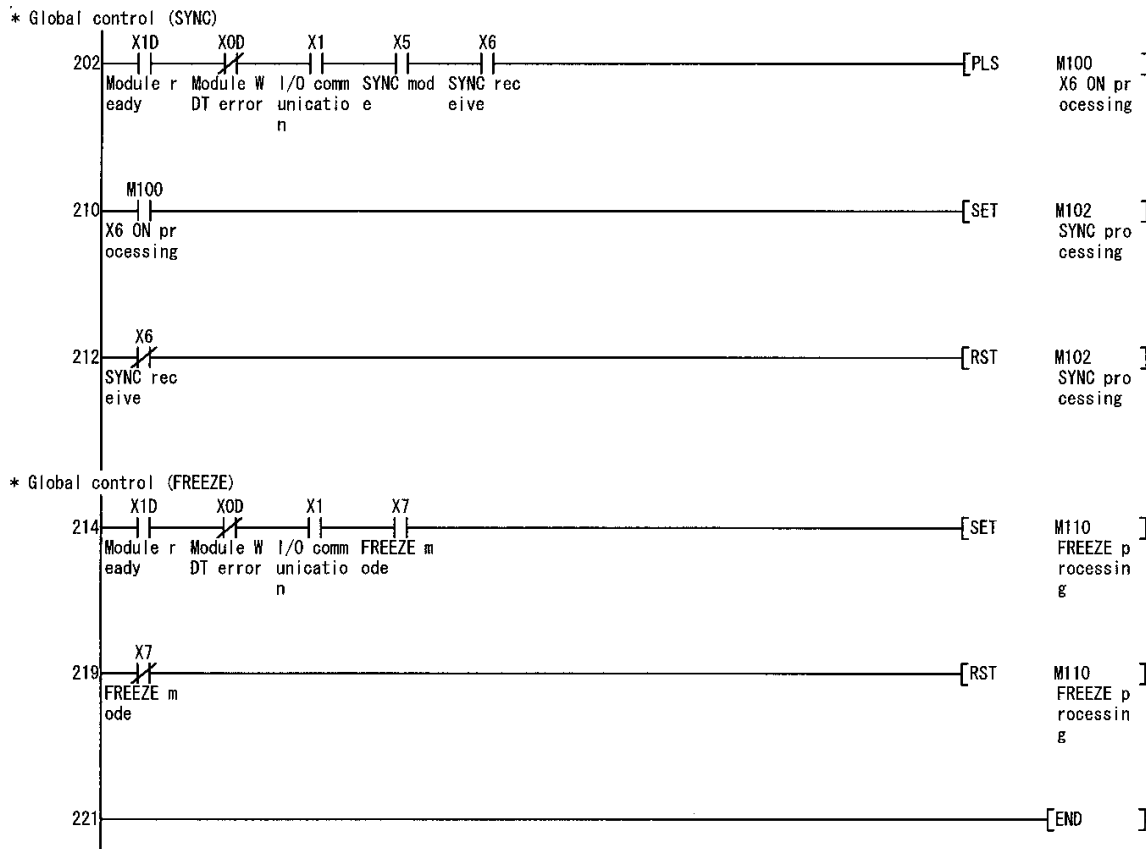






7.4 Global Control-driven Program Execution

The following is the example of a program to be added for program execution triggered by the receipt of global control.



8 Troubleshooting

The following is the troubleshooting of the A1SJ71PB93D.

When any error has occurred, first check the CPU module or power supply module for a fault.

When the CPU module has no fault, refer to Sections 8.1 to 8.4.

8.1 LED-indicated Error Causes and Actions

The following indicates the causes of the errors indicated by the LEDs and the actions to be taken.

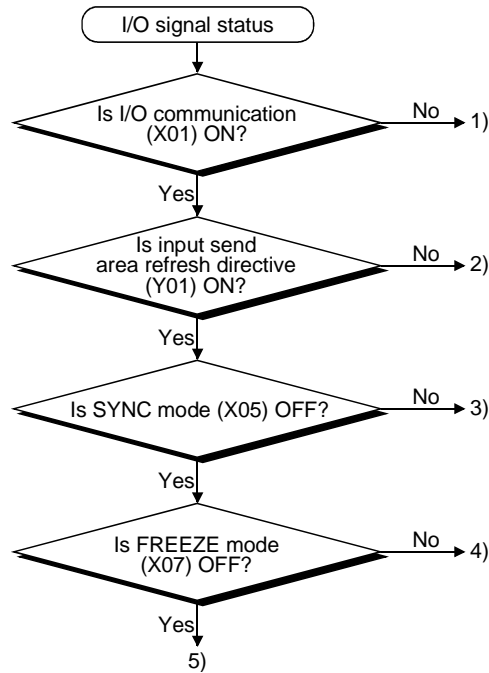
LED	Status	Cause	Action
RUN	Off	WDT error occurred.	Consult the nearest system service or representative.
ERR.	On	Parameter setting error or module error occurred.	Correct the parameter.
BF	On	Communication error was detected or data communication is not yet started.	<ul style="list-style-type: none"> • Check the parameter setting and cable wiring and check for open cable and like. (Refer to Section 8.2) • Start data communication. • Set the station number.

8.2 Checks and Actions for Network-related Faults

Checked Area	Action
Transmission path	Use three or less repeaters to be relayed (refer to Section 3.2).
	Use each segment within the specified length (refer to Section 3.2).
	Install one termination resistor at each end (refer to Section 3.2).
	Use within the specified number of devices connected in each segment (refer to Section 3.2).
	Check the cable wiring and check for open cable.
	Check whether the cables are of Type A or not.
LED	Confirm the error with the on/off status of the LEDs and take the corrective action (refer to Section 8.1).
Module error information area of buffer memory (Buffer memory address: 2040 (7F8H))	Confirm the error with the error code and take the corrective action (refer to Section 8.4).
Master station	Confirm the error of the master station and take the corrective action (refer to the master station manual).

8.3 Causes of Failure to Make Normal Data Communication and Actions to Be Taken

The following I/O signal status flowchart indicates the causes of a failure to make normal data communication and the actions to be taken.



Status	Cause	Action
1) No I/O communication	A communication start request is not given from the master station.	Check the master station. Check the transmission path (refer to Section 8.2).
2) Output data is not sent to master.	The output refresh directive is not given.	Turn on the output refresh directive signal (Y00).
3) Output data is held and data does not change.	In the SYNC mode	Execute the UNSYNC service from the master station.
4) Input data is held and data does not change.	In the FREEZE mode	Execute the UNFREEZE service from the master station.
Data is not communicated to a correct area.	The buffer memory address of the FROM/TO instruction is wrong.	Check the used status of the data modules in the input send area used status (buffer memory address: 2288 to 2299 (8F0H to 8FBH)) and output receive area used status (buffer memory address: 2272 to 2283 (8E0H to 8EBH))*. Check the sequence program.
5) Error does not occur in A1SJ71PB93D when master station becomes faulty.	The communication WDT setting in the parameter is 0.	Check the current setting with the current communication WDT value (buffer memory address: 2257 S(8D1H))*. Set the communication WDT in the master parameter.
Upper and lower bytes of data sent and received are inverse.	The swap setting in the slave parameter of the master station is not appropriate for the data sent/received by the master.	Check the current setting with the swap function setting status (buffer memory address: 2259 (8D3H))*. Set "Yes/No" of swap setting in the master station parameter according to the data sent/received by the master station.

*: Check during I/O communication (when X01 is ON).

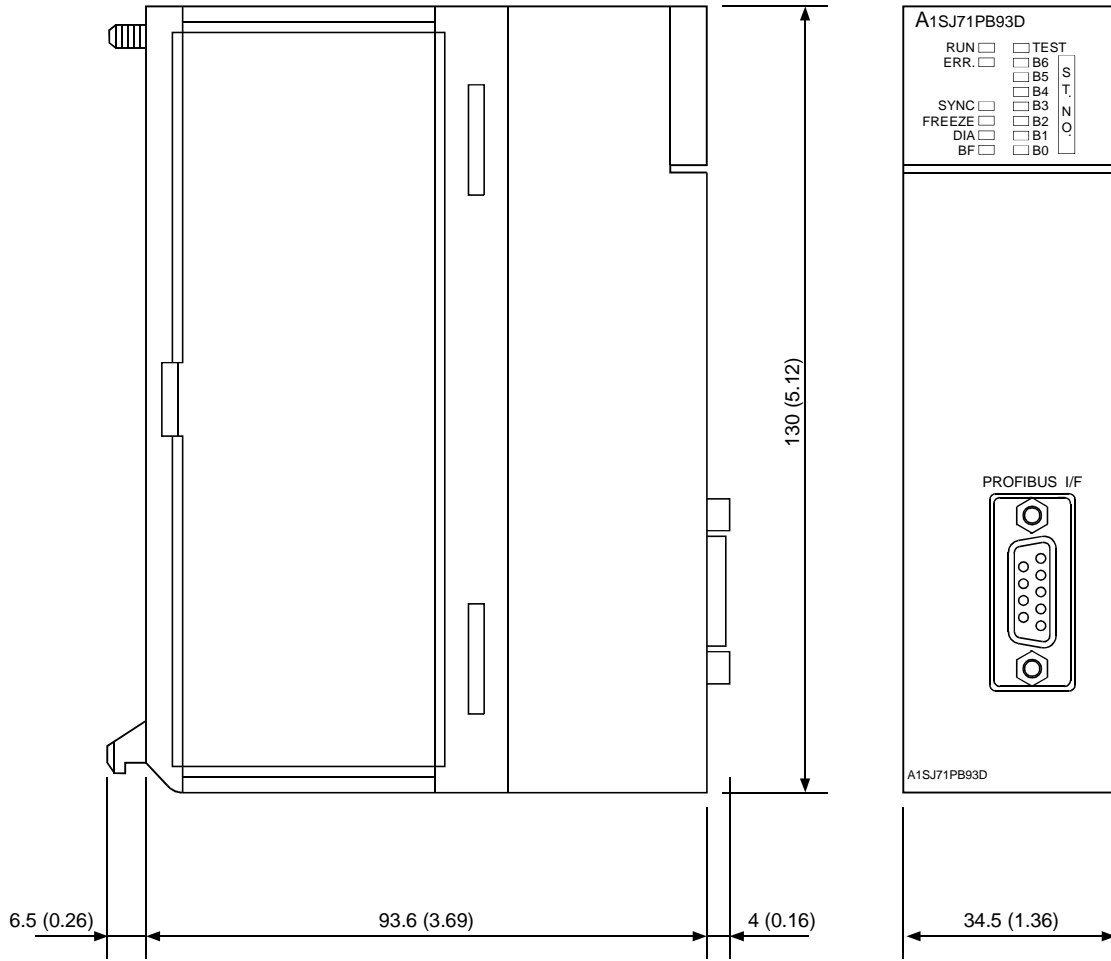
8.4 Error Code List

The following are the error codes of the A1SJ71PB93D.

Any of the error codes is stored into the module error information area (buffer memory address: 2040 (7F8H)) at error occurrence.

Error Code	Error Name	Description	Corrective Action
1001H	Station number error	The station number saved on the flash ROM is outside the range.	Set the station number to within the range again.
1002H		An attempt was made to change the station number to the one outside the range.	Set the station number to within the range.
1006H	Station number rewrite error	A station number setting request was given (Y13 turned on) in the following station number rewrite disabled status. <ul style="list-style-type: none"> • "TRUE" was set for "No_Add_Chg" in the station number setting from the class 2 master station. 	Clear the station number with a station number setting request.
2001H	Station number rewrite count excess error	Station number rewrite to the flash ROM was performed more than 60 times consecutively.	<ul style="list-style-type: none"> • Switch power on again. • Give a station number change request to clear the station number.(refer to Section 3.5.2(6))
2002H	Flash ROM memory access error	Hardware fault	Change the module.
3002H	Illegal receive parameter error	The setting of the communication WDT is too long.	Check the slave parameters of the master station.
3003H		The "Min_Tsdr" value is outside the setting range.	
3006H	Communication chip fault	Hardware fault	Change the module.
3007H	Communication time-out error	Time-out occurred in communication with the master station.	<ul style="list-style-type: none"> • Check the master station status. • Check the cable connection status. • Increase the setting of the communication WDT.
3061H	I/O configuration information error	The data module is not a word type.	Check the slave parameters of the master station.
3062H		The swap setting is outside the range.	
3063H		The data assignment mode setting is outside the range.	
3064H		The data module count setting is outside the range.	
3065H		The data module setting is outside the range.	
3066H		The station number set in the parameter is illegal.	
3067H		In the normal operation mode, the I/O configuration information differs from that of the master parameter.	<ul style="list-style-type: none"> • Check the slave parameter of the master station. • Re-set the A1WJ71PB93D parameter.

Appendix 1 Outline Drawings



Unit : mm (inch)

INDEX

- [A]
- area
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WARRANTY

Please confirm the following product warranty details before starting use.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the dealer or Mitsubishi Service Company. Note that if repairs are required at a site overseas, on a detached island or remote place, expenses to dispatch an engineer shall be charged for.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

- (1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
- (2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
 1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
 2. Failure caused by unapproved modifications, etc., to the product by the user.
 3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
 4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
 5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
 6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
 7. Any other failure found not to be the responsibility of Mitsubishi or the user.

2. Onerous repair term after discontinuation of production

- (1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
- (2) Product supply (including repair parts) is not possible after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of chance loss and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to damages caused by any cause found not to be the responsibility of Mitsubishi, chance losses, lost profits incurred to the user by Failures of Mitsubishi products, damages and secondary damages caused from special reasons regardless of Mitsubishi's expectations, compensation for accidents, and compensation for damages to products other than Mitsubishi products and other duties.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

- (1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.
- (2) The Mitsubishi general-purpose programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or National Defense purposes shall be excluded from the programmable logic controller applications.

Note that even with these applications, if the user approves that the application is to be limited and a special quality is not required, application shall be possible.

When considering use in aircraft, medical applications, railways, incineration and fuel devices, manned transport devices, equipment for recreation and amusement, and safety devices, in which human life or assets could be greatly affected and for which a particularly high reliability is required in terms of safety and control system, please consult with Mitsubishi and discuss the required specifications.

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